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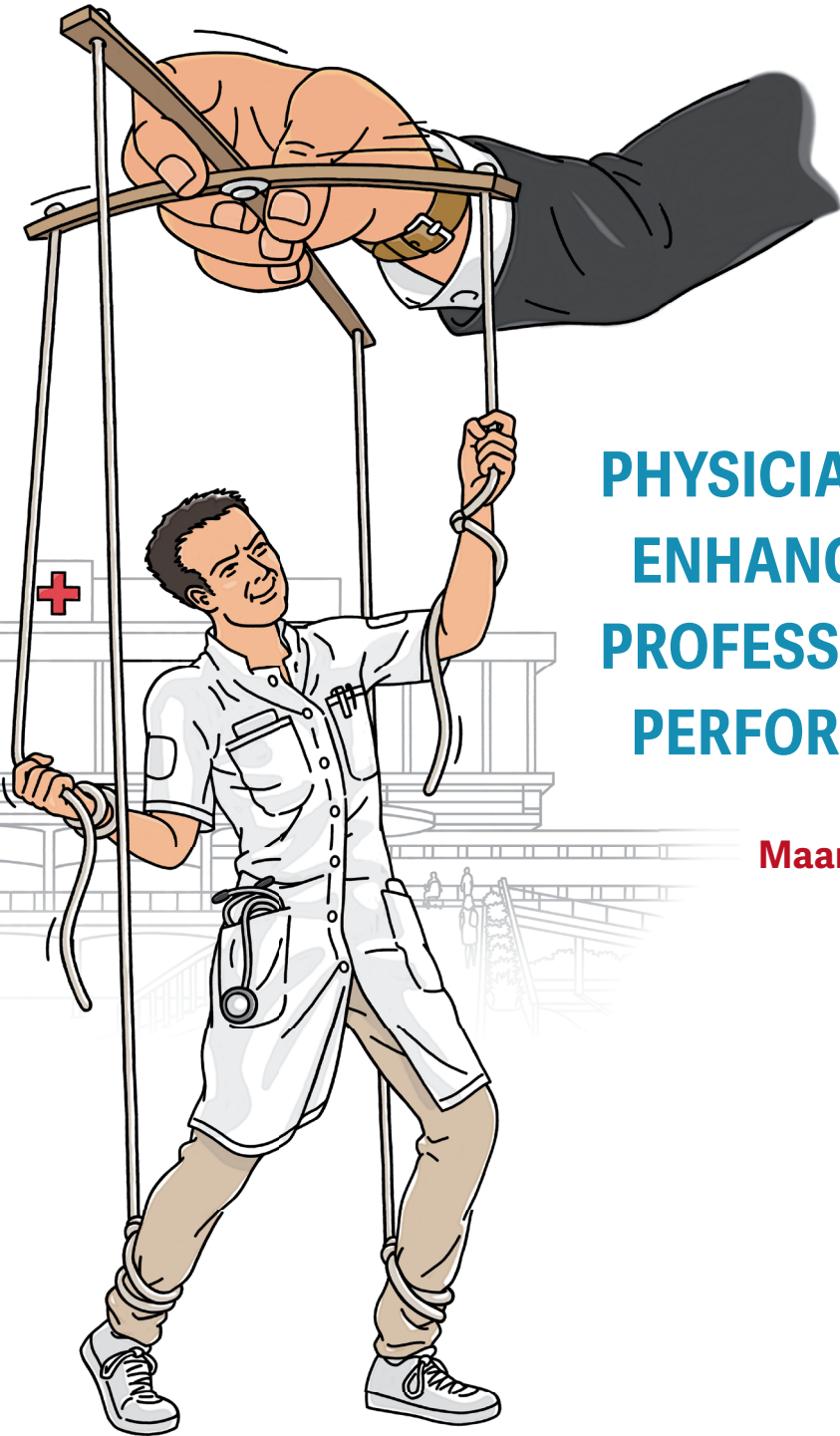
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PHYSICIANS ENHANCING THEIR PROFESSIONAL PERFORMANCE

Maarten Debets

Physicians enhancing their professional performance

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Physicians enhancing their professional performance

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General introduction

In hospital settings, most patients hold their physicians to high standards: they expect their physicians to deliver the highest quality of care. This goes beyond the provision of appropriate diagnostics and treatment options. Patients also expect their physicians to treat them with respect, dignity and compassion. In other words: patients – and society more widely – expect physicians to deliver more than ‘just’ good care; they expect them to deliver excellent *professional performance*.

According to the modern scientific discourse, physicians’ professional performance can be defined as “what physicians are seen to do in practice” [1]. More concretely, physicians’ professional performance results from three core pillars: a constant pursuit of excellence, conducting humanistic practice, and taking accountability for one’s actions [1]. A constant pursuit of excellence pertains to physicians being intrinsically motivated for their work and improvement-oriented, meaning they are committed to engage in science and education to gain and apply medical knowledge. Humanistic practice means that physicians empathize with patients and provide compassionate care. The last element, accountability, refers to the idea that physicians comply with professional values (Hippocratic Oath), guidelines and agreements, as well as participate in quality assessments regularly. To achieve excellent professional performance, and therefore high-quality patient care, physicians must continuously work towards fulfilling these three pillars [1, 2].

These three pillars together form a helpful framework that defines the main components of physicians’ professional performance. However, this framework lacks a detailed break-down of the behaviors and tasks needed to fulfill each pillar. This is because the notion of what is considered excellent professional performance depends on the implicit relationship between the medical profession and society, also called the social contract [3-5]. This so-called social contract includes the obligations and expectations society and physicians have of each other. Therefore, it determines what physicians should focus on and work towards to achieve excellent professional performance. The exact meaning of professional performance is hence context-dependent. An example of this is the societal weight assigned to shared decision-making nowadays versus the more physician-led decision-making that was common – and societally accepted – 50 years ago [6, 7]. Through the social contract, society grants physicians status, respect, autonomy in practice, financial rewards, and the right to self-regulate. In return, physicians are supposed to meet the expectations and obligations as ‘defined’ in the social contract by acting as competent professionals that adequately meet the healthcare needs of individual patients and society at large [4].

In an ideal world, physicians have supporting working environments that enable them to meet the social contract and perform at a high professional standard. However, rising healthcare demands, rapidly occurring medical and technological advancements, and the increasing complexity of healthcare organizations are examples of current developments that challenge physicians' professional performance [2, 8, 9]. Rising healthcare demands, for example, may result in excessive workloads for physicians with high administrative burdens, causing less time for patient contact [10]. These demanding working circumstances can also negatively affect physicians' well-being, which we know can further jeopardize the safety of patient care [10]. Considering these kinds of challenges, it is a given that maintaining or enhancing physicians' professional performance in the current healthcare landscape is complex – for physicians and those outside the profession that aim to support physicians.

Given the many challenges that potentially hinder physicians' professional performance, I consider it important to gain a better understanding of how physicians perceive and manage their professional performance. Such insight might aid physicians and those involved in the profession to enhance physicians' professional performance in contemporary medical practice. In the introduction of my thesis, I will therefore first describe what professional performance encompasses today. I will then address three main challenges for physicians' professional performance that are relevant in the modern healthcare context: the increasing healthcare demands, the need to keep up with medical and technological advancements, and the complexity of healthcare organizations. Then, I will utilize two lenses to look at ways of enhancing physicians' professional performance: the role of physicians' occupational well-being and leadership. I will conclude this introductory chapter with this thesis' overall research aim and question, followed by a description of the research setting, research team and stance, and an outline of the studies I conducted to answer the overall research question.

PROFESSIONAL PERFORMANCE TODAY

One way to determine what physicians' professional performance encompasses today is to look at competency frameworks for medical training, often developed by the medical profession itself. These frameworks are not only used to train medical residents; they are also reflected in licensure and medical specialists' (re)registration requirements and legislation to ensure that attending physicians maintain and enhance their professional performance. Therefore, these frameworks represent the competencies and behaviors needed for realizing high-quality care and hence are expected of the modern physician. While various competency frameworks are employed worldwide [11], I discuss the widely

used Canadian Medical Education Directions for Specialists (CanMEDS) framework for illustrative purposes since this is the leading framework in the Netherlands [12, 13].

The CanMEDS framework outlines seven roles and abilities that physicians need to apply to effectively meet the healthcare needs of patients [13]. At the heart of the framework sits the role of ‘medical expert’, which represents the ability to integrate insights and skills from all roles to provide high-quality care [13]. The other roles represented in the framework are the communicator, collaborator, leader, health advocate, scholar, and professional [13]. Thus, besides applying medical knowledge and clinical skills when providing high-quality patient care (medical expert), physicians are expected to communicate well with patients and their families (communicator), collaborate effectively with patients and other healthcare professionals (collaborator), contribute to the development of a high-quality healthcare system (leader), use their expertise to improve patient populations’ health (health advocate), engage in continuous learning (scholar), and comply with medical professional and ethical standards when caring for patients while safeguarding their well-being (professional).

From the above, it becomes clear that what it means and takes to be a physician in contemporary medical practice has changed considerably from the traditional image of physicians ‘merely’ providing medical care to patients, often free from and protected against the majority of managerial logics and other contextual factors. Hospital physicians nowadays perform various non-clinical tasks next to their clinical duties, including administrative work, managing budgets, and leading quality improvement projects [14, 15]. While many are motivated for such tasks, others are hesitant to perform them because it conflicts with the available time for patient care responsibilities, does not fit their interests, or competencies [14, 15]. Medical training may have insufficiently prepared physicians for their many different roles in the healthcare system, just as today’s hospitals may insufficiently encourage, facilitate and compensate practicing physicians to take on extra tasks and non-clinical responsibilities [5, 8, 16, 17]. Therefore, it is not self-evident that physicians can live up to the contemporary views of professional performance and provide high-quality patient care.

PROFESSIONAL PERFORMANCE UNDER PRESSURE

Several developments within healthcare challenge physicians’ ability to maintain or enhance their professional performance. Although there are numerous of such challenges, I will discuss the three I consider to be most important: dealing with increased

healthcare demands, keeping up with medical and technological advancements, and navigating complex healthcare organizations.

First, in the Netherlands, the average life expectancy and the relative number of elderly in the total population are increasing, a phenomenon known as ‘double aging populations’. In addition, patients more often have co-morbidities which increases the complexity of the care provided [9, 18]. These developments substantially increase healthcare demands and decrease the supply due to reduced personnel capacity [9, 18]. Growing demands weigh on the available resources, meaning physicians need to increasingly use their awareness of available resources when making clinical decisions [9, 19]. This requires ‘new’ skills, such as resource stewardship [20]. Rising healthcare demands and the need to adapt and learn new skills in such a high-pressure context jeopardize physicians’ professional performance.

Second, medical and technological innovations are being developed in a rapid pace, e.g., new medication and treatment options, virtual care, robotics, and artificial intelligence [21, 22]. On the one hand, medical and technological advancements can (and are often meant to) improve the quality of new diagnostics and treatments, physician-patient and physician-physician communication, or streamlining of healthcare processes and tasks [22]. On the other hand, they can also jeopardize physicians’ professional performance. It is time-consuming for physicians to keep up with the rapidly expanding body of knowledge and assess the usefulness of innovations for clinical practice [23, 24]. Physicians need to be trained before using new technologies and may also require specialized training to use new technologies effectively [25, 26]. Considering this training is often lacking, physicians may use new technology incorrectly or not use the technology at all [25, 26]. Furthermore, some technological advancements come with extra data entry time, at the cost of physicians’ time with their patients [10, 27]. Thus, not only is there a risk for error due to limited training or understanding of new developments, but some physicians may also lose motivation due to undesirable job changes, e.g., less patient contact.

Third, healthcare organizations have become more complex. In Western healthcare systems, many hospitals have merged, leading to larger organizations with more diverse organizational cultures, intricate quality controls, and governance structures [8, 28]. As a result, physicians’ professional performance increasingly depends on how organizational systems and processes are arranged [8]. Although physicians require some knowledge about the organization to perform adequately, studies indicate that physicians’ organizational literacy and leadership skills are underdeveloped, potentially leading to sub-optimal professional performance [16]. Collaborating inter-professionally and

harmonizing different working procedures and cultures is a different challenge [8, 29]. Moreover, in these complex working environments, physicians are required to perform administrative tasks, such as providing information for obtaining quality labels or meeting requests from regulators or health insurers, and it is not always clear how these tasks contribute to high-quality patient care. When the purpose of these activities is unclear, physicians may perceive them as hindering patient care as they cost time and effort, reducing their motivation and well-being in their work [30-32]. This is also problematic because it may reduce physicians' willingness to contribute to the organization, e.g., by identifying quality improvement opportunities that help achieve and sustain high-quality patient care.

Clearly, it is challenging for physicians to maintain and enhance their performance. They must find new ways to serve patients best professionally, effectively, and efficiently within the complex context of today's society and healthcare institutions.

Although there are many ways in which physicians might increase their potential for high professional performance, in this thesis, I have chosen to study the construct of physicians' professional performance in hospitals through two specific research lenses: well-being and leadership. I chose these two research lenses because physicians' occupational well-being and leadership qualities are part of a contemporary discussion and essential to their professional performance [10, 33-37]. In the following two sections, I will explain why I think these lenses are relevant, what we already know in terms of research and what the knowledge gaps are.

ENHANCING PROFESSIONAL PERFORMANCE THROUGH THE LENS OF WELL-BEING

Physicians who feel well generally perform better than those who do not [38]. Research has established, for example, that exhausted physicians are more likely to make medical errors than energetic physicians [39-42]. Physicians' occupational well-being, however, is more than merely the absence of exhaustion or the presence of energy. It is a multi-faceted construct, and concepts such as job satisfaction, workaholism, burnout, work engagement, and professional fulfillment can all indicate how well physicians feel in their work [39, 43, 44].

Particular burnout has received ample attention. Studies report alarming burnout levels among physicians – sometimes up to 80% [45] – and show the detrimental effects of physician burnout on patient care and physicians' health [43, 44]. However, there is sub-

stantial variation in the definition of burnout and assessment methods, leading to great diversity in the reported burnout prevalence among physicians [45]. There is an ongoing debate to determine whether burnout actually 'exists' and is distinguishable from mental health issues such as depression [46]. Practicing physicians struggle to adequately diagnose burnout, which complicates finding appropriate solutions and treatments [46]. In the organizational and occupational psychology literature, there is more consensus on the definition and operationalization of burnout. The most widely used definition is that of Maslach, Schaufeli & Leiter; they define burnout as a prolonged response to chronic emotional and interpersonal stressors on the job and more concretely covers three dimensions: exhaustion, cynicism, and inefficacy [47]. The exhaustion component appears to be the core characteristic of burnout. Although researchers have used different assessment methods, they have successfully and consistently reported on the negative relationship between exhaustion and job performance [48, 49]. Therefore, while the concept of burnout may be problematic in clinical terms, studying burnout to enhance physicians' professional performance in the workplace is worthwhile.

The positive counterpart of burnout, work engagement is defined as a fulfilling work-related state of mind characterized by vigor, dedication, and absorption [50]. As such, burnout and work engagement can be seen as two independent constructs that indicate different aspects of the multifaceted construct of work-related well-being. This independence means that reducing burnout does not automatically lead to work engagement. For example, physicians can be devoid of stress and exhaustion and perform well, yet have low energy levels and hardly any enjoyment in their work. Physicians' work engagement has received far less attention than burnout but is also relevant to their professional performance [51, 52].

Well-being and professional performance

Burnout as an indicator of reduced well-being relates negatively to physicians' professional performance. A recent systematic review and meta-analysis showed that physician burnout is positively associated with career disengagement, reduced productivity, and professionals' turnover intentions [53]. Those with higher burnout levels are also more likely to abuse substances, engage in suicidal ideations, and care badly for themselves [54]. Exhausted physicians are also more likely to make medical errors and sub-optimally communicate with patients and colleagues [40, 41, 54]. Therefore, it may not be surprising that physicians who suffer from burnout symptoms provide an overall reduced quality of care [53, 54]. Physicians with high burnout levels are thus not only a threat to themselves but also potentially a danger to patients [42]. Burnout can furthermore incur increased costs for a healthcare system due to the inefficiencies and mistakes physicians suffer [38, 54].

In contrast to burnout, work engagement is a positive well-being indicator [55]. Research shows that work engagement positively relates to various performance outcomes among other populations than physicians [56, 57]. While there is also some evidence among physicians, it is more limited and conflicting. Work-engaged physicians report fewer medical errors and better teamwork than those suffering from high burnout levels [41]. In addition, residents rate the teaching performance of work-engaged supervisors higher than of those who feel less engaged [58]. At the same time, studies could not establish clear associations between physicians' work engagement and patients' satisfaction with care [59] and hospital mortality rates [60].

Predictors of well-being

There are many factors that predict or impact physicians' well-being. Some of the most significant predictors are the physician's personality, personal situation (e.g., young children, informal caregiving), self-care skills, and workplace factors [44, 54, 61]. Since these factors manifest in the personal and organizational realm of physicians, researchers and practitioners emphasize that physicians and organizations have a shared responsibility for enhancing physicians' well-being [61]. So far, however, efforts to improve physicians' well-being have mainly centered around the individual, leading to interventions that primarily address self-care skills and personal resilience rather than workplace factors [34, 62, 63]. Individual-centered interventions aim to offer tools and strategies to individual physicians to help them cope with the demands they face in their workplace. Examples of individual-centered interventions are stress management and mindfulness training. Organization-centered interventions address processes in the workplace that impact employees' job resources and demands. Examples include working hour reductions, streamlining electronic health records, and flexible scheduling. Systematic reviews and meta-analyses show that both intervention types can be effective and are necessary [62, 63]. However, research shows that physicians' resilience is already higher than that of the general working population [64]. Expecting physicians to become even more resilient may therefore be idle hope. Furthermore, organizational-centered interventions are more sustainable solutions than enhancing physicians' self-care skills only as they address the root cause of job demands [34, 62, 63, 65].

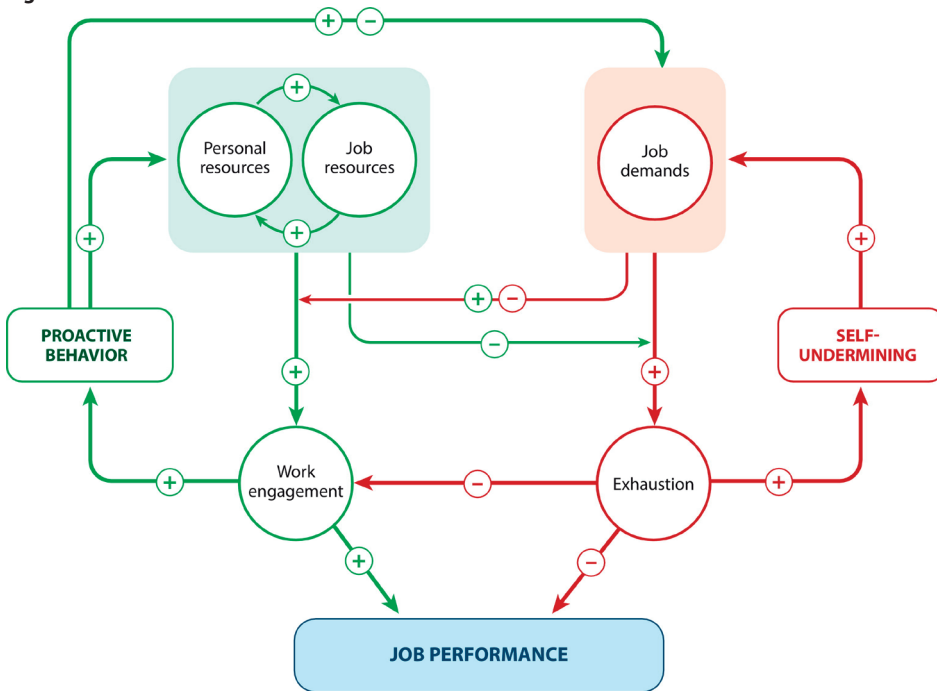
The Job Demands-Resources model (JD-R) was initially introduced to establish relationships between workplace factors and burnout [66]. Later the JD-R model included work engagement and performance outcomes [67]. Nowadays, the propositions of the JD-R framework have been so well-established that researchers speak of JD-R theory, which includes hypotheses about how job demands and resources and physicians' personal resources (e.g., self-efficacy) relate to burnout, work engagement, and performance outcomes [49]. According to JD-R theory, all workplace factors can be classified as a

job demand or resource [49, 67]. Job demands are job aspects that require physical, cognitive, or emotional efforts, such as excessive workloads [49, 67]. Job resources, such as professional development opportunities, assist in coping with job demands, are functional in achieving work goals, and stimulate personal growth [49, 67]. The JD-R model has been validated among physicians in hospitals and other occupational settings [49]. Examples of job demands that have been found to predict physician burnout are excessive workloads, night shifts, administrative work and distractions from patient care, unsupportive leaders and colleagues, and role conflicts [54, 59, 68, 69]. Examples of job resources that have been found to reduce physician burnout or enhance work engagement are learning and development opportunities, participation in decision-making, leadership and colleague support, autonomy in work, and constructive job feedback [54, 59, 68, 69]. Optimizing the balance between job resources and job demands enables excellent professional performance [49, 67].

Enhancing well-being and professional performance

As discussed, physicians' well-being links to their professional performance, and various workplace factors, i.e., job demands and job resources, are important predictors of physicians' well-being. According to JD-R theory, job demands and resources relate to performance via the health impairment and motivational process [49, 67]. The *health impairment process* is triggered when physicians perceive excessive job demands. Without sufficient time to recover, this leads to stress and burnout and, in turn, reduced health and performance. In contrast, the *motivational process* initiates when physicians perceive abundant job resources, leading to higher motivation, work engagement, and enhanced performance. More recent versions of the JD-R model (Figure 1) also include personal resources, such as self-efficacy and optimism, because research shows they moderate the effect of job demands and resources on well-being and performance [49]. Personal resources lead to proactive behaviors that help to obtain more job resources, e.g., feeling comfortable asking for support. Through this pathway personal resources benefit work engagement and reduce the detrimental effects of job demands [49]. Thus, physicians' well-being can be enhanced by reducing job demands and improving job resources as well as personal resources. The propositions of the JD-R model have been used to design interventions to enhance well-being in the workplace [70]. Employing a positive psychology perspective [71], Schaufeli emphasizes that enhancing job resources may be particularly helpful as job resources reduce the adverse effects of job demands and enhance work engagement [70, 72]. Enhancing job resources is especially relevant in patient care settings where job demands cannot be easily reduced.

Figure 1. the JD-R model.



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A recent version of the JD-R model, illustrating how job demands and resources impact job performance via the motivational process (green) and the health impairment process (red).

Knowledge gaps in the well-being literature

Clearly, as just described, researchers have conducted a substantial amount of necessary groundwork to understand the relationships between work environments, physicians’ well-being, and several performance outcomes. Now that this groundwork is available, researchers can address more specific knowledge gaps to surpass the more exploratory nature of research and gain more in-depth knowledge. Here, I identify four knowledge gaps concerning physicians’ well-being that are worthwhile to explore; the obtained insights may inform approaches to enhance physicians’ professional performance.

Knowledge gap 1 pertains to the fact that most research has focused on one ‘negative’ component of physicians’ well-being, namely burnout [53]. Consequently, knowledge of work engagement and other positive well-being indicators such as professional fulfillment, is relatively limited [52, 73]. More specifically it is unclear which factors predict such indicators of well-being and how they relate to physicians’ professional performance [39, 51]. Also, studying both positive and negative well-being indicators

simultaneously may provide insight in how they relate and can be best addressed to enhance physicians' professional performance.

Next, the literature shows substantial variation in the characteristics of working environments [49, 74]. *Knowledge gap 2* addresses how relevant job demands and resources and their impact on performance may vary in different occupational contexts, e.g., acute healthcare settings and outpatient clinics [54, 74]. Validating – and potentially nuancing – previous findings in various healthcare contexts is necessary to contribute to the growing evidence-base supporting the JD-R model and to provide concrete suggestions that will most likely enhance physicians' professional performance in clinical practice.

Knowledge gap 3 concerns the lack of insight into how physicians' perceptions of job demands and resources differ and the consequences this may have for their well-being and professional performance. Researchers found that physicians perceive job demands and resources differently [75] and that there are various manifestations of occupational well-being, or the lack thereof, such as different burnout phenotypes [76]. Physician subgroups defined by their well-being and performance levels in response to specific job demands or resources may benefit from interventions tailored to their perceptions to maintain or enhance their professional performance [76, 77]. To inform the design of more tailored interventions, exploring subgroup differences regarding how physicians perceive their well-being and performance in relation to job demands is a necessary first step. This type of research is especially relevant in situations where physicians' professional performance is particularly at risk, such as during night shifts [77].

Lastly, while there is ample attention to creating healthy working environments, most research has focused on individual-centered interventions rather than organizational-centered interventions [62, 63]. One reason is that until recently burnout has largely been seen as an individual problem; over the last decade views have shifted dramatically and burnout is now widely considered a systems problem [34]. I identify *knowledge gap 4* as the limited information beyond individual-centered well-being interventions for physicians. Insight into physicians' well-being needs and practical experiences on developing and evaluating interventions that address the workplace can inform the development of novel strategies to enhance physicians' well-being and professional performance [78].

In this thesis, I have conducted individual studies to (partly) address these identified knowledge gaps. Table 1 at the end of this chapter provides an overview of the studies and to which knowledge gap(s) they aim to contribute.

ENHANCING PROFESSIONAL PERFORMANCE THROUGH THE LENS OF LEADERSHIP

Before diving into the significance of leadership for professional performance, it is necessary to define physicians' leadership as I use it in this thesis, as the literature provides no universal definition. In this thesis, my view on leadership is based on the 'leader' role described in the CanMEDS framework [13]: "as leaders, physicians engage with others to contribute to a vision of a high-quality healthcare system and take responsibility for the delivery of excellent patient care through their activities as clinicians, administrators, scholars, or teachers" [13]. Professional associations of physicians in the Netherlands stress the importance of medical leadership for the viability of the Dutch healthcare system [79, 80]. To get a better grasp on what it means to be a physician leader, the four key competencies identified for the leader role in the CanMEDS framework are helpful: physician leaders (1) contribute to the improvement of healthcare delivery in teams, organizations, and systems, (2) engage in stewardship of healthcare resources, (3) demonstrate leadership in professional practice, and (4) manage career planning, finances, and human resources for health [13].

In this thesis, I build on contemporary leadership perspectives highlighting leadership is not merely a matter for physicians in formal leadership positions [81, 82]. Rather, all physicians can contribute as leaders, in different ways, depending on their roles and capabilities [83]. Physicians who are hospital CEOs are involved with strategy-making, shaping organizational cultures, and internal and external stakeholder management. Department chairs can and should communicate the hospital's strategic objectives appropriately to the work floor and have an ear for medical professionals' concerns and comments. However, also physicians at the frontline without formal leadership roles can contribute as leaders by speaking up against unprofessional behavior and by identifying improvement opportunities.

Leadership and professional performance

Not only can physicians fulfill various leadership roles, they can also apply different leadership styles. A leadership style is "the relatively consistent pattern of behavior that characterizes a leader" [84]. Researchers have identified numerous leadership styles [84, 85]. There is no one size fits all leadership style; the effectiveness of a particular approach depends on the leader's personality and skills, the competencies of the people they lead, and the situation [85-87]. Studies show that physicians often have a preferred leadership style and do not often adjust their approach to the situation [85, 88]. A broad categorization between transactional and transformational leadership styles can be

made to better understand the various leadership styles presented in research and practice [89].

Transformational leaders are able to create a vision, communicate that vision effectively, and empower and motivate others to work towards achieving that vision [84, 85, 89]. They recognize the potential of the people they lead by intellectually challenging them, serving as mentors, and providing regular performance feedback [84, 85, 89]. In contrast, transactional leaders motivate others through rewards and punishments [84, 85, 89]. Transactional leaders are typically very goal-oriented and provide clear expectations and guidelines to those they lead [84, 85, 89]. Physicians, like other professionals, generally prefer their leaders to show transformational over transactional approaches because they value the opportunity to learn and grow, be challenged intellectually, and have a sense of purpose in their work [85]. Moreover, they are highly skilled and knowledgeable in their respective medical disciplines and transformational leaders tend to tap into that expertise by collaborating and encouraging physicians to contribute to high-quality care. Contrastingly, leaders applying a transactional style may not acknowledge physicians' expertise and can potentially reduce their autonomy through strict rule setting, leading to suboptimal professional performance [31, 85].

Indeed, various studies have shown the benefits of transformational leadership for physicians' well-being, professional performance, and patient outcomes [16]. For example, transformational leadership behaviors facilitate physicians' professional performance, e.g., by offering learning and development opportunities, thereby improving teamwork, safety practices, and continuous improvement [16, 89]. Transformational leadership relates directly and positively to hospital physicians' task performance and indirectly by enhancing their motivation and coping styles [90]. A study in a large hospital found that the transformational leadership qualities of physicians' immediate supervisors correlated positively with job satisfaction and negatively with burnout [91], which respectively relate positively and negatively to physicians' professional performance [51, 53]. Physicians and other healthcare professionals with leaders applying a transformational leadership style report more satisfaction and organizational commitment than followers without such leaders [92]. Organizational commitment predicts extra-role performance, i.e., desirable behaviors not part of the formal job description [93, 94].

At the senior leadership level, leaders influence hospital performance by decision-making on hospital-wide topics and setting the organizational culture. Systematic reviews show that hospitals led by physicians perform better in terms of the quality of care provided while generally not performing worse on resource management and financial performance than hospitals led by CEOs with a background in management or economics

[37, 95]. This difference may be explained in a few ways. First, physician leaders usually have more expertise about medical practice than CEOs from other backgrounds [14, 15]. Second, leaders from within the profession are often seen by the institution's medical faculty as more credible compared to non-peer leaders [14, 15, 31]. Third and last, Sarto and Veronesi reported that physicians usually pay great attention to patients' needs due to ethical beliefs and professional norms [95]. Clearly, medical leadership can also come with specific challenges, such as conflicts between physicians and managers and a lack of leadership and managerial expertise [14, 15]. In short: physician leadership seems beneficial to achieve high-quality care and enable the performance of other physicians, although this is not self-evident.

Enhancing leadership and professional performance

Physicians with adequate leadership competencies are thus essential to enable the professional performance of themselves and the physicians and healthcare professionals they lead. There is ample knowledge about which physician leadership behaviors and styles are desired for achieving high-quality care, but these are currently underdeveloped among many physicians [14, 16, 35, 83]. Fortunately, research shows one can train to become a leader [96]. Therefore, professional bodies worldwide incorporate leadership into medical education competency frameworks, e.g., CanMEDS [36, 97], and most hospitals invest in developing physician leaders [35, 98]. Almost every hospital in countries such as the Netherlands, the United States, and the United Kingdom, offers some form of leadership training to physicians – varying from short one-off lectures or workshops to longitudinal time-intensive leadership development programs that address a portfolio of leadership competencies [35, 96].

Systematic reviews give insight into the effectiveness of these programs and include a wide array of beneficial outcomes [35, 96, 99, 100]. A list of reported outcomes includes enhanced leadership competencies such as communication and administrative decision-making, enhanced leadership confidence, behavioral change, better teamwork, enhanced organizational commitment, increased willingness to lead, attainment of leadership positions, quality improvement skills, the implementation of quality improvement projects, and objectively measured improvement in patient outcomes [35, 96, 99, 100]. However, leadership development programs do not consistently produce these beneficial results due to the heterogeneity of leadership development programs and the organizational contexts in which they have been implemented [35, 100].

Knowledge gaps with regard to leadership

From the above, it is clear that leadership can benefit physicians' professional performance. In this thesis, besides the previously discussed knowledge gaps on well-being, I

identify two additional gaps regarding physician leadership and enhancing physicians' professional performance. *Knowledge gap 5* pertains to the fact that there is limited information about what physicians with a formal leadership role do to enable the professional performance of the people they lead [8, 29]. More specifically, there is a dearth of knowledge on the leadership styles they employ, the activities they undertake, and the instruments they use. For example, it remains unclear how they support physicians' well-being, how they guarantee they have adequate information to monitor physicians' professional performance, or how they prevent or reduce the likelihood of poor performance. Insight into this and what challenges physician leaders encounter might lead to more effective leadership approaches, and ultimately to better patient care.

Knowledge gap 6 has to do with the limited understanding of the working mechanisms by which leadership development programs may impact hospital outcomes (e.g., organizational culture, quality of care, leadership capacity) [35, 100, 101]. Previous research mainly lists the outcomes of leadership development programs for physicians but provides little information on the *how* and *why* of the production of these outcomes [35, 96]. While there is knowledge of the working mechanisms of these programs regarding the development of leadership competencies and enhancing teamwork, knowledge about the pathways by which these programs can impact higher-level hospital outcomes is lacking [35, 100-102]. Providers of these programs can use this information to design or adjust their programs, and more effectively and consistently realize desired hospital outcomes.

In the following sections, before introducing the outline of studies in this thesis that (partly) address the six identified knowledge gaps described above, I describe this thesis's overall aim, research question, the research setting, and research team and stance.

AIM AND RESEARCH QUESTION

Ultimately, this thesis aims to support the consistent manifestation of physicians' high professional performance in their demanding medical work environments. As the developments that cause these demanding working conditions cannot be easily reduced or mitigated, it is worthwhile to look at other ways to support physicians' professional performance. In this introduction, I have illustrated that physicians' well-being and leadership qualities are essential to their professional performance in hospitals in several ways. I recognize and build on the valuable groundwork of research on these topics and address six knowledge gaps that may help advance physicians' professional performance. More specifically, this thesis investigates both negative and positive indicators of physicians' well-being (*Knowledge gap 1*), validates the relationships of job demands

and resources with well-being and professional performance in various Dutch hospital settings (*Knowledge gap 2*), explores how perceptions of night shift work and the subsequent impact on well-being and performance differs for groups of physicians (*Knowledge gap 3*), and provides insight into developing and evaluating a well-being intervention targeting job demands and resources (*Knowledge gap 4*). Concerning leadership, this thesis explores the strategies physician leaders use to support professional performance and achieve high-quality care (*Knowledge gap 5*) as well as the working mechanisms by which leadership development programs for physicians may impact hospital outcomes (*Knowledge gap 6*). Addressing these knowledge gaps on well-being and leadership may contribute to new insights that physicians and others outside the profession can use to support physicians' professional performance and achieve high-quality patient care. Therefore, in this thesis, I will answer the following overall research question:

How do physicians in Dutch hospital settings perceive and enhance their professional performance with regard to well-being and leadership?

RESEARCH SETTING

This thesis focuses on physicians who work in the Dutch hospital setting. Physicians, in this case, refer to attending physicians, called medical specialists in the Netherlands, and their residents, physicians in training to become a medical specialist. There are 32 acknowledged medical disciplines, with postgraduate medical education taking up to six years [103]. Physicians that completed their residency training are registered as medical specialists by the Registration Committee of Medical Specialists (RGS) [104]. As defined by the College of Medical Specialties (CGS), and ratified by the Minister of Health, medical specialists must meet several requirements – e.g., work at least 16 hours per week in your own professional discipline, reflect yearly on your own professional performance and record this in a personal development plan – to maintain their license to practice, which the RGS assesses every five years.

The Federation of Medical Specialists represents 23.000 practicing specialists in hospitals and other institutions in the Netherlands [105]. There are various hospital settings in the Netherlands. The most straightforward division is between academic and non-academic hospitals. There are seven academic hospitals and 61 non-academic hospitals [105]. Due to mergers, the actual number of hospitals declined from 131 in 2000 to 69 in 2023 [106]. Around 5.000 medical specialists work in academic hospitals and 12.500 in non-academic hospitals [105]. In academic hospitals, all medical specialists are employed by the hospital. In non-academic hospitals, medical specialists are self-employed

or employed by the hospital. In non-academic hospitals, about 65% are self-employed, and the hospital employs the other 35% [105]. The number of medical specialists in self-employed practice has declined over the last few years.

Those who provide their services as self-employed physicians primarily work in medical specialist companies (MSCs) [107]. Each MSC consists of multiple professional disciplines and represents its members with a chosen board of peers that collaborates and negotiates with the hospital's administration about various aspects of medical specialist care [107]. Negotiations often include agreements about production norms, the quality of care, and the professional performance of MSC members. Within MSCs, physicians may have more leeway to shape their working environments and enhance professional performance.

RESEARCH TEAM AND STANCE

The studies conducted in this thesis were performed by various multidisciplinary research teams that were established to suit each study's topic and research question. This multidisciplinary approach fits the conceptual nature of physicians' professional performance, well-being, and leadership since they are multifaceted and do not manifest within the boundaries of a single discipline.

The research stance opted for this thesis varies for the individual studies between post-positivists and constructivists research paradigms [108]. The post-positivistic paradigm implies that there is a single truth that we can only partly unravel by measuring it. If findings can be replicated, they provide more certainty about reality. Quantitative research methods and statistical analysis fit best with this paradigm; therefore, a post-positivistic perspective was taken for the quantitative studies in this thesis.

Constructivism suggests there is no single truth, and knowledge is construed in interactions between participants and participants and researchers. Therefore, this paradigm seeks to understand the phenomena under study from participant experiences. Qualitative research methods such as interviews and focus groups are suited for this. Hence, the qualitative studies in this thesis were designed from a constructivist research paradigm.

OUTLINE OF STUDIES

This thesis comprises seven studies to investigate how physicians in Dutch hospital settings perceive and enhance their professional performance with regard to well-being and leadership. Six are empirical studies, and one is a review. Table 1 provides an overview of the individual studies, the research questions, study designs, settings and samples, and addressed knowledge gaps. The studies are presented in individual chapters of which a brief description is as follows:

Enhancing professional performance through the lens of well-being

- **Chapter 2** details the relationships of job demand and resources with burnout and work engagement and physicians' work ability. This observational study uses a structural equation modelling analysis to investigate whether work engagement and burnout mediate the effect of these workplace factors with physicians' work ability.
- **Chapter 3** describes the relationship between physicians' self-kindness and professional fulfillment. More specifically, this observational study investigates whether work-life balance and personal resilience mediate this relationship by employing a parallel mediation analysis.
- **Chapter 4** zooms in on a vital aspect of physicians' professional performance and fulfillment: being able to provide care with compassion. This qualitative interview study investigates and compares what compassionate care means for physicians and patients as well as which workplace factors may hinder and enable physicians to deliver compassionate care.
- **Chapter 5** reports on physicians' professional performance and well-being in the context of night shifts. More specifically, by employing latent profile analysis, this observational study investigates whether (groups of) physicians perceive a different impact of working night shifts on their alertness, contentedness and calmness levels.
- **Chapter 6** reports on developing and evaluating a team-based well-being program for physicians. This study uses multiple data sources such as survey results, feedback forms and telephonic interviews to share insights with others that aim to improve physicians well-being.

Enhancing professional performance through the lens of well-being

- **Chapter 7** describes a qualitative focus group study among physician boards of MSCs. It explores what strategies MSCs use to enhance physician members' professional performance and achieve high-quality care. It also reports what challenges they encounter when executing these strategies.
- **Chapter 8** presents a realist review investigating how, why, and under which circumstances leadership development programs for physicians can impact hospital outcomes.

Table 1. Overview of studies

Ch.	Research question(s)	Data source	Design	Setting	Sample	KG*
2	To what extent does work engagement mediate the relationships of job resources with work ability, and to what extent does burnout mediate the relationships of job demands and resources with work ability?	Surveys	Multicenter observational study, structural equation modelling	Academic and non-academic hospitals	Attending physicians (n=385), multiple professional disciplines	1,2
3	To what extent 1) is cardiologists' self-kindness related to their professional fulfillment? and 2) is this relationship mediated by personal resilience and work-home interference?	Surveys	Multicenter observational study, multiple mediation analysis	Academic and non-academic hospitals	Attending physicians (n=374), cardiologists	1,2
4	What are experiences of patients and physicians regarding compassionate care?	Semi-structured Interviews	Constructivist qualitative study, template analysis	Academic hospital	Residents (n=10), 1,2 patients (n=8)	1,2
5	What profiles can be identified based on physicians' alertness, contentedness and calmness scores before and after night shifts? Do physicians' profiles and respective alertness, contentedness and calmness scores before the night shift differ significantly from after the night shift and if so, how? Which physicians demographics and night shift circumstances associate with changes in alertness, contentedness and calmness?	Surveys pre / post	Multicenter observational study, latent profile analysis	Academic and non-academic hospitals	Attending physicians and residents (n=211), surgeons and gynecologists	3
6	To report on developing and piloting a team-based program for physicians to improve their working conditions and well-being.	Surveys, evaluation forms, telephone interviews	Evaluation study	Academic and non-academic hospitals	Attending physicians and residents (n=377) from 48 teams, multiple professional disciplines	2,4
7	What strategies do Medical Specialist Companies use to address physicians' professional performance, and what do they encounter when executing these strategies to achieve high quality and safe care?	Focus groups	Constructivist exploratory qualitative study	Medical Specialist Companies, non-academic hospitals	Eight MSC boards (n=33)	5
8	How, why, and under which circumstances can leadership development programs for physicians impact organization-level outcomes?	Existing documents	Realist review	Various hospital settings internationally	Leadership development programs (n=38)	6

*KG = knowledge gap

REFERENCES

1. Lombarts K. Professional performance van artsen: tussen tijd en technologie. 2016. 20/10 Uitgevers, Rotterdam.
2. Lombarts K. Vertrouwen in de dokter: Professional performance in tijden van verzakelijking, versnelling en verharding. In *Wat is er met de dokter gebeurd?* Bohn Stafleu van Loghum. 2018:133-142.
3. Freidson, E. (2001). *Professionalism: The Third Logic*. Chicago, IL: The University of Chicago Press.
4. Cruess S, Cruess R. Professionalism and medicine's social contract with society. *AMA J Ethics*. 2004;6(4):185-8.
5. Smith R. Why are doctors so unhappy? *BMJ*. 2001;322(7294):1073-4.
6. Hanna B, Fania R, Anne M, Arwen H. Key components of shared decision making models: a systematic review. *BMJ Open*. 2019;9(12):e031763.
7. Stewart M. Effective physician-patient communication and health outcomes: a review. *CMAJ*. 1995;152(9):1423-33.
8. Rothman D, Blumenthal D, Thibault G. Medical Professionalism In An Organizational Age: Challenges And Opportunities. *Health Aff*. 2020;39(1):108-14
9. Sociaal Economische Raad. *Zorg voor de toekomst: Over de toekomstbestendigheid van de zorg*. Verkenning 20/02. Juni 2020.
10. Thomas L, Ripp J, West C. Charter on Physician Well-being. *JAMA*. 2018;319(15):1541-42.
11. Batt A, Tavares W, Williams B. The development of competency frameworks in healthcare professions: a scoping review. *Adv Health Sci Educa*. 2020;25(4):913-87.
12. Frank J, Danoff D. The CanMEDS initiative: implementing an outcomes-based framework of physician competencies. *Med Teach*. 2007;29(7):642-47.
13. CanMEDS Physician Competency Framework [accessed June 2023] (<https://www.royalcollege.ca/content/rcpsc/ca/en/canmeds/about-canmeds.html>).
14. Savage M, Savage C, Brommels M, Mazzocato P. Medical leadership: boon or barrier to organisational performance? A thematic synthesis of the literature. *BMJ Open*. 2020;10(7):e035542.
15. Denis J, Van Gestel N. Medical doctors in healthcare leadership: theoretical and practical challenges. *BMC Health Services Res*. 2016;16:45-56.
16. Blumenthal D, Bernard K, Bohnen J, Bohmer R. Addressing the Leadership Gap in Medicine: Residents' Need for Systematic Leadership Development Training. *Acad Med*. 2012;87(4):513-22.
17. Shanafelt T, Noseworthy J. Executive leadership and physician well-being: nine organizational strategies to promote engagement and reduce burnout. *Mayo Clin Proc*. 2017;92(1):129-46.
18. Longev L. Care for ageing populations globally. *Lancet Healthy Longev*. 2021;2(4):e180.
19. Bodenheimer T. High and rising health care costs. Part 1: seeking an explanation. *Ann Intern Med*. 2005;142(10):847-54.
20. Moleman M, Zuiderent-Jerak T, Lageweg M, Van den Braak G, Schuitmaker-Warnaar T. Doctors as Resource Stewards? Translating High-Value, Cost-Conscious Care to the Consulting Room. *Health Care Anal*. 2022;30(3-4):215-39.
21. Bodenheimer T. High and rising health care costs. Part 2: technologic innovation. *Ann Intern Med*. 2005;142(11):932-37.
22. Bohr A, Memarzadeh K. The rise of artificial intelligence in healthcare applications. *Artif Intell Health Care*. 2020:25-60.
23. Johnston S. Anticipating and training the physician of the future: the importance of caring in an age of artificial intelligence. *Acad Med*. 2018;93(8):1105-06.

24. Sunarti S, Rahman F, Naufal M, Risky M, Febriyanto K, Masnina R. Artificial intelligence in healthcare: opportunities and risk for future. *Gac Sanit.* 2021;35(Supple1):S67-570.
25. Graham-Jones P, Jain S, Friedman C, Marcotte L, Blumenthal D. The need to incorporate health information technology into physicians' education and professional development. *Health Aff.* 2012;31(3):481-87.
26. Inspectie Gezondheidszorg en Jeugd. Convenant medische technologie (2e druk): Veilig toepassing van medische technologie in de medisch specialistische zorg. 2016.
27. Woolhandler S, Himmelstein D. Administrative work consumes one-sixth of US physicians' working hours and lowers their career satisfaction. *Int J Health Serv.* 2014;44(4):635-42.
28. Muhlestein D, Smith N. Physician consolidation: rapid movement from small to large group practices, 2013–15. *Health Aff.* 2016;35(9):1638-42.
29. Scholten G, Van der Grinten T. The integration of medical specialists in hospitals. Dutch hospitals and medical specialists on the road to joint regulation. *Health Policy.* 2005;72(2):165-73.
30. Ogbeiwu O. General concepts of goals and goal-setting in healthcare: A narrative review. *Organ Manag J.* 2018;27(1):1-18.
31. Witman Y, Smid G, Meurs P, Willems D. Doctor in the lead: balancing between two worlds. *Organization.* 2011;18(4):477-95.
32. Trybou J, Gemmel P, Desmidt S, Annemans L. Fulfillment of administrative and professional obligations of hospitals and mission motivation of physicians. *BMC Health Serv Res.* 2017;17:1-10.
33. Jackson S, Sam M, Dawson M, Porter D. The wellbeing pandemic: Outline of a contested terrain and a proposed research agenda. *Front Sociol.* 2022;7:950557.
34. Shanafelt T. Physician well-being 2.0: where are we and where are we going? *Mayo Clin Proc.* 2021;96(10):2682-93.
35. Lyons O, George R, Galante J, Mafi A, Fordwoh T, Frich J, et al. Evidence-based medical leadership development: a systematic review. *BMJ Lead.* 2021;5(3):206-13.
36. Keijser W, Handgraaf H, Isfordink L, Janmaat V, Vergroesen P, Verkade J, et al. Development of a national medical leadership competency framework: the Dutch approach. *BMC Med Educ.* 2019;19(1):1-19.
37. Kaiser F, Schmid A, Schlüchtermann J. Physician-leaders and hospital performance revisited. *Soc Sci Med.* 2020;249:112831.
38. Wallace J, Lemaire J, Ghali W. Physician wellness: a missing quality indicator. *Lancet.* 2009;374(9702):1714-21.
39. Trockel M, Bohman B, Lesure E, Hamidi M, Welle D, Roberts L, et al. A brief instrument to assess both burnout and professional fulfillment in physicians: reliability and validity, including correlation with self-reported medical errors, in a sample of resident and practicing physicians. *Acad Psychiatry.* 2018;42(1):11-24.
40. Shanafelt T, Balch C, Bechamps G, Russell T, Dyrbye L, Satele D, et al. Burnout and medical errors among American surgeons. *Ann Surg.* 2010;251(6):995-1000.
41. Prins J, Van Der Heijden F, Hoekstra-Weebers J, Bakker A, Van de Wiel H, Jacobs B, et al. Burnout, engagement and resident physicians' self-reported errors. *Psychol Health Med.* 2009;14(6):654-66.
42. Abdalla R, Ansari S, Hurley M, Attarian H, Fargen K, Hirsch J, et al. Correlation of call burden and sleep deprivation with physician burnout, driving crashes, and medical errors among US neurointerventionalists. *Am J Neuroradiol.* 2022;43(9):1286-91.
43. Mäkikangas A, Rantanen J, Bakker A, Kinnunen M, Pulkkinen L, Kokko K. The circumplex model of occupational well-being: Its relation with personality. *J Pers Oriented Res.* 2015;1(3):115-129.

44. Bakker, Arnold B., and Wido G.M. Oerlemans, ' Subjective Well-being in Organizations', in Gretchen M. Spreitzer, and Kim S. Cameron (eds), *The Oxford Handbook of Positive Organizational Scholarship*, Oxford Library of Psychology (2011; online edn, Oxford Academic, 21 Nov. 2012),
45. Rotenstein L, Torre M, Ramos M, Rosales R, Guille C, Sen S, et al. Prevalence of burnout among physicians: a systematic review. *JAMA*. 2018;320(11):1131-50.
46. Vinkers C. In de ban van burn-out: over de grenzen van stress. Uitgeverij Prometheus. 2022.
47. Maslach C, Schaufeli W, Leiter M. Job burnout. *Annu Rev Psychol*. 2001;52(1):397-422.
48. Lubbadeh T. Job burnout: A general literature review. *Int Rev Manag Mark*. 2020;10(3):7-12.
49. Bakker A, Demerouti E, Sanz-Vergel A. Job Demands-Resources Theory: Ten Years Later. *Annu Rev organ*. 2022;10(1):25-53.
50. Schaufeli W, Salanova M, González-Romá V, Bakker A. The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *J Happiness stud*. 2002;3:71-92.
51. Scheepers R, Boerebach B, Arah O, Heineman M, Lombarts K. A systematic review of the impact of physicians' occupational well-being on the quality of patient care. *Int J Behav Med*. 2015;22:683-98.
52. Loerbroks A, Glaser J, Vu-Eickmann P, Angerer P. Physician burnout, work engagement and the quality of patient care. *Occup Med*. 2017;67(5):356-62.
53. Hodkinson A, Zhou A, Johnson J, Geraghty K, Riley R, Zhou A, et al. Associations of physician burnout with career engagement and quality of patient care: systematic review and meta-analysis. *BMJ*. 2022;378:e070442.
54. West C, Dyrbye L, Shanafelt T. Physician burnout: contributors, consequences and solutions. *J Intern Med*. 2018;283(6):516-29.
55. Bakker A, Schaufeli W, Leiter M, Taris T. Work engagement: An emerging concept in occupational health psychology. *Work Stress*. 2008;22(3):187-200.
56. Mazzetti G, Robledo E, Vignoli M, Topa G, Guglielmi D, Schaufeli W. Work engagement: A meta-analysis using the job demands-resources model. *Psychol Rep*. 2023;126(3):1069-1107.
57. Kim W, Kolb J, Kim T. The relationship between work engagement and performance: A review of empirical literature and a proposed research agenda. *Hum Resour Dev Rev*. 2013;12(3):248-76.
58. Scheepers R, Arah O, Heineman M, Lombarts K. How personality traits affect clinician-supervisors' work engagement and subsequently their teaching performance in residency training. *Med Teach*. 2016;38(11):1105-11.
59. Scheepers R, Lases L, Arah O, Heineman M, Lombarts K. Job resources, physician work engagement, and patient care experience in an academic medical setting. *Acad Med*. 2017;92(10):1472-79.
60. Teoh K, Hassard J, Cox T. Doctors' working conditions, wellbeing and hospital quality of care: A multilevel analysis. *Safe Sci*. 2021;135:105115.
61. Bohman B, Dyrbye L, Sinsky C, Linzer M, Olson K, Babbott S, et al. Physician well-being: the reciprocity of practice efficiency, culture of wellness, and personal resilience. *NEJM Catalyst*. 2017;3(4).
62. West C, Dyrbye L, Erwin P, Shanafelt T. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet*. 2016;388(10057):2272-81.
63. Panagioti M, Panagopoulou E, Bower P, Lewith G, Kontopantelis E, Chew-Graham C, et al. Controlled interventions to reduce burnout in physicians: a systematic review and meta-analysis. *JAMA Intern Med*. 2017;177(2):195-205.
64. West C, Dyrbye L, Sinsky C, Trockel M, Tutty M, Nedelec L, et al. Resilience and burnout

- among physicians and the general US working population. *JAMA Netw Open*. 2020;3(7):e209385-e.
65. Montgomery A, Panagopoulou E, Esmail A, Richards T, Maslach C. Burnout in health-care: the case for organisational change. *BMJ*. 2019;366:14774.
 66. Demerouti E, Bakker A, Nachreiner F, Schaufeli W. The job demands-resources model of burnout. *J Appl Psychol*. 2001;86(3):499.
 67. Bakker A, Demerouti E. The job demands-resources model: State of the art. *J Manag Psychol*. 2007;22(3):309-28.
 68. Langballe E, Innstrand S, Aasland O, Falkum E. The predictive value of individual factors, work-related factors, and work-home interaction on burnout in female and male physicians: a longitudinal study. *Stress Health*. 2011;27(1):73-85.
 69. Verweij H, Van der Heijden F, Van Hooff M, Prins J, Lagro-Janssen A, Van Ravesteijn H, et al. The contribution of work characteristics, home characteristics and gender to burnout in medical residents. *Adv Health Science Educ Theory Pract*. 2017;22(4):803-18.
 70. Schaufeli W. Applying the job demands-resources model. *Organ Dyn*. 2017;2(46):120-32.
 71. Seligman M, Steen T, Park N, Peterson C. Positive psychology progress: empirical validation of interventions. *Am Psychol*. 2005;60(5):410-21.
 72. Schaufeli W, Salanova M. How to improve work engagement? *Handbook of employee engagement: Perspectives, Issues, Research and Practice*. Edward Elgar Publishing. 2010.
 73. Wee K, Lai A. Work engagement and patient quality of care: a meta-analysis and systematic review. *Med Care Res Rev*. 2022;79(3):345-58.
 74. Shanafelt T, West C, Sinsky C, Trockel M, Tutty M, Wang H, et al. Changes in burnout and satisfaction with work-life integration in physicians and the general US working population between 2011 and 2020. *Mayo Clin Proc*. 2022;97(3):491-506.
 75. Van den Berg J, Verberg C, Berkhout J, Lombarts M, Scherpbier A, Jaarsma A. A qualitative interview study on the positive well-being of medical school faculty in their teaching role: job demands, job resources and role interaction. *BMC Res Notes*. 2015;8:1-11.
 76. Huang R, Hewitt D, Cheung E, Agarwal G, Etkin C, Smink DS, et al. Burnout phenotypes among US general surgery residents. *J Surg Educ*. 2021;78(6):1814-24.
 77. Awan M, Zagales I, McKenney M, Kinslow K, Elkbuli A. ACGME 2011 Duty Hours Restrictions and Their Effects on Surgical Residency Training and Patients Outcomes: A Systematic Review. *J Surg Educ*. 2021;78(6):e35-e46.
 78. Shanafelt T, Trockel M, Ripp J, Murphy M, Sandborg C, Bohman B. Building a program on well-being: key design considerations to meet the unique needs of each organization. *Acad Med*. 2019;94(2):156-61.
 79. Federatie Medisch Specialisten. Medisch Leiderschap in de medische vervolgopleiding. 2016.
 80. Federatie Medisch Specialisten. Visiedocument Medisch Specialist 2025: ambitie, vertrouwen, samenwerken. 2017.
 81. West M, Lyubovnikova J, Eckert R, Denis J. Collective leadership for cultures of high quality health care. *J Organ Eff*. 2014;1(3):240-60.
 82. Janssens S, Simon R, Beckmann M, Marshall S. Shared Leadership in Healthcare Action Teams: A Systematic Review. *J Patient Saf*. 2021;17(8):e1441-e51.
 83. Spurgeon P, Long P, Clark J, Daly F. Do we need medical leadership or medical engagement? *Leadersh Health Serv*. 2015;23(3):173-84.
 84. Nanjundeswaraswamy TS, Swamy D. Leadership styles. *Advanc Manage*. 2014;7(2):57-62.

85. Kibbe M. Leadership Theories and Styles. In: Kibbe M, Chen H. Leadership in Surgery. Springer, Cham. 2019: 27-36.
86. Lin S, Scott B, Matta F. The Dark Side of Transformational Leader Behaviors for Leaders Themselves: A Conservation of Resources Perspective. *Acad Manage J*. 2019;62(5):1556-82.
87. Chen W, Zhang J. Does shared leadership always work? A state-of-the-art review and future prospects. *JWAM*. 2023;15(1):51-66.
88. Slootweg I, Van der Vleuten C, Heineman M, Scherpbier A, Lombarts K. Program directors in their role as leaders of teaching teams in residency training. *Med Teach*. 2014;36(12):1073-9.
89. Bass B, Avolio BJ, Jung D, Berson Y. Predicting unit performance by assessing transformational and transactional leadership. *J Appl Psychol*. 2003;88(2):207-18.
90. Chu H, Qiang B, Zhou J, Qiu X, Yang X, Qiao Z, et al. The impact of transformational leadership on physicians' performance in China: a cross-level mediation model. *Front Psychol*. 2021;12:586475.
91. Shanafelt T, Gorringer G, Menaker R, Storz K, Reeves D, Buskirk S, et al. Impact of organizational leadership on physician burnout and satisfaction. *Mayo Clin Proc*. 2015;90(4):432-40.
92. Hussain M, Khayat R. The impact of transformational leadership on job satisfaction and organisational commitment among hospital staff: A systematic review. *J Healthc Manag*. 2021;23(4):614-30.
93. Allen N, Meyer J. The measurement and antecedents of affective, continuance and normative commitment to the organization. *J Vocat Behav*. 1990;63(1):1-18.
94. Hoff T, Lee D, Prout K. Organizational commitment among physicians: A systematic literature review. *Health Serv Manage Res*. 2021;34(2):99-112.
95. Sarto F, Veronesi G. Clinical leadership and hospital performance: assessing the evidence base. *BMC Health Services Res*. 2016;16:85-97.
96. Frich J, Brewster A, Cherlin E, Bradley E. Leadership development programs for physicians: a systematic review. *J Gen Intern Med*. 2015;30(5):656-74.
97. Matsas B, Goralnick E, Bass M, Barnett E, Nagle B, Sullivan E. Leadership development in US undergraduate medical education: a scoping review of curricular content and competency frameworks. *Acad Med*. 2022;97(6):899-908.
98. Lucas R, Goldman E, Scott A, Dandar V. Leadership development programs at academic health centers: results of a national survey. *Acad Med*. 2018;93(2):229-36.
99. Steinert Y, Naismith L, Mann K. Faculty development initiatives designed to promote leadership in medical education. A BEME systematic review: BEME Guide No. 19. *Med Teach*. 2012;34(6):483-503.
100. Geerts J, Goodall A, Agius S. Evidence-based leadership development for physicians: a systematic literature review. *Soc Sci Med*. 2020;246:112709.
101. Stoller J. Developing physician-leaders: key competencies and available programs. *J Health Adm Educ*. 2008;25(4):307-28.
102. Husebø S, Akerjordet K. Quantitative systematic review of multi-professional teamwork and leadership training to optimize patient outcomes in acute hospital settings. *J Adv Nurs*. 2016;72(12):2980-3000.
103. Federatie Medisch Specialisten. Opbouw van de opleiding [accessed June 2023] (<https://demedischspecialist.nl/medische-ervolgopleidingen/opbouw-van-de-opleiding>).
104. Koninklijke Nederlandse Maatschappij tot bevordering der Geneeskunst. Over de RGS [accessed June 2023] (<https://www.knmg.nl/opleiding-herregistratie-carriere/rgs/over-de-rgs>).
105. Federatie Medisch Specialisten. FAQ over medisch-specialistische zorg [accessed

- June 2023] (<https://demedischspecialist.nl/over-ons/faq-medisch-specialistische-zorg#:~:text=Er%20zijn%20volgens%20de%20Registratiecommissie,specia%20meegerekend%20die%20niet%20praktiseren>).
106. Karadarevic A. Concentratie van ziekenhuiszorg is beter dan fuseren. *Skipr*. 2018.
107. Federatie Medisch Specialisten. MSB [accessed June 2023] (<https://demedischspecialist.nl/themas/thema/msb>).
108. Bunniss S, Kelly D. Research paradigms in medical education research. *Med Educ*. 2010;44(4):358-66.



2

Structural equation modelling analysis on relationships of job demands and resources with work engagement, burnout and work ability: an observational study among physicians in Dutch hospitals

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ABSTRACT

Objective: To investigate to what extent work engagement mediates the relationships of job resources with work ability, and to what extent burnout mediates the relationships of job demands and resources with work ability.

Design: Multicenter observational study.

Setting: Academic and non-academic hospitals in the Netherlands.

Participants: Physicians (n=385) participated in this study.

Primary and secondary outcome measures: We measured work ability with selected items from the validated Questionnaire of Experience and Evaluation of Work 2.0 (QEEW2.0), work engagement with the Utrecht Work Engagement Scale, and burnout with the exhaustion subscale of the Oldenburg Burnout Inventory. The job demand 'workload' and job resources 'development opportunities', 'participation in decision making', 'inspirational leadership', and 'relationships with colleagues' were measured using the QEEW2.0. The job demand 'bureaucratic burden' was measured with the Three Item Red Tape scale. A structural equation model was built to answer our research question.

Results: Work engagement mediated relationships of job resources with physicians' work ability, and burnout mediated relationships of job resources and demands with work ability. Development opportunities ($\beta=0.39$, $SE=0.12$, $p<0.001$), participation in decision making ($\beta=0.18$, $SE=0.08$, $p=0.028$), and relationships with colleagues ($\beta=0.19$, $SE=0.19$, $p=0.002$) were positively related to work engagement. Development opportunities ($\beta=-0.20$, $SE=0.08$, $p=0.004$) was negatively related and workload ($\beta=0.51$, $SE=0.19$, $p<0.001$) was positively related to burnout. Work engagement ($\beta=0.22$, $SE=0.04$, $p<0.001$) was positively related and burnout ($\beta=-0.56$, $SE=0.06$, $p<0.001$) was negatively related to work ability.

Conclusions: Physicians' work engagement and burnout mediated the relationships of various job demands and resources with their work ability. More work-engaged and less burned-out physicians reported better work ability. Hospitals may attenuate excessive workloads and facilitate development opportunities, participation in decision making, and good collegial relationships to enhance physicians' occupational well-being and performance.

INTRODUCTION

In contemporary medical practice, many physicians report a lack of work engagement and experience high levels of burnout [1, 2]. Work engagement is a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption, whereas burnout is defined as a work-related syndrome characterized by exhaustion, cynicism, and inefficacy [3]. Work engagement and burnout are different aspects of physicians' occupational well-being that are negatively related and lead to contrasting outcomes [4, 5]. Physicians' work engagement benefits physician retention and the cost-efficiency and quality of patient care [6-9]. Work-engaged physicians communicate better with patients and colleagues, report fewer medical errors, and show higher levels of work ability [7, 9, 10]. Physicians with high burnout levels, however, are more likely to make medical errors, leave the profession, and their patients report less satisfaction [11, 12]. Therefore, reducing physicians' burnout and enhancing engagement is a top priority for medical professional associations and hospitals [6, 11, 13, 14].

Hospitals can reduce burnout rates and promote work engagement by optimizing working conditions in the organization [11, 15-17]. These working conditions are, based on the evidence-based job demands and resources model (JD-R), categorized into job demands and resources [4, 18]. Job demands are job aspects that require physical, cognitive, or emotional efforts, such as excessive workloads [4, 18]. Job resources, such as development opportunities, assist in coping with job demands, are functional in achieving work goals, and stimulate personal growth [4, 18].

The main premise of the JD-R model is that excessive job demands trigger stress reactions – the health impairment process – whereas having abundant job resources leads to higher motivation and productivity – the motivational process [4, 18]. Hence, excessive job demands lead to burnout and abundant job resources to work engagement. According to the JD-R model, work engagement mediates relationships of job resources with performance outcomes, and burnout does so for job demands. Furthermore, job resources can also directly reduce burnout and thereby mitigate the negative consequences of burnout for performance [19]. In addition, the JD-R model considers that job resources can attenuate the negative consequences of job demands on burnout and job demands can reduce the positive effect of job resources on work engagement [4, 18]. For example, Bakker et al. found that social support from colleagues attenuated the ramifications of excessive workload on burnout (exhaustion) [20]. However, the evidence for these interaction effects is inconsistent [21], while research has systematically provided evidence for the health impairment and motivational process in the JD-R model [18, 19].

As job demands and resources are specific to their context and setting, a needs assessment among physicians in the current setting under study – Dutch hospitals – informed the selection of job demands and resources to be investigated [22]. The importance of the selected job demands (i.e. bureaucratic burden, workload) and resources (development opportunities, participation in decision making, inspirational leadership, relationships with colleagues) for physicians' well-being has been previously demonstrated in the medical setting [10, 11, 17, 23-25]. Despite this, more knowledge of physicians' perceptions of bureaucracy and inspirational leadership is needed. Although researchers report that bureaucracy is a leading cause of physician burnout [26, 27], we are unaware of studies that have investigated physicians' perceptions of bureaucracy in relation to their well-being and performance using the JD-R model. Furthermore, leadership is also important in the medical setting: Shanafelt et al. found that physicians who attribute good leadership qualities to their supervisor report less burnout [28]. However, a meta-analysis could not confirm the positive relationship between engaging leadership and work engagement due to limited studies [29].

Less burned-out and more work-engaged physicians are better able to perform their work [11, 30]. Physicians' ability to perform their work is conceptualized as the coping dimension of work ability [31], i.e. having the physical and mental capacity to manage certain work tasks successfully. Researchers linked impaired work ability with the risk of reduced quality, sickness absence, and early retirement [32]. Job demands have been shown to affect work ability in various settings [32-34]. In particular, high workloads seem to reduce physicians' work ability [32]. Contrastingly, studies indicate that job resources including social relationships and support at work, development opportunities, and autonomy benefit physicians' work ability [33, 34]. Physicians who experience more work engagement report higher scores on work ability [34].

The above shows the evidence base for the JD-R model in various contexts, including healthcare. Previous studies have investigated relationships of job demands and resources with physicians' work engagement or burnout [15, 16, 23, 35] or relationships of work engagement or burnout with performance or work ability [7, 17, 34, 36]. Still, studies using the JDR model and investigating job demands and resources in relation to physicians' well-being and performance in one measurement model are scarce [24]. Furthermore, knowledge about physicians' perceptions of bureaucratic demands and inspirational leadership concerning their well-being and performance is also limited [29]. Lastly, insight into the interaction effects of job demands and resources in specific (medical) contexts is welcome due to inconsistent evidence [21]. Healthcare organizations could use such knowledge to determine which job demands and resources to address to reduce physicians' burnout and enhance their engagement, subsequently,

performance [24]. Therefore, following the JD-R model, this study investigates the relationships of job demands and resources with physicians' work engagement, burnout, and work ability (Figure 1). More specifically, this study answers the research question: to what extent does work engagement mediate the relationships of job resources with work ability, and to what extent does burnout mediate the relationships of job demands and resources with work ability? Investigating the potential interactions of job demands and resources is a sub-aim of this study. The obtained knowledge can inform interventions to improve physicians' working conditions, well-being, and performance.

METHODS

Study setting and population

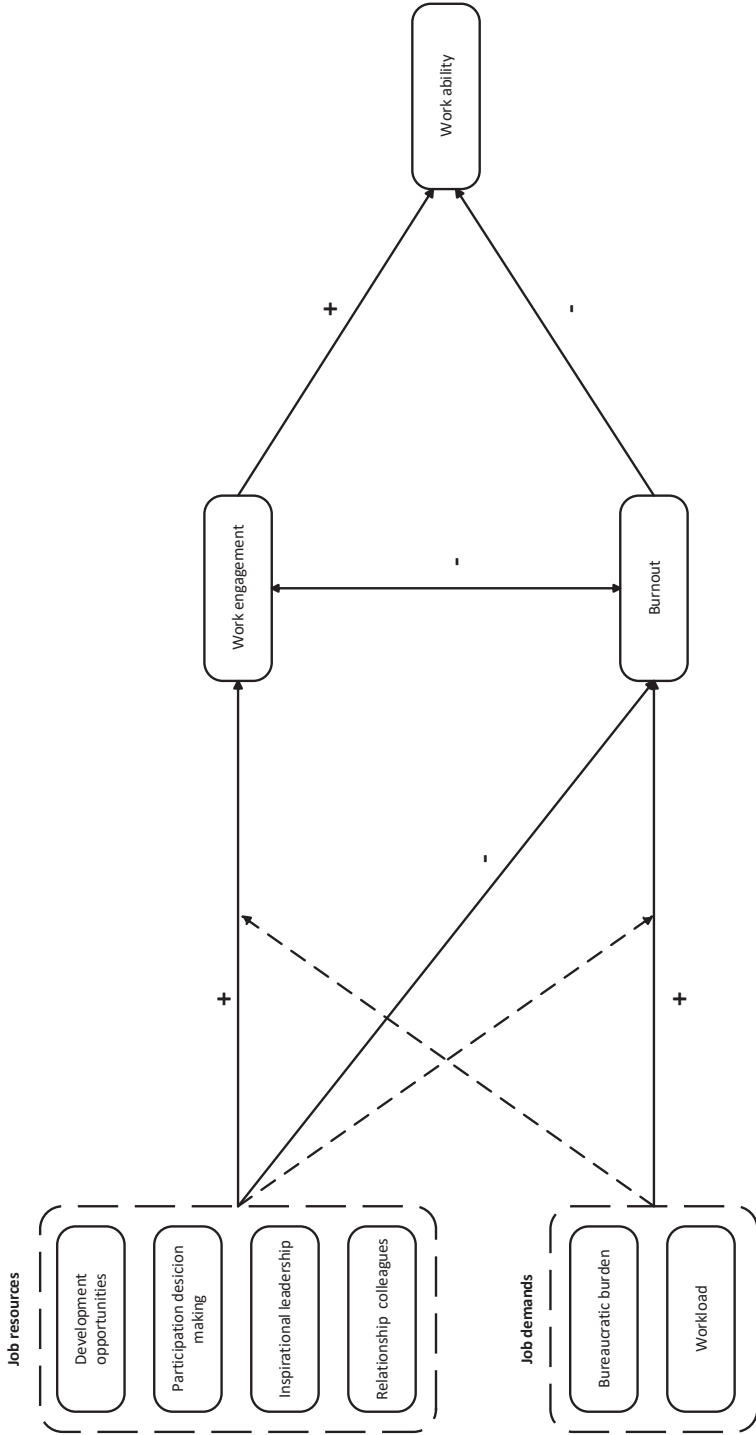
Data from this study were collected from April 2017 to June 2018 in the context of a nationwide well-being program for physicians in 50 clinical departments of 16 Dutch hospitals [22, 37]. In total, 118 residents and 531 medical specialists were invited to participate in the online survey. This study focused on medical specialists only (hereafter physicians). Of the 531 physicians invited, 385 completed the survey (72.5% response rate). Due to the settings of the survey, only complete data was received. Missing data could only occur due to wrong data entry on demographic variables.

Measurements

This study included previously validated measurements of job demands and resources [38, 39], work engagement [40], burnout [41], and work ability [38]. The included job demands and resources were identified via a needs assessment among physicians, which was part of the nationwide well-being program development [22]. In the needs assessment, physicians rated working conditions of interest to be included in the well-being program, hence the online survey to collect data for this study.

Job demands included in this study were workload and bureaucratic burden. Workload was measured using the 6-item scale on workload of the Questionnaire on the Experience and Evaluation of Work 2.0 (QEEW 2.0), with responses ranging from 1 ('never') to 4 ('always') [38]. Bureaucratic demands were measured by the Three Item Red Tape Scale (TIRT), with responses ranging from 1 ('not burdensome') to 5 ('burdensome'), 1 ('necessary') to 5 ('unnecessary'), and 1 ('effective') to 5 ('ineffective') [39]. Two researchers independently translated the English version into Dutch, which another bilingual researcher subsequently back-translated.

Figure 1. Conceptual model.



Notes: Individual job demands and resources are investigated, not all relationships are depicted for clarity reasons; dotted lines represent potential interactions of job demands and resources.

Job resources included development opportunities, participation in decision making, inspirational leadership, and relationships with colleagues, and were measured using the QEEW 2.0 [38]. The development opportunities scale (3 items) and participation in decision making scale (4 items) had response options ranging from 1 ('totally disagree') to 5 ('totally agree'). Responses to the inspirational leadership scale (4 items) and relationship with colleagues scale (5 items) ranged from 1 ('never') to 4 ('always').

Work engagement (9 items) was measured using the Utrecht Work Engagement Scale [40]. An example item is "at my work, I feel bursting with energy". Physicians rated their engagement on a scale from 1 ('Never') to 7 ('Always/Daily').

Burnout was measured by the exhaustion subscale (8 items) of the Oldenburg Burnout Inventory [41]. Exhaustion is considered the core dimension of burnout [15, 42]. Physicians scored items from 1 ('Strongly disagree') to 5 ('Strongly agree'). An example item is "there are days when I feel tired before I arrive at work".

Physicians rated their work ability using eight selected items from the subscales willingness to perform and ability to perform from the QEEW 2.0 16-item work fatigue scale [38]. The item selection shortened the total survey length, considering physicians' limited time, and was made in collaboration with a physician in a formal leadership role. The statement "please indicate which situation applies most to you" was repeated eight times, with different and contrasting response options on a 5-point answer scale, with higher scores indicating a better work ability: 'attention keeps dropping' to 'no problem with attention'; 'difficulty concentrating' to 'no concentration difficulties'; 'difficulty with planning own actions' to 'acting effortlessly'; 'unable to easily do different things in succession' to 'able to transition from one task to another without any problems'; 'taking risks that are actually too great' to 'taking no risks'; 'working on automatic pilot' to 'working with attention'; 'continue working costs the greatest effort' to 'continue working effortlessly'; 'needing to overcome resistance before acting' to 'getting to activity without any problems'.

We also collected data on respondents' sex (male, female), specialty type (surgical, non-surgical, supporting, non-medical), years since completing the first registration as medical specialist (categorical) and hospital type (academic, non-academic), which we included as covariates in the analysis.

Statistical analyses

Missing values were imputed using expectation maximization (EM). Sample characteristics were represented using descriptive statistics. Means, standard deviations and

inter-correlations were calculated to understand the variables under investigation and their mutual relationships. Mean scale scores were computed by averaging the item scores. Before computing scales, confirmatory factor analyses on the items of individual constructs were performed and the contribution of each item to the reliability of the scale was checked, i.e. improvement or deterioration in Cronbach's alpha. Items with factor loadings lower than 0.30 and that affected the scale's reliability negatively were considered for deletion. Due to the low factor loadings and decrease in Cronbach's alpha, one item of the work ability scale was dropped: 'taking risks that are actually too great' to 'taking no risks'. The reliability of all included measurement scales was checked using Cronbach's alpha, with values of ≥ 0.70 considered acceptable [43]. These analyses were performed in IBM SPSS Statistics version 26.

To answer our research question, we build a structural equation model in Lavaan 0.6-9 in R version 3.6.3, following the literature about the JD-R model (Figure 1) [18, 19]. Endogenous variables in our SEM – variables that are changed or determined by its relationships with other variables in the model – were work engagement, burnout and work ability. Exogenous variables – variables not determined by the model – included job demand and resources. The SEM included the relationships of the individual job resources development opportunities, participation in decision making, inspirational leadership and relationships with colleagues on work engagement and burnout. The SEM also included the relationships of the individual job demands bureaucratic burden and workload on burnout. Furthermore, the relationships of work engagement and burnout on work ability were included. Indirect relationships of job demands and resources via burnout or/and work engagement on work ability were calculated.

The SEM was specified in a way that each latent construct had three indicators. This was achieved by item parceling, which can reduce random error, approximate latent constructs better and improve model efficiency, especially in the case of noises (e.g. correlated residuals) and small sample sizes [44]. We applied the radial algorithm for parceling, meaning items with the smallest distance between factor loadings were grouped together by mean averaging [44].

Potential interaction effects were investigated for significant relationships of job demands with burnout and job resources with work engagement. Latent interaction terms were calculated using the double-mean centering approach in the SemTools 0.5-5 package [45].

Covariates were included to the regressions in the structural model if they showed a relationship, i.e. correlation, with the dependent variables under investigation. All co-

variables were coded as binary variables: sex (male, female), hospital type (non-academic, academic), specialty (non-surgical, surgical), type of contract (full-time, part-time), and years since first registration as medical specialist (≤ 10 years, ≥ 11 years).

The assumption of multivariate normality was checked in R using the MVN 5.9 package. As our data did not meet the assumption of multivariate normality, we used maximum likelihood estimation (MLM) with robust standard errors and a Satorra-Bentler scaled test statistic [46]. Model fit was assessed using the following *robust* fit indices [46]: Comparative Fit Index (CFI) and Tucker-Lewis index (TLI) both with values of $\geq .90$ indicating acceptable fit and $\geq .95$ of good fit, Root Mean Square Error of Approximation (RSMEA) $\leq .10$ indicating acceptable fit and <0.06 good fit, and chi-square $p \geq 0.05$ for good fit [47]. The fit indices are presented for the SEM without latent interaction terms as these can strongly influence the fit indices.

Ethical approval

The institutional ethical review board of the Amsterdam UMC provided a waiver declaring the Medical Research Involving Human Subjects Act (WMO) did not apply to the current study (ID XT4-118). All participants gave written informed consent before taking part.

Patient and Public Involvement

Physicians were consulted to inform the choices about the inclusion of job demands and resources in the online survey by means of a needs assessment. One physician with a formal leadership role informed the item selection of the work ability construct. Researchers made the final decision about which job demands and resources to include in the survey and physicians had no role in designing or conducting this study.

RESULTS

Sample characteristics

In total, 385 physicians participated in this study (Table 1). About half was male (50.1%), most worked in a non-surgical specialty (64.7%) and a non-academic hospital (81.3%). Table 2 presents the Cronbach's alpha's, means, standard deviations, and inter-correlations of the variables under investigation. The 26 missing values on 'years since registration' were imputed using EM.

Table 1. Participant characteristics

Characteristics	Valid percent (n = 385)
<i>Sex</i>	
Male	50.1% (n = 193)
Female	49.9% (n = 192)
<i>Year since first registration</i>	
0-5 years	24.0% (n = 86)
6-10 years	26.5% (n = 95)
11-15 years	21.2% (n = 76)
16-21 years	16.2% (n = 58)
22-45 years	12.3% (n = 44)
Missing	n = 26
<i>Specialty type</i>	
Medical	54.0% (n = 208)
Surgical	35.3% (n = 136)
Other	10.7% (n = 41)
<i>Hospital type</i>	
Academic	18.7% (n = 72)
Non-academic	81.3% (n = 313)
<i>Contract type</i>	
Full-time	55.3% (n = 213)
Part-time	44.7% (n = 172)

Structural Equation Model

Figure 2 depicts the results of the SEM. The robust model fit statistics were as follows: chi-square = 722.203, $df=372$, $p<0.001$ (Satorra-Bentler correction 1.068); CFI=0.933; TLI=0.922; RMSEA=0.051, $p=.562$, 90% CI, 0.046 to 0.057, indicating acceptable model fit. Here we present standardized coefficients. The SEM model specifications and comprehensive output including unstandardized coefficients is presented in the supplementary materials.

The analysis showed that the job resources 'development opportunities' ($\beta=0.39$, $SE=0.12$, $p<0.001$), 'participation in decision making' ($\beta=0.18$, $SE=0.08$, $p=0.028$), and 'relationships with colleagues' ($\beta=0.19$, $SE=0.19$, $p=0.002$) were positively related to work engagement. Development opportunities ($\beta=-0.20$, $SE=0.08$, $p=0.004$) was negatively related and the job demand 'workload' was positively to burnout ($\beta=0.51$, $SE=0.19$, $p<0.001$). The job demand 'bureaucratic burden' moderated the relationship of relationships with colleagues and work engagement ($\beta=-0.10$, $SE=0.15$, $p=0.015$). Workload moderated the relationship between participation in decision making and work engagement ($\beta=-0.15$, $SE=0.10$, $p=0.005$).

Table 2. Cronbach's alpha's means, standard deviations and inter-correlations of the main variables

Variable†	Cronbach's alpha	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Development opportunities	0.83	4.08 (0.69)	-												
2. Participation decision making	0.83	3.62 (0.77)	0.44**	-											
3. Inspirational leadership	0.92	2.56 (0.84)	0.31**	0.41**	-										
4. Relationships colleagues	0.76	3.38 (0.48)	0.26**	0.36**	0.29**	-									
5. Bureaucratic burden	0.76	3.14 (0.75)	-0.20**	-0.36**	-0.22**	-0.20**	-								
6. Workload	0.79	2.88 (0.52)	-0.05	-0.32**	-0.14**	-0.16**	0.15**	-							
7. Work engagement	0.90	5.35 (0.85)	0.45**	0.39**	0.28**	0.30**	-0.22**	-0.24**	-						
8. Burnout	0.88	2.69 (0.75)	-0.31**	-0.43**	-0.27**	-0.29**	0.24**	0.56**	-0.54**	-					
9. Work ability	0.85	3.81 (0.63)	0.25**	0.30**	0.18**	0.22**	-0.18**	-0.38**	0.46**	-0.63**	-				
10. Sex	n/a	n/a	0.03	-0.12*	0.00	0.06	-0.05	0.22**	-0.02	0.21**	-0.15**	-			
11. Years since first registration	n/a	n/a	-0.18**	-0.02	-0.13*	-0.19**	0.02	-0.12*	-0.02	-0.09	0.15**	-0.19**	-		
12. Speciality type	n/a	n/a	0.02	-0.08	-0.06	-0.06	0.08	0.18**	0.08	0.09	0.02	-0.04	0.00	-	
13. Hospital type	n/a	n/a	0.04	-0.15**	0.00	-0.05	0.16**	0.12*	0.07	0.02	-0.05	0.08	0.19**	-	
14. Contract type	n/a	n/a	0.09	-0.06	0.12*	0.17*	-0.03	0.15**	-0.07	0.17**	-0.16**	0.51**	-0.22**	-0.10	0.05

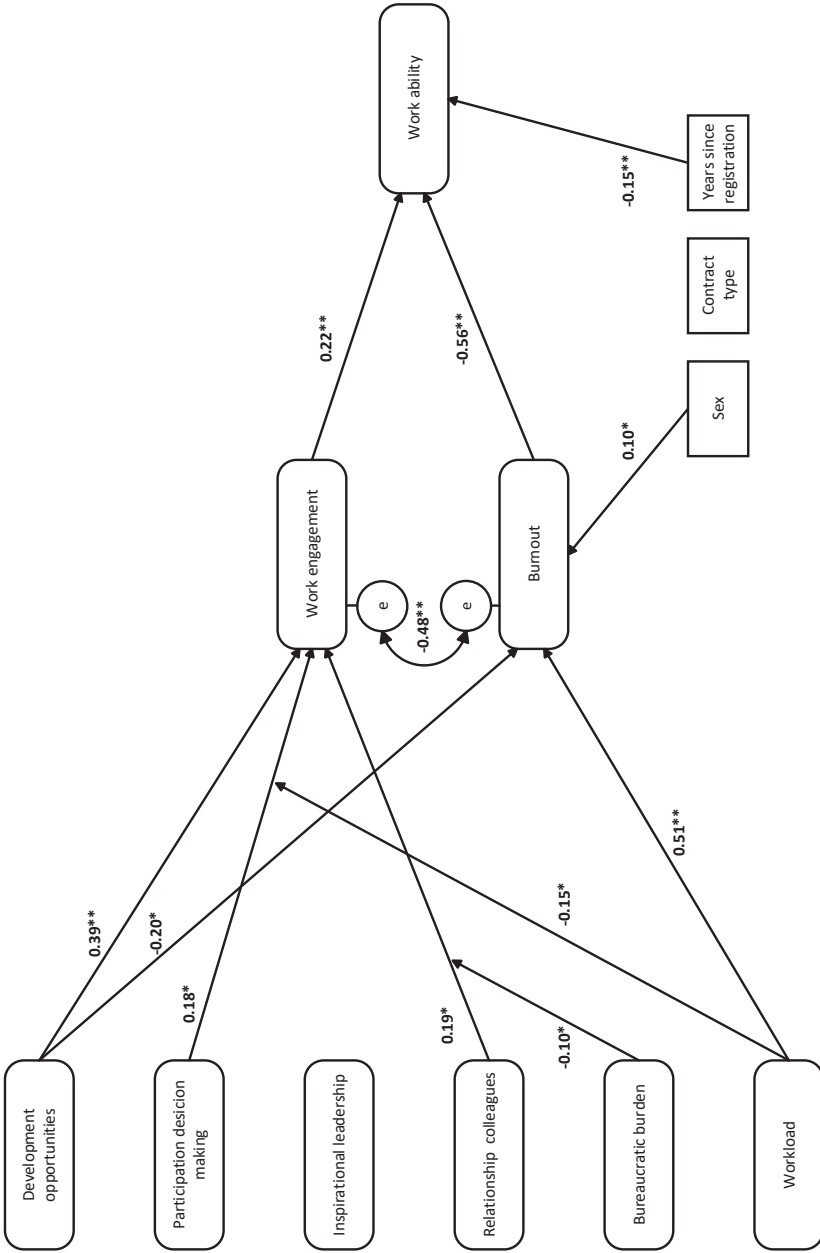
* Correlation is significant at the p<.05 level (2-tailed).

** Correlation is significant at the p<.01 level (2-tailed).

† Answer scales 1. (1-5), 2. (1-5), 3. (1-4), 4. (1-4), 5. (1-5), 6. (1-4), 7. (1-7), 8. (1-5), 9. (1-5), 10. (0=male, 1=female), 11. (0= \leq 10 years, 1= \geq 11 years), 12. (0=non-surgical, 1=surgical), 13. (0=non-academic, 1=academic), 14. (0= full-time, 1=part-time).

Notes: non-parametric correlations were calculated for variables 11 to 14; correlation coefficients were rounded to two decimal places.

Figure 2. Structural model.



Notes: n=385; **p≤.001, *p < .05; standardized coefficients are displayed; measurement model and covariance between exogenous variables are not displayed.

Work engagement mediated the relationships of development opportunities (indirect effect (IE), $\beta=0.08$, $SE=0.03$, $p=0.005$) and relationships with colleagues (IE, $\beta=0.04$, $SE=0.04$, $p=0.021$) with work ability. The indirect effect of participation in decision making (IE, $\beta=0.04$, $SE=0.01$, $p=0.061$) on work ability through work engagement was not significant. Burnout mediated the relationships of development opportunities (IE, $\beta=0.11$, $SE=0.04$, $p=0.007$) and workload (IE, $\beta=-0.29$, $SE=0.06$, $p<0.001$) with work ability. Work engagement ($\beta=0.22$, $SE=0.04$, $p<0.001$) was positively related and burnout ($\beta=-0.56$, $SE=0.06$, $p<0.001$) was negatively related to work ability. Finally, the job resource 'inspirational leadership' did not relate to physicians' work engagement, burnout or work ability.

DISCUSSION

Main findings

Physicians reporting more job demands in terms of higher workloads and insufficient job resources in terms of development opportunities felt more burned out and less able to perform their work tasks. On the other hand, physicians who experienced sufficient job resources in terms of development opportunities, abilities to participate in decision making, and positive relationships with colleagues reported higher work engagement levels. Work-engaged physicians reported higher work ability levels than those burned-out. Work engagement mediated the relationships of development opportunities and relationships with colleagues with work ability. Burnout mediated the relationship of development opportunities and workload with work ability.

Explanation of findings

This study provides more evidence for the health impairment and motivational process proposed by the JD-R model [4, 18, 19]. Our results confirm the importance of development resources (participation in decision making) in comparison to social resources (relationships with colleagues) or more general job resources (participation in decision making) [29]. Furthermore, the findings that high workloads and excessive bureaucratic burdens reduced the positive relationships of 'participation in decision making' and 'relationships with colleagues' with physicians' work engagement contribute to the inconsistent literature about interaction effects [21].

Workload was a substantial job demand negatively relating to physicians' burnout and work ability. It seems that an early outcome of heavy workloads is physicians' perception of distress. When distress endures, it makes the work less pleasant and exhausts physicians' resources to cope with job demands, leading to reduced work ability [4, 18].

Under high workloads, physicians' work engagement benefitted less from being able to participate in decisions making, e.g., influencing scheduling and the division of tasks. Under such circumstances, they might be hindered in influencing decisions in a way that benefits their work engagement. For example, being able to influence scheduling is of less help when the only choice is between non-preferred options due to high workloads. In addition, physicians might rather prefer to spend time on patients than participating in decision making in the face of high workloads [48]. Meta-analyses on interventions to improve physicians' well-being show that organizational strategies to alleviate workloads substantially reduce physicians' burnout [49, 50]. However, reducing workloads might be challenging due to increasing patient care volumes and responsibilities to safeguard the continuity of care.

Rather than reducing job demands, enhancing job resources is an alternative strategy to improve physicians' work engagement and reduce burnout [49, 50]. Based on our results, enhancing physicians' professional development opportunities, ability to participate in decision making, and relationships with colleagues seem instrumental to improving physicians' occupational well-being and work ability, matching previous studies [15, 17, 33, 34].

In contrast with expectations based on the literature [11, 51-55], this study did not find a relationship between bureaucratic burden and physicians' burnout. It could be that some bureaucracy assists physicians' in their professional performance. Bureaucracy is concerned with standardizing and centralizing decision-making, formal policies, and procedures to make healthcare more reliable, accessible, and cost-effective [55]. One study found that some bureaucracy contributed to the job satisfaction of long-term care staff because it is crucial for the smooth functioning of the organization [56]. Accordingly, we observed that physicians reported some usefulness of the policies and procedures they experienced, which might explain the absent relation between bureaucratic burden and burnout. However, following the literature about challenging and hindering job demands [57], when bureaucracy hinders physicians in task fulfillment, it becomes detrimental to their occupational well-being.

While we did not observe a direct relationship between bureaucratic burden and physicians' burnout, bureaucracy was indirectly and negatively related to physicians' work engagement. Under excessive bureaucracy, good collegial relationships seem less beneficial to physicians' work engagement. One potential explanation is that colleagues' efforts to help and support are less effective in the context of excessive bureaucracy. A meta-analysis found that bureaucracy negatively related to communication between employees and reduced perceptions of organizational support [58].

Furthermore, this study did not find a relationship between inspirational leadership and physicians' work engagement and burnout. It is often assumed that leadership at strategic and operational levels is crucial for physicians' well-being. Leaders can shape general working conditions and organizational cultures, and inspire their followers [6, 11, 59]. This study measured the supervisor's ability to communicate a vision, a sense of work purpose, and make physicians enthusiastic for their work. A previous study found that higher supervisors' leadership scores reduced physicians' likelihood of burnout and increased the possibility of satisfaction [28]. It would be interesting to investigate cultural and contextual differences in physicians' leadership preferences and needs. Perhaps Dutch medical specialists have other needs than being inspired by their leaders, but future research should confirm such statements.

This study confirms that work engagement and burnout relate to physicians' work ability [32-34]. In particular, physicians with higher burnout reported attentional lapses and struggled with planning and conducting subsequent tasks. The benefits of work engagement are often observable in extra-role behaviors [60], which might explain the stronger relationship of burnout with work ability compared to work engagement. The work ability measurement in this study reflected physicians' physical and mental capacity to manage certain work tasks successfully, predominantly referring to in-role or task performance.

Several studies have linked physicians' burnout symptoms with an increased likelihood of making medical errors [11, 36, 61, 62]; this might be due to decreased work ability [34]. The negative consequences of impaired well-being and work ability may not directly have adverse consequences for patients. Researchers argue that exhausted physicians adopt performance protection strategies to protect their patients by dropping secondary tasks [13]. Still, such strategies can indirectly have adverse consequences for the quality of patient care; a longitudinal study showed that physicians' exhaustion eroded teamwork and thereby patient safety [63].

Strengths and limitations

This study contributed to the existing literature by providing more insight into relationships of job demands and resources with physicians' work engagement, burnout, and work ability. Furthermore, this study included physicians from multiple disciplines and hospitals in the Netherlands, contributing to the generalizability of our findings.

A limitation of this study is that the work ability measurement was based on a selection of validated items instead of the validated Work Ability Index (WAI) [64]. Although this

may have compromised the validity of our measurement, the item selection guaranteed the fit of items to the study context.

Participation in this study was voluntary, which might have led to a selection bias, meaning that physicians with high or low levels of occupational well-being might have been overrepresented. However, a selection bias does not necessarily influence the strength of the relationships found. The results of this study were mostly in line with the literature [15, 17, 29].

Moreover, although physicians' data from multiple professional disciplines might contribute to the generalizability of our results, each professional discipline and workplace will have specific job demands and resources that this study might not have identified. Nonetheless, we selected the job demands and resources that were applicable to the majority of physicians – of diverse specialties – included in our previous needs assessment [22]. Lastly, causal inferences could not be made due to the cross-sectional study design.

Implications for research and practice

Future research could further establish linkages between physicians' workplace, well-being, and performance. Given the current body of knowledge, adopting longitudinal research designs and more objective performance measures are welcomed [30, 65]. It would be valuable if such studies investigated when job demands are perceived as challenging or hindering and which type of job resources are most beneficial [57]. In addition, physicians' perceptions of bureaucracy and leadership in relation to their occupational well-being and performance deserves more attention [29].

This study confirms previous findings that reducing workload is important for reducing physicians' burnout and its negative consequences for physicians' performance [11]. Potential strategies to reduce workload are duty hour limits, optimizing electronic medical records, or additional staff to support physicians [11, 49, 50]. In addition, healthcare organizations can facilitate development opportunities, participation in decision making, and support building relationships with colleagues to promote work engagement. The effectiveness of interventions will depend on the implementation context and thus always requires careful consideration.

Conclusions

Physicians' work engagement and burnout mediated the relationships of various job demands and resources with their work ability. This study suggests that physicians report better work ability when experiencing low burnout and high work engagement levels. In relieving burnout and improving physicians' work engagement, hospitals may consider addressing excessive workloads and creating opportunities for physicians' professional development. Facilitating good collegial relationships and participation in decision making may further benefit physicians' work engagement.

REFERENCES

1. Shanafelt T, West C, Sinsky C, Trockel M, Tutty M, Wang H, et al. Changes in Burnout and Satisfaction With Work-Life Integration in Physicians and the General US Working Population Between 2011 and 2020. *Mayo Clin Proc.* 2022;97(3):491-506.
2. Rotenstein L, Torre M, Ramos M, Rosales R, Guille C, Sen S, et al. Prevalence of Burnout Among Physicians: A Systematic Review. *JAMA.* 2018;320(11):1131-50.
3. Schaufeli W, Salanova M, González-romá V, Bakker A. The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach. *J Happiness Stud.* 2002;3(1):71-92.
4. Bakker A, Demerouti E. The Job Demands-Resources model: state of the art. *J Manag Psychol.* 2007;22(3):309-28.
5. Schaufeli W, Bakker A. Job Demands, Job Resources, and Their Relationship with Burnout and Engagement: A Multi-Sample Study. *J Organ Behav.* 2004;25(3):293-315.
6. Shanafelt T, Noseworthy J. Executive Leadership and Physician Well-being: Nine Organizational Strategies to Promote Engagement and Reduce Burnout. *Mayo Clin Proc.* 2017;92(1):129-46.
7. Loerbroks A, Glaser J, Vu-Eickmann P, Angerer P. Physician burnout, work engagement and the quality of patient care. *Occup Med.* 2017;67(5):356-62.
8. Perreira T, Perrier L, Prokopy M, Jonker A. Physician engagement in hospitals: a scoping review protocol. *BMJ Open.* 2018;8(1):e018837.
9. Kim W, Kolb J, Kim T. The Relationship Between Work Engagement and Performance: A Review of Empirical Literature and a Proposed Research Agenda. *Hum Resour Dev Rev.* 2013;12(3):248-76.
10. Scheepers R, Boerebach B, Arah O, Heineman M, Lombarts K. A Systematic Review of the Impact of Physicians' Occupational Well-Being on the Quality of Patient Care. *Int J Behav Med.* 2015;22(6):683-98.
11. West C, Dyrbye L, Shanafelt T. Physician burnout: contributors, consequences and solutions. *J Intern Med.* 2018;283(6):516-29.
12. Hodkinson A, Zhou A, Johnson J, Geraghty K, Riley R, Zhou A, et al. Associations of physician burnout with career engagement and quality of patient care: systematic review and meta-analysis. *BMJ.* 2022;378:e070442.
13. Montgomery A, Panagopoulou E, Esmail A, Richards T, Maslach C. Burnout in healthcare: the case for organisational change. *BMJ.* 2019;366:l4774.
14. Thomas L, Ripp J, West C. Charter on Physician Well-being. *JAMA.* 2018;319(15):1541-2.
15. Vandebroeck S, Van Gerven E, De Witte H, Vanhaecht K, Godderis L. Burnout in Belgian physicians and nurses. *Occup Med.* 2017;67(7):546-54.
16. Langballe E, Innstrand S, Aasland O, Falkum E. The predictive value of individual factors, work-related factors, and work-home interaction on burnout in female and male physicians: a longitudinal study. *Stress Health.* 2011;27(1):73-87.
17. Scheepers R, Lases L, Arah O, Heineman M, Lombarts K. Job Resources, Physician Work Engagement, and Patient Care Experience in an Academic Medical Setting. *Acad Med.* 2017;92(10):1472-9.
18. Bakker A, Demerouti E. Job demands-resources theory: Taking stock and looking forward. *J Occup Health Psychol.* 2017;22(3):273-85.
19. Lesener T, Gusy B, Wolter C. The job demands-resources model: A meta-analytic review of longitudinal studies. *Work Stress.* 2019;33(1):76-103.
20. Bakker A, Demerouti E, Euwema M. Job Resources Buffer the Impact of Job De-

- mands on Burnout. *J Occup Health Psychol.* 2005;10:170-80.
21. Gonzalez-Mulé E, Kim M, Ryu J. A meta-analytic test of multiplicative and additive models of job demands, resources, and stress. *J Appl Psychol.* 2021;106:1391-411.
 22. Debets M, Lombarts K, Hugenholtz N, Scheepers R. Developing and piloting a well-being program for hospital-based physicians. *Perspect Med Educ.* 2021;10(1):64-9.
 23. Verweij H, Van der Heijden F, Van Hooff M, Prins J, Lagro-Janssen A, Van Ravesteijn J, et al. The contribution of work characteristics, home characteristics and gender to burnout in medical residents. *Adv Health Sci Educ.* 2017;22(4):803-18.
 24. Teoh K, Hassard J, Cox T. Doctors' perceived working conditions and the quality of patient care: a systematic review. *Work Stress.* 2019;33(4):385-413.
 25. Riley R, Buszewicz M, Kokab F, Teoh K, Gopfert A, Taylor A, et al. Sources of work-related psychological distress experienced by UK-wide foundation and junior doctors: a qualitative study. *BMJ Open.* 2021;11(6):e043521.
 26. Brock-Utne J, Jaffe R. Address Physician Burnout by Restoring Control of Health Care to Physicians. *JAMA Intern Med.* 2020;180(2):334.
 27. Travers V. Burnout in orthopedic surgeons. *Orthop Traumatol: Surg Res.* 2020;106(1, Supplement):S7-S12.
 28. Shanafelt T, Gorringer G, Menaker R, Storz K, Reeves D, Buskirk S, et al. Impact of Organizational Leadership on Physician Burnout and Satisfaction. *Mayo Clin Proc.* 2015;90(4):432-40.
 29. Mazzetti G, Robledo E, Vignoli M, Topa G, Guglielmi D, Schaufeli W. Work Engagement: A meta-Analysis Using the Job Demands-Resources Model. *Psychol Rep.* 2023;126(3):1069-1107.
 30. Wee K, Lai A. Work Engagement and Patient Quality of Care: A Meta-Analysis and Systematic Review. *Med Care Res Rev.* 2022;79(3):345-358.
 31. Gould R, Ilmarinen J, Järvisalo J, Koskinen S. Dimensions of work ability: results of the Health 2000 Survey. 2008.
 32. Airila A, Hakanen J, Punakallio A, Lusa S, Luukkonen R. Is work engagement related to work ability beyond working conditions and lifestyle factors? *Int Arch Occup Environ Health.* 2012;85(8):915-25.
 33. Bernburg M, Vitzthum K, Groneberg D, Mache S. Physicians' occupational stress, depressive symptoms and work ability in relation to their working environment: a cross-sectional study of differences among medical residents with various specialties working in German hospitals. *BMJ Open.* 2016;6(6):e011369.
 34. Mache S, Danzer G, Klapp B, Groneberg D. Surgeons' work ability and performance in surgical care: relations between organisational predictors, work engagement and work ability. *Langenbeck's Arch Surg.* 2013;398(2):317-25.
 35. Appelbaum N, Lee N, Amendola M, Dodson K, Kaplan B. Surgical Resident Burnout and Job Satisfaction: The Role of Workplace Climate and Perceived Support. *J Surg Res.* 2019;234:20-5.
 36. Prins J, Van der Heijden F, Hoekstra-Weebers J, Bakker A, Van de Wiel H, Jacobs B, et al. Burnout, engagement and resident physicians' self-reported errors. *Psychol Health Med.* 2009;14(6):654-66.
 37. Scheepers R, Silkens M, Van den Berg J, Lombarts K. Associations between job demands, job resources and patient-related burnout among physicians: results from a multicentre observational study. *BMJ Open.* 2020;10(9):e038466.
 38. Van Veldhoven M, Prins J, Van der Laken P, Dijkstra L. QEEW2. 0: 42 short scales for survey research on work, well-being and performance. 2015.

39. Borry E. A New Measure of Red Tape: Introducing the Three-Item Red Tape (TIRT) Scale. *Int Public Man J.* 2016;19(4):573-93.
40. Schaufeli W, Bakker A, Salanova M. The Measurement of Work Engagement With a Short Questionnaire: A Cross-National Study. *Educ Psychol Meas.* 2006;66(4):701-16.
41. Demerouti E, Bakker A, Vardakou I, Kantas A. The convergent validity of two burnout instruments: A multitrait-multimethod analysis. *Eur J Psychol Assess.* 2003;19(1):12-23.
42. Maslach C, Schaufeli W, Leiter M. Job Burnout. *Annu Rev Psychol.* 2001;52(1):397-422.
43. Cortina J. What Is Coefficient Alpha? An Examination of Theory and Applications. *J Appl Psychol.* 1993;78(1):98-104.
44. Matsunaga M. Item Parceling in Structural Equation Modeling: A Primer. *Commun Methods Meas.* 2008;2(4):260-93.
45. Lin G, Wen Z, Marsh H, Lin H. Structural Equation Models of Latent Interactions: Clarification of Orthogonalizing and Double-Mean-Centering Strategies. *Struct Equ Model.* 2010;17(3):374-91.
46. Savalei V. On the Computation of the RMSEA and CFI from the Mean-And-Variance Corrected Test Statistic with Nonnormal Data in SEM. *Multivariate Behav Res.* 2018;53(3):419-29.
47. Hu L, Bentler P. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Model.* 1999;6(1):1-55.
48. Agarwal S, Pabo E, Rozenblum R, Sherritt K. Professional Dissonance and Burnout in Primary Care: A Qualitative Study. *JAMA Intern Med.* 2020;180(3):395-401.
49. West C, Dyrbye L, Erwin P, Shanafelt T. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet.* 2016;388(10057):2272-81.
50. De Simone S, Vargas M, Servillo G. Organizational strategies to reduce physician burnout: a systematic review and meta-analysis. *Aging Clin Exp Res.* 2021;33(4):883-94.
51. Woolhandler S, Himmelstein D. Administrative Work Consumes One-Sixth of U.S. Physicians' Working Hours and Lowers their Career Satisfaction. *Int J Health Serv.* 2014;44(4):635-42.
52. Rao S, Kimball A, Lehrhoff S, Hidrue M, Colton D, Ferris T, et al. The Impact of Administrative Burden on Academic Physicians: Results of a Hospital-Wide Physician Survey. *Acad Med.* 2017;92(2):237-43.
53. Erickson S, Rockwern B, Koltov M, McLean R. Putting Patients First by Reducing Administrative Tasks in Health Care: A Position Paper of the American College of Physicians. *Ann Intern Med.* 2017;166(9):659-61.
54. Thun S, Halsteinli V, Løvseth L. A study of unreasonable illegitimate tasks, administrative tasks, and sickness presenteeism amongst Norwegian physicians: an everyday struggle? *BMC Health Serv Res.* 2018;18(1):407.
55. Gunderman R, Lynch J. How Bureaucracy Can Foster Burnout. *J Am Coll Radiol.* 2018;15(12):1803-5.
56. Rai G. Job Satisfaction Among Long-Term Care Staff: Bureaucracy Isn't Always Bad. *Admin Soc Work.* 2013;37(1):90-9.
57. Schneider A, Hornung S, Weigl M, Glaser J, Angerer P. Does it matter in the long run? Longitudinal effects and interactions in the differentiated job demands-resources model. *Eur J Work Organ Psychol.* 2017;26:741-54.
58. Blom R, Borst R, Voorn B. Pathology or Inconvenience? A Meta-Analysis of the Impact of Red Tape on People and Organizations. *Rev Public Pers Adm.* 2021;41(4):623-50.
59. Olson K, Marchalik D, Farley H, Dean S, Lawrence E, Hamidi M, et al. Organizational strategies to reduce physician burnout and improve professional fulfillment. *Curr Probl Pediatr Adolesc Health Care.* 2019;49(12):100664.

60. Borst R, Kruyen P, Lako C, de Vries M. The Attitudinal, Behavioral, and Performance Outcomes of Work Engagement: A Comparative Meta-Analysis Across the Public, Semipublic, and Private Sector. *Rev Public Pers Adm.* 2020;40(4):613-40.
61. Shanafelt T, Balch C, Bechamps G, Russell T, Dyrbye L, Satele D, et al. Burnout and Medical Errors Among American Surgeons. *Ann Surg.* 2010;251(6):995-1000.
62. Tawfik D, Scheid A, Profit J, Shanafelt T, Trockel M, Adair K, et al. Evidence Relating Health Care Provider Burnout and Quality of Care. *Ann Intern Med.* 2019;171(8):555-67.
63. Welp A, Meier L, Manser T. The interplay between teamwork, clinicians' emotional exhaustion, and clinician-rated patient safety: a longitudinal study. *Crit Care.* 2016;20(1):110.
64. Ilmarinen J. The work ability index (WAI). *Occup Med.* 2007;57(2):160-160.
65. Linzer M. Clinician Burnout and the Quality of Care. *JAMA Intern Med.* 2018;178(10):1331-2.

SUPPLEMENTARY MATERIALS

Structural Equation Model <-'

#Measurement model, latent variables

Development opportunities (DO) =~ DO1 + DO2 + DO3

Participation decision making (PD) =~ PD1 + PD2 + PD34

Inspirational leadership (IL) =~ IL13 + IL2 + IL4

Relationship colleagues (RC) =~ RC1 + RC24 + RC35

Bureaucratic burden (BB) =~ BB1 + BB2 + BB3

Workload (WL) =~ WL24 + WL36 + WL15

Work engagement (WE) =~ WE125 + WE347 + WE689

Burnout (BO) =~ BO37 + BO248 + BO156

Work ability (WA) =~ WA136 + WA24 + WA78

WL*PD =~ WL24.PD1 + WL24.PD2 + WL24.PD34 + WL36.PD1 + WL36.PD2 + WL36.PD34 + WL15.PD1 + WL15.PD2 + WL15.PD34

BB*RC =~ BB1.RC1 + BB2.RC24 + BB2.RC35 + BB3.RC1 + BB3.RC24 + BB3.RC35

#Regressions

WE ~ a1*DO + a2*PD + IL + a3*RC + WL*PD + BB*RC

BO ~ a4*DO + PD + IL + RC + BB + a5*WL + Sex + Contract type

WA ~ b*WE + b1*BO + Sex + Contract type + Years since registration as medical specialist

Residual (co)variances

BO~~WE

#Indirect effects (independent variable / mediator / dependent variable)

DO/WE/WA := a1*b

PD/WE/WA := a2*b

RC/WE/WA := a3*b

DO/BO/WA := a4*b1

WL/BO/WA := a5*b1'

Latent variables									
Measurement model	Operator	Manif var.	estimate	se	z-value	sig	ci.lower	ci.upper	std.all
Development opp.	==	DO1	1.000	0.000	NA	NA	1.000	1.000	0.709
Development opp.	==	DO2	1.427	0.127	11.260	0.000	1.179	1.676	0.878
Development opp.	==	DO3	1.078	0.106	10.149	0.000	0.869	1.286	0.765
Participation decision	==	PD1	1.000	0.000	NA	NA	1.000	1.000	0.819
Participation decision	==	PD2	0.981	0.057	17.164	0.000	0.869	1.093	0.844
Participation decision	==	PD34	0.703	0.054	13.013	0.000	0.597	0.809	0.718
Inspirational leadership	==	IL13	1.000	0.000	NA	NA	1.000	1.000	0.930

Relationships of job demands and resources with work engagement, burnout and work ability

Inspirational leadership	≈	IL2	0.884	0.039	22.726	0.000	0.807	0.960	0.831
Inspirational leadership	≈	IL4	0.964	0.037	26.001	0.000	0.891	1.036	0.846
Relationship colleagues	≈	RC1	1.000	0.000	NA	NA	1.000	1.000	0.460
Relationship colleagues	≈	RC24	2.006	0.000	7.076	0.000	1.450	2.562	0.872
Relationship colleagues	≈	RC35	1.438	0.226	6.354	0.000	0.995	1.882	0.567
Bureaucratic burden	≈	BB1	1.000	0.000	NA	NA	1.000	1.000	0.626
Bureaucratic burden	≈	BB2	1.108	0.107	10.364	0.000	0.899	1.318	0.773
Bureaucratic burden	≈	BB3	1.084	0.109	9.983	0.000	0.871	1.296	0.769
Workload	≈	WL24	1.000	0.000	NA	NA	1.000	1.000	0.672
Workload	≈	WL36	1.322	0.091	14.573	0.000	1.145	1.500	0.906
Workload	≈	WL15	0.774	0.063	12.372	0.000	0.651	0.896	0.731
Work engagement	≈	WE125	1.000	0.000	NA	NA	1.000	1.000	0.820
Work engagement	≈	WE347	1.022	0.066	15.500	0.000	0.893	1.151	0.856
Work engagement	≈	WE689	0.930	0.061	15.206	0.000	0.810	1.050	0.732
Burnout	≈	BO37	1.000	0.000	NA	NA	1.000	1.000	0.806
Burnout	≈	BO248	1.172	0.055	21.277	0.000	1.064	1.280	0.901
Burnout	≈	BO156	1.028	0.053	19.323	0.000	0.924	1.132	0.867
Work ability	≈	WA136	1.000	0.000	NA	NA	1.000	1.000	0.845
Work ability	≈	WA24	1.087	0.063	17.356	0.000	0.965	1.210	0.803
Work ability	≈	WA78	1.041	0.062	16.753	0.000	0.919	1.162	0.803
Workload*participation d.	≈	WL24*PD1	1.000	0.000	NA	NA	1.000	1.000	0.644
Workload*participation d.	≈	WL24*PD2	0.990	0.069	14.424	0.000	0.855	1.124	0.678
Workload*participation d.	≈	WL24*PD34	0.713	0.084	8.516	0.000	0.549	0.878	0.550
Workload*participation d.	≈	WL36*PD1	1.210	0.110	10.963	0.000	0.994	1.426	0.768
Workload*participation d.	≈	WL36*PD1	1.152	0.119	9.698	0.000	0.919	1.385	0.784
Workload*participation d.	≈	WL36*PD34	0.828	0.126	6.574	0.000	0.581	1.075	0.646
Workload*participation d.	≈	WL15*PD1	0.785	0.099	7.972	0.000	0.592	0.979	0.686
Workload*participation d.	≈	WL15*PD2	0.788	0.103	7.686	0.000	0.587	0.989	0.701
Workload*participation d.	≈	WL15*PD34	0.564	0.099	5.715	0.000	0.371	0.757	0.573
Bureau. bur.*relation. col.	≈	BB1*RC1	1.000	0.000	NA	NA	1.000	1.000	0.378
Bureau. bur.*relation. col.	≈	BB1*RC24	1.726	0.338	5.110	0.000	1.064	2.389	0.596
Bureau. bur.*relation. col.	≈	BB1*RC35	1.473	0.256	5.758	0.000	0.971	1.974	0.449
Bureau. bur.*relation. col.	≈	BB2*RC1	0.932	0.160	5.817	0.000	0.618	1.247	0.412
Bureau. bur.*relation. col.	≈	BB2*RC24	2.029	0.537	3.777	0.000	0.976	3.082	0.755
Bureau. bur.*relation. col.	≈	BB2*RC35	1.587	0.335	4.743	0.000	0.931	2.243	0.576
Bureau. bur.*relation. col.	≈	BB2*RC1	0.974	0.148	6.590	0.000	0.684	1.264	0.433
Bureau. bur.*relation. col.	≈	BB2*RC24	1.962	0.494	3.971	0.000	0.994	2.930	0.746
Bureau. bur.*relation. col.	≈	BB2*RC35	1.584	0.340	4.662	0.000	0.918	2.250	0.571
Regressions									
Dependent variable	Operator	predictor	estimate	se	z-value	sig	ci.lower	ci.upper	std.all
Work engagement	~	DO	0.561	0.122	4.601	0.000	0.322	0.800	0.387

Work engagement	~	PD	0.168	0.077	2.196	0.028	0.018	0.319	0.175
Work engagement	~	IL	0.044	0.056	0.790	0.430	-0.065	0.153	0.047
Work engagement	~	RC	0.590	0.194	3.039	0.002	0.210	0.971	0.194
Work engagement	~	WL*PD	-0.267	0.095	-2.798	0.005	-0.453	-0.080	-0.145
Work engagement	~	BB*RC	-0.371	0.152	-2.442	0.015	-0.668	-0.073	-0.095
Burnout	~	DO	-0.234	0.080	-2.920	0.004	-0.392	-0.077	-0.198
Burnout	~	PD	-0.088	0.055	-1.594	0.111	-0.197	0.020	-0.112
Burnout	~	IL	-0.042	0.038	-1.094	0.274	-0.116	0.033	-0.054
Burnout	~	RC	-0.274	0.146	-1.885	0.059	-0.560	0.011	-0.110
Burnout	~	BB	0.024	0.047	0.505	0.614	-0.069	0.117	0.023
Burnout	~	WL	0.716	0.083	8.681	0.000	0.555	0.878	0.511
Burnout	~	Sex	0.133	0.058	2.284	0.022	0.019	0.246	0.103
Burnout	~	Contract t.	0.053	0.058	0.919	0.358	-0.061	0.168	0.041
Work ability	~	WE	0.152	0.043	3.532	0.000	0.068	0.237	0.215
Work ability	~	BO	-0.483	0.062	-7.743	0.000	-0.605	-0.360	-0.558
Work ability	~	Sex	-0.015	0.055	-0.270	0.787	-0.124	0.094	-0.013
Work ability	~	Years regis.	0.167	0.050	3.327	0.001	0.068	0.265	0.150
Work ability	~	Contract t.	-0.015	0.058	-0.258	0.796	-0.129	0.099	-0.013
Covariances									
Latent variable (ltv)	Operator	Ltv abbr.	estimate	se	z-value	sig	ci.lower	ci.upper	std.all
Work engagement	~~	BO	-0.126	0.021	-5.883	0.000	-0.168	-0.084	-0.476
Development opp.	~~	PD	0.238	0.036	6.554	0.000	0.167	0.309	0.537
Development opp.	~~	IL	0.168	0.031	5.473	0.000	0.108	0.228	0.372
Development opp.	~~	RC	0.048	0.011	4.494	0.000	0.027	0.069	0.343
Development opp.	~~	BB	-0.091	0.022	-4.123	0.000	-0.134	-0.048	-0.272
Development opp.	~~	WL	-0.033	0.016	-2.121	0.034	-0.063	-0.003	-0.133
Development opp.	~~	WL*PD	0.019	0.018	1.021	0.307	-0.017	0.054	0.080
Development opp.	~~	BB*RC	0.001	0.006	0.232	0.817	-0.011	0.014	0.013
Participation decision	~~	IL	0.330	0.044	7.494	0.000	0.243	0.416	0.483
Participation decision	~~	RC	0.086	0.020	4.362	0.000	0.047	0.125	0.407
Participation decision	~~	BB	-0.218	0.037	-5.853	0.000	-0.291	-0.145	-0.433
Participation decision	~~	WL*PD	0.022	0.033	0.669	0.503	-0.042	0.087	0.063
Participation decision	~~	BB*RC	-0.007	0.014	-0.484	0.628	-0.033	0.020	-0.040
Inspirational leadership	~~	RC	0.069	0.017	3.994	0.000	0.035	0.103	0.321
Inspirational leadership	~~	BB	-0.134	0.034	-3.979	0.000	-0.200	-0.068	-0.260
Inspirational leadership	~~	WL	-0.070	0.022	-3.197	0.001	-0.112	-0.027	-0.182
Inspirational leadership	~~	WL*PD	-0.011	0.023	-0.484	0.629	-0.055	0.033	-0.031
Inspirational leadership	~~	BB*RC	-0.001	0.013	-0.079	0.937	-0.027	0.025	-0.006
Relationship colleagues	~~	BB	-0.031	0.011	-2.838	0.005	-0.053	-0.010	-0.196
Relationship colleagues	~~	WL	-0.023	0.008	-2.723	0.006	-0.039	-0.006	-0.193
Relationship colleagues	~~	WL*PD	-0.007	0.008	-0.854	0.393	-0.023	0.009	-0.064

Relationships of job demands and resources with work engagement, burnout and work ability

Relationship colleagues	~~	BB*RC	0.005	0.006	0.832	0.405	-0.007	0.018	0.101
Bureaucratic burden	~~	WL	0.053	0.019	2.794	0.005	0.016	0.090	0.187
Bureaucratic burden	~~	WL*PD	0.013	0.017	0.737	0.461	-0.021	0.047	0.049
Bureaucratic burden	~~	BB*RC	0.006	0.015	0.394	0.694	0.023	-0.035	0.047
Workload	~~	WL*PD	0.011	0.018	0.614	0.539	-0.025	0.047	0.057
Workload	~~	BB*RC	0.002	0.006	0.301	0.763	-0.010	0.013	0.019
Workload*participation d.	~~	BB*RC	0.006	0.007	0.898	0.369	-0.007	0.020	0.072

Variances									
Variable	Operator	Variable	estimate	se	z-value	sig	ci.lower	ci.upper	std.all
DO1	NA	NA	0.290	0.034	8.508	0.000	0.223	0.356	0.497
DO2	NA	NA	0.177	0.034	5.136	0.000	0.109	0.244	0.228
DO3	NA	NA	0.242	0.029	8.224	0.000	0.184	0.300	0.415
PD1	NA	NA	0.327	0.040	8.254	0.000	0.249	0.405	0.329
PD2	NA	NA	0.259	0.040	6.457	0.000	0.180	0.338	0.287
PD34	NA	NA	0.310	0.033	9.470	0.000	0.246	0.374	0.484
IL13	NA	NA	0.109	0.024	4.477	0.000	0.061	0.156	0.135
IL2	NA	NA	0.244	0.029	8.402	0.000	0.187	0.301	0.309
IL4	NA	NA	0.257	0.030	8.539	0.000	0.198	0.315	0.284
RC1	NA	NA	0.249	0.027	9.370	0.000	0.197	0.301	0.789
RC24	NA	NA	0.084	0.026	3.224	0.001	0.033	0.135	0.239
RC35	NA	NA	0.291	0.036	8.043	0.000	0.220	0.361	0.678
BB1	NA	NA	0.590	0.054	10.970	0.000	0.485	0.696	0.608
BB2	NA	NA	0.315	0.045	6.966	0.000	0.227	0.404	0.403
BB3	NA	NA	0.308	0.052	5.921	0.000	0.206	0.410	0.408
WL24	NA	NA	0.255	0.024	10.596	0.000	0.208	0.302	0.549
WL36	NA	NA	0.080	0.016	4.859	0.000	0.048	0.112	0.179
WL15	NA	NA	0.109	0.009	11.989	0.000	0.092	0.127	0.466
WE125	NA	NA	0.300	0.036	8.394	0.000	0.230	0.370	0.327
WE347	NA	NA	0.234	0.035	6.679	0.000	0.166	0.303	0.267
WE689	NA	NA	0.460	0.049	9.333	0.000	0.364	0.557	0.464
BO37	NA	NA	0.223	0.021	10.753	0.000	0.182	0.263	0.351
BO248	NA	NA	0.132	0.017	7.954	0.000	0.099	0.164	0.189
BO156	NA	NA	0.144	0.017	8.561	0.000	0.111	0.177	0.248
WA136	NA	NA	0.124	0.021	5.767	0.000	0.082	0.166	0.286
WA24	NA	NA	0.201	0.028	7.132	0.000	0.146	0.256	0.355
WA78	NA	NA	0.184	0.025	7.478	0.000	0.136	0.232	0.355
WL24*PD1	NA	NA	0.255	0.033	7.856	0.000	0.192	0.319	0.585
WL24*PD2	NA	NA	0.209	0.033	6.401	0.000	0.145	0.273	0.540
WL24*PD34	NA	NA	0.213	0.031	6.837	0.000	0.152	0.274	0.698
WL36*PD1	NA	NA	0.185	0.027	6.789	0.000	0.131	0.238	0.410
WL36*PD1	NA	NA	0.151	0.025	5.944	0.000	0.101	0.201	0.385

Chapter 2

WL36*PD34	NA	NA	0.174	0.028	6.163	0.000	0.119	0.229	0.583
WL15*PD1	NA	NA	0.126	0.015	8.153	0.000	0.096	0.156	0.529
WL15*PD2	NA	NA	0.117	0.015	7.760	0.000	0.087	0.146	0.508
WL15*PD34	NA	NA	0.118	0.019	6.067	0.000	0.080	0.156	0.672
BB1*RC1	NA	NA	0.245	0.037	6.674	0.000	0.173	0.317	0.857
BB1*RC24	NA	NA	0.221	0.035	6.320	0.000	0.153	0.290	0.645
BB1*RC35	NA	NA	0.351	0.054	6.531	0.000	0.246	0.457	0.799
BB2*RC1	NA	NA	0.174	0.025	7.033	0.000	0.125	0.222	0.830
BB2*RC24	NA	NA	0.127	0.016	7.861	0.000	0.095	0.158	0.429
BB2*RC35	NA	NA	0.208	0.029	7.274	0.000	0.152	0.264	0.669
BB2*RC1	NA	NA	0.168	0.028	5.897	0.000	0.112	0.224	0.812
BB2*RC24	NA	NA	0.126	0.019	6.470	0.000	0.088	0.164	0.444
BB2*RC35	NA	NA	0.212	0.028	7.547	0.000	0.157	0.267	0.674
Development opp.	NA	NA	0.293	0.054	5.441	0.000	0.188	0.399	1.000
Participation decision	NA	NA	0.668	0.067	10.022	0.000	0.537	0.799	1.000
Inspirational leadership	NA	NA	0.698	0.050	13.975	0.000	0.600	0.796	1.000
Relationship colleagues	NA	NA	0.067	0.019	3.554	0.000	0.030	0.103	1.000
Bureaucratic burden	NA	NA	0.380	0.062	6.088	0.000	0.258	0.503	1.000
Workload	NA	NA	0.210	0.030	6.940	0.000	0.151	0.269	1.000
Work engagement	NA	NA	0.357	0.045	7.862	0.000	0.268	0.446	0.580
Burnout	NA	NA	0.196	0.025	7.956	0.000	0.147	0.244	0.474
Work ability	NA	NA	0.146	0.019	7.858	0.000	0.110	0.182	0.473
Workload*participation d.	NA	NA	0.182	0.032	5.588	0.000	0.118	0.245	1.000
Bureau. bur.*relation. col.	NA	NA	0.041	0.015	2.688	0.007	0.011	0.071	1.000
Indirect effects									
Indp. var / mediator	Dep var	Operator	estimate	se	z-value	sig	ci.lower	ci.upper	std.all
DO / WE	WA	:=	0.085	0.031	2.794	0.005	0.025	0.145	0.083
PD / WE	WA	:=	0.026	0.014	1.872	0.061	-0.001	0.052	0.038
RC / WE	WA	:=	0.090	0.039	2.310	0.021	0.014	0.166	0.042
DO / BO	WA	:=	0.113	0.042	2.701	0.007	0.031	0.195	0.110
WL / BO	WA	:=	-0.346	0.057	-6.073	0.000	-0.457	-0.234	-0.285



3

The relationship between physicians' self-kindness and professional fulfillment and the mediating role of personal resilience and work-home interference: a cross-sectional study

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ABSTRACT

Background

Professional fulfillment is crucial for physicians' well-being and optimal patient care. Highly demanding work environments, perfectionism and self-critical attitudes jeopardize physicians' professional fulfillment.

Objective

To explore to what extent a kinder attitude towards the self, i.e. self-kindness, was associated with physicians' professional fulfillment and whether this relationship was mediated by personal resilience and work-home interference.

Methods

In 2020, cardiologists ($n=374$) in the Netherlands participated in a web-based survey. Self-kindness was measured by the self-kindness subscale of the Self-Compassion Scale, personal resilience by the Brief Resilience Scale, work-home interference by the negative Work-Home Interference subscale of the Survey Work-Home Interaction – Nijmegen, and professional fulfillment by the corresponding subscale of the Professional Fulfillment Index. Using Hayes' SPSS macro PROCESS v3.5, the authors tested the parallel mediation model.

Results

Self-kindness was not directly associated with professional fulfillment (direct effect = .042, $p = .36$, 95% CI: -0.048, 0.132). Self-kindness was indirectly related to professional fulfillment through individual resilience (indirect effect = .049, 95% CI: .020, 0.086) and work-home interference (indirect effect = .057, 95% CI: .023, 0.096).

Conclusions

This study suggests that improving physicians' self-kindness may enhance professional fulfillment through personal resilience and work-home interference. Our findings may stimulate and remind physicians to be kind towards themselves as it may benefit them and their patients.

INTRODUCTION

Professionally fulfilled physicians derive intrinsic positive rewards from their work, such as professional satisfaction, self-efficacy and happiness. As they work with joy and experience meaningfulness, they are less prone to burnout and leaving the profession than unfulfilled physicians. Patients of professionally fulfilled physicians report higher levels of satisfaction, whereas low professional fulfillment is associated with an increased chance on medical errors [1-5]. Unfortunately, physicians' professional fulfillment is under pressure due to demanding work environments and unhealthy norms in the medical professional culture [1, 6, 7]. While improving physicians' work environments has been high on the agenda of healthcare organizations and professional bodies, work pressures remain high. [8] Unhealthy norms like working late, deprioritizing self-care and shaming approaches after (near-)mistakes neither are supportive for physicians' professional fulfillment [6, 7, 9]. On top of that, in striving to deliver high-quality patient care physicians often develop perfectionistic mindsets, a self-critical attitude and low self-tolerance [6, 7, 9, 10]. Both perfectionism and self-criticism have been associated with burnout in physicians [11-13]. A kinder attitude towards the self, i.e. self-kindness, has been found to buffer against stress and burnout [14-18].

Self-kindness refers to being gentle, supportive and understanding towards the self, instead of being harsh and self-critical. [19] Research has shown that it can be trained in healthcare professionals [9, 18]. While ample evidence shows that self-kindness is associated with reduced burnout in physicians [14-17], coming from a positive psychology perspective [20], we argue that physician well-being encompasses more than the absence of burnout. It is also worthwhile to explore whether kinder self-attitudes are to increase positive well-being indicators such as professional fulfillment, given its presumed benefits for physicians and their patients. However, the relationship between self-kindness and professional fulfillment thus far remains largely underexplored. Previous research has shown how physicians' self-critical and perfectionistic attitudes may harm their professional fulfillment [6, 7], but research on how opposite self-attitudes, such as self-kindness, may actually benefit it, is scarce. Empirical research on self-kindness as a potential predictor for professional fulfillment will add to the body of literature on physician well-being from a more positive angle.

Indications for a direct relationship between self-kindness and professional fulfillment are studies showing that self-kindness stimulates intrinsic motivation, goal-setting behaviors and feelings of happiness and connectedness [21-23], all core characteristics of professional fulfillment [24]. For indirect relationships, the current literature suggests two worthwhile constructs to explore. First, researchers have found positive relation-

ships between self-kindness and personal resilience – the ability to bounce back [25, 26]. Second, self-kindness positively affects self-care and behavior that stimulates well-being [27-30]. Self-kindness seems beneficial for physicians as they often struggle with managing their work-home balance [31]. While both being crucial for maintaining and enhancing the quality of patient care [5, 32, 33], higher levels of personal resilience and fewer work-home interferences have also been found to positively associate with work engagement and job satisfaction amongst physicians [34-38]. Professional fulfillment is an indicator of occupational well-being, like work engagement and job satisfaction, but differs from these constructs by also including a sense of meaningfulness and personal growth [24]. Based on the evidence aforementioned, we hypothesize that i) self-kindness is directly related to professional fulfillment, as well as ii) indirectly, through personal resilience and work-home interference

This study focuses on cardiologists, as the profession of cardiology is known for its competitive culture stimulating its members to appear impervious to pressure – raising worries about their occupational well-being. [39, 40] This study aims to contribute to the literature and practice by addressing the following research questions: To what extent 1) is cardiologists' self-kindness related to their professional fulfillment? and 2) is this relationship mediated by personal resilience and work-home interference? The outcomes of this study provide more insight into cardiologists' attitudes towards the self and how they relate to their occupational well-being. Taking into account the aforementioned detrimental aspects of medicine's professional culture, a better understanding of the role and impact of self-kind attitudes may offer a first step in finding ways to redefine and improve practice [6, 7]. The results of this study may inform new approaches to enhance physicians' professional fulfillment and, subsequently, patient care. In the next section we discuss our research methods, followed by the presentation of our results, a discussion of our findings and a conclusion.

METHODS

Study design, population and setting

This cross-sectional survey study was conducted in 2020 amongst all registered cardiologists who were a member of the Netherlands Society of Cardiology (NVVC) and were working in the Netherlands. In the Netherlands in 2021 approximately 48% of the cardiologists was self-employed and 52% was employed by hospitals– they deliver their medical services within general hospitals, top clinical hospitals, university hospitals and independent treatment centers (unpublished information of the NVVC). In 2021, the average age of cardiologists in the Netherlands was 48 years and approximately 72% of

all cardiologists were male. As a profession, cardiology is known to be demanding and strenuous [39, 41].

Measures

We used validated measures for all included variables and, when needed, four researchers independently translated English measurements to Dutch using the forward-backward translation method [42]. We measured self-kindness using the 5-item self-kindness domain of the self-compassion scale (SCS) developed by Kristin Neff [19]. This domain measures "how often people respond to feelings of inadequacy or suffering" with self-kindness versus with self-judgment [19]. Examples of self-kindness items are "I try to be loving toward myself when I'm feeling emotional pain" and "I'm tolerant of my own flaws and inadequacies." Respondents provided their answers on a 5-point Likert scale from 'almost never' to 'almost always' [19]. The reliability coefficient using Cronbach's alpha for this scale was 0.82 in our sample.

We measured personal resilience using the 6-item Brief Resilience Scale (BRS) developed by Smith and colleagues [43]. Respondents provided their answers on a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree.' Three items are positively worded, i.e., "I tend to bounce back quickly after hard times", while the other 3 items are negatively worded, as in "It is hard for me to snap back when something bad happens" [43]. The reliability coefficient using Cronbach's alpha for this scale was 0.86 in our sample.

We assessed work-home interference using the 9-item sub-scale negative Work-Home Interference (WHI) from the Survey Work-Home Interaction – Nijmegen (SWING), which measures the level at which someone's work negatively influences someone's functioning at home [44]. Items are scored on a 4-point Likert 'how often' scale ranging from '(practically) never' to '(practically) always.' Examples of negative WHI items are "How often do you not fully enjoy the company of your spouse/ family/ friends because you worry about your work?" and "How often do your work obligations make it difficult for you to feel relaxed at home?" [44]. The reliability coefficient using Cronbach's alpha for this scale was 0.88 in our sample.

We measured professional fulfillment using the 6-item professional fulfillment scale from the Professional Fulfillment Index (PFI) developed by Trockel et al. [24]. The scale measures the intrinsic positive rewards an individual receives from doing her or his work, including items about meaningfulness, contribution, happiness, satisfaction, self-worth and feeling in control when dealing with problems. Items are scored on a 5-point Likert scale with options ranging from 'totally disagree' to 'totally agree' [24]. Usually, the PFI

measures professional fulfilment on a scale from 0 to 4. In order to guarantee consistency between the scales of the four main variables we measured professional fulfilment on a scale from 1 to 5, as used for the other scales. Example items of the professional fulfillment scale are: "My work is satisfying to me" and "I'm contributing professionally (e.g. patient care, teaching, research and leadership) in ways that I value most." [24]. The reliability coefficient using Cronbach's alpha for this scale was 0.88 in our sample.

Data collection

This study was part of a larger data collection about the occupational well-being of Dutch cardiologists, commissioned by the Netherlands Society of Cardiology (NVVC). On September 28, 2020, on behalf of the NVVC, the researcher (RB) invited all cardiologists practicing in the Netherlands and registered as an NVVC member, individually per email to participate in an online questionnaire, using Castor EDC. Participation was voluntary. Digital informed consent was obtained and participants' anonymity and confidentiality were safeguarded. Apart from occupational well-being related items, the questionnaire also included questions on respondents' demographics, i.e. sex (male/ female), age (years), years of experience as a cardiologist (year of first registration) and type of institution where the medical specialist was working (general hospital, top clinical hospital, university hospital, independent sector treatment center). These four demographics are able to provide a basic description of our sample and were considered most relevant in explaining physicians' occupational wellbeing by the researchers. Additionally, the NVVC deemed them potentially relevant for defining new, tailored wellbeing policies or interventions. The survey took place from September 28 till December 6, 2020; up till four reminders were sent during the survey period. We have included the survey items relevant for the current study in the supplementary materials.

Statistical analyses

We included cardiologists who reported scores on (the separate items of) all main variables: (1) self-kindness, (2) personal resilience, (3) work-home interference and (4) professional fulfillment. Data were screened for extreme or unrealistic scores using the SPSS functions 'Sort ascending' and 'Sort descending'. No extreme or unrealistic scores were found in the data, leaving 374 cases for analysis. We rightly expected that our data collection would result in a sample that exceeds the general rule of thumb for minimum sample sizes in regression analyses (of which our parallel mediation model consists). [45, 46]. Therefore, we would have sufficient power to detect significant associations between the variables under study and we did not perform an a priori power analysis. With the cleaned data, scale scores for the variables were computed by averaging the individual items. Next, we used descriptive statistics to describe our sample characteristics and main variables.

To answer our research question “to what extent is physicians’ self-kindness related to their professional fulfillment, and is this relationship mediated by personal resilience and work-home interference?”, we performed a parallel mediation analysis with Hayes’ SPSS macro PROCESS v3.5. [47] Hayes’ macro for SPSS is a widely used tool to test parallel mediation models [48]. The procedure makes use of bootstrapping technique to determine the indirect effects. Compared to the Sobel test, which is an alternative way for determining the effects of mediating variables, bootstrapping requires fewer assumptions such as no need for normality in the distributions of the variables, provides a higher study power and lowers the risk of falsely rejecting the null hypothesis [48].

We checked the statistical assumptions for parallel mediation of linearity, homoscedasticity and normality of estimation error by plotting the standardized residuals of all separate regressions building the parallel mediation model [47]. We found no worrying violations of the statistical assumptions. Additionally, we used Pearson’s Correlations for calculating the associations among the main variables to check for multicollinearity. We then tested our parallel mediation model with self-kindness as the independent variable, personal resilience and work-home interference as mediators and professional fulfillment as the dependent variable. Preliminary univariate analyses (T-tests and ANOVA’s) found no statistically significant relationship of any of the demographic variables with professional fulfillment. In line with other well-being research [49-51], however, sex and years of registration were included as covariates. Because of the multicollinearity of age and years of registration ($r = -.824$, $p < 0.001$) [52], we opted to use the latter in the analysis as it was more clinically relevant. We generated a confidence interval (95% CI) from 10000 resamples to examine the significance of our indirect effects. The number of 10000 resamples is recommended by Hayes [47]. All analyses were performed using the SPSS Statistics (version 26; IBM, Armonk, New York).

Ethical approval

The institutional ethical review board of the Amsterdam UMC (METC) of the University of Amsterdam provided a waiver declaring the Medical Research Involving Human Subjects Act (WMO) did not apply to the current study (reference number W20_324 # 20.323). Written informed consent was obtained in the online survey. Participants were only allowed to continue the survey when they entered ‘Yes’ for “I agree to participate in this study”. Information about the research was sent to the participants via email previously and again provided at the beginning of the survey.

RESULTS

Table 1 reports the demographic characteristics of the respondents in this study. In total, 374 (response rate of 34.6%) Dutch cardiologists completed the questionnaire. Most respondents were male ($n = 273$, 73.0%), and the most frequently rated age category and hospital type were 36-45 years old ($n = 145$, 38.8%) and general hospital ($n = 154$, 42.2%). The results are not too deviant from the average age of cardiologists in the Netherlands (almost 70% of our sample was between 36 and 55 years old) and the percentage of male cardiologists (72.0%); for type of hospital and years of experience no population numbers were available. Eight cases were excluded due to incomplete scores on the main variables.

Table 1. Sample characteristics of 374 registered cardiologists in the Netherlands in 2020

Demographic characteristics	N (374)	Frequency (%)
Sex		
Male	273	73.0
Female	101	27.0
Age (years)		
< 36	15	4.0
36-45	145	38.8
46-55	112	29.9
56-65	95	25.4
> 65	7	1.9
First registration (year)		
1981-1990	19	5.1
1991-2000	64	17.1
2001-2010	139	37.2
2011-2021	152	62.8
Type of institute		
General hospital	154	41.2
Tertiary referral hospital	129	34.5
University hospital	62	16.6
Independent sector treatment center	20	5.5
Missings	9	2.4

Table 2 reports the mean scores and standard deviations of the four main variables and the cross-variables' associations. On a 5-point Likert scale respondents' mean scores were 2.76 (SD = 0.7) for self-kindness, 3.85 (SD = 0.6) for professional fulfillment and 3.46 (SD = 0.5) for personal resilience. For work-home interference, respondents reported an average mean score of 2.23 (SD = 0.5) on a 4-point Likert scale.

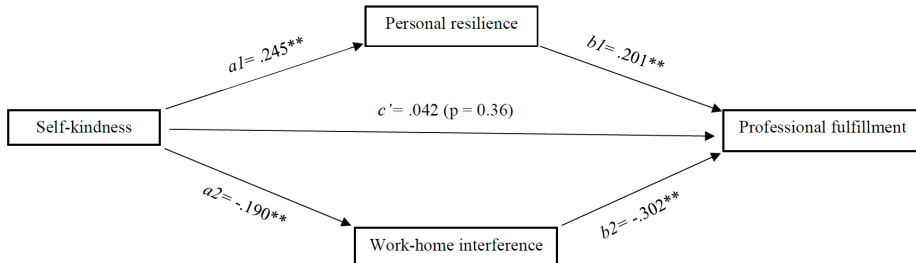
Table 2. Means, Standard Deviations and Pearson Correlations for Self-kindness, Professional fulfillment, Personal resilience and Work-home interference

Variables (scale)	Mean	SD	1	2	3
1. Self-kindness (1-5)	2.76	0.68			
2. Professional fulfillment (1-5)	3.85	0.62	0.17**		
3. Personal resilience (1-5)	3.46	0.67	0.24**	0.32**	
4. Work-home interference (1-4)	2.23	0.51	-0.26**	-0.35**	-0.37**

** ($p < 0.01$), $n = 374$.

Figure 1 shows the unstandardized regression coefficients of the parallel mediation model. The results show a significant indirect effect of self-kindness on professional fulfillment through both personal resilience (indirect effect (a_1b_1) = .049, 95% CI: .020, .086) and work-home interference (indirect effect (a_2b_2) = .057, 95% CI: .023, .096). The combined indirect effect of personal resilience and work-home interference was also significant (indirect effect (total) = .106, 95% CI .061, .156). No significant direct effect of self-kindness on professional fulfillment was found (direct effect (c') = .042, $p = .36$, 95% CI: -0.048, 0.132). A negligible but significant positive effect was found for first registration year on work-home interference ($b = .008$, $p = .007$, 95% CI: 0.002 – 0.014).

Figure 1. Conceptual model.



The model depicts the relationship between self-kindness and professional fulfillment, mediated by personal resilience and work-home interference, found amongst cardiologists in the Netherlands ($n = 374$) in 2020. The model was adjusted for sex and years of registration. **($p < 0.01$).

DISCUSSION

Main findings

This study explored the relationship between self-kindness and professional fulfillment amongst cardiologists and whether this relationship was mediated by personal resilience and work-home interference. In contrast to our first hypothesis, the results did not show a direct relationship between self-kindness and professional fulfillment. However, as hypothesized, this study showed that cardiologists who were more self-kind reported

higher levels of personal resilience and less work-home interference, which in turn benefited their professional fulfillment.

Explanation of findings

The average professional fulfillment score of Dutch cardiologists ($M = 3.85$) is relatively high, compared to those of physicians in general which (converted to our measurement scale) have been reported between 3.25 and 3.50 [24, 53]. One explanation for this finding may lie in the highly rewarding and meaningful nature of the specialty – cardiologists are frequently present at important moments in patients' lives which may be a stimulator for their feelings of intrinsic rewards and motivation [1, 39, 54]. Factors that have been found to positively affect the professional fulfillment of Dutch cardiologists are indeed satisfying physician-patient interactions, but also autonomy, personal resilience, satisfaction with compensation levels and the degree to which the job matches an individual's energy resources [54]. This study adds to that by showing how self-kindness indirectly affects cardiologists' professional fulfillment. Previous research has shown that patients of professionally fulfilled physicians are more satisfied [1] and that self-kindness has been found to be a prerequisite for compassionate care [18, 55]. Therefore, enhancing cardiologists' self-kindness may benefit patients in multiple ways.

Dutch cardiologists reported an average self-kindness score of 2.76 on a 5-point Likert scale. While there is little comparable evidence on physicians' self-kindness specifically, some studies do report physicians' self-compassion scores, which include the subscales of self-kindness, mindfulness and common humanity [14, 56]. Physicians in Canada and New Zealand report mean self-compassion scores of 3.4 and 3.2. According to Neff, a leading expert on self-compassion, people scoring between 2.5 and 3.5 on the self-compassion scale can be considered moderately self-compassionate [57]. Generally, individuals score lowest on the self-kindness subscale of the self-compassion scale [58]. Dutch cardiologists' can be considered moderately self-compassionate, assuming that the scores on the other subscales are slightly higher than 2.74. Still, there is substantial room for improvement.

According to Shanafelt et al. [7], medicine's professional culture lacks self-compassion and creates perfectionistic and self-critical individuals who normalize deferring self-care and personal relationships. Researchers argue that physicians report lower levels of self-compassion than other healthcare professionals, e.g. nurses, due to the way self-compassion is seen and valued within their profession [14]. As the profession of cardiology is known to be competitive, its members often develop perfectionist mindsets [39, 40] and frequently face critical or confronting situations [39], the found moderate score on

self-kindness amongst Dutch cardiologists indicates that they, and their patients, could indeed benefit from being more tolerant towards their own flaws and imperfections.

In contrast to our literature-based expectations, we did not find a direct relationship between cardiologists' self-kindness and professional fulfillment [21-23]. We can think of one theoretical and one methodological potential explanation for the absence of a direct relationship. From a theoretical viewpoint, we regarded self-kindness as the opposite of self-criticism, which is known to potentially harm physicians' professional fulfillment [11-13]. Consequently, we inferred that self-kindness would benefit professional fulfillment. The findings do not confirm this assumption and might imply that self-kindness is not the opposite of self-criticism, or at least does not have the opposite effect on physicians' professional fulfillment. A plausible methodological explanation is that self-kindness relates to specific aspects of the multifactorial professional fulfillment construct only. Being self-kind might not provide meaning in work – a distinctive element of professional fulfillment [24]. Additional analysis of our data seems to support this idea, as self-kindness showed small correlations with all professional fulfillment items except for 'My work is meaningful to me.' Others have found that self-kindness may positively affect certain aspects of professional fulfillment, e.g. feelings of happiness [21-23], and that it may serve as a buffer and burnout [14-16] – the other dimension measured by Trockel et al's Professional Fulfillment Index (PFI) [24].

In line with our expectations, this study furthermore shows that self-kindness may indirectly enhance professional fulfillment through personal resilience and work-home interference. Self-kindness may benefit physicians' resilience when they are facing problems or when they are guiding ill patients, implying that it takes less time for them to recover from adverse experiences or confronting situations. Resilient physicians may find more time and space to enjoy positive feelings and opportunities at work, important indicators of professional fulfillment [24]. Research on physician resilience often stresses the influence of genetics, personality traits and an individual's (professional) environment on one's resilience [59, 60] – at times neglecting the possibility that trainable skills or attitudes may also boost individuals' resilience. Our results add to the body of literature [61-63] which demonstrates that trainable skills, such as self-kindness, may also enhance physician resilience. The finding that work-home interference mediates the relationship between self-kindness and professional fulfillment suggests that self-kind physicians improve their professional fulfillment by better managing their work-home balance. Previous research already showed that fewer work-home interferences positively associate with job satisfaction [36]. Our study supports the body of knowledge showing that self-kindness is associated with self-care skills [27-30], as it seems that better self-care

skills could indeed result in more effectively reducing work's negative impact on physicians' personal spheres.

Strengths and limitations

The strength of this study is that it was set up as a national survey on behalf of the Netherlands Society of Cardiology, thereby inviting all cardiologists registered as a member of the professional body. However, when interpreting the results of this study, two limitations should be considered. First, due to its cross-sectional nature we cannot determine causality. Second, this study may be biased by its relatively low response rate of 34.6%. Nevertheless, response rates of approximately 35% are not uncommon for research into well-being and professional fulfillment amongst medical specialists, especially not during the COVID-pandemic [64, 65]. Further, we do feel reassured by the fact that this study's sample demographic characteristics resemble those of the population of all Dutch cardiologist as reported in unpublished documents of the NVVC.

Implications for practice and research

Research has shown that self-kindness is a trainable skill, for example, through regular self-kindness exercises. Often self-kindness is embedded as one of the three components of self-compassion, next to common humanity and mindfulness, in self-compassion training programs like Neff et al.'s Mindful Self-Compassion Program [9, 66]. The effectiveness of such programs for physicians' occupational well-being has been demonstrated [15, 67]. This study points to aspects that may be enhanced by the self-kindness elements of these training programs specifically: personal resilience, work-home balance and indirectly physicians' professional fulfillment. Physicians and healthcare organizations responsible for the well-being of the medical workforce may include such programs in their well-being enhancing strategies. More so, the results of this study seem to suggest that physicians operating in demanding work environments with a focus on efficiency, productivity and competitiveness [6, 7] may comfortably be more self-kind instead of being harsh and judgmental towards themselves. Doing so will likely benefit their own well-being and thereby ultimately optimize the quality of patient care.

As this study focused on one component of self-compassion, self-kindness, future research may also include the other two subscales of self-compassion – mindfulness and common humanity – to explore their (combined) effect on professional fulfillment. Also it would be worthwhile to explore whether other work-related aspects or physicians' individual characteristics may mediate the relationship between self-kindness and professional fulfillment. Finally, future research could be aimed at investigating which, if any, self-attitudes may directly enhance physicians' professional fulfillment.

Conclusions

This was the first study, to our knowledge, to empirically examine the relationship between physicians' self-kindness and professional fulfillment. The results of this study indicate that Dutch cardiologists report relatively high professional fulfillment levels and are moderately self-kind. Cardiologists who perceived themselves as more self-kind did not report higher levels of professional fulfillment. However, they reported higher levels of resilience and a better work-home balance, which positively contributed to their professional fulfillment. This study may stimulate and remind physicians to be kind towards themselves as it may benefit them and their patients.

REFERENCES

1. Brown S, Gunderman R. Viewpoint: Enhancing the Professional Fulfillment of Physicians. *Acad Med*. 2006;81(6):577-82.
2. Schrijver I, Brady K, Trockel M. An exploration of key issues and potential solutions that impact physician wellbeing and professional fulfillment at an academic center. *PeerJ*. 2016;4:e1783.
3. Baathe F, Rosta J, Bringedal B, Rø K. How do doctors experience the interactions among professional fulfilment, organisational factors and quality of patient care? A qualitative study in a Norwegian hospital. *BMJ Open*. 2019;9(5):e026971.
4. Olson K, Marchalik D, Farley H, Dean S, Lawrence E, Hamidi M, et al. Organizational strategies to reduce physician burnout and improve professional fulfillment. *Curr Probl Pediatr Adolesc Health Care*. 2019;49(12):100664.
5. Jyothindran R, d'Etienne J, Marcum K, Tijerina A, Graca C, Knowles H, et al. Fulfillment, burnout and resilience in emergency medicine—Correlations and effects on patient and provider outcomes. *PLoS One*. 2020;15(10):e0240934.
6. Trockel M, Sinsky C, West C, Dyrbye L, Tutty M, Carlasare L, et al., editors. Self-valuation challenges in the culture and practice of medicine and physician well-being. *Mayo Clinic Proceedings*; 2021;96(8):2123-2132.
7. Shanafelt T, Schein E, Minor L, Trockel M, Schein P, Kirch D. Healing the Professional Culture of Medicine. *Mayo Clin Proc*. 2019;94(8):1556-66.
8. Shanafelt T, Dyrbye L, West C. Addressing Physician Burnout: The Way Forward. *JAMA*. 2017;317(9):901-2.
9. Trockel M, Hamidi M, Menon N, Rowe S, Dudley J, Stewart M, et al., editors. Self-valuation: Attending to the most important instrument in the practice of medicine. *Mayo Clin Proc*. 2019;94(10):2022-2031.
10. Gabbard G, Gresch E. The Role of Compulsiveness in the Normal Physician. *J Occup Environ Med*. 1986;28(3):247.
11. Patel R, Bachu R, Adikey A, Malik M, Shah M. Factors related to physician burnout and its consequences: a review. *Behav Sci*. 2018;8(11):98.
12. Vaglum P, Falkum E. Self-criticism, dependency and depressive symptoms in a nationwide sample of Norwegian physicians. *J Affect Disord*. 1999;52(1-3):153-9.
13. Montero-Marín J, Gaete J, Demarzo M, Rodero B, Lopez L, García-Campayo J. Self-criticism: a measure of uncompassionate behaviors toward the self, based on the negative components of the self-compassion scale. *Front Psychol*. 2016;7:1281.
14. Dev V, Fernando A, Consedine N. Self-compassion as a stress moderator: A cross-sectional study of 1700 doctors, nurses, and medical students. *Mindfulness*. 2020:1-12.
15. Raab K. Mindfulness, self-compassion, and empathy among health care professionals: a review of the literature. *J Health Care Chaplain*. 2014;20(3):95-108.
16. Durkin M, Beaumont E, Hollins Martin C, Carson J. A pilot study exploring the relationship between self-compassion, self-judgement, self-kindness, compassion, professional quality of life and wellbeing among UK community nurses. *Nurse Educ Today*. 2016;46:109-14.
17. Solms L, Van Vianen A, Koen J, Theeboom T, De Pagter A, De Hoog M. Turning the tide: a quasi-experimental study on a coaching intervention to reduce burn-out symptoms and foster personal resources among medical residents and specialists in the Netherlands. *BMJ Open*. 2021;11(1):e041708.
18. Sinclair S, Kondejewski J, Raffin-Bouchal S, King-Shier KM, Singh P. Can self-compassion promote healthcare provider well-be-

- ing and compassionate care to others? Results of a systematic review. *Appl Psychol Health Well-Being*. 2017;9(2):168-206.
19. Neff K. The self-compassion scale is a valid and theoretically coherent measure of self-compassion. *Mindfulness*. 2016;7(1):264-74.
 20. Seligman M, Csikszentmihalyi M. Positive psychology: An introduction. Flow and the foundations of positive psychology: Springer; 2014. p. 279-98.
 21. Neff K. Self-Compassion: An Alternative Conceptualization of a Healthy Attitude Toward Oneself. *Self Identity*. 2003;2(2):85.
 22. Berry K, Kowalski K, Ferguson L, McHugh T. An empirical phenomenology of young adult women exercisers' body self-compassion. *Qual Res Sport Exerc*. 2010;2(3):293-312.
 23. Breines J, Toole A, Tu C, Chen S. Self-compassion, body image, and self-reported disordered eating. *Self Identity*. 2014;13(4):432-48.
 24. Trockel M, Bohman B, Lesure E, Hamidi M, Welle D, Roberts L, et al. A brief instrument to assess both burnout and professional fulfillment in physicians: reliability and validity, including correlation with self-reported medical errors, in a sample of resident and practicing physicians. *Acad Psychiatry*. 2018;42(1):11-24.
 25. Karasek R. Healthy work. Stress, productivity, and the reconstruction of working life. 1990.
 26. Jacobson P, Pomfret S. ERISA litigation and physician autonomy. *JAMA*. 2000;283(7):921-6.
 27. Neff K, Leary S, Hoyle R. Individual Differences in Social Behavior (pp. 561-573). New York: Guilford Press.
 28. Smith J. Self-compassion and resilience in senior living residents. *Sen Housing Care J*. 2015;23(1):17-31.
 29. Menon N, Trockel M, Shanafelt T, editors. Developing a portfolio to support physicians' efforts to promote well-being: one piece of the puzzle. *May Clin Proc*. 2019;94(11):2171-2177.
 30. Nicklin J, Seguin K, Flaherty S. Positive work-life outcomes: Exploring self-compassion and balance. *Eur J Appl Posit Psychol*. 2019;3(6):1-13.
 31. Dyrbye L, Sotile W, Boone S, West C, Tan L, Satele D, et al. A survey of U.S. physicians and their partners regarding the impact of work-home conflict. *J Gen Intern Med*. 2014;29(1):155-61.
 32. Epstein R, Krasner M. Physician resilience: what it means, why it matters, and how to promote it. *Acad Med*. 2013;88(3):301-3.
 33. Dyrbye L, Freischlag J, Kaups K, Oreskovich M, Satele D, Hanks J, et al. Work-Home Conflicts Have a Substantial Impact on Career Decisions That Affect the Adequacy of the Surgical Workforce. *Arch Surg*. 2012;147(10):933-9.
 34. Bakker A, Schaufeli W, Leiter M, Taris T. Work engagement: An emerging concept in occupational health psychology. *Work Stress*. 2008;22(3):187-200.
 35. Mache S, Vitzthum K, Klapp B, Danzer G. Surgeons' work engagement: Influencing factors and relations to job and life satisfaction. *Surgeon*. 2014;12(4):181-90.
 36. Dousin O, Collins N, Kaur Kler B. Work-life balance, employee job performance and satisfaction among doctors and nurses in Malaysia. *Int J Hum Resour Stud*. 2019;9:306-19.
 37. Keeton K, Fenner D, Johnson T, Hayward R. Predictors of physician career satisfaction, work-life balance, and burnout. *Obstet Gynecol*. 2007;109(4):949-55.
 38. Malik M, Saleem F, Ahmad M. Work-life balance and job satisfaction among doctors in Pakistan. *South Asian J Manag*. 2010;17(2):112.
 39. Panagioti M, Geraghty K, Johnson J. How to prevent burnout in cardiologists? A review of the current evidence, gaps, and future directions. *Trends Cardiovasc Med*. 2018;28(1):1-7.

40. Patel R, Sweeney M, Baker C, Greenberg N, Piper S, Shergill S, et al. If not now, when? Enhancing cardiologists' psychological well-being as a COVID-19 gain. *Heart*. 2021;107(7):593-5.
41. Michel J, Sangha D, Erwin J. Burnout Among Cardiologists. *Am J Cardiol*. 2017;119(6):938-40.
42. Lee W, Chinna K, Lim Abdullah K, Zainal Abidin I. The forward-backward and dual-panel translation methods are comparable in producing semantic equivalent versions of a heart quality of life questionnaire. *Inter J Nurs Pract*. 2019;25(1):e12715.
43. Smith B, Dalen J, Wiggins K, Tooley E, Christopher P, Bernard J. The brief resilience scale: assessing the ability to bounce back. *Int J Behav Med*. 2008;15(3):194-200.
44. Marais C, Mostert K, Geurts S, Taris T. The Psychometric Properties of a Translated Version of the Survey Work-Home Interaction — Nijmegen (SWING) Instrument. *S Afr J Psychol*. 2009;39(2):202-19.
45. Green S. How many subjects does it take to do a regression analysis. *Multivariate Behav Res*. 1991;26(3):499-510.
46. Van Voorhis C, Morgan B. Understanding power and rules of thumb for determining sample sizes. *Tutor Quant Methods Psychol*. 2007;3(2):43-50.
47. Hayes A. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach: Guilford publications; 2017.
48. Abu-Bader S, Jones T. Statistical mediation analysis using the sobel test and hayes SPSS process macro. *Int J Quant Qual Res Meth*. 2021.
49. Dyrbye L, West C, Satele D, Boone S, Tan L, Sloan J, et al. Burnout Among U.S. Medical Students, Residents, and Early Career Physicians Relative to the General U.S. Population. *Acad Med*. 2014;89(3).
50. Dyrbye L, Varkey P, Boone S, Satele D, Sloan J, Shanafelt T, editors. Physician satisfaction and burnout at different career stages. *Mayo Clin Proc*. 2013;88(12):1358-67.
51. Shanafelt T, Gradishar W, Kosty M, Satele D, Chew H, Horn L, et al. Burnout and career satisfaction among US oncologists. *J Clin Oncol*. 2014;32(7):678.
52. Kim J. Multicollinearity and misleading statistical results. *Korean J Anesthesiol*. 2019;72(6):558-69.
53. Shanafelt T, Wang H, Leonard M, Hawn M, McKenna Q, Majzun R, et al. Assessment of the association of leadership behaviors of supervising physicians with personal-organizational values alignment among staff physicians. *JAMA Netw Open*. 2021;4(2):e2035622-e.
54. Bogerd R, Silkens M, Keuken D, Hassink R, Henriques J, Lombarts K. Work-Related Well-Being Among Dutch Cardiologists – A National Survey. *Curr Probl Cardiol*. 2023;48(4):101538.
55. Serçe Ö, Partlak N, Çelik S, Zeybekçi S. Experiences of oncology nurses regarding self-compassion and compassionate care: A qualitative study. *Int Nurs Rev*. 2022;69(4):432-41.
56. Babenko O, Mosewich A, Lee A, Koppula S. Association of physicians' self-compassion with work engagement, exhaustion, and professional life satisfaction. *Med Sci*. 2019;7(2):29.
57. Neff K. Test how self-compassionate you are. Self-compassion.org. [Available from: <https://self-compassion.org/self-compassion-test/>.]
58. Neff K, Whittaker T, Karl A. Examining the factor structure of the Self-Compassion Scale in four distinct populations: Is the use of a total scale score justified? *J Pers Assess*. 2017;99(6):596-607.
59. Eley D, Cloninger C, Walters L, Laurence C, Synnott R, Wilkinson D. The relationship between resilience and personality traits in doctors: implications for enhancing well being. *PeerJ*. 2013;1:e216.

60. Feder A, Nestler E, Charney D. Psychobiology and molecular genetics of resilience. *Nat Rev Neurosci*. 2009;10(6):446-57.
61. Kemper K, Mo X, Khayat R. Are mindfulness and self-compassion associated with sleep and resilience in health professionals? *J Altern Complement Med*. 2015;21(8):496-503.
62. Mehta D, Perez G, Traeger L, Park E, Goldman R, Haime V, et al. Building Resiliency in a Palliative Care Team: A Pilot Study. *J Pain Symptom Manage*. 2016;51(3):604-8.
63. Moorfield C, Cope V. Interventions to increase resilience in physicians: A structured literature review. *Explore*. 2020;16(2):103-9.
64. O'Brien J, Goncin U, Ngo R, Hedlin P, Chakravarti A. Professional fulfillment, burnout, and wellness of anesthesiologists during the COVID-19 pandemic. *Can J Anaesth*. 2021;68(5):734-6.
65. Mehta S, Lewis J, Duvernoy S, Rzeszut K, Walsh N, Harrington Robert A, et al. Burnout and Career Satisfaction Among U.S. Cardiologists. *J Am Coll Cardiol*. 2019;73(25):3345-8.
66. Mills J, Chapman M. Compassion and self-compassion in medicine: Self-care for the caregiver. *The Australas Med J*. 2016;9(5):87-91.
67. Zessin U, Dickhäuser O, Garbade S. The relationship between self-compassion and well-being: A meta-analysis. *Appl Psychol: Health Well Being*. 2015;7(3):340-64.

SUPPLEMENTARY MATERIALS

NVVC Survey on Cardiologists' Occupational Well-being

[Translated from Dutch to English]

Sociodemographic characteristics¹

- .1| I agree to participate in this research.
 - Yes
- .2| Date of consent.
 - “Dropdown with dates”
- .3| What is your sex?
 - Male
 - Female
 - Other
- .4| What is your age?
 - Younger than 36 years old
 - 36 – 45 years old
 - 46 – 55 years old
 - 56 – 65 years old
 - > 65 years old
- .5| What type of hospital are you currently working in?
 - Independent sector treatment center
 - General hospital
 - Top clinical hospital
 - University hospital

Self-kindness

- .1| I try to be loving towards myself when I'm feeling emotional pain.
- .2| When I'm going through a very hard time, I give myself the caring and tenderness I need.
- .3| I'm kind to myself when I'm experiencing suffering.
- .4| I'm tolerant of my own flaws and inadequacies.
- .5| I try to be understanding and patient towards those aspects of my personality I don't like.

This subscale was answered on a 5-point Likert scale: Never; Sometimes; Regularly; Often; Always

¹ Respondents could only select one answer option per sociodemographic item.

Individual resilience

- .1| I tend to bounce back quickly after hard times.
- .2| I have a hard time making it through stressful events.
- .3| It does not take me long to recover from a stressful event.
- .4| It is hard for me to snap back when something bad happens.
- .5| I usually come through difficult times with little trouble.
- .6| I tend to take a long time to get over set-backs in my life.

This subscale was answered on a 5-point Likert scale: Totally disagree; Disagree; Neutral; Agree; Totally agree

Work-home interference

How often does it happen that...

- .1| You have trouble combining your work and private life?²
- .2| You do not have the energy to engage in leisure activities with your spouse/family/friends because of your job?
- .3| You are irritable at home because your work is demanding?
- .4| You find it difficult to fulfil your domestic obligations because you are constantly thinking about your work?
- .5| You have to cancel appointments with your spouse/family/friends due to work-related commitments?
- .6| Your work schedule makes it difficult for you to fulfil your domestic obligations?
- .7| You have to work so hard that you do not have time for any of your hobbies?
- .8| Your work takes up time that you would have liked to spend with your spouse/family/friends?
- .9| Your work obligations make it difficult for you to feel relaxed at home?

This subscale was answered on a 4-point Likert scale: Never; Sometimes; Often; Always

Professional fulfillment

- .1| I feel happy at work.
- .2| I feel worthwhile at work.
- .3| My work is satisfying to me.
- .4| I feel in control when dealing with difficult problems at work.

2 This first item differs from the first item in the official negative Work-Home Interference subscale of the Survey Work-Home Interaction – Nijmegen: "You do not fully enjoy the company of your spouse/family/friends because you worry about your work?". The authors decided to change this item after thorough discussions with the Netherlands Society of Cardiology, because all felt that the "new" item covers more than the official item and would offer a more realistic picture of the (potential) work-home interferences Dutch cardiologists experience.

.5| My work is meaningful to me.

.6| I'm contributing professionally (e.g. patient care, teaching, research, and leadership) in the ways I value most.

This subscale was answered on a 5-point Likert scale: Totally disagree; Disagree; Neutral; Agree; Totally agree



4

Compassionate care through the eyes of patients and physicians: an interview study

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ABSTRACT

Background

Although compassion is a crucial element of physicians' professional performance and high-quality care, research shows it often remains an unmet need of patients. Understanding patients' and physicians' perspectives on compassionate care may provide insights that can be used to foster physicians' ability to respond to patients' compassion needs. Therefore, this study aims to understand how both patients and physicians experience the concept and practice of compassionate care.

Methods

We conducted semi-structured interviews with eight patients and ten resident physicians at a University Medical Center in the Netherlands. Using thematic analysis, we separately coded patient and resident transcripts to identify themes capturing their experiences of compassionate care. This study was part of a larger project to develop an educational intervention to improve compassion in residents.

Results

For both patients and residents, we identified four themes encompassing compassionate care: being there, empathizing, actions to relieve patients' suffering, and connection. For residents, a fifth theme was professional fulfillment (resulting from compassionate care). Although patients and residents both emphasized the importance of compassionate care, patients did not always perceive the physician-patient encounter as compassionate. According to residents, high workloads and time pressures hindered their ability to provide compassionate care.

Discussion and conclusion

Patients and residents have similar and varying understandings of compassionate care at the same time. Understanding these differences can aid compassion in medical practice. Based on the findings, three topics are suggested to improve compassion in residents: (1) train residents how to ask for patients' compassion needs, (2) address residents' limiting beliefs about the concept and practice of compassion, and (3) acknowledge the art and science of medicine cannot be separated.

BACKGROUND

Providing care with compassion is a crucial aspect of physicians' professional performance and essential for achieving high-quality care [1]. Compassion involves the response to patients' suffering coupled with the wish, intention, and action to relieve it [2, 3]. Research shows that compassion benefits patients' clinical experience and alleviates their distress and anxiety [1, 3-7]. Moreover, compassionate patient care is associated with better patient self-care as it drives patient engagement and treatment adherence [1]. Although patients find compassion crucial, it is often an unmet need [1, 8-11]. In a large US survey, only half of the patients reported receiving compassionate care [8]. Similar results have been found in other countries [12, 13]. The ramifications of this unmet need are serious, as less physician compassion has been associated with slower wound healing [5], less optimal blood sugar in diabetic patients [4], and higher levels of anxiety and pain [5]. Moreover, a lack of compassion is linked with lower quality of care, such as higher risks of medical errors [11].

While physicians agree with patients on the significance of compassion for successful medical treatment, they report that demanding work circumstances, such as excessive workloads and resulting time constraints, challenge their ability to provide compassionate care [8]. Moreover, during residency training, the skills and attitudes to provide compassionate care are not explicitly taught and role modelled [14]. Studies report decreased empathy – a crucial aspect of compassion – among residents and early physicians [15, 16]. This may endanger the quality of patient care and physicians' well-being [1, 8, 11], as both self-compassion and compassion for others can mitigate burnout and increase physicians' work engagement and job satisfaction [17, 18].

Healthcare institutions, and those working in them, are therefore expected to develop and sustain compassionate care in practice [13, 19-21]. However, evidence-based educational interventions equipping physicians with the knowledge, skills and attitude to provide compassionate care are mainly absent [21, 22]. Knowing how patients and physicians experience compassionate care is required to best serve patients, to teach compassionate care and to design improvement interventions. In contrast to the nursing profession [23-25], the focus on physicians' experiences of compassion in clinical practice remains limited [26], and the voice of patients, needs further exploration [10, 23]. The few studies that touched upon patients' experiences of compassion predominantly focused on cancer patients. These studies showed that compassion for these patients included the health care provider's understanding of patients' needs, relational communicating, and attending to needs [10, 27].

Against this background, this study aims to understand patients' and physicians' experiences of compassionate care by identifying key themes for both. Such an understanding can serve as a basis for educational interventions aimed at fostering compassionate care by physicians, by providing insights into the differences between views of patients and physicians on compassion and into potential barriers for compassionate care. Indeed, missed opportunities to provide compassionate care represent a significant challenge [21, 28, 29]: when physicians are unaware of what compassionate care means for patients, providing compassionate care is complicated. Understanding both perspectives is an important starting point for informing educational interventions for physicians to improve compassion. Therefore, this study answers the following research question: What are experiences of patients and physicians regarding compassionate care? Based on the answer to this question, we will discuss topics in the Discussion which are relevant for enhancing compassion in residents.

METHODS

This interview study was conducted among patients and resident physicians (hereafter: residents) at a large University Medical Center (UMC) in the Netherlands. Residents are physicians in training and are responsible for providing patient care. This study was part of a larger project to develop an educational intervention to improve compassion in residents.

Sampling and data collection

Patients and residents were selected through convenience sampling, meaning that patients and residents who were willing to participate were interviewed. We recruited patients via medical specialists and the Client Advisory Council in the UMC. Residents were recruited via Program Directors and through snowballing by asking participating residents. In total, eight patients (5 female) participated in an interview. Patients were between the age of 22 and 79. Patients were under treatment within the (sub)specialties of cardiology (4) or internal medicine (4). Ten residents (8 female) participated in an interview. They varied in postgraduate years (ranging from year 1 to 6) and specialty, including radiology (1), internal medicine (5), ophthalmology (1), and surgery (3). All participants were invited by phone call or e-mail, and they received a study information letter by e-mail.

The research team developed semi-structured interview guides for patients and residents. The guides contained the same questions; only the wording was tailored to patients or residents (Supplementary Materials). During the interview, patients and

residents were asked to describe their experiences with respectively receiving and providing compassionate care to explore their perceptions. All interviews were conducted between August 2019 and December 2019 by authors MD, IJ, RB, and MDi. They regularly discussed the interviews afterward to share reflections as it facilitated the following interviews. Interviews were audiotaped, transcribed verbatim, and anonymized before data analysis.

Ethical approval and consent to participate

The institutional ethical review board of the Amsterdam UMC of the University of Amsterdam provided a waiver declaring the Medical Research Involving Human Subjects Act (WMO) did not apply for the project (reference number W19_327 # 19.386). All participants provided written informed consent. Participation in the study was voluntary at all times.

Data analysis

All interviews were analyzed using thematic analysis [28]. We took the following steps to develop the final template. First, three resident transcripts were read and open coded independently by MD and IJ. Then, MD and IJ discussed the codes and constructed themes (i.e., how codes cluster together), resulting in an initial template. After the research team discussed the template, IJ applied the template to the following transcripts. We refined the themes iteratively during regular team meetings until we agreed upon the template. In the final stage, IJ applied the template to all transcripts. Then, the same data analysis steps were applied to patient interviews. We regularly checked throughout the interviews whether patients were talking about residents or other healthcare professionals; the latter fragments were excluded. After analyzing ten resident and eight patient transcripts, saturation was met, meaning we had collected enough data to globally understand how patients and residents experienced compassionate care and where differences occurred. MAXQDA (version MAXQDA Plus 2020) supported data analysis.

RESULTS

The data analysis identified four interrelated themes that express what compassionate care entails for patients and residents: (1) being there, (2) empathizing with the patient's suffering, (3) actions aimed to relieve this suffering, and (4) connection. Within these four themes, different subthemes emerged for patients and residents. For residents, a fifth theme was professional fulfillment resulting from compassionate care (see Table 1). Generally, patients and residents emphasized the importance of compassion for optimal patient care. Nevertheless, patients also shared that they did not always perceive their

care as compassionate, and residents touched upon the challenges in providing compassionate care to their patients.

Table 1. Themes and subthemes for patients and residents expressing compassionate care

Theme	Subthemes of patients	Subthemes of residents
Being there with and for patients	Displaying attention by taking time and being prepared (+)	Taking the time for patients (+)
	Having a demeanor of calmness (+)	Taking responsibility to manage patients' healthcare processes (+)
	Showing stress (-)	
Empathizing	Seeing and treating patients as a person (+)	Seeing patients as fellow human beings (+)
	Asking about patients' needs (+)	Standing in patients' shoes (+)
	A lack of empathy (-)	Balancing over-involvement and detachment (+/-)
Action	Communicating clearly (+)	Small and extraordinary actions (+)
	Involving patients during the medical process (+/-)	Relieving patients' suffering (+)
		Time pressures and lack of time (-)
Connection	To click with someone (+)	To click with someone (+)
	Equal relationship (+)	Reciprocal relationship (+/-)
	Engaged and medically interested patients (+)	Bad mood (-)
Professional fulfillment	N.A.	Making a difference for patients (+)
	N.A.	Organizational hassle (-)

(+) indicates that the subtheme had a positive influence on compassion.

(-) indicates that the subtheme had a negative influence on compassion.

Patients

Being there with and for patients

Patients perceived residents' attention when they literally took (more) time by, for example, planning them "at the end of the consultation so that I had enough time to ask questions" (P3). When residents had well prepared for the consultation and were informed about their situation, patients felt that residents were interested in them.

Also, patients experienced residents being there for them through their demeanor of calmness by sitting down while talking to patients as it "shows that [residents] have more time instead of just quickly call on me" (P5). In contrast, when residents were stressed or in a hurry, patients felt being a "box that should be ticked off" (P5). In these situations, they felt unheard, less free to ask questions and, at times, a burden.

Empathizing

Patients felt being seen as a person when residents were understanding and caring, rather than only “examining the heart and moving on” (P5). According to patients, empathy could be expressed by saying “I notice what it does to you, it is intense” (P5).

They frequently indicated that residents should ask patients “what do you need?” (P4). This subtheme was closely related to the previous one, as asking contributes to being seen as a person. When residents did ask such questions, patients felt taken seriously, and it was easier for them to open up and share thoughts or concerns:

‘What do you need?’. Who is that person sitting across from me? [...] I really believe that then you will have a better conversation [...] seeing the complete picture and not only the illness sitting across from you, really seeing the person facing you. (P3)

Patients also provided narratives showing how they experienced residents’ lack of empathy. They felt that residents did not always recognize their unease or behaved inappropriately, which evoked emotional reactions:

Then he puts his ultrasound on [belly pregnant patient]. He says ‘O, I can only see four fingers and a thumb’, which was meant as a joke. I thought, well, you have no idea how I feel, as it was the special clinic for high-risk pregnancies. [...] I was terrified because I thought, now it is all wrong. (P5)

Action

Patients recognized the relevance of action as an element of compassion: residents doing something to relieve their suffering, in which suffering could be for example pain, confusion or uncertainty. An act of compassion could be remembering what patients had said in an earlier consult or comforting patients by saying “it’s going to be okay” (P4). Patients indicated two specific actions that could relieve their suffering: communicating clearly, and involving patients in the medical process.

For patients, clear communication included residents explaining a medical procedure step-by-step. Patients found it important that residents were aware of their way of communicating as “c’est le ton qui fait la musique [it is the tone that makes the music]” (P8) and that residents adjusted their communication to their understanding. The importance patients ascribed to clear communication became apparent as patients highlighted how medical interventions could technically be successful but fail in the sense that patients still suffered from confusion and uncertainty due to insufficient explanation.

For patients, action also included involving them in the medical process, enabling them to maintain voice and control. When residents involved patients for example, during decision-making processes, they felt taken seriously. In contrast, non-involvement could evoke emotions such as frustration or anger. Especially during physical examinations, patients felt extra vulnerable and were upset when residents did not involve them in what was going to happen or did not provide reassurance:

Well, I was lying there in the room covered by my towel, so that makes you vulnerable, right. And he walked in [...] Immediately, a blob on the ultrasounds head, pulling down the towel and putting the ultrasound on my skin. It's really an invasion of your body. (P2)

Connection

Patients described a connection with a resident as to “click with someone” which could promote a long-term relationship with a resident:

I have been a patient with [physician] for six years. [...] I noticed that we very quickly developed a certain mutual sympathy. We have the same kind of humor, I think. And the connection was there right away. [...] We have a connection, understand each other and you do not have to make that explicit. (P8)

For patients, a connection with residents also entailed a relationship based on equality, meaning residents are symbolically “standing next to me, instead of positioning themselves above me” (P4). As a result, patients noticed being more forgiving (e.g., if a consultation runs late), taking residents’ advice more seriously, and feeling safer to ask questions. Finally, patients noticed residents’ enthusiasm when patients were engaged and interested in their own medical situation through, for instance, preparing the consultation and asking questions.

Residents

Being there with and for patients

By taking time for patients, residents intended to give them the feeling that they were being heard and taken seriously. Removing distracters (e.g., pagers) and sitting down with patients helped residents to take time for patients and be present.

Also, residents talked about the responsibility to manage healthcare processes, such as making phone calls or consulting other physicians. Even when residents could not physically be there for patients, i.e., because their shift had ended or they were on leave, they still felt responsible for searching for replacement:

If a new patient shows up at four o'clock, you can't say I only work until five. You have to find at least someone else to see the patient. [...] Being a physician is not just an activity, rather it is a responsibility. (R3)

Empathizing with patients

For residents, empathy included looking beyond the patients' disease and seeing them as fellow human beings by, for example, asking patients about:

Hobbies and the home situation. If you just ask people, what do you like to do? Then a patient changes into a human being. (R4)

Residents empathized with patients by metaphorically standing in their shoes: residents imagined how they themselves would like to be treated or how "I would like my mother to be taken care of" (R9). While residents described the ability to empathize as a personality trait, they also stressed that it can be learned and developed. Empathizing with patients could also create tensions for residents, for example when trying to find the balance between over-involvement and detachment in patient encounters:

You can't cry along with every patient. Then you can't practice medicine because tremendously miserable things happen. (R8)

Empathizing was facilitated or hindered by residents' judgment of the severity of patients' medical condition. When residents judged the medical situation as severe, feelings of empathy arose and providing compassionate care was "more obvious and recognizable" (R6). On the other hand, when residents evaluated the situation as less severe, being compassionate felt less necessary, e.g., when patients had undergone the treatment before and knew what to expect.

Action

While residents highlighted that actions could be small gestures which are "the little things one can do" (R9), they also often talked about out-of-routine care efforts, such as visiting the patient once more during on-call shifts, or extraordinary action.

Regardless of whether the actions were small or extraordinary, residents aimed to relieve patients' suffering. For example, one resident described alleviating patients' stress by playing their favorite music during surgery:

So, in that sense, it just created peace for him. That's a good thing, of course. Because it means that the anesthesia team – being busy with the epidural – can

focus on that while the man [patient] experiences less stress. And of course, you can clearly observe that in the heart rate. You can see that very nicely when someone is attached to the monitor in the OR. (R9).

Residents consistently reported how a lack of time and time pressures constrained their ability to act compassionately. Residents experienced “too little time per patient” (R1) and felt unable to go that “extra mile and perhaps listen a little more [to the patient]” (R1), as their outpatient clinic would run late. Moreover, as some residents experienced high time pressures during consults with patients, they noticed that being compassionate “sometimes slips through the cracks” (R10).

Connection

In line with patients, residents described a connection as to “click with someone”. They noticed that a connection with patients could be fostered by identifying with patients, being moved by their stories, or being involved in patients’ care process for an extended period. Moreover, some residents felt that a connection was promoted when patients expressed interest in medicine, e.g., by describing “very clear symptoms” (R5).

Residents saw a reciprocal relationship as important, meaning that patients behaved appropriately since the patient-resident relationship is a matter of “giving and taking” (R10). Hence, providing compassionate care felt more natural when patients were polite, respectful, and were interested in residents. In contrast, patients who were demanding, complaining, nagging or had ideas that “go against your convictions” (R2) challenged residents’ ability to express compassion. One resident asked herself whether her annoyance towards a patient could have affected her medical judgment:

And if you compare it with patients who have metastasized cancer, then they [patients with breast cancer] nag too easily really, that is the kind of the feeling you get. [...] So did this lady [patient]. [...] There was not much of a chance that something was wrong. And then, later, it turned out that she had metastases everywhere. [...] I wondered whether my lack of patience or empathy actually hampered my assessment. (R4)

Residents also recognized how being in a bad mood could interfere with establishing and maintaining a connection. If they, for example, “had a terrible night of sleep and were cranky” (R6), residents had the feeling that they provided less compassionate care and found themselves “less nice to patients” (R6).

Professional fulfillment

As a result of providing compassionate care, residents reported that they felt “much more fulfilled as a physician” (R7). Organizational hassle hindered their efforts to go that extra mile and thereby their professional fulfillment:

But she [patient] really wants to go on vacation in the meantime so I try to schedule the MRI in a certain week and now I am told there really is no opening [for an MRI] yes I find that very frustrating. (R8)

While residents generally felt satisfied by providing patient care, being compassionate entailed the feeling of really making a difference for patients. This was especially experienced in situations where patients expressed their contentedness as a result of the resident guiding them through important health decisions in their live:

Sometimes I even get a few goosebumps [...] and I think what a unique profession we have, [...] that we are allowed to guide people in this. [...] Of course it also takes energy because you discuss heavy themes, but the fact that you can help people so well. Sometimes I walk out of the consulting room: wow, special. (R2)

DISCUSSION

This study sought to understand how patients and residents experience compassionate care and identified four themes for patients and residents: (1) being there, (2) empathizing with the patient’s suffering, (3) actions aimed to relieve this suffering, and (4) connection. For residents, a fifth theme was professional fulfillment resulting from compassionate care. The identified themes resonate with previous research on compassion [10, 26, 27, 29] and add to a more comprehensive understanding of compassion in the physician-patient encounter. An important finding of this study is that patients did not always perceive compassion in the physician-patient encounter. At the same time, all residents spoke of their intentions to provide compassionate care. Thus, the findings indicate a gap exists between patients’ experiences and residents’ intentions. More closely inspecting the identified themes provides insight into the shared and unique experiences of patients and residents regarding compassion, which may inform educational interventions to bridge this gap.

The additional theme for residents, professional fulfillment, confirms that physicians are mainly driven by their desire to help patients [30]. Also, this finding suggests that enhancing compassion in residents will likely benefit the quality of patient care and

residents' well-being. For most of the shared themes, there were only subtle differences in patients' and residents' experiences of compassion. Within the action theme, there was a more notable difference: more than patients did residents experience providing compassionate care as performing additional (medical) actions. A closer inspection of the themes also shows that residents judged patients' need for compassion based on the severity of their medical condition, and some described providing compassion when they felt they had enough time. These findings suggest residents hold several limiting beliefs (e.g., it takes too much time) about the concept and practice of compassion.

Based on the findings, we will now discuss three topics that need attention in order to improve compassion in residents: (1) train residents how to ask for patients' compassion needs, (2) address residents' limiting beliefs about the concept and practice of compassion, and (3) acknowledge the art and science of medicine cannot be separated.

1. Train residents' how to ask for patients' compassion needs

For patients, small gestures were experienced as an act of compassion, such as a physician putting a comforting hand on the patient's shoulder. This insight may bring compassionate care within the reach of more patients without much extra costs or 'hard work', when residents start noticing and responding to patients' specific, attainable compassion needs. In line with previous findings [2, 26, 27], residents often perceived that assessing patients' compassion needs comes down to the adage 'do unto others as you would have them do unto you'. However, from patients in this study, it can be learned that this approach may not always accurately reflect how patients wish to be treated. Patients suggest that healthcare providers could ask them about their needs instead of making assumptions about their needs. It should be noted here that using such questions (e.g., 'what do you need') merely instrumental, without making a meaningful and sincere connection with patients, is likely to be less effective [1]. Studies on physician-patient communication provide guidelines on how to ask patients for their care preferences, which may inform educational interventions to indeed make a meaningful connection and identify patients' compassion needs [31, 32].

2. Address residents' limiting beliefs about the concept and practice of compassion

This study suggests that residents hold several limiting beliefs about the concept and practice of compassion. Residents occasionally experienced providing compassionate care as difficult, hard work, and an increase to their workload. They experienced providing compassionate care as time-consuming, especially when their clinics ran late. Previous studies show that demanding working circumstances constrain residents' ability to provide compassionate care [8, 17]. However, the perception that compassion includes

'extra' work and cannot be practiced in challenging work environments may entail a limiting belief. Researchers found that small gestures and compassionate communication would only take less than forty seconds per patient and reduces patients' anxiety levels [33, 34]. Moreover, patients in this study particularly experienced residents' humane qualities and behavior, such as treating patients as equals by sitting beside them, as valuable.

Residents also found it challenging to determine the appropriate level of compassion, as they were afraid to become too involved and emotionally attached. This may represent a limiting belief because when compassion is understood and practiced appropriately, it also yields a range of positive outcomes and may even reduce emotional exhaustion [17, 22, 35, 36]. Therefore, additional attention is needed to train residents to determine an appropriate and balanced position regarding compassion. Virtue ethics focuses on the disposition which enables one to find the right middle between two extremes [37-39]. Educational interventions may include insights from virtue ethics and previously noted evidence on the effects of compassion which can enable residents to reflect upon how to determine their appropriate, balanced position on a compassion continuum, namely finding their position between detachment and over-involvement.

Lastly, residents found it challenging to connect with certain patients, hampering their ability to provide compassionate care. For example, when patients misbehaved or had undefinable medical complaints. The opposite was also true; when residents identified with patients or were interested in their medical condition, it facilitated humanistic practice, resonating with previous findings [40-42]. While identification with certain people and personalities is inherent in all human relationships, a positive physician-patient connection is crucial for patients' health and should therefore be established regardless of patients' characteristics [1]. Despite the best intentions of physicians, implicit and explicit biases, for example, regarding race, culture, gender, or the patient's medical condition, influence the patient-physician encounter and patient outcomes [43, 44]. Hence, in an educational intervention, residents can explore their prejudices as awareness of them may help to attenuate instinctive uncompassionate actions regarding challenging patients [45].

3. Acknowledge the art and science of medicine cannot be separated

Our study confirms that compassion is an essential aspect of medical care. Internationally, the importance of compassion is emphasized in, for example, the American Medical Association's Principles of Medical Ethics and the British NHS constitution [29]. However, our results suggest that some residents believe high-quality care can exist without compassion. While this can also be seen as a belief limiting residents' compassion efforts, this

topic deserves more attention in medical practice in general. Implicit messages within the medical environment champion certainty, objectivity, and physicians' procedural skills, while the more elusive qualities like communication and compassion are rarely explicitly included in residency training programs [14, 46, 47]. Leaders in healthcare, supervisors, and training programs must acknowledge that the art and science of medicine cannot be separated and appreciate and value both aspects accordingly, for instance, by supervisors being role models and providing explicit feedback on compassion to residents.

Strengths and limitation

The strengths of this study are the inclusion of both patients and residents and explicitly comparing these insights to elaborate directions for developing educational interventions to improve compassion in physicians, thereby addressing a shortage in the literature [17, 21, 22]. A limitation of this study is that the participating residents were mainly white women, which mirrors the Dutch resident population but likely influenced our results as providing compassionate care might be shaped by such characteristics [17]. For example, researchers found that female physicians' practice patterns included more patient-centered, empathetic communication [47]. Moreover, most participating patients were well-educated, white women. Also, patients' different medical histories may have influenced their perspectives on compassion which could further limit the transferability of this study's findings.

Conclusions

For both patients and residents, we found that compassionate care encompassed: being there, empathizing, actions to relieve patients' suffering, and connection. For residents, compassion included a fifth theme: professional fulfillment. Patients and residents emphasized the importance of compassion, although they had different views about compassionate actions. According to residents, compassionate actions often included 'doing more' in terms of (medical) actions, while patients especially valued residents' human qualities of 'being with' the patient and/or making a human-to-human connection with the patient. Residents' ability to provide compassionate care depended on their perceptions (e.g., it takes too much time), patients' characteristics, and their workload and available time. To improve compassion in residents our findings suggest to (1) train residents how to ask for patients' compassion needs, (2) address residents' limiting beliefs about the concept and practice of compassion, and (3) acknowledge the art and science of medicine cannot be separated.

REFERENCES

1. Trzeciak S, Mazzarelli A, Booker C. Compassionomics: The revolutionary scientific evidence that caring makes a difference. Florida: Studer Group; 2019.
2. Sinclair S, Beamer K, Hack T, McClement S, Raffin Bouchal S, Chochinov H, et al. Sympathy, empathy, and compassion: A grounded theory study of palliative care patients' understandings, experiences, and preferences. *Palliat Med.* 2017;31(5):437-47.
3. Goetz J, Keltner D, Simon-Thomas E. Compassion: an evolutionary analysis and empirical review. *Psychol Bull.* 2010;136(3):351-74.
4. Hojat M, Louis D, Markham F, Wender R, Rabinowitz C, Gonnella J. Physicians' Empathy and Clinical Outcomes for Diabetic Patients. *Acad Med.* 2011;86(3):359-64.
5. Pereira L, Figueiredo-Braga M, Carvalho I. Preoperative anxiety in ambulatory surgery: The impact of an empathic patient-centered approach on psychological and clinical outcomes. *Patient Educ Couns.* 2016;99(5):733-8.
6. Gaufberg E, Hodges B. Humanism, compassion and the call to caring. *Med Educ.* 2016;50(3):264-6.
7. Bendapudi N, Berry L, Frey K, Parish J, Rayburn W. Patients' Perspectives on Ideal Physician Behaviors. *Mayo Clin Proc.* 2006;81(3):338-44.
8. Lown B, Rosen J, Marttila J. An agenda for improving compassionate care: a survey shows about half of patients say such care is missing. *Health Aff.* 2011;30(9):1772-8.
9. Sinclair S, Kondejewski J, Hack T, Boss H, MacInnis C. What is the Most Valid and Reliable Compassion Measure in Healthcare? An Updated Comprehensive and Critical Review. *Patient.* 2022;15(4):399-21.
10. Sinclair S, McClement S, Raffin-Bouchal S, Hack TF, Hagen NA, McConnell S, et al. Compassion in Health Care: An Empirical Model. *J Pain Symptom Manage.* 2016;51(2):193-203.
11. Trzeciak S, Roberts B, Mazzarelli A. Compassionomics: Hypothesis and experimental approach. *Med Hypotheses.* 2017;107:92-7.
12. Lown B, Dunne H, Muncer S, Chadwick R. How important is compassionate healthcare to you? A comparison of the perceptions of people in the United States and Ireland. *J Res Nurs.* 2017;22(1-2):60-9.
13. Francis R. Report of the Mid Staffordshire NHS Foundation Trust Public Inquiry. London: Department of Health; 2013.
14. Lown B, McIntosh S, Gaines M, McGuinn K, Hatem D. Integrating Compassionate, Collaborative Care (the "Triple C") Into Health Professional Education to Advance the Triple Aim of Health Care. *Acad Med.* 2016;91(3):310-6.
15. Neumann M, Edelhäuser F, Tauschel D, Fischer M, Wirtz M, Woopen C, et al. Empathy Decline and Its Reasons: A Systematic Review of Studies With Medical Students and Residents. *Acad Med.* 2011;86(8):996-1009.
16. Bellini L, Shea J. Mood Change and Empathy Decline Persist during Three Years of Internal Medicine Training. *Acad Med.* 2005;80(2):164-7.
17. Sinclair S, Norris J, McConnell S, Chochinov H, Hack T, Hagen N, et al. Compassion: a scoping review of the healthcare literature. *BMC Palliat Care.* 2016;15(1):6.
18. Bogerd R, Debets M, Keuken D, Hassink R, Henriques J, Lombarts K. The relationship between physicians' self-kindness and professional fulfillment and the mediating role of personal resilience and work-home interference: A cross-sectional study. *Plos One.* 2023;18(4):e0284507.
19. Sinclair S, Kondejewski J, Jaggi P, Dennett L, Roze des Ordons A, Hack T. What Is the State of Compassion Education? A Sys-

- tematic Review of Compassion Training in Health Care. *Acad Med.* 2021;96(7):1057-70.
20. Vanselow N, Cuff P. Institute of Medicine (US) Committee on Behavioral and Social Sciences in Medical School Curricula. Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula. Washington: National Academies Press; 2004.
 21. Patel S, Pelletier-Bui A, Smith S, Roberts M, Kilgannon H, Trzeciak S, et al. Curricula for empathy and compassion training in medical education: a systematic review. *PLoS One.* 2019;14(8):e0221412.
 22. Malenfant S, Jaggi P, Hayden K, Sinclair S. Compassion in healthcare: an updated scoping review of the literature. *BMC Palliat Care.* 2022;21(1):1-28.
 23. Maben J, Cornwell J, Sweeney K. In praise of compassion. *J Res Nurs.* 2010;15(1):9-13.
 24. Dev V, Fernando A, Kirby J, Consedine N. Variation in the barriers to compassion across healthcare training and disciplines: A cross-sectional study of doctors, nurses, and medical students. *Int J Nurs Stud.* 2019;90:1-10.
 25. Dev V, Fernando A, Consedine N. Self-compassion as a Stress Moderator: A Cross-sectional Study of 1700 Doctors, Nurses, and Medical Students. *Mindfulness.* 2020;11(5):1170-81.
 26. Sinclair S, Hack T, McClement S, Raffin-Bouchal S, Chochinov H, Hagen N. Healthcare providers perspectives on compassion training: a grounded theory study. *BMC Med Educ.* 2020;20(1):249.
 27. Sinclair S, Bouchal S, Schulte F, M. T. Guilcher G, Kuhn S, Rapoport A, et al. Compassion in pediatric oncology: A patient, parent and healthcare provider empirical model. *Psycho-Oncol.* 2021;30(10):1728-38.
 28. Brooks J, McCluskey S, Turley E, King N. The Utility of Template Analysis in Qualitative Psychology Research. *Qual Res Psychol.* 2015;12(2):202-22.
 29. Strauss C, Lever Taylor B, Gu J, Kuyken W, Baer R, Jones F, et al. What is compassion and how can we measure it? A review of definitions and measures. *Clin Psychol Rev.* 2016;47:15-27.
 30. Van den Goor M, Boerebach B, Bindels E, Heineman MJ, Lombarts K. The Doctor's Heart: A Qualitative Study Exploring Physicians' Views on Their Professional Performance in Light of Excellence, Humanistic Practice and Accountability. 2020.
 31. Noordman J, Schulze L, Roodbeen R, Bolland G, Van Vliet L, Van den Muijsenbergh M, et al. Instrumental and affective communication with patients with limited health literacy in the palliative phase of cancer or COPD. *BMC Palliat Care.* 2020;19(1):1-12.
 32. Elwyn G, Frosch D, Thomson R, Joseph-Williams N, Lloyd A, Kinnersley P, et al. Shared decision making: a model for clinical practice. *J Gen Intern Med.* 2012;27:1361-7.
 33. Fogarty L, Curbow B, Wingard J, McDonnell K, Somerfield M. Can 40 seconds of compassion reduce patient anxiety? *J Clin Oncol.* 1999;17(1):371-9.
 34. Sep M, Van Osch M, Van Vliet L, Smets E, Bensing J. The power of clinicians' affective communication: How reassurance about non-abandonment can reduce patients' physiological arousal and increase information recall in bad news consultations. An experimental study using analogue patients. *Patient Educ Couns.* 2014;95(1):45-52.
 35. Bogerd R, Silkens M, Keuken D, Hassink R, Henriques J, Lombarts K. Work-related Well-being among Dutch Cardiologists—A National Survey. *Curr Probl in Cardiol.* 2022:101538.
 36. Stevens F, Taber K. The neuroscience of empathy and compassion in pro-social behavior. *Neuropsychologia.* 2021;159:107925.
 37. Pellegrino E, Thomasma D. The virtues in medical practice: Oxford University Press; 1993.

38. Ashcroft A, Parker M, Verkerk M, Widdershoven G. Philosophical introduction: case analysis in clinical ethics. *Case analysis in clinical ethics*. 2005;1(6).
39. Molewijk B, Zadelhoff E, Lendemeijer B, Widdershoven G, editors. Implementing moral case deliberation in Dutch health care; improving moral competency of professionals and the quality of care. *Bioethica Forum*. 2008;1(1):57-65.
40. Street R, Gordon H, Haidet P. Physicians' communication and perceptions of patients: is it how they look, how they talk, or is it just the doctor? *Soc Sci Med*. 2007;65(3):586-98.
41. Pavlova A, Wang C, Boggiss A, O'Callaghan A, Considine N. Predictors of Physician Compassion, Empathy, and Related Constructs: a Systematic Review. *J Gen Intern Med*. 2022;37(4):900-11.
42. Thornton R, Powe N, Roter D, Cooper L. Patient-physician social concordance, medical visit communication and patients' perceptions of health care quality. *Patient Educ Couns*. 2011;85(3):201-8.
43. Chapman E, Kaatz A, Carnes M. Physicians and implicit bias: how doctors may unwittingly perpetuate health care disparities. *J Gen Intern Med*. 2013;28:1504-10.
44. Suurmond J, Seeleman C. Shared decision-making in an intercultural context: barriers in the interaction between physicians and immigrant patients. *Patient Educ Couns*. 2006;60(2):253-9.
45. Esquierdo-Leal J, Jacobs N, Strauss S. Prejudice in the health care system: Remediation strategies. *Prejudice, Stigma, Privilege, and Oppression: A behavioral health handbook*. 2020:337-59.
46. Phillips S, Dalgarno N. Professionalism, professionalization, expertise and compassion: a qualitative study of medical residents. *BMC Med Educ*. 2017;17(1):21.
47. Lombarts K, Verghese A. Medicine Is Not Gender-Neutral — She Is Male. *NEJM*. 2022;386(13):1284-7.

SUPPLEMENTARY MATERIALS

Additional file 1: Semi-structured initial interview guide for residents and patients

Not all follow-up and probing questions are included in the interview guides below. During interviews with patients, we regularly checked whether patients talked compassionate care provided by residents.

Interview guide residents

Introductory questions

1. Can you please indicate, in three to five words, on this paper what associations compassion evokes in you?
2. What is the value of compassionate care for you?

Key questions

3. Can you give an example of a situation in which you felt successful in providing compassionate care?
4. Can you also give an example of a situation in which you felt less successful in providing compassionate care?
5. What would be too much or too little compassion for you?
6. What helps you in providing compassionate care to patients?
7. What hinders you in providing compassionate care to patients?
8. Within your current work environment, is there attention for compassion?
9. How good are you at providing compassionate care? Does it feel like a second nature, or do you have to put effort into it?

Wrap-up questions

10. Are there topics that I did not ask about but are essential?

Interview guide patients

Introductory questions

1. Can you please indicate in three to five words on this paper what associations compassion evokes in you?
2. How did you experience compassion in your health care trajectory within this hospital?

Key questions

3. Can you give an example of a situation where you felt that your physician provided compassionate care?

4. Can you also give an example of a situation where you felt that your physician provided less compassionate care?
5. Looking back at the examples you just offered, how do you feel when you:
 - a. Are treated compassionately by your physician?
 - b. Are treated less compassionately by your physician?
6. What would be too much or too little compassion for you?
7. What aspects contribute to your experience of compassionate care?
 - a. What factors promote the experience?
 - b. What factors hinder the experience?
8. What tip would you give to physicians so that they can provide (more) compassionate care?

Wrap-up questions

9. Are there topics that I did not ask about but are essential?



5

Doctors' alertness, contentedness and calmness before and after night shifts: a latent profile analysis

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ABSTRACT

Background

While night shifts are crucial for patient care, they threaten doctors' well-being and performance. Knowledge of how the impact of night shifts differs for doctors is needed to attenuate the adverse effects of night shifts. This study aimed to obtain more precise insight into doctors' feelings surrounding night shift by: identifying profiles based on doctors' alertness, contentedness and calmness scores before and after night shifts (research question (RQ) 1); assessing how doctors' pre- and post-shift profiles change (RQ2); and determining associations of doctors' demographics and shift circumstances with alertness, contentedness and calmness change (RQ3).

Methods

Latent Profile Analysis using doctors' pre- and post-shift self-rated alertness, contentedness and calmness scores was employed to identify pre- and post-shift profiles (RQ1). A cross-tabulation revealed pre- and post-shift profile changes (RQ2). Multiple regressions determined associations of demographics (i.e. age, sex, specialty) and night shift circumstances (i.e. hours worked pre-call, hours awake pre-call, shift duration, number of consecutive shifts, total hours of sleep) with alertness, contentedness and calmness change (RQ3).

Results

In total, 211 doctors participated with a mean age of 39.8 ± 10 years; 47.4% was male. The participants included consultants (46.4%) and trainees (53.6%) of the specialties surgery (64.5%) and obstetrics/gynaecology (35.5%). Three pre-shift (Indifferent, Ready, Engaged) and four post-shift profiles (Lethargic, Tired but satisfied, Excited, Mindful) were found. Most doctors changed from Ready to Tired but satisfied, with alertness reducing most. Age, specialty, sleep, shift duration and the number of consecutive shifts associated with alertness, contentedness and calmness changes.

Conclusions

The results provided nuanced insight into doctors' feelings before and after night shifts. Future research may assess whether specific subgroups benefit from tailored interventions.

INTRODUCTION

Providing high-quality patient care inevitably involves working night shifts for most doctors. Night shifts can negatively impact doctors' health and performance [1-5]. Doctors that regularly work at night are more prone to chronic diseases [2], sleeping disorders [3], and burnout [5]. Due to sleep loss and circadian misalignment, shift work also associates with fatigue, reduced alertness and impaired psychomotor and cognitive performance [6-11]. Consequently, doctors that regularly work night shifts are more likely to make significant medical errors due to the effects of these shifts [5, 12]. Therefore, it is crucial for doctors and patients that night shifts' adverse effects are maximally attenuated.

The first steps to attenuate these adverse effects have been made. Internationally, regulating authorities such as the Accreditation Council for Graduate Medical Education (ACGME) restricted duty hours to protect doctors and patients. While some researchers report that general interventions like reducing working hours seem beneficial [13], others did not find effects on patient outcomes or doctors' well-being [14]. Even with reduced working hours, doctors' may still feel burned out and experience a suboptimal quality of life due to working at night and, as a result, intend to leave the profession [15]. More detailed research on doctors' feelings surrounding night shift is needed to attenuate its adverse effects further and optimise patient care.

This study focuses on doctors' self-rated alertness, contentedness (mood) and calmness before and after night shifts, which is important for several reasons. Firstly, subjective assessments are likely to influence behaviour and decision making [16]. For example, the decision to drive home after a night shift is likely to be made based on perceptions of alertness, which does not robustly relate to objective driving performance [17]. Another example is that doctors who rated their mood as bad indicated to talk less with patients than their peers in good moods [18]. Secondly, to prevent severe well-being issues like burnout, it is necessary to know how night shifts affect doctors contentedness. Feeling discontented can be a timely signal that one needs to recover and not engage in challenging activities [5, 19]. Lastly, based on doctors' varying levels of alertness, contentedness and calmness, efforts to reduce night shifts' adverse effects can be customised and gain effectiveness, complementing general interventions.

Several studies show that night shifts can negatively impact doctors' alertness and various mood states related to contentedness and calmness [5, 6, 8, 9, 20-23]. These studies also show that sleep, the shifts' duration and the number of consecutive shifts are crucial for doctors' performance and well-being [5, 6, 8, 9, 20-23]. However, it is unknown how the impact of night shifts differs for individuals. Person-centred analyses, such as

latent profile analysis, are suitable for identifying specific subgroups and complement existing studies by providing more insight into the heterogeneity of doctors' alertness, contentedness, and calmness surrounding night shifts [24]. Researchers recommend using knowledge obtained by person-centred analyses to customise interventions [24]. In addition, more information on how night shift circumstances differ between subgroups and which shift circumstances predict alertness, contentedness and calmness change would be informative to shape interventions. However, such knowledge is lacking, hampering the design of tailor-made interventions to attenuate the adverse effects of night shifts. Therefore, this study will answer the following research questions (RQ):

RQ1: What profiles can be identified based on doctors' alertness, contentedness and calmness scores before and after night shifts?

RQ2: Do doctors' profiles and respective alertness, contentedness and calmness scores before the night shift differ from after the night shift and if so, how?

RQ3: Which doctor demographics and night shift circumstances associate with changes in alertness, contentedness and calmness?

METHODS

Setting

In the Netherlands, night shifts are organised differently for consultants and trainees. Trainees are in-house for a maximum of 12 hours during the night. They have protected time off after a night shift and usually perform multiple consecutive shifts. Consultants supervise trainees and work only on demand during the night. The scheduling of consultant shifts may vary per hospital. Most consultants perform on-call night shifts following their regular day shift. Some consultants are scheduled to continue to work immediately following their night shift, performing another regular day shift, while others have a protected day off.

Participants and data collection

This project is part of a larger Dutch research project on fitness to perform, for which a comprehensive description of data collection is published by Tummers et al [25, 26]. The project collected data on doctors' objective performance and their subjective alertness, contentedness and calmness scores the latter of which were used in this study. This study's participants were consultants or trainees from the specialties surgery and obstetrics and gynaecology (OB/GYN) from nine Dutch hospitals. They rated their alert-

ness, contentedness and calmness levels before and/or after one or more night shifts using a questionnaire. Trainees completed the pre-call measurements before the start of the night shift, usually around 10 PM. Consultants completed pre-call measurements around the transition from dayshift to being on-call for the night (around 5 PM). For all doctors, post-call measurements were completed at the change from night shift to dayshift (around 8 AM). Participants were asked to complete the pre- and post-call measurements within 1 hour before or after the change of shifts.

Measurements

Participants completed the 16-item Bond-Lader questionnaire measuring 3 domains: alertness (nine items), contentedness (five items) and calmness (two items) [27]. Table 2 in the results section provides an overview of the composite scale scores and the individual items scores. Each item was scored using a visual analogue scale (VAS), which means that answer scales were depicted using bipolar 100 mm horizontal lines with two opposing adjectives at either end (e.g. Alert-Drowsy, Contented-Discontented, Calm-Excited). The Bond-Lader questionnaire has established validity in clinical practice and relevant reference frames [27, 28]. For example, the legal driving limit of 0.06% ethanol intoxication (i.e. two units of alcohol) corresponds with -8.17 points on alertness [28]. Doctors' demographics and night shift circumstances were assessed by an additional questionnaire (supplementary materials). Demographics included in this study were: sex (male/female), age in years, clinical function (consultant/trainee), specialty (surgery / OB/GYN), average hours of sleep per night, and average hours of work per week. Included night shift circumstances were: hours worked before the night shift, hours awake before the night shift, shift duration in hours, number of consecutive shifts, hours awake, hours of sleep during the night shift, and activity during the night shift (% rest, operating room (OR), emergency room (ER), telephone).

Statistical analyses

Doctors with missing data on subjective alertness, contentedness and calmness were excluded. To answer our research questions, we divided our total sample into three separate samples: 1) all doctors with a pre-shift measurement, 2) all doctors with a post-shift measurement and 3) doctors with paired measurements only. The pre and post-shift samples hold unique data that are not represented in the paired sample, but samples do partly overlap as doctors with paired measurements were also incorporated in the pre- and post-shift samples. For RQ1 (identifying pre- and post-shift profiles) we used the pre- and post-shift samples. Using the pre- and post-shift samples guaranteed that we calculated profiles on the most complete data and therefore represented reality closest. Furthermore, we chose to analyse the unequal pre- and post-shift samples to have the largest sample of unique doctors as possible given the data. For RQ2 (assessing pre-

and post-shift profile changes) and RQ3 (associations of demographics and night shift circumstances with alertness, contentedness and calmness change) we used the sample with paired measurements. For doctors with measurements from multiple shifts, we only included the first paired, pre- or post-shift measurement to assure data independence and equal weighting of participants. Descriptive statistics were used to summarise the characteristics of doctors in each sample. As the samples were not completely identical, ANOVA and χ^2 were used to analyse differences in doctors' demographic characteristics.

To answer RQ1, we calculated doctor profiles separately for the pre- and post-shift sample using Latent Profile Analysis (LPA). LPA is a statistical modelling approach that tries to identify groups of individuals (i.e. latent profiles) based on their responses to a series of continuous variables [29]. LPA is a person-centred analysis that can reveal hypothetical patterns in the data and find the 'less obvious' subgroups [24]. It complements variable-centred analyses, which look for associations between variables for the entire sample or subgroups made based on demographic variables [24, 29]. Previous studies have used this method to identify burnout phenotypes among surgery trainees [30], patterns in unprofessional behaviours of medical students [31], or classify clinical departments' learning climate performance [32]. In this study, LPA was conducted in the R environment (version 3.6.1.) using the MClust 5.4.6. package. Profiles were calculated using standardised domain scores of alertness, contentedness and calmness.

The following three criteria were used to determine the most optimal profile solution: 1) the model with the highest Bayesian Information Criterion (BIC) was selected, 2) the selected model was specified using Bootstrap Likelihood Ratio Testing (BLRT) to compare the increase in model fit when an additional profile was added using the *p*-value provided by this method (e.g. 2 vs 3 profiles *p* = .999), and 3) the three best profile solutions were discussed and interpreted by the research team (profile interpretability) [33]. Based on the selected profile solution, each respondent was assigned to a pre- and post-shift profile in R. All further analyses were conducted in IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA).

Both consultants and trainees were included in the LPA because we expected differences in night shift circumstances to become apparent when comparing the different profiles. Such an approach may provide more nuanced insight into the differences between how consultants and trainees perceive their night shift than a priori dividing them into separate groups. Descriptive statistics were used to calculate doctors' alertness, contentedness, and calmness scores within the identified pre- and post-shift profiles. Descriptive statistics were also used to describe doctors and their night shift circumstances within each profile. ANOVA and χ^2 tests assessed differences between the

profiles. For the ANOVA, results were checked for consistency using Brown-Forsythe and Welch F-test given potential unequal sample sizes and variances within profiles as these tests are more robust to such violations. Bonferroni and Games-Howell post-hoc tests were performed. Fisher's exact test was used instead of χ^2 when data had more than 20% of less than 5 counts.

To answer RQ2, we conducted a before and after the night shift measurement. We selected doctors with paired measurements and identified their pre- and post-shift profiles using a cross-tabulation. The pre-shift profiles were entered as rows and the post-shift profiles as columns to identify how doctors' profiles changed. We inspected the corresponding change in alertness, contentedness, and calmness scores for each observed combination of pre- and post-shift profiles.

For RQ3, we further investigated the sample with paired measurements to determine which demographic variables and night shift circumstances were predictive of changes in alertness, contentedness and calmness. To that end, we conducted multiple regressions on the change scores of each outcome variable (post-shift minus pre-shift scores). Negative regression coefficients indicate deterioration in the corresponding outcome. Demographics included in the regression were age, sex, and specialty. Included night shift circumstances were hours worked pre-call, hours awake pre-call, shift duration, number of consecutive shifts, and total hours of sleep. The relative importance of the tested effects was assessed using Cohen's guidelines, which state that a β of 0.10-0.29 is considered a small effect, 0.30-0.49 a moderate effect and 0.50 or greater a large effect [34, 35].

Boxplots revealed two outliers on calmness; one in the pre-shift sample (score = 21.50) and one in the post-shift sample (score = 9.00), from different respondents. The research team discussed these cases and concluded they represent realistic values within the scoring range of 0 to 100. Since these values were expected to occur in the population too, they were included in the analyses.

RESULTS

Study participants

This study's total sample comprised 211 doctors with a mean age of 39.8 ± 10 years; 47.4% was male. The sample included consultants (46.4%) and trainees (53.6%) of the specialties surgery (64.5%) and OB/GYN (35.5%). Table 1 describes the study participants within each subsample. ANOVA and χ^2 showed no substantial differences between the samples. Table 2 presents the alertness, contentedness and calmness of doctors within each sample.

Table 1. Participant characteristics by sample

	Pre (N=189)	Post (N=157)	Paired (N=135)
Age M±SD	40.4±9.95	39.3±9.82	40.1±9.77
Missing#	1	1	1
Male n(%)	92(48.7%)	73(46.5%)	65(48.1%)
Female n(%)	97(51.3%)	84(53.5%)	70(51.9%)
Consultants n(%)	95(50.3%)	71(45.2%)	68(50.4%)
Trainees n(%)	94(49.7%)	86(54.8%)	67(49.6%)
Surgery n(%)	115(60.8%)	97(61.8%)	76(56.3%)
OB/GYN n(%)	74(39.2%)	60(38.2%)	59(43.7%)
Avg. sleep M±SD	6.82±.72	6.76±.70	6.80±.72
Missing#	17	12	11
Avg. work M±SD	50.5±8.72	50.3±8.08	49.4±7.89
Missing#	29	23	20

Note: ANOVA and χ^2 for showed no significant differences in demographics between the samples (all *p-values* > .05). M=mean, SD=standard deviation.

Participants with missing data in demographics or descriptive variables are represented in the total N presented in this table.

Table 2. Bond and Lader Visual Analogue Scales (VAS)

Code	Item	Pre sample	Post sample	Paired sample (pre)	Paired sample (post)
Alertness	Composite score	69.3±14.7	58.8±18.9	71.4±14.3	59.0±18.7
VASBL01	Alert – Drowsy	29.2±18.1	42.4±22.1	26.3±16.9	42.0±21.7
VASBL03	Strong – Feeble	30.5±16.6	39.3±19.9	28.2±15.4	39.3±19.4
VASBL04	Confused – Clear Headed	70.6±17.3	59.6±22.0	72.9±16.2	59.6±21.6
VASBL05	Well-coordinated – Clumsy	26.5±16.0	37.0±20.3	24.6±15.2	36.4±19.6
VASBL06	Lethargic – Energetic	59.8±19.3	45.9±25.5	62.1±18.9	46.3±25.5
VASBL09	Mentally slow – quick-witted	65.7±19.0	54.2±23.6	67.6±18.2	53.7±23.2
VASBL11	Attentive – Dreamy	32.0±18.3	44.1±22.0	30.2±18.5	43.7±22.0
VASBL12	Incompetent – Proficient	75.4±15.1	66.1±18.8	77.3±14.1	65.9±18.6
VASBL15	Interested – Bored	29.6±17.7	33.6±18.4	27.7±16.8	33.6±17.8
Contentedness	Composite score	72.0±14.4	69.9±15.5	73.7±13.9	70.1±15.3
VASBL07	Contented – Discontented	27.6±16.3	28.3±17.3	25.4±15.4	27.9±17.1
VASBL08	Troubled – Tranquil	70.7±16.6	69.4±19.3	72.1±16.1	70.1±18.3
VASBL13	Happy – Sad	26.0±17.7	27.4±16.8	24.3±16.8	26.9±16.2
VASBL14	Antagonistic – Amicable	74.0±17.0	71.1±17.4	75.5±16.2	71.3±17.0
VASBL16	Withdrawn – Gregarious	68.9±18.0	64.5±20.3	70.6±17.7	63.8±20.3
Calmness	Composite score	68.6±17.3	68.6±16.7	68.9±17.9	69.8±15.6
VASBL02	Calm – Excited	30.1±19.5	28.9±18.9	30.3±20.6	27.9±17.5
VASBL10	Tense – Relaxed	67.2±18.8	66.1±19.1	68.2±18.9	67.5±17.7

Note: score range is 0-100. The formulae to calculate the composite alertness, contentedness, and calmness scores is provided in the supplementary material A.

Doctors pre- and post-shift profiles (RQ1)

Three pre-shift profiles (BIC = -1349.75, Variable volume/Variable shape/Equal orientation (VVE) model; BLRT = 3 vs. 4 $p = .945$) and four post-shift profiles (BIC = -1089.52, Variable volume/Equal shape/Equal orientation (VEE) model; BLRT = 4 vs 5 $p = .165$) were found (Table 3). We labelled the three pre-shift profiles as *Indifferent* ($n = 35$), *Ready* ($n = 90$), and *Engaged* ($n = 64$). On average, doctors in *Indifferent* were neither alert nor drowsy, contented or discontented, nor calm or excited. They scored neutral on all measures. Those in *Ready* were characterised by feeling somewhat alert, contented and calm. Doctors in *Engaged* reported high levels of alertness, contentedness and calmness.

Table 3. Doctors' mood profiles before and after night shifts

		Name given	N=	Alert M±SD	Content M±SD	Calm M±SD	Mixing probabilities
Pre profile	1.	Indifferent	35	52.6±6.17	54.8±5.64	51.7±11.1	17.5%
	2.	Ready	90	67.1±13.6	71.6±13.3	65.4±16.6	51.2%
	3.	Engaged	64	81.5±6.95	82.1±9.00	82.2±8.78	31.3%
Post profile	1.	Lethargic	14	48.7±4.25 ^a	50.5±2.96	49.9±2.70 ^e	7.7%
	2.	Tired but satisfied	91	48.1±12.7 ^a	64.6±12.6 ^c	66.5±11.6	59.8%
	3.	Excited	11	72.0±14.6 ^b	75.7±12.8 ^{c,d}	40.6±12.7 ^e	7.8%
	4.	Mindful	41	82.5±7.51 ^b	86.5±6.62 ^d	87.1±6.85	24.7%

Note: Identical superscript letters indicate that these profile scores are NOT significant at $p < .05$ (equal variances not assumed). When equal variances are assumed all scores are significantly different.

The four post-shift profiles were: *Lethargic* ($n = 14$), *Tired but satisfied* ($n = 91$), *Excited* ($n = 11$) and *Mindful* ($n = 41$). Doctors in *Lethargic* scored lower on all mood measures than the pre-shift profile *Indifferent*. Their scores slightly tended towards drowsiness and mental slowness, and tension. They were neither contented nor discontented. Doctors in *Tired but satisfied* had the lowest levels of alertness of all post-profiles, although they reported feeling somewhat contented and calm. Those in *Excited* were relatively alert and contented and showed low levels of calmness. Finally, doctors in *Mindful* showed relatively high alertness levels and even higher scores on contentedness and calmness.

Table 4 shows and compares doctors' demographics and night shift circumstances per profile. Before the night shift, only the proportion of consultants and the age of doctors in the profiles *Ready* and *Engaged* differed significantly. The post-shift profiles showed more marked differences, especially between *Tired but Satisfied* and *Mindful*.

Table 4. Demographics and night shift circumstances per profiles

Pre-shift (N=189)	1. Indifferent (N=35)	2. Ready (N=90)	3. Engaged (N=64)	
Age M±SD	39.5±9.56	38.5±9.57 ³	43.7±9.98 ²	
Male n(%)	12(34.3%)	43(47.8%)	37(57.8%)	
Female n(%)	23(65.7%)	47(52.2%)	27(42.2%)	
Consultants n(%)	17(48.6%)	34(37.8%) ³	44(68.8%) ²	
Trainees n(%)	18(51.4%)	56(62.2%) ³	20(31.3%) ²	
Surgery n(%)	21(60.0%)	58(64.4%)	36(56.3%)	
OB/GYN n(%)	14(40.0%)	32(35.6%)	28(43.8%)	
Avg. sleep M±SD	6.76±.66	6.87±.70	6.79±.77	
Avg. work M±SD	49.2±6.77	50.4±8.96	51.3±9.29	
Hrs. awake	9.73±4.17	9.14±4.44	9.60±3.83	
Hrs. worked	4.80±4.73	3.89±4.72 ³	6.06±4.85 ²	
Nmbr. cons shifts M±SD	1.69±1.35	2.17±1.87	1.62±1.45	
Post-shift (N=157)	1. Lethargic (N=14)	2. Tired but satisfied (N=91)	3. Excited (N=11)	4. Mindful (N=41)
Age M±SD	39.0±9.63	36.4±7.82 ⁴	33.6±5.04 ⁴	47.2±10.5 ^{2,3}
Male n(%)	5(35.7%)	37(40.7%) ⁴	3(27.3%)	28(68.3%) ²
Female	9(64.3%)	54(59.3%) ⁴	8(72.7%)	13(31.7%) ²
Consultants n(%)	7(50.0%)	29(31.9%) ⁴	1(9.09%) ⁴	34(82.9%) ^{2,3}
Trainees n(%)	7(50.0%)	62(68.1%) ⁴	10(90.9%) ⁴	7(17.1%) ^{2,3}
Surgery n(%)	10(71.4%)	51(55.6%)	7(63.6%)	29(70.7%)
OB/GYN n(%)	4(28.6%)	40(44.4%)	4(36.4%)	12(29.3%)
Avg. sleep M±SD	6.77±.53	6.80±.66	6.47±.71	6.75±.83
Avg. work M±SD	50.5±8.43	49.3±8.24	48.9±7.56	52.9±7.45
(Pre)Hrs. awake M±SD	8.85±4.26	8.78±4.22	7.20±4.66	9.58±3.87
(Pre)Hrs. worked M±SD	4.54±5.00	3.28±4.64 ⁴	.60±1.34 ⁴	7.36±4.00 ^{2,3}
Nmbr. cons shifts M±SD	2.60±2.41	2.30±1.84 ⁴	2.80±1.93	1.23±.77 ²
Duration shift M±SD*	15.4± 6.26	13.4±5.15 ⁴	12.0±2.75	16.2±5.46 ²
Hrs. sleep M±SD	2.75±2.80	1.83±2.07 ⁴	2.10±2.28 ⁴	4.83±2.33 ^{2,3}
Hrs. awake M±SD	9.10±8.91	10.9±7.93 ⁴	11.0±9.06	5.20±7.60 ²
% Activity M±SD				
Telephone	12.3%±11.0	17.6%±18.3	24.2%± 24.0	12.5%±17.5
OR	17.0%±30.2	11.2%±17.6	16.7%±29.4	16.8%±23.3
ER	28.5%±28.5	43.1%±29.4 ⁴	40.2%±25.5	17.9%± 23.1 ²
Rest	42.2%± 33.4	28.1%±28.8 ⁴	18.9%± 26.3 ⁴	52.9%±35.0 ^{2,3}

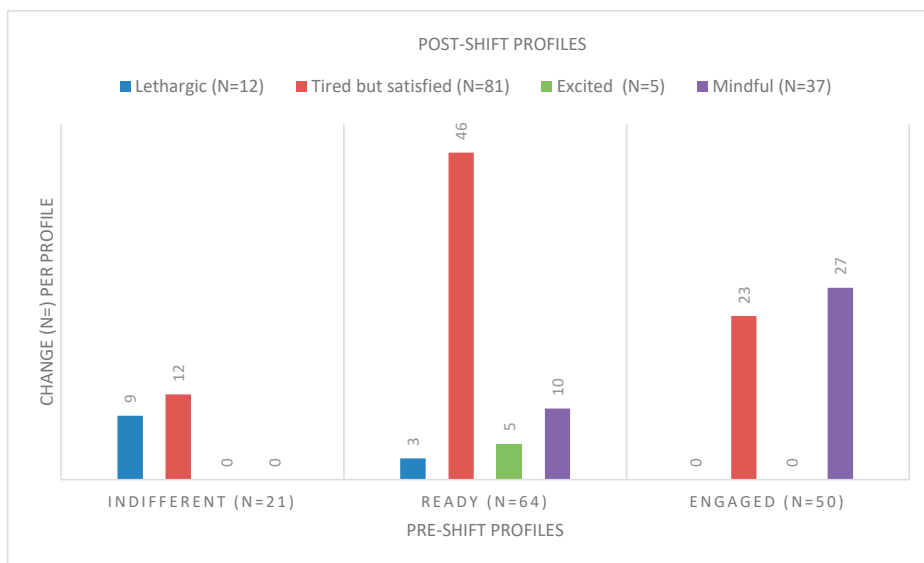
Notes: each superscript indicates the profile number from which differences are significant at $p < .05$. * $p = .51$. Pre-shift missings on demographic variables are: Age (n=1), Avg. Sleep (n=17), Avg. Work (n=29), Nmbr. Consecutive shifts (n=6), Hrs. awake (n=6), Hrs. worked (n=4). Post-shift missings on demographic variables are: Age (n=1), Duration shift (n=18), Nmbr. Consecutive shifts (n=18), Hrs. sleep (n=18), Hrs. awake (n=18), Telephone (n=18), OR (n=18), ER (n=18), Rest (n=18).

Profile changes before and after night shifts (RQ2)

Figure 1 shows to which profile doctors with paired measurements ($n = 135$) belonged before and after one night shift. Doctors from *Indifferent* were classified as *Lethargic* ($n = 9$) or *Tired but satisfied* ($n = 12$) after the night shift. No doctors from *Indifferent* changed to *Excited* or *Mindful*. Three doctors from *Ready* fell into *Lethargic*. The most observed profile change within *Ready* was to *Tired but satisfied* ($n = 46$). Five doctors from *Ready* moved to *Excited* and ten to *Mindful*. None doctors from *Engaged* were classified as *Lethargic* or *Excited* after the night shift. Instead, they fell into the profiles *Tired but satisfied* ($n = 23$) or *Mindful* ($n = 27$).

The supplementary materials show the mean difference (post-shift minus pre-shift scores) of alertness, contentedness and calmness for each observed profile change. Doctors who changed from *Ready* to *Tired but satisfied*, the most observed switch, showed substantially reduced alertness (-20.8 ± 15.96), decreased contentedness (-5.76 ± 13.5) and improved calmness ($+3.11 \pm 21.5$).

Figure 1. Pre- and post-shift profiles of doctors with paired measurements



Predictors of change in alertness, contentedness and calmness (RQ3)

Age ($\beta = .262$ (small effect); 95% CI .060 – .844; $p = .024$) was positively related to a change in alertness, meaning older doctors felt more alert after working a night shift. Doctors from the specialty OB/GYN decreased more on alertness than those from surgery ($\beta = -.345$ (moderate effect); 95% CI -17.251 – -5.653; $p < .001$). Shift duration ($\beta = -.285$

(small effect); 95% CI -1.495 – -.200; $p = .011$) associated negatively with a change in alertness and total hours of sleep associated positively ($\beta = .330$ (moderate effect); 95% CI .667 – .3422; $p = .004$). The contentedness of doctors from OB/GYN reduced more than those from surgery ($\beta = -.206$ (small effect); 95% CI -10.285 – -.189; $p = .042$). The number of consecutive shifts associated negatively with contentedness ($\beta = -.302$ (moderate effect); 95% CI -3.718 – -.531; $p = .009$) and calmness change ($\beta = -.307$ (moderate effect); 95% CI -5.509 – -.603; $p = .015$).

DISCUSSION

For surgery and OB/GYN consultants and trainees working night shifts, this study investigated their levels of alertness, contentedness and calmness and identified three pre-shift profiles (*Indifferent, Ready, Engaged*) and four post-shift profiles (*Lethargic, Tired but satisfied, Excited, Mindful*) (RQ1). Most doctors changed from *Ready* to *Tired but satisfied*, with the most substantial reduction in alertness. No movement was observed from *Indifferent* to *Excited* or *Mindful* and from *Engaged* to *Lethargic* or *Excited* (RQ2). The alertness of older doctors was less affected by the night shift. Compared to surgery, those from OB/GYN scored lower on alertness and contentedness. Doctors that slept more and had shorter shifts felt more alert, and having more consecutive shifts was detrimental to their contentedness and calmness (RQ3).

When comparing the identified pre- and post-shift profiles, it seems that doctors' alertness, contentedness and calmness show more complex manifestations after the night shift. The pre-shift profiles distinguish themselves on relatively low, average and high scores on all three outcome measures. After the night shift, two profiles, namely *Lethargic* and *Mindful*, also represent doctors with the lowest and highest scores. In contrast to the pre-shift profiles, an additional post-shift profile was identified, and the scores within the post-profiles varied more from each other. This variation can be observed most clearly within the profiles *Tired but satisfied* and *Excited*. In *Tired but satisfied* doctors' alertness scores were substantially lower than their contentedness and calmness levels. In *Excited*, low levels of calmness contradicted with relatively high alertness and contentedness scores.

Our findings suggest that measured demographics and night shift circumstances can only partially explain the differences in the identified profiles. Some differences between *Ready* and *Engaged* seem to originate from the unequal proportion of included consultants and trainees and their respective working circumstances. Consultants will usually be more experienced in performing night shifts and work more hours before-

hand. Post-shift differences between *Tired but Satisfied* and *Engaged* and, to a lesser extent, *Excited* and *Engaged* could also be partly explained by included proportions of trainees and consultants and their respective night shift circumstances, such as sleep and the number of consecutive shifts. Perhaps more interesting is that the *Indifferent* and the *Lethargic* profiles did not significantly differ on demographics and night shift circumstances from the other profiles. This finding suggests that factors outside work should also be considered to safeguard or enhance doctors' fitness to perform at night.

Multiple factors could explain the obtained profiles, such as doctors' individual preferences or personal situation [36, 37], genetics in terms of needing sleep [38], or unmeasured working circumstances such as experienced workload and personnel staffing at night [39]. Doctors' well-being may also be an explaining factor. For example, doctors from *Engaged* and *Mindful* may experience work engagement, while those from *Indifferent* and *Lethargic* may experience less work engagement and potentially even signs of burnout. Burnout may undermine the quality of care provided and is defined by emotional exhaustion, depersonalization, and reduced personal accomplishment [40]. These terms are akin to descriptors used in this study, such as mentally slow, withdrawn, and incompetent. A recent study identified different burnout phenotypes among surgery trainees and showed that burnout can be complex and have variable manifestations, for which different interventions may be needed [30].

Although more research is needed, we can speculate about the consequences of falling into a specific profile. Here we consider the post-shift profiles. Doctors from *Lethargic* were characterised by relatively low scores on all outcome measures. Due to reduced alertness, they may be at risk of impaired cognitive and psychomotor performance, making medical errors, or being involved in vehicle crashes [1, 4, 41]. They may communicate and collaborate worse with colleagues due to low levels of contentedness and calmness, indicative of low levels of well-being [19]. After the night shift, this may pose particular risks to the quality of handoffs as researchers have shown handoffs consist of various cognitive tasks that require good communication [42]. Doctors in *Tired but satisfied* had the lowest levels of alertness and may also be at risk of the abovementioned consequences. However, they seem less prone to well-being issues given their contentedness levels. The *Tired but satisfied* may overestimate their alertness as they performed the most consecutive shifts and felt relatively well. Ganesan et al. showed that healthcare workers perceive themselves as less alert on the first night than during subsequent nights, although their objective performance was equally impaired [22]. The *Excited* group of doctors seem alert and contented but not calm. Sport research has shown that high levels of arousal (i.e. excitement) can be detrimental for tasks involving complex and fine controlled movements, such as archery and golf putting

[43, 44]. Doctors' excitement may hinder their performance in high complex tasks under stressful circumstances, such as surgery. In contrast, doctors classified as *Mindful* may be vigilant and calm which makes them able to concentrate and oversee the situation. Mindfulness has been related to various positive outcomes such as attention, ability to establish good relationships with colleagues and patients and psychological well-being in general [45, 46].

Our findings do not tell precisely why doctors belonged to a specific profile, nor the consequences for their professional performance after the night shift. If we would better understand the causes and consequences of falling and changing to a specific profile, interventions to reduce the adverse effects of night shifts may be tailored. For example, doctors belonging to the *Indifferent* or *Lethargic* profile show relatively low alertness, contentedness, and calmness before and after the night shift. Therefore, doctors from both groups may benefit from interventions to reduce burnout, which are usually divided into individual- (e.g. attention to self-care) and organisation-directed (e.g. support flexible work schedules) interventions [47, 48]. Literature suggests that an aligned combination of both is most effective [47, 48]. Doctors belonging to *Ready* or *Tired but satisfied* may benefit from interventions training them to become more engaged in their work or retain their alertness levels. For the latter, researchers have proposed various practical interventions such as naps in combination with caffeine intake and adjusted workplace lighting [49-51]. If the *Tired but satisfied* tend to overestimate their performance, self-awareness training may also be beneficial. Doctors in *Excited* may use relaxation techniques to reduce arousal in stressful situations. Those in *Mindful* might want use of flexible working arrangements, enabling them to perform some post-shift activities.

The found associations between night shift circumstances and doctors' alertness, contentedness and calmness suggest that for some doctors restricting duty hours may be beneficial for how they feel and think they perform at night [9, 13, 21]. At the same time, this study's findings indicate heterogeneity among doctors' perceptions of their night shift work. Other studies show that general measurements, such as duty hour restrictions, are not consistently associated with improving doctors' well-being or patient outcomes [14, 52]. More flexible or personalized approaches are needed to balance doctors' training needs, well-being, and performance [14, 52] – for which this study may provide some first insights.

Strengths and limitations

A strength is that this study provided a more nuanced insight into doctors' alertness, contentedness and calmness before and after night shifts than previously known by

identifying doctor profiles. A limitation of this study is that the pre- and post-shift profiles were calculated on unequal samples, which may have influenced the obtained profile solution. Nonetheless, the samples overlap, and our results showed no substantial differences in doctors' demographics. Although we used a diverse sample including trainees and consultants from the specialties surgery and OB/GYN, it is unknown whether the profiles can be generalised to other populations.

Another strength of this study was that we used validated measures to assess clinical fitness after performing night shifts with relevant reference values [27, 28]. A potential downside of the used scale is that it has been mainly used in the context of substance use, such as caffeine intake [53], and not so much in the context of occupational performance and well-being. Contrarily, the visual analogue scales used may be more feasible and better detect subtle before-after changes than often used instruments in such contexts with Likert-type scales [27, 54].

While this study included various variables about night shift circumstances, a limitation is that we could not fully explain the identified profiles and assess the consequences in terms of doctors' professional performance after the night shift.

Recommendations for research and practice

This study identified various doctor profiles based on their alertness, contentedness, and alertness. Future research could replicate our findings using larger samples, perhaps aimed at specific subgroups (e.g. surgery trainees). It would also be relevant to study whether profiles stay stable over multiple night shifts, or whether the representation of profiles varies when multiple consecutive night shifts are investigated. Moreover, studies could investigate the causes of belonging to a particular profile and the consequences to doctors' professional performance after the night shift. For example, researchers may investigate how doctors from different profiles perform handovers after a night shift.

For practice, this study suggests that healthcare organisations should consider investing in safeguarding doctors working at night, and thus protect their patients. Healthcare organisations should aim to identify doctors at risk of impaired performance and well-being timely. While healthcare organisations may also cautiously investigate flexible working arrangements for doctors, they should aim to establish healthy workplaces. For example, by addressing the six areas of the worklife model: workload, control, reward, community, fairness, and values [55]. Doctors themselves could participate in interventions to improve their well-being, self-awareness or alertness.

Conclusions

This study sought to obtain more nuanced insight into how doctors feel before and after night shifts to further attenuate the adverse effects of night shifts. RQ1 focused on identifying profiles based on doctors' self-rated alertness, contentedness, and calmness. The analysis identified three pre-shift (*Indifferent, Ready, Engaged*) and four-post shift profiles (*Lethargic, Tired but Satisfied, Excited, Mindful*). RQ 2 investigated changes in doctors' pre- and post-shift profiles and respective differences in alertness, contentedness and calmness scores. The results showed that most doctors change from Ready to Tired but Satisfied, with the most substantial reductions in alertness. Responding to RQ 3, we found that sleep and the number of consecutive shifts were the most important night shift circumstances predicting alertness, contentedness and calmness change. Future research may build on these findings by investigating the causes – including factors outside work – and the consequences of belonging to a particular profile regarding doctors' professional performance as well as whether specific subgroups benefit from tailored interventions.

REFERENCES

1. Barger L, Cade B, Ayas N, Cronin J, Rosner B, Speizer F, et al. Extended Work Shifts and the Risk of Motor Vehicle Crashes among Interns. *NEJM*. 2005;352(2):125-34.
2. Rivera A, Akanbi M, O'Dwyer L, McHugh M. Shift work and long work hours and their association with chronic health conditions: A systematic review of systematic reviews with meta-analyses. *Plos One*. 2020;15(4):e0231037.
3. Wickwire E, Geiger-Brown J, Scharf S, Drake C. Shift Work and Shift Work Sleep Disorder: Clinical and Organizational Perspectives. *Chest*. 2017;151(5):1156-72.
4. Mansukhani M, Kolla B, Surani S, Varon J, Ramar K. Sleep Deprivation in Resident Physicians, Work Hour Limitations, and Related Outcomes: A Systematic Review of the Literature. *Postgrad Med*. 2012;124(4):241-9.
5. Trockel M, Menon N, Rowe S, Stewart M, Smith R, Lu M, et al. Assessment of Physician Sleep and Wellness, Burnout, and Clinically Significant Medical Errors. *JAMA Netw Open*. 2020;3(12):e2028111-e.
6. Dula D, Dula N, Hamrick C, Wood G. The effect of working serial night shifts on the cognitive functioning of emergency physicians. *Ann Emerg Med*. 2001;38(2):152-5.
7. Maltese F, Adda M, Bablon A, Hraeich S, Guervilly C, Lehingue S, et al. Night shift decreases cognitive performance of ICU physicians. *Intensive Care Med*. 2016;42(3):393-400.
8. Rollinson D, Rathlev N, Moss M, Killiany R, Sassower K, Auerbach S, et al. The effects of consecutive night shifts on neuropsychological performance of interns in the emergency department: A pilot study. *Ann Emerg Med*. 2003;41(3):400-6.
9. Wali S. Effects of On-Call Shifts on Physicians' Cognitive Performance, Level of Alertness, Mood, and Safety: A Review Article. *Saudi J Intern Med*. 2011(1(2)):11-6.
10. Wesnes K, Walker M, Walker L, Heys S, White L, Warren R, et al. Cognitive performance and mood after a weekend on call in a surgical unit. *Br J Surg*. 1997;84(4):493-5.
11. Huizinga C, Tummers F, Marang-van de Mheen P, Cohen A, Van der Bogt K. A review of current approaches for evaluating impaired performance in around-the-clock medical professionals. *Sleep Med Rev*. 2019;46:97-107.
12. Landrigan C, Rothschild J, Cronin J, Kaushal R, Burdick E, Katz J, et al. Effect of Reducing Interns' Work Hours on Serious Medical Errors in Intensive Care Units. *NEJM*. 2004;351(18):1838-48.
13. Weaver M, Landrigan C, Sullivan J, O'Brien C, Qadri S, Viyaran N, et al. The Association Between Resident Physician Work-Hour Regulations and Physician Safety and Health. *Am J Med*. 2020;133(7):e343-e54.
14. Awan M, Zagales I, McKenney M, Kinslow K, Elkbuli A. ACGME 2011 Duty Hours Restrictions and Their Effects on Surgical Residency Training and Patients Outcomes: A Systematic Review. *J Surg Educ*. 2021;78(6):e35-e46.
15. Antiel R, Reed D, Van Arendonk K, Wightman S, Hall D, Porterfield J, et al. Effects of Duty Hour Restrictions on Core Competencies, Education, Quality of Life, and Burnout Among General Surgery Interns. *JAMA Surg*. 2013;148(5):448-55.
16. Schwarz N. Emotion, cognition, and decision making. *Cogn Emot*. 2000;14(4):433-40.
17. Verster J, Roth T. Drivers can poorly predict their own driving impairment: a comparison between measurements of subjective and objective driving quality. *Psychopharmacology*. 2012;219(3):775-81.
18. Kushnir T, Kushnir J, Sarel A, Cohen A. Exploring physician perceptions of the impact of emotions on behaviour dur-

- ing interactions with patients. *Fam Prac.* 2010;28(1):75-81.
19. Desmet P. Design for Mood: Twenty Activity-Based Opportunities to Design for Mood Regulation. *Int J Des.* 2015; 9(2): 1-19.
 20. Costa C, Mondello S, Micali E, Indelicato G, Licciardello A, Vitale E, et al. Night shift work in resident physicians: does it affect mood states and cognitive levels? *J Affect Disord.* 2020;272:289-94.
 21. Wali S, Qutah K, Abushanab L, Basamh R, Abushanab J, Krayem A. Effect of on-call-related sleep deprivation on physicians' mood and alertness. *Ann Thorac Med.* 2013;8(1):22-7.
 22. Ganesan S, Magee M, Stone J, Mulhall M, Collins A, Howard M, et al. The Impact of Shift Work on Sleep, Alertness and Performance in Healthcare Workers. *Sci Rep.* 2019;9(1):4635.
 23. Lockley S, Cronin J, Evans E, Cade B, Lee C, Landrigan C, et al. Effect of Reducing Interns' Weekly Work Hours on Sleep and Attentional Failures. *NEJM.* 2004;351(18):1829-37.
 24. Kusurkar R, Mak-van der Vossen M, Kors J, Grijpma J, Van der Burgt S, Koster A, et al. 'One size does not fit all': The value of person-centred analysis in health professions education research. *Perspect Med Ed.* 2021;10(4):245-51.
 25. Tummers F, Huizinga C, Van Pampus M, Stockmann H, Cohen A, Van der Bogt K, et al. Assessment of fitness to perform using a validated self-test in obstetric and gynecological night shifts in the Netherlands. *Am J Obstet Gynecol.* 2021;224(6):617.e1-e14.
 26. Tummers F, Huizinga C, Stockmann H, Hamming J, Cohen A, Van der Bogt K, et al. Objective Assessment of Fitness to Perform (FTOP) After Surgical Night Shifts in the Netherlands: An Observational Study Using the Validated FTOP Self-test in Daily Surgical Practice. *Ann Surg.* 2019;270(5):930-6.
 27. Bond A, Lader M. The use of analogue scales in rating subjective feelings. *Br J Med Psychol.* 1974;47(3):211-8.
 28. Huizinga C, de Kam M, Stockmann H, Van Gerven J, Cohen A, Van der Bogt K. Evaluating Fitness to Perform in Surgical Residents after Night Shifts and Alcohol Intoxication: The development of a "Fit-to-Perform" test. *J Surg Educ.* 2018;75(4):968-77.
 29. Muthén B, Muthén L. Integrating Person-Centered and Variable-Centered Analyses: Growth Mixture Modeling With Latent Trajectory Classes. *Alc Clin Exp Res.* 2000;24(6):882-91.
 30. Huang R, Hewitt D, Cheung E, Agarwal G, Etkin C, Smink D, et al. Burnout Phenotypes Among U.S. General Surgery Residents. *J Surg Educ.* 2021;78(6):1814-24.
 31. Mak-van der Vossen M, Van Mook W, Kors J, Van Wieringen W, Peerdeman S, Croiset G, et al. Distinguishing Three Unprofessional Behavior Profiles of Medical Students Using Latent Class Analysis. *Acad Med.* 2016;91(9):1276-83.
 32. Silkens M, Chahine S, Lombarts K, Arah O. From good to excellent: Improving clinical departments' learning climate in residency training. *Med Teach.* 2018;40(3):237-43.
 33. Nylund K, Asparouhov T, Muthén B. Deciding on the Number of Classes in Latent Class Analysis and Growth Mixture Modeling: A Monte Carlo Simulation Study. *Struc Equ Mod.* 2007;14(4):535-69.
 34. Cohen J. The effect size. Statistical power analysis for the behavioral sciences. 2nd ed.; Erlbaum: Hillsdale, MI, USA, 1988; ISBN 0-8058-0283-5.
 35. Fey C, Hu T, Delios A. The Measurement and Communication of Effect Sizes in Management Research. *Manag Organ Rev.* 2023;19(1):176-97.
 36. Cygler J, Page A, Ginsburg S. Life on Call: Perspectives of Junior and Senior Internal Medicine Residents. *Acad Med.* 2021;96(5):744-50.

37. Storemark S, Fossum I, Bjorvatn B, Moen B, Flo E, Pallesen S. Personality factors predict sleep-related shift work tolerance in different shifts at 2-year follow-up: a prospective study. *BMJ Open*. 2013;3(11):e003696.
38. Webb J, Fu Y. Recent advances in sleep genetics. *Curr Opin Neurobiol*. 2021;69:19-24.
39. Mazur L, Mosaly P, Hoyle L, Jones E, Marks L. Subjective and objective quantification of physician's workload and performance during radiation therapy planning tasks. *Pract Radiat Oncol*. 2013;3(4):e171-e7.
40. Maslach C, Schaufeli W, Leiter M. Job Burnout. *Annu Rev Psychol*. 2001;52(1):397-422.
41. Rosekind M. Underestimating the societal costs of impaired alertness: safety, health and productivity risks. *Sleep Med*. 2005;6:S21-S5.
42. Militello L, Rattray N, Flanagan M, Franks Z, Rehman S, Gordon H, et al. "Workin' on Our Night Moves": How Residents Prepare for Shift Handoffs. *Jt Comm J Qual Patient Saf*. 2018;44(8):485-93.
43. Oxendine J. Emotional Arousal and Motor Performance. *Quest*. 1970;13(1):23-32.
44. Janelle C, Fawver B, Beatty G. Emotion and Sport Performance. *Handbook of Sport Psychology* 2020. p. 254-98.
45. Scheepers R, Emke H, Epstein R, Lombarts K. The impact of mindfulness-based interventions on doctors' well-being and performance: A systematic review. *Med Educ*. 2020;54(2):138-49.
46. Eberth J, Sedlmeier P. The effects of mindfulness meditation: a meta-analysis. *Mindfulness*. 2012;3(3):174-89.
47. West C, Dyrbye L, Erwin P, Shanafelt T. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet*. 2016;388(10057):2272-81.
48. Panagioti M, Panagopoulou E, Bower P, Lewith G, Kontopantelis E, Chew-Graham C, et al. Controlled interventions to reduce burnout in physicians: a systematic review and meta-analysis. *JAMA Intern Med*. 2017;177(2):195-205.
49. Schweitzer P, Randazzo A, Stone K, Erman M, Walsh J. Laboratory and Field Studies of Naps and Caffeine as Practical Countermeasures For Sleep-Wake Problems Associated With Night Work. *Sleep*. 2006;29(1):39-50.
50. Smith M, Fogg L, Eastman C. Practical Interventions to Promote Circadian Adaptation to Permanent Night Shift Work: Study 4. *J Biol Rhythms*. 2009;24(2):161-72.
51. Song Y, Lv X, Qin W, Dang W, Chen Z, Nie J, et al. The Effect of Blue-enriched White Light on Cognitive Performances and Sleepiness of Simulated Shift Workers: A Randomized Controlled Trial. *J Occup Environ Med*. 2021;63(9):752-9.
52. Ahmed N, Devitt K, Keshet I, Spicer J, Imrie K, Feldman L, et al. A systematic review of the effects of resident duty hour restrictions in surgery: impact on resident wellness, training, and patient outcomes. *Ann Surg*. 2014;259(6):1041.
53. Haskell C, Kennedy D, Wesnes K, Scholey A. Cognitive and mood improvements of caffeine in habitual consumers and habitual non-consumers of caffeine. *Psychopharmacology*. 2005;179(4):813-25.
54. Cummins R, Gullone E, editors. Why we should not use 5-point Likert scales: The case for subjective quality of life measurement. Proceedings, second international conference on quality of life in cities; 2000; 74(2): 74-93.
55. Montgomery A, Panagopoulou E, Esmail A, Richards T, Maslach C. Burnout in health-care: the case for organisational change. *BMJ*. 2019;366:l4774.

SUPPLEMENTARY MATERIALS

A) The 16 items representing the Bond and Lader Visual Analogue Mood Rating Answer Scales*

- VASBL01 Alert - Drowsy
- VASBL02 Calm – Excited
- VASBL03 Strong – Feeble
- VASBL04 Confused – Clear-headed
- VASBL05 Well-coordinated – Clumsy
- VASBL06 Lethargic – Energetic
- VASBL07 Contented – Discontented
- VASBL08 Troubled – Tranquil
- VASBL09 Mentally slow – Quick-Witted
- VASBL10 Tense – Relaxed
- VASBL11 Attentive – Dreamy
- VASBL12 Incompetent – Proficient
- VASBL13 Happy – Sad
- VASBL14 Antagonistic – Amicable
- VASBL15 Interested – Bored
- VASBL16 Withdrawn - Gregarious

*Each item is rated using a Visual Analogue Scale.

Calculation of each of the three domains using the 16 individual items represented above.

VAS Alertness= $100 - ((\text{VASBL01}) + (\text{VASBL03}) + 100 - (\text{VASBL04}) + (\text{VASBL05}) + 100 - (\text{VASBL06}) + 100 - (\text{VASBL09}) + (\text{VASBL11}) + 100 - (\text{VASBL12}) + (\text{VASBL15})) / 9$

VAS Contentedness= $100 - ((\text{VASBL07}) + 100 - (\text{VASBL08}) + (\text{VASBL13}) + 100 - (\text{VASBL14}) + 100 - (\text{VASBL16})) / 5$

VAS Calmness= $100 - ((\text{VASBL02}) + 100 - (\text{VASBL10})) / 2$

B) Fit to Perform Questionnaire

Personal and experience data

- Function
 - o Attending/ resident (AIOS or ANIOS)
- In case of an attending: subspecialty
- Man/Woman
- Years of experience
 - o In case of attending
 - Year of graduation residency

- o In case of resident
 - Year of graduation medical doctor
- Partnership/Salaried Employment
- Hours sleep per night (estimated mean last 4 weeks)
 - o Numeric
- Hours work per week (estimated mean last 4 weeks)
 - o Numeric

Shift characteristics

- Type of measurement
 - o Non-call measurement/ precall/postcall
- Do you qualify yourself as fit to perform surgery
 - o Yes/No
- Do you qualify yourself as fit to see patients at the outpatient clinic
 - o Yes/No
- Would you prefer to move a planned surgery, or let someone else perform the surgery?
 - o Yes/No
- In case of Non-call measurement
 - o Hours slept
 - Numeric
- In case of precall
 - o Hours already worked
 - Numeric
- In case of postcall
 - o Total hours of shift
 - Numeric
 - o Number of consecutive nightshift
 - Numeric
 - o Hours awake
 - Numeric
 - o Hours slept
 - Numeric
 - o Percentage activity during shift (calls/OR/ER or ward/nothing)
 - Numeric, total max of 100%
 - o Do you need to continue work activities?
 - Yes/no

C) Table. *Delta mean alertness, contentedness and calmness scores for observed change pattern*

Profile change pre - post	N=	$\Delta M \pm SD$ Alert.	$\Delta M \pm SD$ Content.	$\Delta M \pm SD$ Calm.
Indifferent - Lethargic	9	-4.05±6.14	-4.42±5.37	-4.17±4.56
Indifferent - Tired but satisfied	12	-9.90±11.1	+1.03±7.32	+10.4±16.7
Ready - Lethargic	3	-21.9±9.28	-12.7±17.6	+9.17±19.8
Ready - Tired but satisfied	46	-20.8±15.96	-5.76±13.5	+3.11±21.5
Ready - Excited	5	-5.18±11.1	-4.88±13.8	-12.3±20.2
Ready - Mindful	10	+11.4±12.5	+11.6±10.4	+16.4±11.8
Engaged - Tired but satisfied	23	-22.9±12.0	-10.2±12.2	-11±11.6
Engaged - Mindful	27	-2.55±6.46	-0.48±6.18	+0.28±6.62



6

Developing and piloting a well-being program for hospital-based physicians

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ABSTRACT

Background

Demanding working conditions in medical practice pressurise well-being of physicians across all career stages, likely harming patients and healthcare systems. Structural solutions to harmful working conditions are necessary as well as interventions to support physicians in contemporary practice. We report on developing and piloting a team-based program for physicians to improve their working conditions and well-being.

Approach

Program development steps involved: a preparatory phase, needs assessment, and program design. The program consisted of (1) a feedback tool addressing working conditions and well-being, and an intervention including (2a) a facilitated team dialogue and (2b) a team training on communication and collaborative job crafting. In the program's pilot, 377 physicians from 48 teams in 14 Dutch hospitals used the feedback tool. Four teams participated in the team dialogue. Two teams performed the team training.

Evaluation

Physicians indicated that the program was a useful format to gain insight into their working conditions and well-being, and possibly to improve their well-being collaboratively.

Reflection

We provide seven critical reflections on developing and piloting our program, accompanied by recommendations for developing well-being interventions. Our development approach, program components, and recommendations may support physicians and other healthcare professionals in demanding work environments.

BACKGROUND & NEED FOR INNOVATION

Physicians' well-being is essential for delivering high-quality patient care [1-3]. Unfortunately, the well-being of medical students and physicians across all career stages is at considerable risk, evidenced by many studies showing high levels of burn-out [4, 5]. Recently, a meta-analysis associated physician burn-out with increased odds of unsafe patient care, unprofessional behaviours, and lower patient satisfaction [3]. Burn-out is a result of chronic workplace stress that has not been successfully managed [6]. Still, most interventions addressing burn-out in healthcare have focused on enhancing individuals' stress management skills [7, 8].

Equipping individuals with stress management skills can be helpful but does not provide a structural solution to workplace stressors [3, 9]. The overrepresentation of individualistic approaches is, however, not surprising. Adjusting working conditions in hospitals is often more complex, costly, and out of the control of individual physicians or even teams [9]. Nonetheless, if physicians within a team discuss their experiences about the workplace and their well-being, together they might be able to recognise and address workplace stressors and resources [9-11]. Moreover, physicians might assist each other in finding solutions to occupational well-being issues. Literature indicates that teams proactively reducing stressors and improving resources in the workplace are more engaged and perform better [11].

Therefore, we developed a team-based well-being program for hospital-based physicians. In this study, we reflect on developing and piloting the program. This contribution aims to inform healthcare professionals and intervention developers, and support them in improving physicians' well-being.

Goal of Innovation

The goal of our program was to assist physicians in improving their working conditions and well-being.

Steps taken for Development and Implementation

The Dutch Ministry of Social Affairs and Employment funded the program development. Following the approved grant proposal, the program included (1) a feedback tool addressing working conditions and well-being, and (2) a team-based intervention aimed at improving working conditions. The project team consisted of researchers (MD, KL, RS), trainers (NH), and software developers, all familiar with the medical profession.

The project team developed the program in three consecutive steps: a preparatory phase, needs assessment, and program design (October 2016 until March 2017). Next, we piloted the program (April 2017 until September 2017).

Step 1 – Preparatory phase

Two researchers searched and mapped reliable and valid measures of physicians' working conditions and well-being for potential inclusion in the feedback tool. To inform the intervention, they also mapped evidence-based interventions to improve physicians' well-being. We used the resulting overview to construct the needs assessment's survey.

Step 2 – Needs assessment

Our needs assessment included one focus group in an academic hospital ($n = 12$) and one in a non-academic teaching hospital ($n = 12$), followed by an online survey ($n = 218$).

The focus groups lasted 75 minutes and aimed to obtain in-depth insight into physicians' needs concerning their working conditions and well-being. Beside residents and medical specialists, we invited HR-staff and senior hospital management to illustrate how hospital policies and practices could address physicians' needs. Four key questions structured the discussion: 'What characterises well-being in practice?', 'What needs do physicians have to improve their well-being?', 'What influences physicians' well-being in practice?', and 'What possibilities do you see for promoting physicians' well-being?'. A moderator facilitated the focus groups; two observers made notes about verbal and non-verbal communication. Participants indicated that a feedback tool should be easily accessible, time-friendly, and encourage discussion about well-being. Furthermore, an intervention should provide a positive and psychologically safe environment. Also, it should address team members' shared workplace issues (e.g. lack of social support) while respecting individuals' needs (e.g. no collegial contact outside working hours).

The survey aimed to quantify physicians' needs regarding the feedback tool and intervention. Using the previously mentioned overview (step 1), we listed working conditions and well-being aspects for which validated measures were available, as well as evidence-based interventions. The survey asked physicians to rate working conditions (e.g. workload) and well-being aspects (e.g. work engagement) of interest. Additionally, physicians indicated preferred methods of discussing the feedback tool's results and evidence-based interventions.

Project team members invited physicians from Dutch hospitals for the survey using their professional networks, company newsletters and websites. In total, 218 physicians participated, of which 50.3% were male. The mean age was 43.3 ($SD = 9.97$) years. Most

represented specialties were surgery (17.8%), neurology (14.1%), and internal medicine (12.0%). Most frequently rated working conditions of interest were administrative burden, appreciation by patients, learning and professional development opportunities, inspirational leadership, and workload. The top rated well-being aspect was work-life balance. Furthermore, physicians preferred to discuss the feedback tool's results in a facilitated team dialogue. Most preferred interventions were team communication training and collaborative job crafting training.

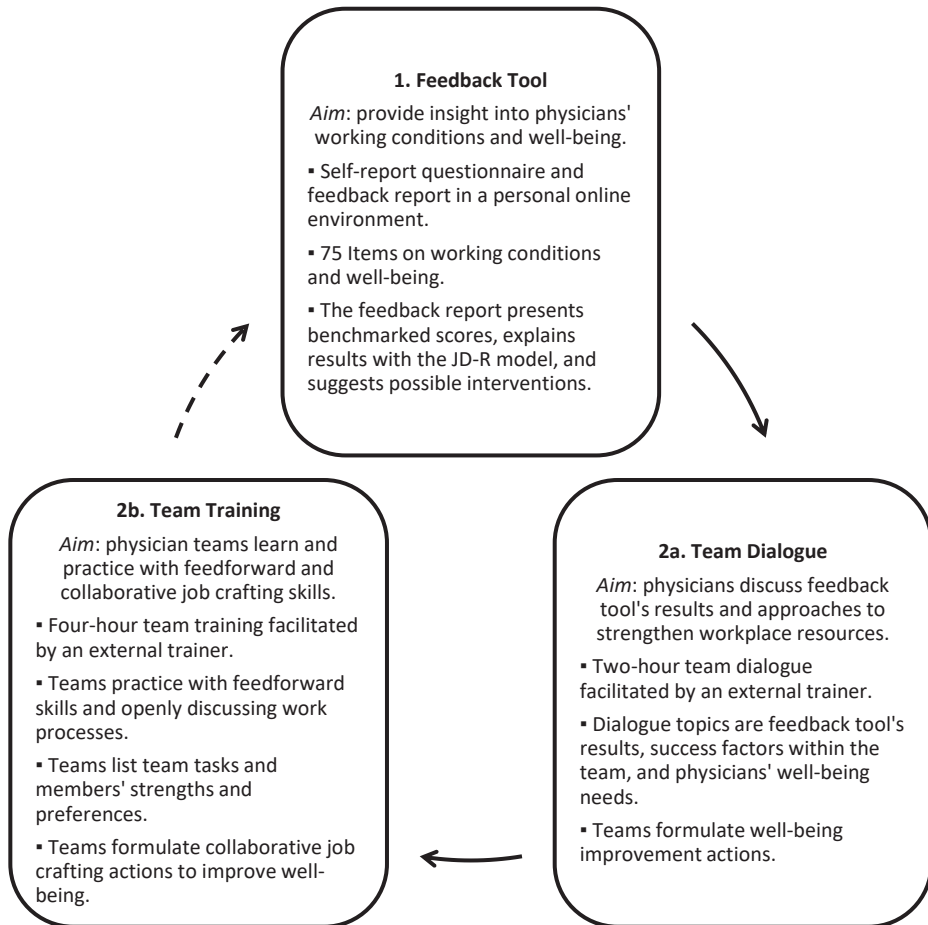
Step 3 – Program design

Based on the previous steps, we designed the content of the (1) feedback tool and (2) intervention, shown in Figure 1. The job demands-resources (JD-R) model [12] and positive psychology [13] guided the program design. According to the JD-R model, individuals classify perceived working conditions as job-demands (i.e. workplace stressors, requiring energy) or job-resources (i.e. workplace resources, providing energy). Optimising the balance between both can improve well-being. Also, focusing on enhancing team strengths and workplace resources – i.e. positive psychology – is worthwhile to improve well-being [14]. Workplace resources are functional in achieving work goals, stimulate personal growth, and alleviate the negative impact of stressors [12, 14].

The feedback tool (1) consisted of a self-report questionnaire and feedback report on perceived working conditions and well-being. The questionnaire counted 75 items (completion time of 10-15 minutes) based on validated measures of working conditions (i.e. administrative burden, collegial support, inspirational leadership, intrinsic motivation for patient care, learning and professional development opportunities, participation in decision making, workload) and well-being (i.e. emotional exhaustion, work engagement, work fatigue, work-home interference). Software developers implemented the feedback tool in an existing online environment, wherein physicians could conduct the questionnaire and download the feedback report. The feedback report included results benchmarked against ratings from peers and explained the JD-R model to analyse working conditions concerning well-being. When peer scores were unavailable, the report showed benchmarks of the general working population.

The intervention consisted of two consecutive parts: (2a) a team dialogue and (2b) a team training on team communication and collaborative job crafting (Figure 1). The (2a) team dialogue was a two-hour session facilitated by an external trainer, in which teams discussed their working conditions and well-being to formulate improvement actions. The feedback tool's results served as input for the dialogue, although physicians decided themselves what they wanted to share. We organised a focus group with trainers and senior physicians ($n = 8$) to design a team dialogue guide.

Figure 1. The developed well-being program for physicians and its components.



*The dotted arrow depicts the suggested continuous approach to improve working conditions and well-being, although in this project usage of the feedback tool was not repeated.

This guide included an exemplar schedule and defined preferred conditions for a productive meeting (i.e. no beepers, external facilitator). Also, the guide suggested an appreciative inquiry approach, which invites participants to discuss stories about what is working well. The identified strengths are the starting point for positive change actions [15].

The (2b) team training was a four-hour training in which physicians practised with providing team members feedforward. Furthermore, physicians exercised collaborative job crafting to address the formulated improvement actions regarding working conditions and well-being from the facilitated team dialogue. Typically, feedforward focuses on future expectations and tasks to create lasting improvement [16]. Collaborative job

crafting refers to physicians determining together how to alter workplace stressors and resources to meet their well-being goals [11]. To design the team training, trainers used prior communication and job crafting workshops, and collaborative job crafting literature [17]. The training combined both topics because of the relevance of communication for team learning of job crafting [17].

Pilot testing

Project team members invited physician teams to participate in the program's pilot using their professional networks, company websites and newsletters. We piloted the feedback tool in 14 Dutch hospitals, and 377 physicians from 48 teams completed the questionnaire (71% response rate) and received a feedback report: 47.7% were male, 78.8% medical specialist, and 21.2% resident. After completing the feedback tool, teams were more inclined to participate in team dialogues. We selected physician teams based on variation in size and specialty (medical or surgical) and conducted four team dialogues in different hospitals. From those teams, two were willing and available to address formulated improvement actions in the team training, completing all program components. To evaluate the program, we inspected respondents' answers on open text evaluations of the feedback tool and consulted its helpdesk to obtain insight into participants' experiences. Furthermore, we examined observers' notes from the intervention, inspected printed evaluation forms from the team training, and conducted 14 telephonic interviews with participants.

EVALUATION OF INNOVATION

The program was perceived by physicians as a useful approach (Figure 1) to address working conditions, and presumably to improve well-being. In the following sections, we report on the evaluation of each program component.

Feedback tool

According to the participants, the feedback report provided insight into their working conditions and well-being by explaining their benchmarked questionnaire results. During the pilot, we used anonymised results of the feedback tool to calculate more specific peer benchmarks for all measures. Physicians evaluated the feedback tool's online environment as accessible and user-friendly. The questionnaire items represented physicians' work well, although some were open to multiple interpretations. For instance, concerning inspirational leadership items, some self-employed physicians mentioned not having a direct supervisor. To improve the questionnaire, participants suggested

to include more items about their personal life, a 'not applicable' option, and 'free text boxes' to clarify answers.

Intervention

Physicians appreciated the facilitated team dialogues' structured and theory-based approach. During the sessions, physicians shared knowledge and reflected on their personal qualities, team strengths, and coping with workplace stressors, leading to practical well-being improvement actions. For example, team members discussed a rotation system to attend management meetings, joint administration days, and taking small breaks in the ambulance hall. Physicians valued the opportunity for team-based reflection on working conditions and well-being since it was uncommon in clinical practice.

During the team training, most physicians experienced practising feedforward and collaborative job crafting positively. They mentioned obtaining insight into their own and colleagues' strengths and task preferences, and exchanged tasks accordingly. Also, physicians appreciated job crafting examples of other teams. However, some were sceptical about collaborative job crafting, as they believed there is not much to 'craft' in the medical environment due to regulations and focus on production quotas. Finally, physicians regarded the training's four-hour duration as a barrier for participation, especially given the team-based approach.

CRITICAL REFLECTIONS

In this section, we provide seven critical reflections on the development, implementation, and evaluation of our well-being program, accompanied by recommendations for developing well-being interventions (Table 1).

Development

First, involving physicians was essential for gaining insight into physicians' needs and aligning the program with the medical work environment. Also, we found that involving researchers, trainers and software developers was valuable as they each offered unique expertise during project team meetings, jointly developing a well-integrated program serving both user-friendliness and scientific robustness. We recommend involving physicians and stakeholders with diverse backgrounds when developing well-being interventions.

Second, we recommend aligning recruitment and selection strategies with interventions' goals. Our goal was to assist physician teams willing to improve their working

conditions and well-being. Therefore, we aimed at recruiting these teams by employing various strategies, such as using company newsletters. Perhaps, physicians interested in improving working conditions and well-being were more inclined to participate, possibly leading to an overrepresentation of their voice [18]. Consequently, our program and the pilot results might not apply to all physicians. Different recruitment strategies might be needed to reach those less affiliated with the program's goal. However, based on the diversity of participating teams, we do not have the impression that specific subgroups were overrepresented.

Implementation

Third, physicians already familiar with the online environment accommodating the feedback tool needed less (technical) support than those using other web-based platforms. Employing one online system for multiple performance assessments enabled more natural coordination for planning assessments, limiting the chance of measurement fatigue. Accordingly, we recommend aligning well-being interventions with existing (online) infrastructure.

Fourth, we recommend facilitating physicians engaging in well-being interventions, as it might prevent experiencing participation as yet another job demand. Multiple methods can foresee in offering support, such as having a helpdesk, scheduled participation time and no participation fees.

Fifth, from the project's start, we realised that psychological safety was crucial, yet not self-evident, for a team-based well-being intervention. We recommend creating a psychologically safe environment for participants, for example, by adopting a leadership style in which every team member gets heard and acknowledged [19]. Our program facilitated physicians' psychological safety by anonymous assessment, offering aftercare, using experienced external trainers, focusing on working conditions in team dialogues, and using appreciative inquiry as a strengths-based approach.

Evaluation

Sixth, the one-year time frame, defined by the grant proposal, left no time to evaluate the program's effectiveness more deeply nor to implement it in other hospitals. We recommend considering rigorous evaluation of both implementation strategies and interventions' effectiveness timely. Although we did not test our programs' effectiveness over time, our evaluation methods provided insight into participants' experiences and the functioning of program components.

Seventh and lastly, this project showed the value of a continuous approach (Figure 1) to improve working conditions and well-being. The feedback tool – potentially serving as an intervention itself – stimulated participation and discussion in team dialogues, leading to actions to address in the training. Moreover, the feedback tool can repeatedly measure changes in workplace conditions and well-being, providing novel input for enhancement while also monitoring the program’s effectiveness. Therefore, we recommend designing well-being interventions with a continuous character using instruments sensitive to change.

Table 1. Recommendations for designing well-being interventions for physicians based on seven critical reflections

Development	
1.	Involve physicians and stakeholders with diverse backgrounds.
2.	Consider the implications of proposed recruitment and selection strategies concerning interventions’ goals.
Implementation	
3.	Align well-being interventions with existing (online) infrastructure.
4.	Facilitate physicians while engaging in well-being interventions.
5.	Create a psychologically safe environment for physicians.
Evaluation	
6.	Consider rigorous evaluation of implementation strategies and interventions’ effectiveness timely.
7.	Design interventions with a continuous character, using instruments to stimulate discussion and measure change.

Conclusion

In response to work-related risks to physicians’ well-being, we successfully developed and piloted a program addressing physicians’ working conditions and well-being. We reported and reflected on our approach and provided recommendations for developing similar interventions – hopefully contributing to physicians’ workplaces and health.

REFERENCES

1. Wallace J, Lemaire J, Ghali W. Physician wellness: a missing quality indicator. *Lancet*. 2009;374(9702):1714-21.
2. West C, Dyrbye L, Shanafelt T. Physician burnout: contributors, consequences and solutions. *J Intern Med*. 2018;283(6):516-29.
3. Panagioti M, Geraghty K, Johnson J, Zhou A, Panagopoulou E, Chew-Graham C, et al. Association Between Physician Burnout and Patient Safety, Professionalism, and Patient Satisfaction: A Systematic Review and Meta-analysis. *JAMA Intern Med*. 2018.
4. National Academies of Sciences, Engineering, and Medicine 2019. Taking Action Against Clinician Burnout: A Systems Approach to Professional Well-Being. Washington, DC: The National Academies Press.
5. Shanafelt T, West CP, Sinsky C, Trockel M, Tutty M, Satele D, et al. Changes in Burnout and Satisfaction With Work-Life Integration in Physicians and the General US Working Population Between 2011 and 2017. *Mayo Clin Proc*. 2019.
6. World Health Organization. Burn-out an “occupational phenomenon”: international classification of diseases [accessed November 2019] (https://www.who.int/mental_health/evidence/burn-out/en/).
7. West C, Dyrbye L, Erwin P, Shanafelt T. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet*. 2016;388(10057):2272-81.
8. Panagioti M, Panagopoulou E, Bower P, Lewith G, Kontopantelis E, Chew-Graham C, et al. Controlled interventions to reduce burnout in physicians: a systematic review and meta-analysis. *JAMA Intern Med*. 2017;177(2):195-205.
9. Montgomery A, Panagopoulou E, Esmail A, Richards T, Maslach C. Burnout in health-care: the case for organisational change. *BMJ*. 2019;366:l4774.
10. Shanafelt T, Trockel M, Ripp J, Murphy M, Sandborg C, Bohman B. Building a Program on Well-Being: Key Design Considerations to Meet the Unique Needs of Each Organization. *Acad Med*. 2018;94(2):156-61.
11. Tims M, Bakker A, Derks D, Van Rhenen W. Job crafting at the team and individual level: Implications for work engagement and performance. *Group Organ Manage*. 2013;38(4):427-54.
12. Bakker A, Demerouti E. Job demands–resources theory: Taking stock and looking forward. *J Occup Health Psychol*. 2017;22(3):273-85.
13. Seligman M, Csikszentmihalyi M. Positive psychology: An introduction. *Am Psychol*. 2000;55(1):5-14.
14. Nielsen K, Nielsen M, Ogonnaya C, Käänsälä M, Saari E, Isaksson K. Workplace resources to improve both employee well-being and performance: A systematic review and meta-analysis. *Work Stress*. 2017;31(2):101-120.
15. Cooperrider D, Whitney D, Stavros J. The appreciative inquiry handbook: For leaders of change. Oakland, CA Berrett-Koehler Publishers; 2008.
16. Baker D, Zuvella D. Feedforward strategies in the first-year experience of online and distributed learning environments. *Assess Eval High Educ*. 2013;38(6), 687-697.
17. Mäkikangas A, Bakker A, Schaufeli W. Antecedents of daily team job crafting. *Eur J Work Organ Psychol*. 2017;26(3):421-33.
18. Linnan L, Sorensen G, Colditz G, Klar D, Emmons K. Using theory to understand the multiple determinants of low participation in worksite health promotion programs. *Health Educ Behav*. 2001;28(5):591-607.
19. Nembhard I, Edmondson A. Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams. *J Organ Behav*. 2006;27(7):941-66.



7

Building organisations, setting minds: Exploring how boards of Dutch Medical Specialist Companies address physicians' professional performance

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ABSTRACT

Background

Governments worldwide are reforming healthcare systems to achieve high quality and safe patient care while maintaining costs. Self-employed physicians reorganise into novel organisations to meet reconfiguration demands, impacting their work environment and practice. This study explores what strategies these novel organisations use to address physicians' professional performance and what they encounter when executing these strategies to achieve high quality and safe care.

Methods

This constructivist exploratory qualitative study used focus groups to answer our research question. Between October 2018 and May 2019, we performed eight focus group sessions with purposively sampled Medical Specialist Companies (MSCs), which are novel physician-led organisations in the Netherlands. In each session, board members of an MSC participated (n=33).

Results

MSCs used five strategies to address physicians' professional performance: 1) actively managing and monitoring performance, 2) building a collective mindset, 3) professionalising selection and onboarding, 4) improving occupational well-being, and 5) harmonising working procedures. The MSC's unique context determined which strategies and quality and safety topics deserved the most attention. Physicians' support, trusting relationships with hospital administrators, and the MSC's organisational maturity seem critical to the quality of the strategies' execution.

Conclusions

The five strategies have clear links to physicians' professional performance and quality and safety. Insight into whether an MSC's strategies together reflect medical professional or organisational values seems crucial to engage physicians and collaboratively achieve high quality and safe care.

BACKGROUND

Governments in high-income countries are reforming healthcare systems to achieve high quality and safe care while maintaining costs [1, 2]. To meet reconfigurations demands, self-employed physicians reorganise themselves into new and often larger organisations, impacting their work environment and practice [3-7]. Self-employed physicians may find that by reorganising, they gain control over their work, allocate resources more efficiently [5], or create a strong collective that may offer more power to negotiate with hospitals [8, 9]. An example of such a novel organisation of self-employed physicians is the Medical Specialist Company (MSC) in the Netherlands. Self-employed physicians merged their specialty group partnerships into MSCs after the Dutch government introduced the Act on Integrated Funding in 2015 to optimise healthcare cost-efficiency (see setting). A typical MSC, of which there are around 70 in the Netherlands [10], comprises multiple mono-disciplinary specialty groups, has an exclusive relationship with one hospital, and is governed by a board of peers.

However, the success of MSCs and similar organisations is currently unknown and may depend on physicians' involvement and organisational strategies enabling them to live up to their professional responsibilities [4, 11, 12]. The organisation might not function well if physicians are unwilling to take the lead or remediate peers [12, 13]. Conversely, physicians' may be less likely to fulfil leadership positions and disclose performance information when the organisation fails to recognise the value of leadership and implement adequate performance monitoring systems, possibly harming the quality of patient care [4, 11, 14]. Moreover, physicians are primarily trained in medicine and may lack essential leadership skills and organisational knowledge needed for excellent professional performance in these new settings [15-18].

Therefore, it is problematic that we have limited insight into how novel physician-led organisations like MSCs achieve high quality and safe care [3, 5, 19]. More particularly, knowledge about effective strategies to address physicians' professional performance is lacking [4, 11, 20]. Hence, this study will answer the following research question: What strategies do MSCs use to address physicians' professional performance, and what do they encounter when executing these strategies to achieve high quality and safe care? Such information is especially relevant to boards of MSCs and similar organisations to guide their organisational development and improve their leadership and strategies to address physicians' professional performance.

METHODS

Setting

On January first 2015, the Dutch government reformed the payment model of medical specialist care. Before this time, self-employed medical specialists and hospitals billed their services separately, which was deemed more complex, difficult to regulate and costly [21]. The reform established integrated funding to align hospitals' and medical specialists' interests and improve healthcare quality and cost-efficiency. However, it also meant self-employed medical specialists lost their autonomous billing rights, a condition for the Dutch Tax Authority to qualify as an entrepreneur (i.e. self-employed) [22]. Without entrepreneurial status, they would lose their felt professional independence and eligibility for related tax benefits. Therefore, integrated funding drove most self-employed medical specialists to organise themselves in MSCs to maintain their entrepreneurial status and independence. Another effect was that MSCs and hospitals were required to make formal agreements about the quality and safety of patient care. Initially, MSCs devoted most of their efforts to the legal aspects of reorganising into MSCs [21]. However, more recent policy evaluations indicate that MSCs increasingly focus on quality and safety [22].

While various MSC types and organisational formats exist, such as regional MSCs or MSCs including only one professional discipline, this study focuses on typical MSCs. Each MSC consists of multiple medical specialties and represents its members with a chosen board of peers that collaborates and negotiates with the hospital's administration about various aspects of medical specialist care. The collaboration and specific negotiated agreements between MSCs and the hospital are contractually regulated. While hospital administration is ultimately accountable for all aspects of quality and safety by law, the MSC board is responsible for realising the goals stated in the contract.

Ethics and consent to participate

All procedures were in accordance with the Helsinki Declaration. The institutional ethical review board of the Amsterdam UMC provided a waiver declaring the Medical Research Involving Human Subjects Act (WMO) did not apply to the current study (ref. W18_082#18.106). All participants provided written informed consent to participate.

Study design

This constructivist exploratory qualitative study used focus groups [23] to answer our research question: What strategies do MSCs use to address physicians' professional performance, and what do they encounter when executing these strategies to achieve high quality and safe care? By constructivist, we mean that knowledge is constructed

from the experience and interaction between participants and the researcher. Focus groups are well suited within a constructivist paradigm and are particularly appropriate for exploratory research [23, 24].

Research team

The team consisted of researchers from various disciplines; all are familiar with physicians' professional performance research: a social scientist with a background in Strategic Human Resource Management (MD); a health scientist and research fellow in medical education within the NHS; a healthcare services researcher well-established in healthcare policy and management (KL) and a hospital administrator (KK) with a background in medicine and public administration. KK has a long-standing experience as hospital administrator of a teaching hospital where she witnessed the introduction of an MSC and collaborated with the MSC for several years.

In addition to the research team, we consulted two experts to further inform the development of the discussion guide and data collection: 1) a non-executive board member of a large teaching hospital collaborating with an MSC and 2) a policy consultant from the Dutch Association of Medical Specialists charged with assisting MSC boards.

Sampling and inviting participants

We purposively selected MSCs varying in the number of adjoined medical specialists, hospital size, and geographic region to ensure maximum variation in our sample. We selected MSCs iteratively, meaning that each focus group session informed the next inclusion. KL and KK used available contact credentials to invite MSC chairs by email to participate in a focus group session, or MD approached the MSC board's secretary to acquire contact credentials. Entire MSC boards were invited. Upon interest, MD provided a participation information letter by email.

Participants

Half of the approached MSC boards agreed to participate in a focus group discussion (n=8); others indicated lacking time or having other priorities. MSCs' board sizes varied between three and seven members, and a professional staff supported all but one MSC. In four of the focus group sessions, the entire MSC board participated. Other sessions included all but one board member (n=3) or half of the board and two supporting staff members (n=1), resulting in 33 participants (28 physician board members, 5 non-physician board members and support staff). Table 1 provides a brief description contextualising the participating MSCs.

Table 1. Descriptions of participating MSCs

	≈ Number of specialists	Board size	Hospital size	Hospital recently merged	Hospital location
MSC1	250	Large	Medium	Yes	Peripheral
MSC2	250	Small	Large	Yes	Peripheral
MSC3	150	Small	Medium	No	Urban
MSC4	50	Small	Small	No	Peripheral
MSC5	350	Large	Large	Yes	Peripheral
MSC6	250	Medium	Medium	No	Urban
MSC7	200	Medium	Large	Yes	Urban
MSC8	200	Large	Large	Yes	Urban

* Board size: small (<4), medium (4), large (>4).

** Hospital size in number of employees and yearly patient visits: small (< 2000 & < 250.000), medium (2000-4000 & 250.000-500.000), large (> 4000 & > 500.000).

*** Recently merged meant merged within the last five years at the time of data collection.

Data collection & discussion guide

From October 2018 until June 2019, we conducted all focus group sessions in the hospitals of participating MSCs. To answer our research question, we developed a discussion guide consisting of three main parts (Additional file 1): 1) MSCs' most critical quality and safety issues, 2) strategies to address physicians' professional performance, and 3) MSC boards' relationships with physician members and the hospital's administration. Part one was introductory, part two addressed the main research question, and part three provided contextualisation. Policy evaluations and expert consultations pointed to the importance of part three to effectively address physicians' professional performance.

A moderator (KL, MS) led the 60-75-minute sessions; an observer (MD) took notes about verbal and nonverbal communication. The observer and moderator reviewed and discussed each focus group session directly following the meeting. All sessions were audio-recorded and transcribed. No financial compensation for participation was provided.

Data analysis

Two researchers (MD, MS) independently read and open coded the first transcript and compared and discussed labelling and interpretations of codes until consensus. Next, MD coded the first three transcripts and grouped similar open codes to establish categories. Subsequently, the research team discussed initial categorisation to identify the most significant themes (axial coding). The remaining transcripts were double coded by MS in sections relevant to the research question. Lastly, the research team used a selective coding process to establish the interconnectedness between themes, i.e. noting all main themes and discussing mutual relationships.

The research team discussed the outcomes of all coding stages extensively. After focus group session eight, the categories seemed to manage the data without further modifications, indicating theoretical sufficiency [26]. MAXQDA was used to support all analyses.

RESULTS

We found five strategies that MSCs used to address physicians' professional performance to achieve high quality and safe care: 1) actively monitoring and managing performance, 2) building a collective mindset, 3) professionalising selection and onboarding, 4) improving occupational well-being, and 5) harmonising working procedures. MSC boards seemed to agree that excellent performance included being a medical expert and team player, actively participating in the MSC, and understanding organisational processes in the MSC and hospital.

Table 2 provides insight into how MSCs address physicians' professional performance (i.e. an overview of strategies, efforts, instruments, or tools used), whereas the elaboration on each strategy below describes why they are needed and *what* happens when applying them.

1. Actively monitoring and managing performance

MSC boards monitored and managed various aspects of physicians' professional performance to keep track of quality and safety. The most substantial aspect was specialty group's patient care volume and related quality indicators. Less frequently monitored aspects were compliance to hand hygiene and physicians' professional learning goals and well-being. The topics that deserved priority depended on MSCs' local context, e.g. outcomes of quality and safety audits. However, MSCs also reported a series of challenges when executing this strategy: depending on physicians' willingness to share performance information, having insufficient insight into 'softer' performance aspects, and managing unprofessionalism.

MSC boards reported that physicians were not always willing to share performance information, especially when this involved reporting peers: "It is a bit of betrayal of your mate, and you don't do that lightly (MSC6, R2)". Another worry was that MSC boards might "reduce your autonomy (MSC6, R1)" and interfere with practice. Some specialty groups would rather cover-up performance issues and let them evolve into more significant problems before consulting the MSC board. "Well, it is very much covering-up (...) we've seen it coming for years that it is just not good [enough]. And then they get a bad audit, and suddenly they do come to you (MSC6, R3)".

Table 2. Overview of reported specific initiatives within the five identified strategies used by MSC's to address physicians' professional performance.

1. Monitoring and managing performance	2. Building a collective mindset	3. Prof. selection & onboarding	4. Improving occupational well-being	5. Harmonising working procedures
Individual and group performance appraisals	Continually emphasising shared goals	Introduction programs	Offering social support	Harmonising medical protocols and guidelines
Soft signal systems	Appointing specialty group representatives with a collective mindset	New recruitment and selection methods (e.g. 360 degrees feedback)	Referring to professional help	Harmonising well-being practices and policies
Specialty group visits	Company drinks and party's	Monitoring the need for vacancies within specialty groups	Initiating occupational well-being programs	Offering insight in MSCs policies and practices relevant to all members
Assisting specialty group representatives	Introducing a company website and newsletter	Buddy systems for new members	Career path polices	Codes of conduct for all members
Role modelling	Changing the physical setting of meetings to involve members	Checking the qualifications of new members rigorously	Flexible working (less night shifts, hours)	Offering to facilitate insurance for all members
Speaking-up to members about their performance				
Financial compensation or sanction				
Mediation trajectories				
Remediation trajectories				

* The presented initiatives can serve multiple goals and strategies but are depicted under the most relevant strategy

Related to this, MSC boards reported to mainly have sight on extreme incidents and missed "a clear overview of all specialty groups, if there are indeed, those soft signals (MSC2, R1)". Soft signals referred to early indications of performance issues, e.g. a colleague starting to communicate unfriendly to other healthcare professionals. Therefore, MSCs reported initiating specialty group visits to exchange performance information with physicians and so-called soft signal systems "to prevent that a remediation trajectory needs to follow (MSC1, R4)". While soft signal systems allowed hospital actors to report concerns about physicians' professional performance, MSC boards indicated implementation and widespread use would take time.

MSC boards considered managing physicians' unprofessional behaviours particularly challenging as these behaviours were often ambiguous, physicians thought differently about 'unprofessionalism', and related protocols and procedures were vague. MSC boards said: "The consequences for certain behaviours or the absence of good behaviour in the field of quality and safety are really lacking (MSB2, R2)". They reported that this related to the MSC's non-hierarchical structure: "You have no boss above you and you have a lot of freedom. But if there is a hitch somewhere (...) you have no instruments to do anything (MSC6, R3)". More clear cut procedures were available for managing 'dysfunctioning' medical specialists, which was a joint task of the MSC board and hospital administrators requiring mutual trust. MSC boards reported that a lack of trust prevented effective monitoring and managing: "In theory, this could mean that I delay reporting a dysfunctioning medical specialist, that is the effect if you do not have mutual trust (MSC3, R2)".

When executing this strategy MSC boards mainly focused on underperforming physicians and specialty groups: "Before you know it, you are only looking at problem situations, and you are not hearing the specialty groups that are doing quite well (MSC7, R2)". MSC boards occasionally mentioned sharing best practices or financially rewarding desired behaviours. Trustworthy relationships with the hospital's administration, the boards' leadership competencies (e.g. conflict management skills), and the implementation phase of performance monitoring systems appeared critical for the effectiveness of this and the other strategies reported below.

2. Building a collective mindset

MSC boards worked towards building a collective mindset, which meant physicians were encouraged to rise above their own speciality group's perspective and adopt a hospital-wide focus. A collective mindset was considered crucial to create buy-in from physicians, facilitate best practice sharing, openness to new ways of working, and inter-disciplinary collaboration. For this strategy, specialty group representatives were vital because they acted as a linking pin between the MSC board and the work floor and "know what is going on, behind them is a group [of MSC members] that probably doesn't know what's going on, they absolutely rely on what their specialty group representative tells them to vote (MSC3, R2)". Participants reported appointing specialty group representatives with a positive attitude towards the MSC to foster a collective mindset (Table 1).

However, MSC boards described achieving this hospital-wide thinking as "our biggest challenge (MSC1, R4)" and that "it is not so much about the hospital, and you notice that in all specialty groups (MSC6, R1)". They wanted to facilitate "the translation to a really actively participating medical specialist in this company, that this is also their company, their nest, and that you have to keep it very good. Some think that is logical, but a

large part sees it different (MSC6, R3)". According to participants, building a collective mindset was challenging due to physicians' perceptions and fears of losing autonomy, influence or resources since the foundation of the MSC. Some specialty groups would say: "Previously we could arrange things for ourselves much better than the MSC can arrange it for us (MSC7, R1)", while MSC boards aimed "to do the best for the corporation (...) So they must give up some [profit] for the others who had arranged it less well (MSC7, R3)". Also, groups were no longer allowed to make individual arrangements with the hospital administration: "All arrangements that are made with specialty groups run through the MSC (...) especially specialty groups that frequently dealt directly with the hospital administration see it as an obstacle (MSC7, R3)". Trustworthy relationships with the hospital's administration prevented that specialty groups were able to bypass the MSC board.

MSC boards sought adequate tools and leadership styles to build a collective mindset. They learned by trial and error, and some experienced the benefits of more actively involving physicians in decision making. This strategy assisted in obtaining physicians' support, which MSC boards indicated as crucial in a company among equals in which members vote for MSC proposals with potentially adverse consequences for themselves or their specialty group. Therefore, physicians' support was a critical factor for executing all strategies.

3. Professionalising selection and onboarding

MSCs improved procedures of selecting new physicians and supported integration in the MSC and hospital. They used this strategy to select qualified physicians and obtain enhanced insight into their ambitions to participate in quality and safety committees or leadership positions. MSCs also employed this strategy to foster physicians' organisational awareness. They said to find it important "that people are more aware of the organisation in which we work (MSC3, R2)" and have an idea of "what a manager actually does and why he is not only a burden (MSC5, R1)".

MSC boards described coordinating open vacancies to more professionally recruit and build the medical staff: "Now an extra pair of eyes is watching; is that vacancy really necessary? (MSC1, R1)". They also discussed implementing more rigorous selection procedures, such as "a built-in reference check (...) the hospital and adjacent specialties provide 360-degree feedback and that determines whether someone should be welcomed definitely (FG3, R3)". Regarding integration, participants mentioned offering leadership and management training, and MSC6 supported integration using a buddy system, facilitating social support and opportunities to build a professional network in the hospital.

Still, sometimes it was challenging to achieve the expected outcomes. For example, one MSC described not reaping the benefits of sending physicians to a leadership program because they "chose people who were too young (MSC3, R2)", meaning they already had too much on their plate (e.g. children, high workload). Furthermore, some MSCs struggled to attract and attain qualified medical specialists "because we are located in a region that is less attractive to the average doctor (MSC1, R1)", which for them enhanced this strategy's importance.

4. Improving occupational well-being

MSC boards said to work on improving physicians' occupational well-being, encouraged by well-being featured in the media and the realisation that "apart from the personal misery, it also has consequences for quality and safety (MSC5, R1)". Most MSC boards mentioned offering informal and professional help to peers on sick leave or those at risk of dropping out. However, they also expressed their ambitions to be more proactive, for example, by aligning physicians' professional preferences and working conditions: "How can we ensure that everyone gets their right place, (...) you enter a different life phase, in which you want to have children or want to do other things, and how do you create room for that, we are working that out in an HR working group (MSC2, R1)".

Nonetheless, such initiatives were infant, and MSC boards described several complexities in addressing occupational well-being, such as "how generic can you make it [flexible night shift policies], because the conditions differ per specialty group (MSC5, R1)" and "if he starts doing fewer night shifts, that means another colleague will be charged more (MSC4, R2)". Also, participants contemplated how to deal with (younger generation) physicians refusing to perform MSC tasks to achieve a better work-life balance. Lastly, some MSC boards said "I notice that we are actually increasingly taking the role of employer (MSC5, R3)" and questioned their role and responsibilities for addressing well-being in an organisation of self-employed physicians.

5. Harmonising working procedures

MSC boards reported harmonising work procedures that differed between specialty groups to benefit patient care. This was especially true for MSCs of merged hospitals, for example, when harmonising work procedures of two gastroenterologist groups: "Then you have the rules of two professional associations in your specialty group (...) they have different opinions on sub-topics, and what opinion will you follow? You have to be audited by two associations as one specialty group (...) and we saw all kinds of problems occur that we did not find acceptable (MSC7, R3)". Therefore, MSC7 financially supported the training of physicians enabling them to work according to one professional guide-

line. MSC boards indicated that executing this strategy could be challenging as some specialty groups would like to stick to their ways of working.

Furthermore, this strategy included providing “more clarity and information, that we can offer a solution together, that it is not a problem of the individual alone or the specialty group. (MSC2, R1)”. MSC boards indicated that physicians were often unaware of MSC-wide policies, regulations and resources.

Conceptual model

Figure 1 summarises our findings and depicts the five strategies MSCs used to address physicians’ professional performance to achieve high quality and safe care. Furthermore, it shows three critical factors to the overall functioning of the MSC and the quality of the strategies’ execution: physicians’ support, trusting relationships with hospital administrators, and the MSC’s organisational maturity. Without physicians’ support, the board lacked administrative power to govern the organisation. Trustworthy relationships with the hospital administration were crucial to manage dysfunctioning physicians and negotiate preferred working circumstances overall. Organisational maturity refers to aspects such as MSC boards’ leadership competencies and the implementation phase of performance monitoring systems. The model shows that MSC’s unique context influenced which strategies and quality and safety topics deserved the most attention. The feedback loop illustrates that MSC boards may learn from addressing physicians’ professional performance and improve their strategies accordingly.

DISCUSSION

This study explored what strategies Dutch Medical Specialist Companies (MSCs) – novel physician-led organisations – use to address physicians’ professional performance and what they encounter when applying these strategies to achieve high quality and safe care. The empirical analysis revealed five strategies: 1) actively monitoring and managing performance, 2) building a collective mindset, 3) professionalising selection and onboarding, 4) improving occupational well-being, and 5) harmonising working procedures. We first discuss how each strategy may relate to the quality and safety of patient care. Then, we adopt a strategy-overarching perspective discussing how MSCs addressed physicians’ professional performance concerning their main challenge.

Without monitoring and managing performance, it is impossible to know whether physicians’ performance is consistent with quality and safety standards. However, our results indicate that effective monitoring was hampered by physicians’ reluctance to

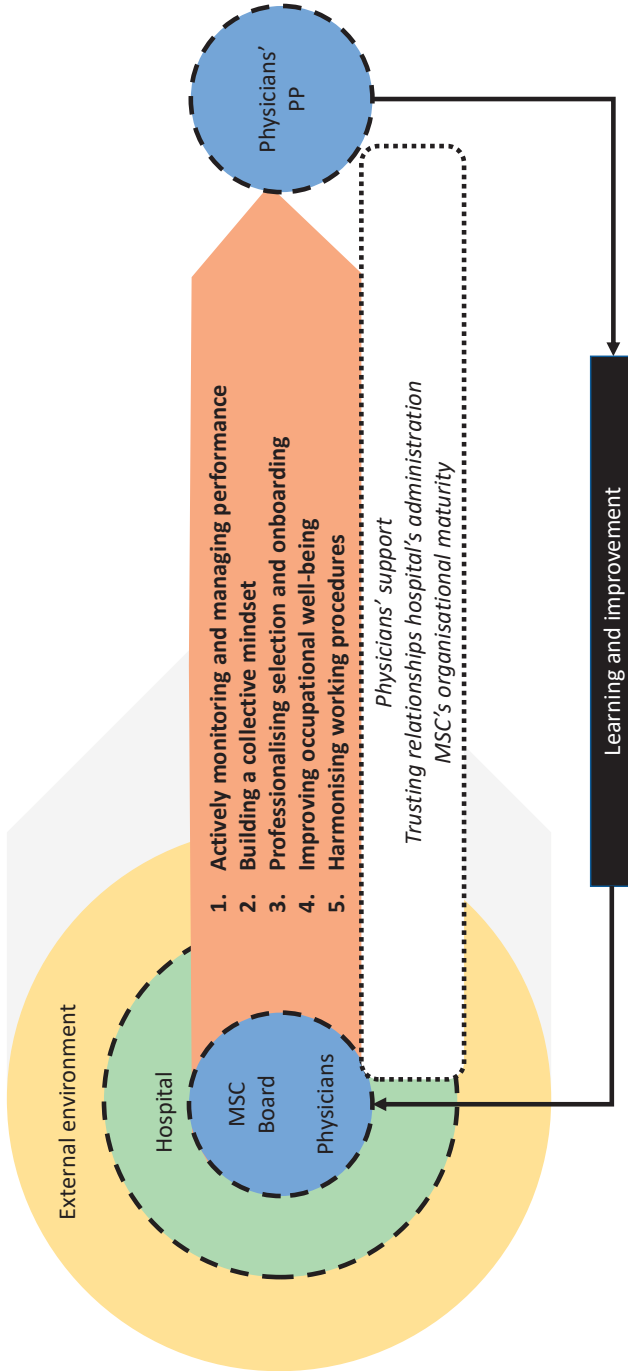


Figure 1. Conceptual model

share information, which stemmed from protecting peers or their autonomy. Prior studies reported similar reasons for physicians not reporting incidents, such as a rejection of bureaucracy and a culture of protectionism [26, 27]. Also, MSCs seemed predominantly aware of extreme incidents, which provides an incomplete picture of quality and safety [28, 29]. Literature suggests that soft signals, previously described as observable deviations from a colleague's regular professional performance, are vital for comprehensively assessing patient safety risks [29]. Although MSCs described initiating such soft signal systems, they rarely discussed creating a blame-free culture essential for hospital actors to report soft signals [28, 29]. Concerning managing, addressing unprofessionalism seemed particularly challenging due to unclear protocols, varying views on professionalism, and a lack of tools. However, not acting on unprofessionalism may undermine a safety culture and increase risks of medical errors and surgical complications [30].

Building a collective mindset can improve quality and safety by aligning MSC's vision and strategies with specialty groups' practice [31, 32]. This alignment was crucial for novel hospital-wide committees to contribute to continuous quality improvement in postgraduate medical education [32]. A shared vision can also guide goal-setting, which motivates and contributes to performance [33]. In the context of MSCs, participatory goals setting might contribute to ownership and active involvement [33], hence the quality and safety provided in hospitals [12].

The strategy professionalising selection and onboarding might foresee in recruiting physicians with leadership aspirations who underscore the vision and values of the MSC [34]. A stronger person-organisation fit correlates with reduced turnover intentions, increased affective commitment, job satisfaction and organisational citizenship behaviours [35, 36]. MSC boards also described using integration to get more insight into physicians' professional preferences and leadership ambitions, which can help create a leadership pipeline needed to cope with future challenges [37]. Moreover, such information can be used to design physicians' 'jobs' in personally meaningful ways [38, 39], potentially improving their well-being and performance [40, 41].

That improving occupational well-being relates to the quality and safety of patient care is well underpinned by research, leading researchers to describe physicians' well-being as 'a quality indicator' [42]. Ample evidence shows that physicians' occupational well-being contributes to better patient satisfaction and interpersonal aspects of care [43]. There also seems to be a link between physicians' occupational well-being and patient outcomes, but the evidence rests mainly on self-reported data [44]. Studies indicate that sustainably improving physicians' occupational well-being requires proactive efforts from physicians and their organisations [45, 46].

Unharmonised working procedures endanger patient care as complicated, inaccurate, unrealistic, absent or poorly presented protocols cause adverse events in hospitals [47].

From a strategy-overarching perspective, MSC boards identified creating an actively involved cadre of physicians with a hospital focus as their primary challenge. Our results indicate that this is a cultural challenge originating in physicians' perceptions of losing autonomy, influence or resources since the formation of the MSC. Physicians may perceive the MSC board and its strategies, despite the board's collegial nature, as an intrusion of organisational logics into the medical domain. Organisational leadership generally endorses values like control, costs and efficiency, which physicians may see as detrimental to medical professional values, e.g. providing high quality and compassionate care [48-50]. Managing these conflicting values requires excellent leadership skills, and inexperienced leaders often feel more comfortable controlling physicians' performance based on rationality than intervening on ambiguous cultural performance aspects [17, 51, 52].

Although MSC boards acknowledged the importance of intervening on culture, they regularly used descriptions that seem to reflect organisational logics and ambitions to control physicians' professional performance, potentially reinforcing their main challenge. Control-based approaches to managing performance encompass compliance to rules, supervision and autocratic decision making [53, 54]. For example, MSC boards described focusing on poor performance and wanted instruments to punish unprofessionalism. Another example is that an MSC board initially did not consider physicians' workload before 'sending' them to a leadership development program. While MSC boards seemed to have the best intentions, these examples may unintentionally convey to physicians 'we do not trust you' or 'your time and well-being are less valuable than organisational priorities' [55, p.1558]. Due to value dissonance, a control orientation may result in a loss of physicians' support, impede organisations to learn from what is going well, and create a work environment in which burnout thrives [54, 56, 57]. Commitment-based approaches steer physicians' performance by developing skills, motivation, sharing best practices, facilitation, and participatory leadership [53, 54], and align better with professional medical values [14, 49, 58, 59]. When MSC boards aim to commit physicians and ensure the employed strategies reflect their intentions, they might address physicians' professional performance more effectively.

Strengths and limitations

Strengths of this study are the inclusion of differently composed 'typical' MSCs throughout the Netherlands and the participation of entire MSC boards. These strengths contributed to in-depth insight into the perspectives of and interaction between board

members within MSCs, and how different MSCs address physicians' professional performance.

Including the perspective of MSC boards only can also be a limitation, as their opinions might not completely represent what is happening in practice, or at some points may be perceived differently by their physician members.

Lastly, the unique Dutch setting of this study might be seen as a limitation. The findings may not be transferable to other contexts one-on-one. However, this study provides more insight into the complexities of leading novel physician organisations and might inform strategies to address physicians' performance to improve patient care.

Implications for research and practice

Future research could focus on discrepancies between MSC physician members' and MSC boards' perspectives on managing professional performance. Understanding such discrepancies is essential for achieving high quality and safe care because physicians presumably act on their perceptions of initiatives rather than on how boards intended them [14, 55]. More specifically, studies could unravel under what circumstances physicians' experience the board's actions in line with medical professional or organisational logics. Lastly, quantitative research could establish the link between MSCs' strategies and patient outcomes or experiences.

For practice, this study indicates that it might be beneficial for boards of novel physician organisations to actively address culture next to building organisational structures, systems and guidelines. Moreover, it seems necessary to evaluate whether the strategies used resonate with the MSC's vision and intentions to address physicians' performance. Leadership training programs could help physician board members to develop the needed skills. They could also offer leadership training to physicians, particularly specialty group representatives, to foster organisational awareness and involvement.

Conclusions

This study explored how MSCs address physicians' professional performance to achieve high quality and safe care and identified five strategies. The identified strategies have clear links with professional performance and quality and safety. Considering whether the strategies reflect medical professional or organisational values might help create a cadre of actively involved physicians with organisational awareness. Future research on MSC physicians' perspectives is needed to obtain a more balanced understanding of MSCs' practice.

REFERENCES

1. Dubas-Jakóbczyk K, Albrecht T, Behmane D, Bryndova L, Dimova A, Džakula A, et al. Hospital reforms in 11 Central and Eastern European countries between 2008 and 2019: a comparative analysis. *Health Policy*. 2020;124(4):368-79.
2. Stadhouders N, Kruse F, Tanke M, Koolman X, Jeurissen P. Effective healthcare cost-containment policies: A systematic review. *Health Policy*. 2019;123(1):71-9.
3. Zwiep T, Brehaut J, Balaa F, McIsaac D, Rich S, Wallace T, et al. Group practice impacts on patients, physicians and healthcare systems: a scoping review. *BMJ Open*. 2021;11(1):e041579.
4. Rothman D, Blumenthal D, Thibault G. Medical Professionalism In An Organizational Age: Challenges And Opportunities: Strategies for physicians to address the key responsibilities of medical professionalism in an era of profound change in the structure of medical care. *Health Aff*. 2020;39(1):108-14.
5. Welch W, Cuellar A, Stearns S, Bindman A. Proportion of physicians in large group practices continued to grow in 2009–11. *Health Aff*. 2013;32(9):1659-66.
6. Muhlestein D, Smith N. Physician consolidation: rapid movement from small to large group practices, 2013–15. *Health Aff*. 2016;35(9):1638-42.
7. Denis J, Van Gestel N. Medical doctors in healthcare leadership: theoretical and practical challenges. *BMC Health Serv Res*. 2016;16(2):158.
8. Scholten G, Van der Grinten T. The integration of medical specialists in hospitals. Dutch hospitals and medical specialists on the road to joint regulation. *Health Policy*. 2005;72(2):165-73.
9. Scholten G, Van der Grinten T. Integrating medical specialists and hospitals. The growing relevance of collective organisation of medical specialists for Dutch hospital governance. *Health Policy*. 2002;62(2):131-9.
10. Federatie Medisch Specialisten. MSB [accessed Juli 2021] (<https://demedischspecialist.nl/themas/thema/msb>).
11. Egner B, Mason D, McDonald W, Okun S, Gaines M, Fleming D, et al. The Charter on Professionalism for Health Care Organizations. *Acad Med*. 2017;92(8):1091-9.
12. Sarto F, Veronesi G. Clinical leadership and hospital performance: assessing the evidence base. *BMC Health Serv Res*. 2016;16(2):169.
13. ABIM Foundation; ACP-ASIM Foundation; European Federation of Internal Medicine. Medical Professionalism in the New Millennium: A Physician Charter. *Ann Intern Med*. 2002;136(3):243-6.
14. Savage M, Savage C, Brommels M, Mazzocato P. Medical leadership: boon or barrier to organisational performance? A thematic synthesis of the literature. *BMJ Open*. 2020;10(7):e035542.
15. Blumenthal D, Bernard K, Bohnen J, Bohmer R. Addressing the leadership gap in medicine: residents' need for systematic leadership development training. *Acad Med*. 2012;87(4):513-22.
16. Stoller J. Developing physician-leaders: a call to action. *J Gen Intern Med*. 2009;24(7):876-8.
17. Keijser W, Huq J, Reay T. Enacting medical leadership to address wicked problems. *BMJ Lead*. 2020;4(1).
18. Frich J, Brewster A, Cherlin E, Bradley E. Leadership development programs for physicians: a systematic review. *J Gen Intern Med*. 2015;30(5):656-74.
19. Baker L, Pesko M, Ramsay P, Casalino L, Shortell S. Are Changes in Medical Group Practice Characteristics Over Time Associated With Medicare Spending and Quality of Care? *Med Care Res Rev*. 2018;77(5):402-15.

20. Kuhlmann E, Batenburg R, Dussault G. Where health workforce governance research meets health services management. *Health Serv Manage Res.* 2016;29(1-2):21-4.
21. Nederlandse Zorgautoriteit. Monitor Integrale bekostiging medisch-specialistische zorg 2015. [accessed Juli 2021] (https://puc.overheid.nl/nza/doc/PUC_3417_22/1/).
22. Nederlandse Zorgautoriteit. Monitor Integrale bekostiging medisch-specialistische zorg 2018. [accessed Juli 2021] (https://puc.overheid.nl/nza/doc/PUC_252727_22/1/).
23. Stalmeijer R, McNaughton N, Van Mook W. Using focus groups in medical education research: AMEE Guide No. 91. *Med Teach.* 2014;36(11):923-39.
24. Watling C, Lingard L. Grounded theory in medical education research: AMEE Guide No. 70. *Med Teach.* 2012;34(10):850-61.
25. Varpio L, Ajjawi R, Monrouxe L, O'Brien B, Rees C. Shedding the cobra effect: problematising thematic emergence, triangulation, saturation and member checking. *Med Educ.* 2017;51(1):40-50.
26. DesRoches C, Rao S, Fromson J, Birnbaum R, Iezzoni L, Vogeli C, et al. Physicians' perceptions, preparedness for reporting, and experiences related to impaired and incompetent colleagues. *JAMA.* 2010;304(2):187-93.
27. Perez B, Knych S, Weaver S, Liberman A, Abel E, Oetjen D, et al. Understanding the Barriers to Physician Error Reporting and Disclosure: A Systemic Approach to a Systemic Problem. *J Patient Saf.* 2014;10(1):45-51.
28. Kok J, Wallenburg I, Leistikow I, Bal R. "The doctor was rude, the toilets are dirty. Utilizing 'soft signals' in the regulation of patient safety". *Saf Sci.* 2020;131:104914.
29. Van den Goor M, Silkens M, Heineman M, Lombarts K. Investigating Physicians' Views on Soft Signals in the Context of Their Peers' Performance. *J Healthc Qual.* 2018;40(5):310-317.
30. Cooper W, Spain D, Guillaumondegui O, Kelz R, Domenico H, Hopkins J, et al. Association of Coworker Reports About Unprofessional Behavior by Surgeons With Surgical Complications in Their Patients. *JAMA Surg.* 2019;154(9):828-34.
31. Wagner C, Groene O, Thompson C, Dersarkissian M, Klazinga N, Arah O, et al. DUQuE quality management measures: associations between quality management at hospital and pathway levels. *Int J Qual Health Care.* 2014;26(suppl_1):66-73.
32. Silkens M, Slootweg I, Scherpbier A, Heineman M, Lombarts K. Hospital-wide education committees and high-quality residency training. *Perspect Med Educ.* 2017;6(6):396-404.
33. Ogbeiwi O. General concepts of goals and goal-setting in healthcare: A narrative review. *Organ Manag J.* 2018;27:1-18.
34. Verma P, Ford J, Stuart A, Howe A, Everington S, Steel N. A systematic review of strategies to recruit and retain primary care doctors. *BMC Health Serv Res.* 2016;16(1):126.
35. Amos E, Weathington B. An Analysis of the Relation Between Employee—Organization Value Congruence and Employee Attitudes. *J Psychol.* 2008;142(6):615-32.
36. Suwanti S, Udin U, Widodo W. Person-organization fit, person-job fit, and innovative work behavior: the role of organizational citizenship behavior. *Eur Res Stud.* 2018;21:389-402.
37. Hess C, Barss C, Stoller J. Developing a leadership pipeline: the Cleveland Clinic experience. *Perspect Med Educ.* 2014;3(5):383-90.
38. Tims M, Bakker A. Job crafting: Towards a new model of individual job redesign. *SA J Ind Psychol.* 2010;36(2):1-9.
39. Berg J, Dutton J, Wrzesniewski A. Job crafting and meaningful work. Purpose and meaning in the workplace. *APA;* 2013:81-104.

40. Lichtenthaler P, Fischbach A. A meta-analysis on promotion-and prevention-focused job crafting. *Eur J Work Organ Psychol.* 2019;28(1):30-50.
41. Gordon H, Demerouti E, Le Blanc P, Bipp T. Job crafting and performance of Dutch and American health care professionals. *J Personnel Psychol.* 2015;14(4):192-202.
42. Wallace J, Lemaire J, Ghali W. Physician wellness: a missing quality indicator. *Lancet.* 2009;374(9702):1714-21.
43. Scheepers R, Boerebach B, Arah O, Heine-man M, Lombarts K. A systematic review of the impact of physicians' occupational well-being on the quality of patient care. *Int J Behav Med.* 2015;22(6):683-98.
44. Linzer M. Clinician burnout and the quality of care. *JAMA Intern Med.* 2018;178(10):1331-2.
45. Panagiotti M, Panagopoulou E, Bower P, Lewith G, Kontopantelis E, Chew-Graham C, et al. Controlled Interventions to Reduce Burnout in Physicians: A Systematic Review and Meta-analysis. *JAMA Intern Med.* 2017;177(2):195-205.
46. West C, Dyrbye L, Erwin P, Shanafelt T. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet.* 2016;388(10057):2272-81.
47. Smits M, Zegers M, Groenewegen P, Timmermans D, Zwaan L, Van der Wal G, et al. Exploring the causes of adverse events in hospitals and potential prevention strategies. *Qual Saf Health Care.* 2010;19(5):e5-e.
48. Reay T, Hinings C. Managing the rivalry of competing institutional logics. *Organ Stud.* 2009;30(6):629-52.
49. Noordegraaf M, Schneider M, Van Rensen E, Boselie J. Cultural complementarity: reshaping professional and organizational logics in developing frontline medical leadership. *Public Manag Rev.* 2016;18(8):1111-37.
50. Noordegraaf M. Hybrid professionalism and beyond:(New) Forms of public profes-sionalism in changing organizational and societal contexts. *JPO.* 2015;2(2):187-206.
51. Witman Y, Smid G, Meurs P, Willems D. Doctor in the lead: balancing between two worlds. *Organization.* 2011;18(4):477-95.
52. Bolman L, Deal T. Reframing organizations: Artistry, choice, and leadership. New Jersey: Wiley; 2017.
53. Hauff S, Alewell D, Hansen N. HRM systems between control and commitment: Occur-rence, characteristics and effects on HRM outcomes and firm performance. *Human Resour Manag J.* 2014;24(4):424-41.
54. Su Z, Wright P, Ulrich M. Going beyond the SHRM paradigm: Examining four approaches to governing employees. *J Manage.* 2018;44(4):1598-619.
55. Shanafelt T, Schein E, Minor L, Trockel M, Schein P, Kirch D, editors. Healing the professional culture of medicine. *Mayo Clin Proc.* 2019;94(8):1556-1566.
56. Mannion R, Braithwaite J. Unintended consequences of performance measurement in healthcare: 20 salutary lessons from the English National Health Service. *Intern Med J.* 2012;42(5):569-74.
57. Smaggus A. Safety-I, Safety-II and burnout: how complexity science can help clinician wellness. *BMJ Qual Saf.* 2019;28(8):667-71.
58. Weske U, Boselie P, Van Rensen E, Schnei-der M. Physician compliance with quality and patient safety regulations: The role of perceived enforcement approaches and commitment. *Health Serv Manage Res.* 2019;32(2):103-12.
59. Weske U, Boselie P, Van Rensen E, Schnei-der M. Using regulatory enforcement theory to explain compliance with quality and patient safety regulations: the case of internal audits. *BMC Health Serv Res.* 2018;18(1):1-6.

SUPPLEMENTARY MATERIALS

Additional file 1: Discussion guide

Introduction

- Please motivate your answers from the perspective of a MSC board member
- Please specifically keep the initiatives proposed by the MSC aimed at enhancing physician members' professional performance in order to achieve high quality and safe care in mind throughout your participation.
- Could you please tell me your name and current position?

Key questions

Part 1

- What do you consider to be the three most important professional quality and safety topics during the past year?
 - Each board member writes down his or her most important themes. Next, the moderator facilitates plenary discussion using similarities and discrepancies between the topics noted by board members.

Part 2

- How do you ensure that physician members can perform optimally within the MSC?
- How do you deal with [case presented] or [physician members' occupational well-being]?
 - The moderator hands over case descriptions of fictional MSC physician members to the participants (see the case descriptions below).

Part 3

- How would you position the MSC board in relation to physician members' and the hospital's administration?
 - The moderator hands over stickers and a sheet of blanc paper (see example below) to each board member to indicate how they perceive the relationship – focusing on position and distance-with physician members and hospital administrators. Each board members explains his or her sheet of paper, opening up the conversation.

Wrap-up

- Are there topics that have not been discussed but are essential for us to know in the light of this study?

Case descriptions

Edwin, 58 years old, has been working as a neurologist for 25 years. Lately, he has been going to work with less pleasure and enthusiasm. He increasingly experiences the evening and night shifts as a (physical) burden and notices that his capacity to recover is diminishing. He has difficulty adapting to the many workplace changes, such as remote consultations, working with new administrative systems, and the many quality requirements imposed on him and his colleagues. Due to (marital) problems at home, he hardly gets rest there.

Yvonne is 37 years old and has been working as a surgeon for five years now. She does her job well, is ambitious, and fits well within the team. Yvonne notices that after five years, she needs more flexibility in her work – she has two young children at home. She is broadly interested and would like to do doctoral research. She wonders what the possibilities are within her current position. Yvonne is satisfied with her job, but regularly receives offers from other hospitals.

Stickers on blanc paper



RvB = hospital administration
MSB Bestuur = MSC board
MSB Leden = MSC physician members



8

Linking leadership development programs for physicians with organization-level outcomes: a realist review

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ABSTRACT

Background

Hospitals invest in Leadership Development Programs (LDPs) for physicians, assuming they benefit the organization's performance. Researchers have listed the advantages of LDPs, but knowledge of how and why organization-level outcomes are achieved is missing.

Objective

To investigate how, why and under which circumstances LDPs for physicians can impact organization-level outcomes.

Methods

We conducted a realist review, following the RAMESES guidelines. Scientific articles and grey literature published between January 2010 and March 2021 evaluating a leadership intervention for physicians in the hospital setting were considered for inclusion. The following databases were searched: Medline, PsycInfo, ERIC, Web of Science, and Academic Search Premier. Based on the included documents, we developed a LDP middle-range program theory (MRPT) consisting of Context-Mechanism-Outcome configurations (CMOs) describing how specific contexts (C) trigger certain mechanisms (M) to generate organization-level outcomes (O).

Results

In total, 3904 titles and abstracts and, subsequently, 100 full-text documents were inspected; 38 documents with LDPs from multiple countries informed our MRPT. The MRPT includes five CMOs that describe how LDPs can impact the organization-level outcomes categories 'culture', 'quality improvement', and 'the leadership pipeline': 'Acquiring self-insight and people skills (CMO1)', 'Intentionally building professional networks (CMO2)', 'Supporting quality improvement projects (CMO3)', 'Tailored LDP content prepares physicians (CMO4)', and 'Valuing physician leaders and organizational commitment (CMO5)'. Culture was the outcome of CMO1 and CMO2, quality improvement of CMO2 and CMO3, and the leadership pipeline of CMO2, CMO4, and CMO5. These CMOs operated within an overarching context, the leadership ecosystem, that determined realizing and sustaining organization-level outcomes.

Conclusions

LDPs benefit organization-level outcomes through multiple mechanisms. Creating the contexts to trigger these mechanisms depends on the resources invested in LDPs and adequately supporting physicians. LDP providers can use the presented MRPT to guide the development of LDPs when aiming for specific organization-level outcomes.

INTRODUCTION

Hospitals are offering leadership development programs (LDPs) to physicians to ensure the delivery of high-quality, accessible, and affordable patient care [1-7]. For example, 65% of academic health centers in the United States provide formal LDPs [1]. Evidence shows that these LDPs can benefit individual-level outcomes (e.g., enhanced leadership knowledge), team-level outcomes (e.g., better teamwork), and organization-level outcomes (e.g., less complications) [2, 4-10]. At the same time, researchers have focused less on describing *how* and *why* LDPs produce these outcomes. While some studies are instrumental in explaining the links between LDP components and individual-level and team-level outcomes [11, 12], knowledge of how and why LDPs achieve organization-level outcomes is limited [2, 4, 5]. This lack of knowledge may exist because it is challenging to systematically investigate how LDPs produce organization-level outcomes, due to the heterogeneity of LDPs and the organizational contexts in which they operate [5]. Realist reviews can account for this complexity as they aim to explain how and why interventions work in particular contexts to generate outcomes [13].

This realist review builds on previous research by investigating how and why LDPs impact organization-level outcomes, which we, based on studying the literature on LDPs, define as outcomes that reflect changes in culture, quality improvement in patient care or organizational processes, and the leadership pipeline at the organizational level. The leadership pipeline refers to the availability of a pool of well-prepared leaders, i.e., the organization's leadership succession bench. Motivating physicians to lead and realize organization-level outcomes is important, as they have the medical expertise to identify quality improvement opportunities, access to scarce healthcare resources, and possible positions to persuade other healthcare professionals to adjust their way of working [3, 14, 15]. The competency-based framework, CanMEDS, states that physicians as leaders engage with others to contribute to a vision of a high-quality healthcare system and take responsibility for delivering excellent patient care [16]. Hospitals led by physicians perform better on quality of care but do not outperform CEOs with economic or managerial backgrounds regarding resource management and financial performance [17, 18].

A few studies tried to unravel how LDPs produce organization-level outcomes. Two systematic reviews provide insight into LDPs' design considerations and the likelihood of achieving these outcomes [2, 5]. Geerts et al. found that LDPs with multiple learning approaches, project work, and mentoring most reliably produce organization-level outcomes [5]. In contrast, Lyons et al. found no clear associations between LDPs' content and achieving organization-level outcomes [19]. One realist evaluation aimed to describe the impacts of a LDP on participants and the organization [19]. It provided

information on how stakeholders' perceived the working mechanisms of that LDP and insight into critical enablers (e.g., senior management support) and barriers (e.g., time constraints) [19]. However, extensive evidence about how and why LDPs for physicians lead to organization-level outcomes is lacking. Therefore, this study aims to answer the following research question: How, why, and under which circumstances can LDPs for physicians impact organization-level outcomes? LDP providers may use this knowledge to optimize LDPs for physicians and more effectively realize hospitals' ambitions, including improved patient care.

METHODS

Realist reviews aim to understand how complex interventions work (or not) and how intervention components interact to generate outcomes [13, 20, 21]. Realist reviews are suited when an explorative focus is needed to identify how and why complex interventions work [13, 20, 21]. This is especially true when other methods, such as meta-analyses, are inadequate because interventions are heterogeneous, have multiple components, and are implemented in different organizational contexts [13, 20, 22] – which is the case for LDPs [5]. Both systematic and realist reviews employ a systematic search and screening of the literature [20]. However, whereas systematic reviews focus on determining whether interventions are effective, realist reviews adopt an explanatory analysis discerning why interventions may or may not be successful, under what circumstances, and for whom [20]. Following realist methodology, 'program theories' use Context-Mechanism-Outcome (CMO) configurations (hereafter CMOs) to explain how specific contexts (C) and mechanisms (M) work together to generate outcomes (O) [13, 20, 21]. Realist researchers develop program theories at various abstraction levels, 'normal' program theories provide the most granular explanations about how and what works in specific settings [13, 23]. Middle-range program theories (MRPT) are more abstract and apply to broader settings [13, 23]. We developed an MRPT, given the heterogeneity in LDPs and the organizational context in which they are conducted.

Developing a program theory helps to determine the review's scope and structure the findings. Successful realist reviews begin with an *initial* program theory and end with a more *refined* program theory [13, 20, 21]. We inspected relevant systematic reviews to develop our initial MRPT (supplementary material A) [2, 4-10]. In this initial MRPT, we were able to identify important design choices (e.g., needs assessments), contextual factors (e.g., safe learning environment), and ingredients for potential mechanisms (e.g., improved confidence) to impact organization-level outcomes (e.g., enhanced patient care). However, in this initial MRPT, we could not distinguish between particular contexts

and mechanisms that work together to generate specific organization-level outcomes. To answer our research question and refine our MRPT, we designed this study following the RAMESES guidelines [21, 22] and four iterative steps formulated by Pawson et al. [20]. These steps are described below.

1. Clarify scope

The research team formulated the research question using realist terminology (how, why, under what circumstances) and investigating the literature on LDPs for physicians. We conducted a pilot search (screening titles and abstract and full text articles), after which we extracted data and conducted an analysis of 10 key articles. Key articles were selected through discussion in the research team, which assessed the articles' relevance to the research question, link to our initial MRPT, and methodological rigor. The purpose of this was to get acquainted with the literature and potential theories explaining the working of LDPs. Consequently, based on theoretical (e.g., changing perspectives on physician leadership) and practical (e.g., feasibility given the resources of this study) arguments, we decided to narrow the scope of this review, which is considered best practice [21]. We narrowed this review's scope by considering documents published between January 2010 and March 2021 from various hospital settings, e.g., academic, non-academic, public, private. We excluded studies with resident physicians only and those focusing on educational leadership (see Table 1).

2. Search for evidence

The search strategy was developed over time in multiple sessions with a librarian (JD). Using VOS viewer [24], we were able to iteratively focus our search by discussing the inclusion or exclusion of several search terms [25]. The findings of our exercises to get acquainted with the literature, pilot screenings, and focusing the scope of this review informed our final search strategy. We searched for various combinations and synonyms of the words: leadership, program, development, and physician in the following databases: Medline, PsycInfo, ERIC, Web of Science and Academic Search Premier. Supplementary material B presents the comprehensive search strategies.

3. Appraise primary studies and extract data

Eligibility criteria

Table 1 presents the inclusion and exclusion criteria of this review. Only documents (grey literature and scientific studies, hereafter articles or studies) describing and evaluating a leadership intervention were included. We defined a leadership intervention as an educational course, curriculum or program that included one or more interventions for which developing leadership skills, attributes, or competencies was the primary goal.

Studies on leadership-related topics, such as collaboration or quality improvement, that did not explicitly use the term leadership were excluded. The LDPs had to focus on physicians working in hospitals: secondary (community hospitals) and tertiary care (academic medical centers and teaching hospitals). Included articles had to describe the interventions' content sufficiently, i.e., the duration of the intervention, topics addressed, and learning methods used. The results of the leadership intervention had to be reported on a level beyond participant satisfaction (> Kirkpatrick's level 1) [26].

Table 1. Eligibility criteria

Inclusion	Exclusion
Leadership intervention	Interventions not explicitly using the term leadership or leadership development was a minor objective
Content of the intervention is sufficiently described	Intervention's content is insufficiently described
Outcomes reported beyond participant satisfaction	No, or very limited, outcome description
Hospital setting	Primary care and other non-hospital settings
At least one physician (in combination with other healthcare professionals e.g., nurses)	No physicians (residents were also excluded)
Published between January 2010 and March 2021*	Educational or academic leadership only Languages other than English

* None of included documents reported on LDPs conducted within the specific context of the COVID-19 pandemic.

Data screening process

Articles were screened in two steps: 1) title and abstract screening and 2) full-text screening. The main author and a research assistant (ResA) independently screened all titles and abstracts in four batches. MD and ResA resolved conflicts by discussion until consensus. Members of the research team (IJ, KL, WK, KK, YS, MS) were consulted for doubtful cases or when no consensus was reached. Rayyan QCRI software facilitated the title-abstract screening [27].

For full-text screening, MD and ResA used a screening template and independently assessed each eligibility criterion in the following order: 1) physicians, 2) hospital context, 3) leadership intervention (focus), 4) outcomes adequately reported, and 5) intervention sufficiently described. The reviewers terminated full-text screening when a criterion was not met. Full-text articles were screened in six batches, and for doubtful or conflicting cases, the research team was consulted. We adjusted the PRISMA Flow Diagram to present the different phases of our systematic search and screening process [28].

Data extraction

Two data extraction forms were developed based on a pilot screening and analysis conducted within the research team. The first extraction form was an Excel file with mul-

tiple potential CMOs in the columns and the included studies in rows. From each study, fragments that evidenced the context, mechanism, or outcome were extracted (Table 2). The second form was a table in Word extracting the main study and LDP characteristics. The first author extracted information in batches (five to ten studies), which was verified multiple times by the research team who also read and extracted data fragments for subsets of the data.

Table 2. Operationalization of context, mechanism and outcome in this study

Context	Pertains to the relational and dynamic features that shaped the mechanisms through which LDPs work [29].
Mechanism	Mechanisms describe how the resources embedded within a LDP influence the reasoning and behavior of program physicians [30].
Outcome	Refers to intended, unintended, or unexpected program outcomes on various levels, e.g., individual, team, organization [30]. In synthesizing the evidence, we focused on organization-level outcomes.

In addition, and in line with realist review guidelines [21], MD assessed the rigor (high/low) and relevance (high/low) of included articles. The assessment of relevance was based on the article’s contribution to the MRPT; rigor was about the trustworthiness of results in relation to the methods used. As systematic reviews indicated that the overall study quality of LDP evaluations is low [2, 4], this exercise was mainly performed to obtain insight into the relative rigor and relevance of the studies in our sample. The most rigorous and relevant articles – both scoring high on rigor and relevance [19, 31-37] – received the most weight during data synthesis.

4. Synthesize evidence and draw conclusions

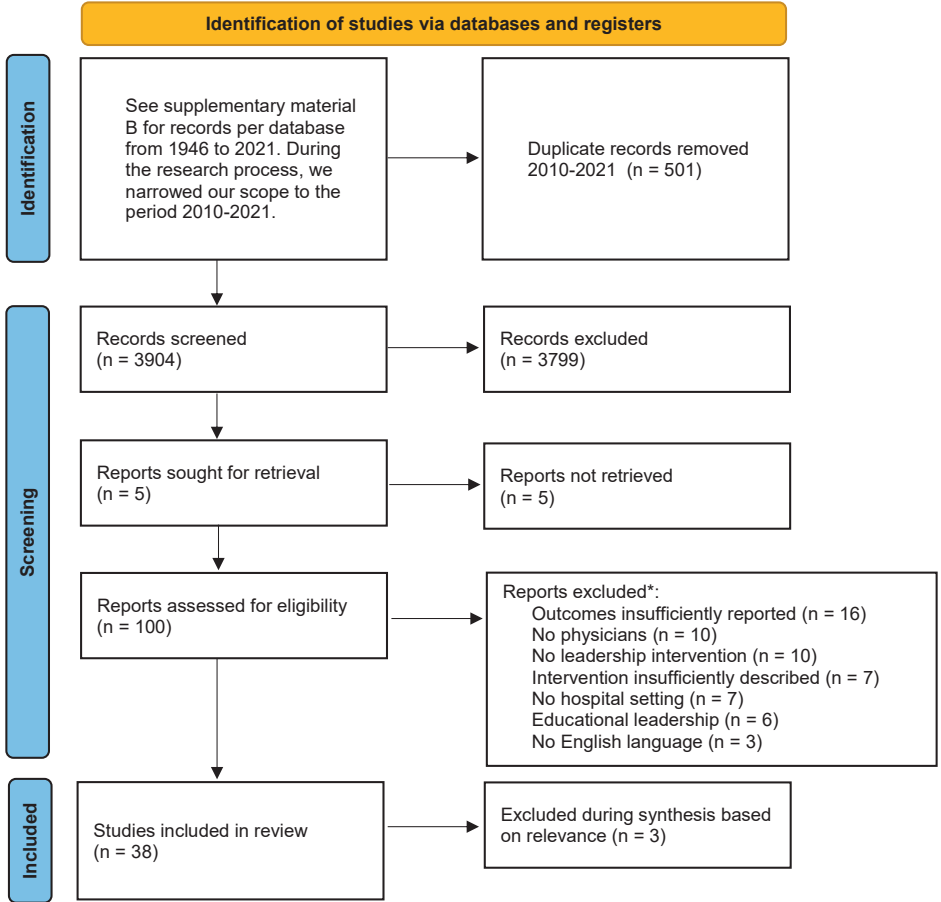
During and after data extraction, an iterative process of theory refinement was performed. This meant integrating and refining all potential CMOs from the data extraction sheet towards a smaller set of CMOs relevant to the abstraction level of the research question, i.e., focusing on explaining organization-level outcomes. The most robust and relevant articles formed the foundation of this reconfiguration exercise and therefore received the most weight. A study provided evidence for a CMO if it included proof of at least the C and M, or C and O, or M and O. Moving up the abstraction ladder was complicated due to the diversity of reported LDP outcomes and the different methods researchers used to classify outcome-levels, e.g., own classification [36] or Kirkpatrick’s approach [34, 35]. Based on discussions within the research team and the iterative process of theory refinement, we identified three organization-level outcomes categories for our final program theory: culture, quality improvement (patient care and organizational processes), and the leadership pipeline. MD led the iterative process of theory refinement which encompassed going back and forth between included studies, extracted documents, and

revising CMO formulations. Multiple sessions with the research team were conducted until we reached consensus about a final set of CMOs.

RESULTS

In total, 3904 titles and abstracts and 100 full-text articles were screened (Figure 1). Of these articles, 59 were excluded based on exclusion criteria. During the synthesis of evidence, three articles were excluded from the final results because they were not informative to our MRPT based on relevance.

Figure 1. Screening procedure



Characteristics of included LDPs

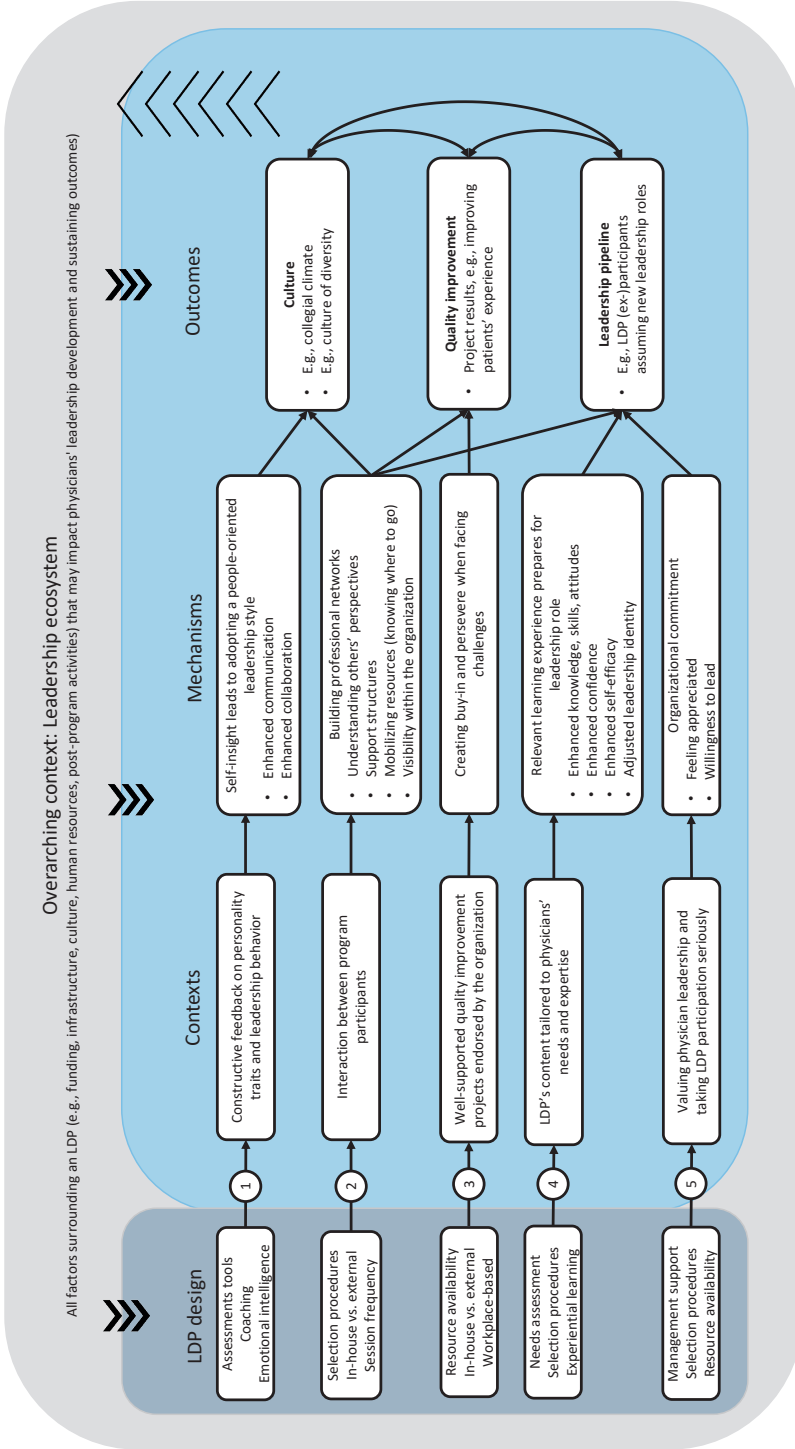
Thirty-eight articles were included to inform our MRPT (supplementary material C) [19, 31-67]. These articles reported on 35 unique LDPs,³ 23 took place in the United States [31, 33, 34, 36, 37, 39, 40, 43-45, 47, 48, 50, 51, 57-63, 65, 66], 5 in the United Kingdom [19, 35, 41, 54, 64], 2 in the Netherlands [38, 67], 2 in Australia [49, 52], 1 in Canada [53], 1 in Iran [46] and 1 in multiple countries located in Sub-Saharan Africa [42]. Twenty-one LDPs were classified as in-house programs [19, 31, 32, 34, 36, 37, 40, 43, 44, 47, 50, 52, 54, 57-64, 66], meaning that they were conducted within, and developed for, participants from one healthcare institution or system (multiple hospitals within one region). Fourteen LDPs were classified as external programs [33, 35, 38, 39, 41, 42, 45, 46, 48, 49, 51, 53, 65, 67]. The profiles of the (post-residency) physicians participating in LDPs were diverse in terms of medical discipline, being a faculty member, level of seniority, and having a formal leadership role (e.g., medical director). The duration of the LDPs varied from one day [41] to two years [45, 62]. Twenty-seven LDPs had a time span of 6 months or more [19, 32, 34, 35, 37-40, 42-47, 49-54, 57-59, 62, 63, 65, 66]. Most LDP's primary goal included training physicians to realize organizational change and improve healthcare [19, 31, 33, 36, 38, 39, 42, 46, 48, 49, 54, 57, 59, 60, 63] or prepare them for leadership roles and strengthen the organization's leadership pipeline [40, 43, 44, 46, 47, 52, 61]. With one exception [41], all LDPs used multiple learning methods with diverse content delivered to participants. Examples of frequently included topics were: leadership theory and styles, quality improvement, health systems, emotional intelligence, group dynamics, negotiating and conflict management, quality improvement, and administrative skills. Studies on LDPs reported a great diversity of outcomes between and within programs, on different levels. For example, Bhalla et al. reported enhanced quality improvement skills and the outcomes of quality improvement projects on diverse domains [39], whereas Berghout's et al. primary outcome was describing how LDP participation adjusted physicians' leadership identities [38].

Middle-range program theory

Figure 2 presents our MRPT, which summarizes how, why, and under which circumstances LDPs for physicians can impact the organization-level outcome categories: culture, quality improvement, and the leadership pipeline. Figure 2 shows that LDPs are embedded within and interact with an overarching context: the leadership ecosystem. The leadership ecosystem encompasses all factors surrounding a LDP that may impact physicians' leadership development and the sustainability of perceived outcomes, including funding, infrastructure (e.g., alignment with other training programs, clear

3 Here we cited Hopkins et al. for the Stanford Leadership Development Program and Daniels et al. for the Afya Bora Fellowship as more than one study reported on these LDPs.

Figure 2. Middle-range program theory



career paths), culture (e.g., recognizing the value of program participants, role models), human resources (e.g., educators, coaches), and post-program activities (e.g., alumni networks, follow-up learnings). Leadership ecosystems aid physicians in transferring their learnings to the workplace after program participation and therefore help to sustain outcomes. Studies of in-house and external LDPs illustrate that adequate leadership ecosystems prevent skill attrition [42, 61], enhance the uptake of leadership behaviors [19, 38, 57], and contribute to the durability of quality improvement projects [39, 51, 59]. Especially LDPs with a relatively long duration or those that were conducted regularly (e.g., annually) seemed to interact with the leadership ecosystem by producing tangible and intangible resources, e.g., quality improvement project outcomes, trained program staff, and networks with external speakers or institutions [31, 36, 59, 60, 63]. The following description illustrates this:

“Previous [name LDP] graduates serve as coaches for current attendees, which helps broaden the learning resources for new students and reinforce previous training for coaches.” [59]

The leadership ecosystem determines whether LDP providers can introduce intervention components adequately to create a particular learning context for participants. Figure 2 presents critical design aspects of LDPs that contribute to creating specific learning contexts that enhance the likelihood of initiating mechanisms and realizing organization-level outcomes. For example, within some leadership ecosystems, it might be more challenging to create a constructive feedback context through assessment tools than in others. However, the extent to which such a context is realized determines the likelihood of physicians acquiring self-insight and adopting a people-oriented leadership style, benefitting the organization’s culture (CMO 1). Figure 2 presents the five identified CMOs, which are the main body of our program theory. Table 3 spells out each CMO and shows which studies provide supporting evidence for each CMO. The CMOs are depicted linearly to illustrate the main pathways of how and why LDPs achieve organizational outcomes and to be instrumental to LDP providers. The two-way arrows illustrate that the outcome categories may influence each other. In their paper, Smith et al. illustrate the interaction between the outcome categories ‘leadership pipeline’ and ‘the organization’s culture’ [63]:

“The [name of LDP] was an important vehicle to prepare and promote women for intra-departmental leadership progression, creating role models in leadership positions and thus enhancing the value and culture of the organization.”

In the remainder of this results section, we elaborate on each CMO.⁴ Supplementary material D provides more precise insight into the data, i.e., original text fragments from included studies, backing up this program theory (CMOs, the interconnectedness of outcomes categories, leadership ecosystems).

Acquiring self-insight and people skills (CMO1)

Self-assessments and modules on emotional intelligence or self-awareness gave physicians feedback on their personality traits and leadership behavior [33-36, 43-45, 47, 57, 58, 61, 62, 67]. The perception of a safe learning environment allowed physicians' to share their feelings [64]. Various tools were used to gather feedback, one example of such a tool is the Dominance Influence Steadiness Contentiousness (DISC)-360 degrees assessment [34, 43]. These tools were most effective when physicians were coached to interpret feedback constructively [19, 43, 45, 57, 58, 64]. Feedback enhanced physicians' insight into their leadership strengths and weaknesses [57, 58, 61]. In particular, co-workers' feedback helped physicians to adjust their leadership behavior to the preferences and needs of the people they lead [19, 34-37, 44, 47, 61], i.e., a people-oriented leadership style. For example:

"It made me more confident as a leader and yet more willing to listen to others and give credit to them for their ideas." [36]

Physicians with a people-oriented leadership style listened better [37, 47, 54, 61, 67] and acknowledged others' contributions [36, 47]. Consequently, such a leadership style led to more effective communication and collaboration, which benefitted the organization's culture [19, 33, 36, 37, 43, 47, 58]. For example, Vitous et al. showed that a LDP positively changed the culture within a surgical department due to promoting people-oriented leadership [37]. Rask et al. suggest that a critical mass of LDP (ex-)participants is needed to achieve culture change [60].

Intentionally building professional networks (CMO2)

A cohort-based training model, having multiple meetings over time, protected time to interact, and working in teams on projects facilitated interaction between participants [19, 31, 32, 35, 36, 48, 50, 53, 55, 57]. Some LDPs intentionally used these principles to stimulate networking [32, 36, 45, 48, 50, 55], while for others building professional networks seemed an unintended outcome [34, 35, 53, 61]. Other LDP aspects – i.e., in-house vs. external, selecting participants and speakers – influenced the professional

4 Note that referencing may not be exhaustive. In the process of theory refinement, the main goal was backing up the program theory with supporting evidence and not counting the frequency of occurrence.

Table 3. CMOs and supporting evidence

CMO title and description	Studies that provide (partial) evidence
<p>Acquiring self-insight and people skills (CMO1) If LDPs include constructive feedback on physicians’ personality traits and leadership behavior [C], physicians become more self-aware and acquire insight into the needs and preferences of the people they lead. Accordingly, they adopt a people-oriented leadership style which benefits communication and collaboration [M], and thereby the organization’s culture [O].</p>	[19, 32-37, 43-45, 47, 54, 57, 58, 61, 62, 64, 67]
<p>Intentionally building professional networks (CMO2) If LDPs stimulate interaction between program participants [C], physicians build professional networks [M], which may impact the organization’s culture [O₁], quality improvement [O₂] and the leadership pipeline [O₃]. When participants are from the same organization, professional networks seem most effective for realizing organization-level outcomes [C].</p> <ul style="list-style-type: none"> • Due to building professional networks, physicians gain understanding in the perspectives of others (e.g., administrators, other medical disciplines) and collaborate better [M]. Networks also function as support structures [M], benefitting the organization’s culture [O₁]. • Professional networks mobilize resources: physicians know where to go for collaborations or when facing challenges [M], leading to more effective quality improvement [O₂]. • Due to building professional networks, physicians become more visible within the organization and are more likely to be promoted [M], strengthening the organizations’ leadership pipeline [O₃]. 	[19, 31, 32, 34-37, 45, 48, 50, 51, 53, 55, 57, 61]
<p>Supporting quality improvement projects (CMO3) If LDPs include well-supported quality improvement projects (i.e., coaching or mentoring (hereafter coaching), project management support, funding, protected time, facilities) endorsed by the organization [C], this allows physicians to create buy-in and be more perseverant when facing challenges [M]. This increases the likelihood of successful implementation of the project and quality improvement [O].</p> <p>Note: by quality improvement projects, we refer to a wide range of LDP projects that cover numerous topics. Project topics include reducing patients’ waiting time, enhancing internal communication, more competitive purchasing of medical supplies, reducing unnecessary laboratory testing, and standardizing clinical processes.</p>	[19, 31, 32, 34, 38-40, 42, 43, 49, 56, 57, 59, 60, 63]
<p>Tailored LDP content prepares physicians (CMO4) If LDPs’ content is tailored to physicians’ leadership needs and expertise [C], physicians perceive the LDP content as relevant, and the learning experience prepares (i.e., knowledge, skills, attitudes, confidence, self-efficacy, identity as leader) them for current or future leadership roles [M]. They are more willing to assume leadership roles and considered competent, leading to new leadership roles and strengthening the leadership pipeline [O].</p>	[19, 31-39, 41, 43, 44, 46, 47, 49, 50, 52, 53, 55, 58, 60-62, 66]
<p>Valuing physician leaders and organizational commitment (CMO5) If LDPs reflect that hospitals value physician leaders by facilitating program participation and taking the program seriously [C], physicians feel appreciated, commit to the organization, and are more willing to adopt new leadership roles [M]. This strengthens the leadership pipeline [O], which seems especially true for underrepresented groups in the organization’s leadership pipeline [C].</p>	[19, 31, 32, 34, 36, 43, 44, 50, 52, 61, 63]

networks' composition and resulting outcomes. For example, in-house programs with participants from multiple departments stimulated interdepartmental networks and collaborations within the organization [19, 36, 57]. In contrast, networks from external programs functioned as a non-power-based source of advice and personal support [48], sometimes with global reach [48], or led to lasting research collaborations [55]. The following illustrates how an in-house LDP stimulated networking:

"I met people who I still have interactions with. That was the best. I made connections helpful from both work and personal perspectives. After 3 or 4 of the meetings, people were comfortable with each other and could say whatever." [31]

As a result of networking, physicians gained insight into the perspectives of other professions (e.g., managers) and perceived the value of their efforts and skills [19, 31, 34, 37]. Professional networks led to the breakdown of silos between departments and improved inter-professional collaboration [19, 34-36, 57]. These networks established support structures for physicians [34, 35, 48, 61]. Physicians used the obtained contacts to overcome various challenges, start collaborations [31, 34], and avoid duplication of efforts [19]. Lastly, there were indications that professional networks enhanced participants' visibility within the organization, contributing to career advancement [31, 50, 51]. In these ways building professional networks benefitted culture, quality improvement, and the leadership pipeline.

Supporting quality improvement projects (CMO3)

LDPs that incorporated quality improvement projects led to improvements in various domains [19, 31, 32, 34, 39, 43, 49, 51, 56, 57, 59, 60, 63], for example: improving efficiency in inpatient or emergency department settings, enhancing transitional care among patients, and reducing hospital-acquired infections or improving sepsis care [39]. Quality improvement projects were described as innovation incubators as they led to innovative ideas to combat healthcare organizations' challenges [40, 43, 57].

Quality improvement projects that were in line with the strategic priorities of the organization were more likely to be successful [19, 32, 39, 43, 51, 56, 59, 60, 63]. This is because such alignment enabled physicians to obtain buy-in from management, project funding, and other required resources [19, 43, 51, 60]. In-house LDPs facilitated alignment between projects and institutional priorities [31, 32, 34, 43, 59, 60]. Matching physicians' motivation and institutional priorities took up to 8 weeks in a LDP with project work in external organizations [56]. Ongoing project management or coaching allowed physicians to create buy-in among colleagues and persevere when facing implementation barriers [19, 32, 38, 39, 42, 51, 56, 60]. Daniels' et al. study further illustrates this [42]:

“She [the participant] referenced the important ongoing support her mentor provided in helping her implement the project. She stated that ‘My primary mentor was an obstetrician like myself...he would sit down with me to figure out what needed to be done [on the project]’

Adequate support from colleagues and management, and the availability of sufficient resources (e.g., funding, protected time, facilities) were critical for projects’ quality improvement success [19, 38, 39, 42, 51, 56, 57, 59]. When support and resources diminished or were taken away altogether, often after LDP completion, positive outcomes faded or projects ceased to exist [19, 38, 39, 42, 51, 56, 57, 59].

Tailored LDP content prepares physicians (CMO4)

LDP providers tailored LDPs’ content to physicians’ needs and expertise by employing needs assessment and rigorous selection and nomination procedures [32, 37, 39, 43, 44, 46, 47, 53, 58, 66]. To this end, longitudinal programs used participating physicians’ feedback [31, 36, 39, 43, 48, 55, 58, 59, 62, 65]. Two LDPs had separate tracks with different content based on physicians’ leadership expertise [60, 66]. Experiential learning methods accommodated physicians’ needs for leadership development in the workplace [32, 35, 36, 41, 43, 49, 55, 60].

Tailored LDP content prepared physicians for leadership roles because the content was perceived as relevant and required for adequate professional performance [19, 31, 33, 34, 41, 47, 49, 52, 66]. Physicians who found the content irrelevant did not perceive LDP’s to be beneficial [19, 34, 37]. After LDP participation, physicians reported enhanced knowledge and skills, attitudes [19, 31-37, 39, 41, 43, 44, 46, 47, 49, 50, 53, 58, 60, 61, 66], organizational literacy [35, 36, 49, 53], confidence and self-efficacy as a leader [34, 35, 41, 47, 58]. Moreover, researchers investigating two specific LDPs, reported that physicians’ leadership identity shifted: from an ‘individualistic’ towards a more ‘collaborative’ identity [38, 62]. Physicians were also motivated and considered competent to assume new leadership roles [19, 31, 33-36, 44, 52, 55, 60, 61, 66]. The study of Fernandez et al. illustrates further [33]:

“Interestingly, a large majority of respondents reported receiving a promotion or other similar expansion of role opportunity since completing the course, and all who reported such a job expansion indicated that the skills learned in the course helped prepare them for the new opportunity.”

Supporting physicians after participation in a LDP, e.g., through coaching or formalized career trajectories, seemed vital for physician leaders to remain at the organization and be willing to assume leadership positions [19, 31, 32, 38, 57].

Valuing physician leadership and organizational commitment (CMO5)

Physicians felt honored to be selected for LDPs [34, 43] and recognized the opportunity to participate as a sign that the organization believed in them [44, 50]. They considered LDPs to symbolize the hospital's investment in developing its 'own' leaders [36, 44]. The competitiveness and prestige of LDPs enhanced these perceptions [32, 36, 43, 44]. According to physicians, the presence and support of (senior) management during LDPs showed that the organization regarded leadership development as a priority [19, 52]. The availability of adequate resources indicated that the organization earnestly invested in leadership development [19, 43]. As a result, physicians felt more connected and committed to the institution [32, 34, 43] and assumed new leadership roles [19, 31, 34, 36, 44, 52, 63]. The following description illustrates this CMO:

"Across interviews, the participants stated that they felt their involvement in the leadership development program was an investment by the Center in their personal development and growth. They perceived that the investment meant that the Center believed in them. The participants agreed that their engagement was positively impacted by this perception. This is important to physicians because they do not like to stay in the wrong or be unappreciated." [44]

Underrepresented groups in leadership positions, felt especially appreciated and assumed new leadership roles [31, 36]. Several LDPs targeted underrepresented groups to achieve a more diverse leadership pipeline [31, 36, 50, 61, 63].

DISCUSSION

Main findings – middle-range program theory

This study resulted in a MRPT explaining how, why and under which circumstances LDPs for physicians impact organization-level outcomes. The MRPT presented considers three organization-level outcome categories: culture, quality improvement, and the leadership pipeline. For enhancing culture, a person-oriented leadership style and professional networks were important mechanisms triggered respectively by contexts that provided physicians with feedback on their leadership style and facilitated interaction between participants. Well-supported quality improvement projects endorsed by the organization enabled physicians to create buy-in and persevere when facing challenges,

increasing the likelihood of quality improvement. Also, professional networks aided quality improvement by mobilizing resources within organizations. LDPs enhanced the organization's leadership pipeline by preparing physicians for leadership roles. Tailoring LDP's content to physicians' needs and expertise facilitated the firing of this mechanism. Organizations showing appreciation of physician leaders through LDPs, promote commitment of the physicians to the organization and thereby strengthen the leadership pipeline. Professional networks benefitted the leadership pipeline because potential physician leaders gained visibility. Lastly, the leadership ecosystem is crucial to realizing and sustaining organization-level outcomes.

Explanation of main findings

We further explain our MRPT by elaborating on the concept of a 'leadership ecosystem' and the five identified CMOs. Other researchers have recommended that healthcare organizations view leadership development as an ecosystem rather than an isolated course or program [68]; our MRPT reveals why considering the leadership ecosystem is crucial for impacting organization-level outcomes. In this study, the leadership ecosystem encompassed all factors surrounding a LDP that may impact physicians' leadership development and sustaining organization-level outcomes, including funding, infrastructure, culture, human resources, and post-program activities. By considering the leadership ecosystem, LDP providers can ensure that LDPs' objectives match the resources available. Moreover, adequate leadership ecosystems help physicians transfer LDP learnings to the workplace. A LDP interacts with the surrounding leadership ecosystem, for example, when alumni serve as coaches for the next cohort of participants [59, 63]. Von Thiele et al. confirm the importance of an ecosystem for designing interventions with maximum impact. [69]. Other studies report the constraints of inadequate leadership ecosystems, such as physicians intending to leave the organization because their skills are underutilized [35, 38]. Therefore, it is crucial to consider leadership development in its broader context.

The finding '*Acquiring self-insight and people skills (CMO1)*' confirms that co-workers' feedback is crucial for enhancing physicians' professional performance, especially regarding people skills [12, 70]. For LDPs in hospitals where physicians are not used to receiving feedback, it might be more challenging to create a constructive feedback context than in hospitals where physicians regularly receive feedback on their professional performance [71, 72]. In many healthcare systems, feedback systems and cultures have been implemented with positive effects on physicians' professional development and performance [72-74]. In this review, co-workers' feedback gave physicians insight into their leadership style and the needs of the people they lead, making them adopt a people-oriented leadership style. Researchers have shown that people-oriented leader-

ship styles can promote positive workplaces and enhance healthcare professionals' occupational well-being [75-78]. People-oriented leadership styles among physicians may be underdeveloped as traditional medical training generally devotes little attention to these skills; it usually focuses on solving medical problems and autocratic leadership in emergencies [78, 79]. However, since the introduction of competency-based professionalism frameworks, medical schools are revisiting curricula to pay attention to novel leadership competencies. While one leadership style is not universally best – a crisis may require a directive style [79] – LDPs seem able to identify and address underdeveloped leadership competencies in physicians – people skills – with benefits to the organization.

Interestingly, *'Intentionally building professional networks (CMO2)'* impacted all outcome categories. Leadership development researchers consider intentionally building communities as best practice [9]. According to social capital theory (SCT), professional networks are social capital as they produce resources relevant to the individual and organization [80]. For example, we found that professional networks provide a support structure for physicians and mobilize resources for quality improvement. Three types of social capital can be distinguished: bonding social capital (e.g., relationships between physicians from one department), bridging social capital (e.g., relationships between physicians from different departments or organizations), and linking social capital (e.g., relationships physicians and the hospital's board (different hierarchical levels)) [81]. Based on our findings, LDP providers may develop a particular 'type' of social capital via recruitment and selection of participants. Also, professional networks seemed mainly beneficial to organization-level outcomes when participants came from the same organization. Professional networks with people from other organizations may gain importance as hospitals and policymakers see inter-organizational collaborations as a way to promote the quality and cost-efficiency of patient care [82-84].

Previous researchers have shown the importance of quality improvement work in LDPs for realizing organization-level impact [2, 4, 5]. The finding *'Supporting quality improvement projects (CMO3)'* confirms this and simultaneously shows that quality improvement projects are only likely to succeed with adequate support (e.g., coaching, protected time). Physicians working in cultures where their colleagues regard medical tasks as superior and relatively unrelated to quality improvement may face the most resistance to implementing quality improvement projects [38, 85]. While there is abundant evidence that quality improvement projects can effectively target specific organizational priorities [5, 39, 59], hospitals should not include them in LDPs without careful thought. This is because sufficiently supporting quality improvement projects requires significant resources per participant (high dose [86, 87]). As a result, these LDPs often target high-potential physician leaders to participate (low reach [86, 87]). Some LDP providers may

reduce the resources spent per participant (low dose) to reach a larger number of physicians (high reach) and a critical mass within the organization. Strategic HRM researchers suggest that different development approaches are needed based on the uniqueness and expected return of the human capital to be developed [88]. Providers of LDPs for physicians may use such frameworks for determining the optimum between reach and dose concerning realizing organization-level goals.

Our result, *'Tailored LDP content prepares physicians (CMO4)'*, shows LDPs' ability to realize one of its primary purposes: to prepare physicians for their leadership roles and strengthen the organization's leadership pipeline. Notably, this CMO shows that a 'whole-person' approach to developing and preparing physician leaders is needed. Such an approach includes attention to physicians' knowledge, skills and attitudes, leadership identity, confidence, and self-efficacy as a leader. Previous studies have recommended incorporating insights from professional identity formation theory into leadership development interventions [38, 89, 90]. Bandura's self-efficacy theory [91] and review findings [92] show that confidence and self-efficacy are vital to effective leadership. Physicians with high self-efficacy view issues at work as challenges that should be managed rather than avoided due to perceptions of inadequate skills [91]. This aligns with the concepts of resilience and a growth mindset, as physicians possessing these qualities have the resources to deal with adversities and see them as an opportunity to learn and grow [93, 94]. When physicians believe in themselves and grow as leaders, they are more willing to expand their leadership roles. They experience that they can change things they thought were unchangeable, indicating a sense of psychological ownership over the working environment, which has its roots in self-efficacy, self-identity, and belonging [95, 96]. Psychological ownership may benefit organizational performance and physicians' well-being and may develop due to enhanced organizational literacy or expanded responsibilities in leadership roles [95, 96].

According to Meyer and Allen, affective commitment refers to the employee's emotional attachment to, identification with, and involvement in, the organization [97]. Employees with strong affective commitment continue employment with the organization because they want to. According to the literature, this is based on an exchange relationship [97, 98], reflecting our finding *'Valuing physician leadership and organizational commitment (CMO5)'*. This CMO showed that when physicians felt valued as leaders by the organization through investing in their professional growth, they reciprocated this favor by assuming leadership roles. CMO5 may become even more critical for the next generation of physicians as they highly value personal development and sense-making [99]. Surprisingly, this exchange mechanism seemed most effective for underrepresented groups in leadership positions, e.g., women and participants from the Asian Pacific region. These

groups may not have experienced the same leadership opportunities due to ingrained institutional disadvantages [100, 101]. Striving for equal leadership opportunities for all individuals regardless of their gender or background is not only the morally right thing to do, but establishing an inclusive and diverse leadership pipeline should also be high on hospitals' agendas considering organizational performance [102, 103].

Strengths and limitations

This realist review is the first to comprehensively investigate why and how LDPs for physicians impact organization-level outcomes in hospital settings. One strength of this realist review was the diverse research team with expertise in physicians' professional performance, medical education, leadership development, strategic human resources, sociology, and realist review methodology. Other strengths were conducting a pilot search, screening and analyzing key articles, and developing our search strategy iteratively with a librarian.

The results of this realist review should be considered in light of several limitations. First, the generalizability of our MRPT to other healthcare professions and settings may be limited due to its focus on physicians, the hospital setting, and the fact that most included studies come from Western countries. Mainly including studies from Western countries, brings a particular perspective on leadership, which might have influenced our findings. On the other hand, our MRPT has a higher abstraction level than 'normal' program theories and applies across broader settings [23]. Moreover, multiple LDPs included physicians and other healthcare professionals as participants (see supplementary material C). Additional research is needed to investigate whether our program theory is generalizable to other health professions and settings.

Second, the publication bias in the literature about LDPs for physicians might have influenced our results [2, 4]. Our program theory may not fully capture the aspects of LDPs that do not work and might overestimate the likelihood of some contexts and mechanisms to produce outcomes. However, all the mechanisms found are grounded in broader theoretical perspectives.

A third limitation of this study pertains to the lack of grey literature. Most included documents were scientific articles, although we also incorporated grey literature [19, 57, 62]. While our search strategy enabled for retrieval of grey literature within the inspected databases, there is much information available on the internet about LDPs. Inspecting all these sources was deemed unfeasible given the resources of this study.

Implications for research and practice

This study presented a LDP MRPT about the working of LDPs for physicians in hospital settings regarding organization-level outcomes. Researchers could further verify and refine our MRPT for physicians and other healthcare professionals. For example, they could investigate the relative strengths of the CMOs found and start with investigating more fine-grained CMOs, i.e., linked to specific outcomes at the organizational level. High-quality LDP evaluations facilitate this endeavor. We encourage researchers and LDP providers to employ methods such as realist evaluations to collect more precise knowledge on contextual factors, working mechanisms, and program aspects that do not work. More insight into specific inputs (e.g., costs, time investments) in relation to LDP outcomes is needed as it allows for better judgments on 'what works'. Only a few studies indicated LDP's costs [34, 39, 43, 52, 56], an important aspect of effective programming. Also, more objective data on LDP outcomes are welcomed in addition to most self-perceived evidence, for example, comparing the promotions of physician LDP participants against a control group to evaluate improvements in the leadership pipeline.

Another important direction for future research is the relationship between LDP participation and physicians' well-being [75, 104]. In this review, well-being outcomes were largely absent, which is surprising, given the alarming burnout levels reported among physicians [105]. Professionally fulfilled physicians are needed to navigate challenging healthcare developments, such as aging populations with comorbidities [106]. Future research could specifically investigate the effects of LDPs on the well-being of physicians and the people they lead. Moreover, these studies can consider adverse well-being outcomes, e.g., enhanced workload due to the LDP or dissatisfaction due to peers not recognizing their leadership qualities.

Furthermore, the results add to the existing literature by not only revealing what 'ingredients' may be needed for effective LDPs, but also describing 'how to prepare the meal'. That is, *how* and *why* LDP aspects in certain contexts trigger mechanisms and generate results. Improved understanding of LDPs for physicians may enable LDP providers to develop more effective LDPs and fit-for-purpose evaluations. According to our MRPT, the following topics are essential for LDPs for physicians in hospital settings aiming to impact organization-level outcomes: 1) acquiring self-insight and people skills, 2) intentionally building professional networks, 3) supporting quality improvement projects, 4) tailoring LDP's content to physicians' needs and expertise, 5) valuing physician leadership and organizational commitment, and 6) ongoing leadership development embedded in a leadership ecosystem. Guidelines for designing effective leadership interventions [5, 9, 69] recommend related topics and may also be instrumental to LDP

providers. In addition, LDP providers could include modules on healthcare providers' well-being and incorporate positive (e.g., professional fulfillment) and negative (e.g., burnout) well-being indicators in the program evaluation.

Conclusions

This study offers a MRPT explaining how, why, and under which circumstances LDPs for physicians impact the organization-level outcomes: culture, quality improvement, and the leadership pipeline. The MRPT includes one overarching context, the leadership ecosystem, and five CMOs. Ongoing leadership development within a leadership ecosystem is crucial to realizing and sustaining organization-level outcomes. Moreover, creating learning contexts that fire the working mechanisms of LDPs often requires adequate support and resources for participating physicians. This MRPT may guide the development of LDPs for physicians to realize specific hospital ambitions effectively. Hospitals need a solid physician leadership pipeline to cope with major developments in healthcare. By valuing physician leaders and investing in their leadership development, hospitals can create a cadre of physician leaders who want to go the extra mile for the organization and the patients they serve.

REFERENCES

1. Lucas R, Goldman E, Scott A, Dandar V. Leadership Development Programs at Academic Health Centers: Results of a National Survey. *Acad Med.* 2018;93(2):229-36.
2. Lyons O, George R, Galante J, Mafi A, Fordwoh T, Frich J, et al. Evidence-based medical leadership development: a systematic review. *BMJ Lead.* 2021;5(3):206-13.
3. Spurgeon P, Long P, Clark J, Daly F. Do we need medical leadership or medical engagement? *Leadersh Health Serv.* 2015;28(3):173-84.
4. Frich J, Brewster A, Cherlin E, Bradley E. Leadership Development Programs for Physicians: A Systematic Review. *J Gen Intern Med.* 2015;30(5):656-74.
5. Geerts J, Goodall A, Agius S. Evidence-based leadership development for physicians: A systematic literature review. *Soc Sci Med.* 2020;246:112709.
6. Simas T, Cain J, Milner R, Meacham M, Bannon A, Levin L, et al. A systematic review of development programs designed to address leadership in academic health center faculty. *J Contin Educ Health Prof.* 2019;39(1):42-8.
7. Steinert Y, Naismith L, Mann K. Faculty development initiatives designed to promote leadership in medical education. A BEME systematic review: BEME Guide No. 19. *Med Teach.* 2012;34(6):483-503.
8. Husebø S, Akerjordet K. Quantitative systematic review of multi-professional teamwork and leadership training to optimize patient outcomes in acute hospital settings. *J Adv Nurs.* 2016;72(12):2980-3000.
9. Steinert Y, Mann K, Anderson B, Barnett B, Centeno A, Naismith L, et al. A systematic review of faculty development initiatives designed to enhance teaching effectiveness: A 10-year update: BEME Guide No. 40. *Med Teach.* 2016;38(8):769-86.
10. Straus S, Soobiah C, Levinson W. The Impact of Leadership Training Programs on Physicians in Academic Medical Centers: A Systematic Review. *Acad Med.* 2013;88(5):710-23.
11. Dionne S, Yammarino F, Atwater L, Spangler W. Transformational leadership and team performance. *J Organ Change Manag.* 2004;17(2):177-93.
12. Hammerly M, Harmon L, Schwaitzberg S. Good to Great: Using 360-Degree Feedback to Improve Physician Emotional Intelligence. *J Healthc Manag.* 2014;59(5).
13. Emmel N, Greenhalgh J, Manzano A, Monaghan M, Dalkin S. *Doing realist research*: Sage; 2018.
14. Denis J, van Gestel N. Medical doctors in healthcare leadership: theoretical and practical challenges. *BMC Health Serv Res.* 2016;16(2):158.
15. Stoller J. Developing Physician-Leaders: A Call to Action. *J Gen Intern Med.* 2009;24(7):876-8.
16. CanMEDS Physician Competency Framework [accessed June 2023] (<https://www.royalcollege.ca/content/rcpsc/ca/en/canmeds/about-canmeds.html>).
17. Kaiser F, Schmid A, Schlüchtermann J. Physician-leaders and hospital performance revisited. *Soc Sci Med.* 2020;249:112831.
18. Sarto F, Veronesi G. Clinical leadership and hospital performance: assessing the evidence base. *BMC Health Serv Res.* 2016;16(2):169.
19. Miani C, Marjanovic S, Jones M, Marshall M, Meikle S, Nolte E. Barking, Havering and Redbridge university hospitals NHS trust fellowships in clinical leadership programme: an evaluation. *Rand health quarterly.* 2013;3(3).
20. Pawson R, Greenhalgh T, Harvey G, Walshe K. Realist review—a new method of systematic review designed for complex policy

- interventions. *J Health Services Res Policy*. 2005;10(1_suppl):21-34.
21. Wong G, Westhorp, P, Pawson, Greenhalgh, T. Realist Synthesis RAMESES Training Materials. 2013.
 22. Wong G, Greenhalgh T, Westhorp G, Buckingham J, Pawson R. RAMESES publication standards: realist syntheses. *BMC Med*. 2013;11(1):21.
 23. Punton M, Isabel V, Leavy J, Michaelis C, Boydell E. Reality bites: Making realist evaluation useful in the real world. 2020.
 24. VOS viewer [accessed June 2022] (<https://www.vosviewer.com/publications>)
 25. Wilczynski N, McKibbin K, Haynes R. Search filter precision can be improved by NOTing out irrelevant content. *AMIA Annu Symp Proc*. 2011;2011:1506-13.
 26. Kirkpatrick J, Kirkpatrick W. Kirkpatrick's four levels of training evaluation: Association for Talent Development; 2016.
 27. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Syst Rev*. 2016;5(1):210.
 28. Page M, McKenzie J, Bossuyt P, Boutron I, Hoffmann T, Mulrow C, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71.
 29. Greenhalgh J, Manzano A. Understanding 'context' in realist evaluation and synthesis. *Int J Soc Res Methodol*. 2022;25(5):583-95.
 30. De Weger E, Van Vooren N, Wong G, Dalkin S, Marchal B, Drewes H, et al. What's in a Realist Configuration? Deciding Which Causal Configurations to Use, How, and Why. *Int J Qual Methods*. 2020;19:1609406920938577.
 31. Fassiotto M, Maldonado Y, Hopkins J. A long-term follow-up of a physician leadership program. *J Health Organ Manag*. 2018;32(1):56-68.
 32. Hopkins J, Fassiotto M, Ku M, Mammo D, Valentine H. Designing a physician leadership development program based on effective models of physician education. *Health Care Manage Rev*. 2018;43(4):293-302.
 33. Fernandez C, Noble C, Jensen E, Chapin J. Improving Leadership Skills in Physicians: A 6-Month Retrospective Study. *J Leadersh Stud*. 2016;9(4):6-19.
 34. Throgmorton C, Mitchell T, Morley T, Snyder M. Evaluating a physician leadership development program - a mixed methods approach. *J Health Organ Manag*. 2015;30(3):390-407.
 35. Toma M, Blamey A, Mahal D, Gray N, Allison L, Thakore S, et al. Multi-method evaluation of a national clinical fellowship programme to build leadership capacity for quality improvement. *BMJ Open Qual*. 2020;9(4):e000978.
 36. Tsoh J, Kuo A, Barr J, Whitcanack L, Merry I, Alldredge B, et al. Developing faculty leadership from 'within': a 12-year reflection from an internal faculty leadership development program of an academic health sciences center. *Med Educ Online*. 2019;24(1):1567239.
 37. Vitous C, Shubeck S, Kanters A, Mulholland M, Dimick J. Reflections on a leadership development program: Impacts on culture in a surgical environment. *Surgery*. 2019;166(5):721-5.
 38. Berghout M, Oldenhof L, Van der Scheer W, Hilders C. From context to contexting: professional identity un/doing in a medical leadership development programme. *Sociol Health Illn*. 2020;42(2):359-78.
 39. Bhalla R, Jalon H, Ryan L. The Clinical Quality Fellowship Program: Developing Clinical Quality Leadership in the Greater New York Region. *Am J Med Qual*. 2018;33(2):119-26.
 40. Christensen T, Stoller J. Physician leadership development at Cleveland Clinic: a brief review. *Australas Psychiatry*. 2016;24(3):235-9.
 41. Cohen D, Vlaev I, McMahon L, Harvey S, Mitchell A, Borovoi L, et al. The Crucible simulation: Behavioral simulation improves

- clinical leadership skills and understanding of complex health policy change. *Health Care Manag Rev.* 2019;44(3):246-55.
42. Daniels J, Farquhar C, Nathanson N, Mashalla Y, Petracca F, Desmond M, et al. Training tomorrow's global health leaders: applying a transtheoretical model to identify behavior change stages within an intervention for health leadership development. *Glob Health Promot.* 2014;21(4):24-34.
 43. DeRusso P, Greeley W, St. Geme J. Leading from the Middle: Benefits of a Physician Leadership Program. *J Pediatr.* 2020;219:4-6.e1.
 44. Ennis-Cole D, Cullum P, Iwundu C. Physicians as Operational Leaders: Cost, Curriculum, Technology, and Organizational Challenges. *TechTrends.* 2019;62(3):239-49.
 45. Ferris F, Moore S, Callaway M, Foley K. Leadership Development Initiative: Growing Global Leaders... Advancing Palliative Care. *J Pain Symptom Manage.* 2018;55(2, Supplement):S146-S56.
 46. Gholipour K, Tabrizi J, Farahbakhsh M, Iezadi S, Ghiasi A, Jahanbin H. Evaluation of the district health management fellowship training programme: a case study in Iran. *BMJ Open.* 2018;8(3):e020603.
 47. Hackworth J, Steel S, Cooksey E, DePalma M, Kahn J. Faculty Members' Self-Awareness, Leadership Confidence, and Leadership Skills Improve after an Evidence-Based Leadership Training Program. *J Pediatr.* 2018;199:4-6.e2.
 48. Howell L, Markwood P, Zander D. The Association of Pathology Chairs' Pathology Leadership Academy: Experience From the First 2 Years. *Acad Pathol.* 2019;6:2374289519826309.
 49. Leggat S, Smyth A, Balding C, McAlpine I. Equipping clinical leaders for system and service improvements in quality and safety: an Australian experience. *Austr N Z J Public Health.* 2016;40(2):138-43.
 50. Rachel B. Levine M, Joann Bodurtha, Kimberly A. Skarupski, and Barbara Fivush. Implementation and Evaluation of the Johns Hopkins University School of Medicine Leadership Program for Women Faculty. *J Womens Health.* 2015;24(5):360-6.
 51. Lewis V, Baldwin C, Morahan P, Thorndyke L, Gusic M. Leadership Development Projects: Bidirectional Impact on Faculty and Institutions. *J Contin Educ Health Prof.* 2021;41(1):75-81.
 52. MacPhail A, Young C, Ibrahim J. Workplace-based clinical leadership training increases willingness to lead. *Leadersh Health Serv.* 2014;28(2):100-18.
 53. Maddalena V, Fleet L. Developing a Physician Management & Leadership Program (PMLP) in Newfoundland and Labrador. *Leadersh Health Serv.* 2015;28(1):35-42.
 54. McCray J, Warwick R, Palmer A. Impressions of action and critical action learning: exploring the leadership development of senior doctors in an English healthcare organization. *Int J Train Dev.* 2018;22(1):69-85.
 55. Monroe-Wise A, Mashalla Y, O'Malley G, Nathanson N, Seloilwe E, Gachuno O, et al. Training tomorrow's leaders in global health: impact of the Afya Bora Consortium Fellowship on the careers of its alumni. *BMC Med Educ.* 2016;16(1):241.
 56. Nakanjako D, Namagala E, Semeere A, Kigozi J, Sempa J, Ddamulira J, et al. Global health leadership training in resource-limited settings: a collaborative approach by academic institutions and local health care programs in Uganda. *Hum Resour Health.* 2015;13(1):87.
 57. O'Neil J, Duberman T, Rubenstein K, Satlow T. Physician leadership development at tower health system. Evidence-based initiatives for organizational change and development: IGI Global; 2019. p. 533-46.
 58. Pradarelli J, Jaffe G, Lemac C, Mulholland M, Dimick J. A leadership development

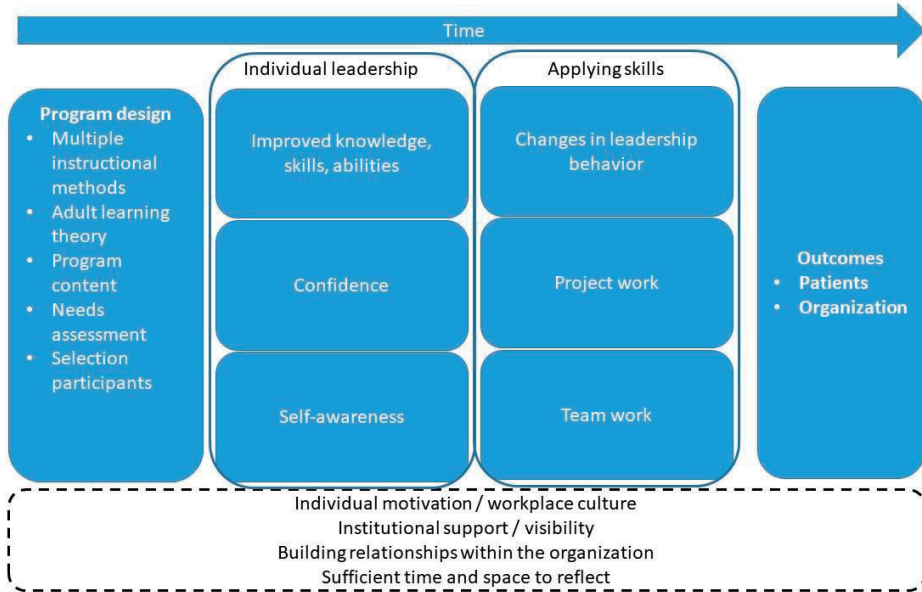
- program for surgeons: First-year participant evaluation. *Surgery*. 2016;160(2):255-63.
59. Rao S, Carballo V, Cummings B, Millham F, Jacobson J. Developing an Interdisciplinary, Team-Based Quality Improvement Leadership Training Program for Clinicians: The Partners Clinical Process Improvement Leadership Program. *Am J Med Qual*. 2017;32(3):271-7.
 60. Rask K, Gitomer R, Spell N, Culler S, Blake S, Kohler S, et al. A Two-Pronged Quality Improvement Training Program for Leaders and Frontline Staff. *Jt Comm J Qual Patient Saf*. 2011;37(4):147-AP2.
 61. Sanfey H, Harris I, Pollart S, Schwartz A. Evaluation of the University of Virginia Leadership in Academic Medicine Program. *Teach Learn Med*. 2011;23(4):347-58.
 62. Smith K. Physicians in 21 st century healthcare: Developing physician leaders for the future: Kansas State University; 2014.
 63. Smith D, Arnold W, Krupinski E, Powell C, Meltzer C. Strategic Talent Management: Implementation and Impact of a Leadership Development Program in Radiology. *J Am Coll Radiol*. 2019;16(7):992-8.
 64. Shah P, Cross V, Sii F. Sailing a Safe Ship: Improving Patient Safety by Enhancing the Leadership Skills of New Consultant Specialist Surgeons. *J Contin Educ Health Prof*. 2013;33(3):190-200.
 65. Steele M, Pennell S, Prescott J, Sweeney N, Steinecke A, Buckley P. Leadership development for future medical school deans: outcomes of the AAMC Council of Deans Fellowship Program. *Acad Med*. 2020;95(12):1887-92.
 66. Torbeck L, Rozycki G, Dunnington G. Leaders Growing Leaders: Designing a Tier-Based Leadership Program for Surgeons. *J Surg Educ*. 2018;75(4):947-56.
 67. Vreeling K, Kersemaekers W, Cillessen L, Van Dierendonck D, Speckens A. How medical specialists experience the effects of a mindful leadership course on their leadership capabilities: a qualitative interview study in the Netherlands. *BMJ Open*. 2019;9(12):e031643.
 68. Winters R, Chen R, Lal S, Chan T. Six Principles for Developing Leadership Training Ecosystems in Health Care. *Acad Med*. 2022;97(6):793-6.
 69. von Thiele Schwarz U, Nielsen K, Edwards K, Hasson H, Ipsen C, Savage C, et al. How to design, implement and evaluate organizational interventions for maximum impact: the Sigtuna Principles. *Eur J Work Organ Psychol*. 2021;30(3):415-27.
 70. Bindels E, Van den Goor M, Scherpbier A, Lombarts K, Heeneman S. Sharing Reflections on Multisource Feedback in a Peer Group Setting: Stimulating Physicians' Professional Performance and Development. *Acad Med*. 2021;96(10).
 71. Brutus S, Derayah M, Fletcher C, Bailey C, Velazquez P, Shi K, et al. Internationalization of multi-source feedback systems: a six-country exploratory analysis of 360-degree feedback. *Int J Hum Resour Manag*. 2006;17(11):1888-906.
 72. Van der Meulen M, Smirnova A, Heeneman S, oude Egbrink M, Van der Vleuten C, Lombarts K. Exploring Validity Evidence Associated With Questionnaire-Based Tools for Assessing the Professional Performance of Physicians: A Systematic Review. *Acad Med*. 2019;94(9).
 73. Van Der Leeuw R, Boerebach B, Lombarts K, Heineman M, Arah O. Clinical teaching performance improvement of faculty in residency training: A prospective cohort study. *Med Teach*. 2016;38(5):464-70.
 74. Bindels E, Boerebach B, Scheepers R, Nooteboom A, Scherpbier A, Heeneman S, et al. Designing a system for performance appraisal: balancing physicians' accountability and professional development. *BMC Health Serv Res*. 2021;21(1):800.
 75. Shanafelt T, Trockel M, Rodriguez A, Logan D. Wellness-Centered Leadership: Equipping Health Care Leaders to Cultivate

- Physician Well-Being and Professional Fulfillment. *Acad Med.* 2021;96(5):641-51.
76. Shanafelt T, Gorringer G, Menaker R, Storz K, Reeves D, Buskirk SJ, et al. Impact of Organizational Leadership on Physician Burnout and Satisfaction. *Mayo Clin Proc.* 2015;90(4):432-40.
 77. Shanafelt T, Noseworthy J. Executive Leadership and Physician Well-being: Nine Organizational Strategies to Promote Engagement and Reduce Burnout. *Mayo Clin Proc.* 2017;92(1):129-46.
 78. Guevara R, Montoya J, Carmody-Bubb M, Wheeler C. Physician leadership style predicts advanced practice provider job satisfaction. *Leaders Health Serv.* 2020;33(1):56-72.
 79. Kibbe M. Leadership Theories and Styles. In: Kibbe M, Chen H, editors. *Leadership in Surgery*. Cham: Springer International Publishing; 2019. p. 27-36
 80. Adler P, Kwon S. Social Capital: Prospects for a New Concept. *Acad Manage Review.* 2002;27(1):17-40.
 81. Woolcock M. Social Capital and Economic Development: Toward a Theoretical Synthesis and Policy Framework. *Theory Soc.* 1998;27(2):151-208.
 82. Integraal Zorg Akkoord. Samen werken aan gezond zorg. 2022.
 83. Kanter G, Polsky D, Werner R. Changes In Physician Consolidation With The Spread Of Accountable Care Organizations. *Health Aff.* 2019;38(11):1936-43.
 84. Debets M, Silkens M, Kruijthof K, Lombarts K. Building organisations, setting minds: exploring how boards of Dutch medical specialist companies address physicians' professional performance. *BMC Health Serv Res.* 2022;22(1):155.
 85. Savage M, Savage C, Brommels M, Maz-zocato P. Medical leadership: boon or barrier to organisational performance? A thematic synthesis of the literature. *BMJ Open.* 2020;10(7):e035542.
 86. Rowbotham S, Conte K, Hawe P. Variation in the operationalisation of dose in implementation of health promotion interventions: insights and recommendations from a scoping review. *Implement Sci.* 2019;14(1):56.
 87. Moore G, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. *Br Med J.* 2015;350:h1258.
 88. Lepak D, Snell S. Examining the Human Resource Architecture: The Relationships Among Human Capital, Employment, and Human Resource Configurations. *J Manage.* 2002;28(4):517-43.
 89. McGivern G, Currie G, Ferlie E, Fitzgerald L, Waring J. Hybrid Manager-Professionals' identity work: the maintenance and hybridization of medical professionalism in managerial contexts. *Public Admin.* 2015;93(2):412-32.
 90. Noordegraaf M, Schneider M, Van Rensen E, Boselie J. Cultural complementarity: reshaping professional and organizational logics in developing frontline medical leadership. *Public Manag Rev.* 2016;18(8):1111-37.
 91. Bandura A, Freeman W, Lightsey R. Self-efficacy: The exercise of control. Springer; 1999.
 92. Paglis L. Leadership self-efficacy: research findings and practical applications. *J Manag Dev.* 2010;29(9):771-82.
 93. Theard M, Marr M, Harrison R. The growth mindset for changing medical education culture. *EClinicalMedicine.* 2021;37:100972.
 94. Roslan N, Yusoff M, Morgan K, A Razak A, Ahmad Shauki N. What Are the Common Themes of Physician Resilience? A Meta-Synthesis of Qualitative Studies. *Int J Environ Res Public Health.* 2022;19(1):469.
 95. Dawkins S, Tian A, Newman A, Martin A. Psychological ownership: A review and research agenda. *J Organ Behav.* 2017;38(2):163-83.

96. Pierce J, Kostova T, Dirks K. The State of Psychological Ownership: Integrating and Extending a Century of Research. *Rev Gen Psychol.* 2003;7(1):84-107.
97. Meyer J, Allen N. Commitment in the workplace: Theory, research, and application. Thousand Oaks, CA, USA: Sage publications. 1997.
98. Hoff T, Lee D, Prout K. Organizational commitment among physicians: A systematic literature review. *Health Serv Manage Res.* 2021;34(2):99-112.
99. Eckleberry-Hunt J, Lick D, Hunt R. Is Medical Education Ready for Generation Z? *J Grad Med Educ.* 2018;10(4):378-81.
100. Rodríguez J, Campbell K, Pololi L. Addressing disparities in academic medicine: what of the minority tax? *BMC Med Educ.* 2015;15(1):6.
101. Lombarts K, Verghese A. Medicine Is Not Gender-Neutral — She Is Male. *NEJM.* 2022;386(13):1284-7.
102. Clayborne E, Martin D, Goett R, Chandrasekaran E, McGreevy J. Diversity pipelines: The rationale to recruit and support minority physicians. *J Am Coll Emerg Physicians Open.* 2021;2(1):e12343.
103. Gomez L, Bernet P. Diversity improves performance and outcomes. *J Natl Med Assoc.* 2019;111(4):383-92.
104. Montgomery A. The relationship between leadership and physician well-being: a scoping review. *J Healthc Leadersh.* 2016;8:71-80.
105. Shanafelt T, West C, Sinsky C, Trockel M, Tutty M, Wang H, et al. Changes in Burnout and Satisfaction With Work-Life Integration in Physicians and the General US Working Population Between 2011 and 2020. *Mayo Clin Proc.* 2022;97(3):491-506.
106. Wallace J, Lemaire J, Ghali W. Physician wellness: a missing quality indicator. *Lancet.* 2009;374(9702):1714-21.

SUPPLEMENTARY MATERIALS

Supplementary material A - Initial middle-range program theory



Supplementary material B – Comprehensive search strategies

Ovid MEDLINE(R) ALL <1946 to March 19, 2021> Search date: 22 March 2021		
#	Searches	Results
1	((manager? or management or leadership or leader?) adj3 (programme? or program? or train* or workshop or develop* or academy or track?)) or mba or "master of business").ab,kf,ti.	49389
2	(physician? or clinician? or fellow* or clinical leader* or medical leader* or faculty or doctor?).ab,hw,kf,ti.	974791
3	(evaluat* or assess* or survey? or inventor* or questionnair* or effect* or outcome? or quality).ab,hw,kf,ti.	13325950
4	and/1-3	6513
5	limit 4 to yr="2000-current"	5624
6	(Symptom? or Drug? or side effect?).ti.	555374
7	(syndrome? or heart failure or adhd or comorbidity or dose or Fracture or osteoporosis or algorithm or disease management programme or coronary heart disease or athlete or agent or prognosis or pregnancy or pharmacotherapy or dmp).ab,kf,ti.	3949411
8	or/6-7 [VOS cluster 2]	4414821
9	(airway management or airway or intubation or ems or difficult airway or airway management training or household or mosquito or simulator).ab,kf,ti. [VOS cluster 3]	315470
10	(primary care clinic or obesity or diabetes or body mass index or diabete or bmi or diet or weight loss or weight management program or obese patient or weight management programme or hypertension or blood pressure or self management support or physical activity or stroke or glycemic control).ab,kf,ti. [VOS cluster 4]	1963702
11	(medication therapy management or mtm or beneficiary or medical home or pcmh or nursing home resident or chronic disease management pro or accountable care organization).ab,kf,ti. [VOS cluster 6]	8691
12	or/8-11 [VOS NOTing out]	6150981
13	5 not 12	4038
14	("leader's edge" or "coaching and leadership" or (doctor? and equip)).ab,kf,ti.	158
15	2 and "leaders growing leaders".mp.	1
16	or/13-15	4188

Ovid APA Psycinfo <1806 to March Week 3 2021> Search date: 22 March 2021		
#	Searches	Results
1	((manager? or management or leadership or leader?) adj3 (programme? or program? or train* or workshop or develop* or academy or track?)) or mba or "master of bu?siness").ab,id,ti.	35850
2	(physician? or clinician? or fellow* or clinical leader* or medical leader* or faculty or doctor?).ab,hw,id,ti.	220182
3	(evaluat* or assess* or survey? or inventor* or questionnair* or effect* or outcome? or quality).ab,hw,id,ti,tm.	2763481
4	and/1-3	2070
5	limit 4 to yr="2000-current"	1832
6	(Symptom? or Drug? or side effect?).ti.	107423
7	(syndrome? or heart failure or adhd or comorbidity or dose or Fracture or osteoporosis or algorithm or disease management programme or coronary heart disease or athlete or agent or prognosis or pregnancy or pharmacotherapy or dmp).ab,id,ti.	358558
8	or/6-7 [VOS cluster 2]	447380
9	(airway management or airway or intubation or ems or difficult airway or airway management training or household or mosquito or simulator).ab,id,ti. [VOS cluster 3]	33099
10	(primary care clinic or obesity or diabetes or body mass index or diabete or bmi or diet or weight loss or weight management program or obese patient or weight management programme or hypertension or blood pressure or self management support or physical activity or stroke or glycemic control).ab,id,ti. [VOS cluster 4]	179896
11	(medication therapy management or mtm or beneficiary or medical home or pcmh or nursing home resident or chronic disease management pro or accountable care organization).ab,id,ti. [VOS cluster 6]	2285
12	or/8-11 [VOS NOTing out]	625110
13	5 not 12	1510
14	("leader's edge" or "coaching and leadership" or (doctor? and equip)).ab,id,ti.	160
15	leaders growing leaders.mp.	0
16	or/13-15	1665

Web of Science		
Search date: 22 March 2021		
#	Searches	Results
1	TS=(((manager? or management or leadership or leader?) NEAR\2 (programme? or program? or train* OR workshop or develop* or academy or track?)) or mba or "master of bu?siness")	5071
2	TS=(physician? or clinician? or fellow* or clinical leader* or medical leader* or hospital? or medicine or doctor?)	1173522
3	#1 AND #2 Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=20102021	91

Ovid ERIC <1965 to January 2021>		
Search date: 22 March 2021		
#	Searches	Results
1	((((manager? or management or leadership or leader?) adj3 (programme? or program? or train* or workshop or develop* or academy or track?)) or mba or "master of bu?siness").tw.	33652
2	(physician? or clinician? or clinical leader* or medical leader* or doctor? or hospital?).tw.	21251
3	(evaluat* or assess* or survey? or inventor* or questionnair* or effect* or outcome? or quality).tw.	950958
4	and/1-3	280
5	limit 4 to yr="2000-current"	143

Ebscohost Academic Search Premier		
Search date: 22 March 2021		
#	Searches	Results
1	AB (((manager? or management or leadership or leader?) n/2 (programme? or program? or train* OR workshop or develop* or academy or track?)) or mba or "master of bu?siness")	4135
2	TI (((manager? or management or leadership or leader?) n/2 (programme? or program? or train* OR workshop or develop* or academy or track?)) or mba or "master of bu?siness")	1138
3	SU (((manager? or management or leadership or leader?) n/2 (programme? or program? or train* OR workshop or develop* or academy or track?)) or mba or "master of bu?siness")	143
4	KW (((manager? or management or leadership or leader?) n/2 (programme? or program? or train* OR workshop or develop* or academy or track?)) or mba or "master of bu?siness")	354
5	S1 OR S2 OR S3 OR S4	4621
6	AB (physician? or clinician? or fellow* or clinical leader* or medical leader* or hospital? or medicine or doctor?)	1271037
7	TI (physician? or clinician? or fellow* or clinical leader* or medical leader* or hospital? or medicine or doctor?)	289798
8	SU (physician? or clinician? or fellow* or clinical leader* or medical leader* or hospital? or medicine or doctor?)	743099
9	KW (physician? or clinician? or fellow* or clinical leader* or medical leader* or hospital? or medicine or doctor?)	183018
10	S6 OR S7 OR S8 OR S9	1813536
11	S5 AND S10 - Publication date: 20000101-20210430	220

Supplementary material C – Characteristics of included LDPs and studies

Note: subsequent rows with a light grey background indicate that the studies in these rows describe the same LDP.

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
1	Berghout, 2020	Medical leadership development programme (MLDP)	The Netherlands	No	1-year (six collective sessions (total of 9 days) and three 2-hour in-house hospital sessions)	<p>LDP goal: To enable physicians to take the lead in the continuous improvement of healthcare.</p> <p>Study aim: To illustrate how physicians, by means of participating in a MLDP, try to undo their often-assumed stable professional identity by reinterpreting their relational position towards hospital contexts to better deal with perceived institutional pressures.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>Module 1: Introduction, theory on leadership styles, group discussion about medical leadership, personal reflection exercise.</p> <p>Module 2: Theory on quality dimensions, theory on short-cycle improvements, individual exercise in applying these on personal projects.</p> <p>Module 3: Guest speaker on leadership in 'high performance organisations', exercise in applying insights on personal projects.</p> <p>Module 4: Guest speaker (physician) on personal leadership, guest speaker (psychologist) on relations in teams, session with directors on lifestyle and prevention.</p> <p>Module 5: Guest speakers (director top-clinical hospitals, patient) on shared decision-making, guest speaker (director Dutch inspectorate) on policy-making and accountability, guest speaker (financial advisor) on healthcare costs and efficiency, expert panel healthcare entrepreneurs.</p> <p>Module 6: Guest speakers (two physicians, one nurse) about their role as 'medical leader', guest speaker (director Dutch Council for Public Health and Society).</p> <p>In-house sessions (3): participants present the developments of their individual improvement projects to hospital directors, facilitators and Peers.</p> <p>In addition to the collective sessions, every participant carried out a hospital-based improvement project.</p>	Yes	23 physicians (six hospitals) representing 13 different medical disciplines. (September 2017–July 2018).	The results illustrate how physicians initially construct conflicting leadership narratives – heroic (pioneer), clinical (patient's guardian) and collaborative (linking pin) leader – in reaction to changing organisational and clinical demands.

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
2	Bhalla, 2018	Clinical Quality Fellowship Program (CQFP)	United States	No	15 months (see article for frequency, days per year of sessions)	<p>LDP goal: To develop necessary skills in competitively selected physician and nurse “quality champions,” and to equip them with the necessary knowledge and support to promote and sustain quality improvement in their clinical settings.</p> <p>Study aim: One goal of this article is to describe the curricular structure and key features of the CQFP. Accordingly, additional goals of this article are to share information on participants’ perceptions of the effectiveness of the CQFP; to describe improvement efforts initiated at participant organizations as part of the CQFP; and to describe pertinent career advancements of participants following program completion.</p>
3	Christensen, 2016	Leading in Health Care (LHC)	United States	Yes	10 months (10 full-day sessions)	<p>LDP goal: Somewhat unclear, two goals: leadership pipeline and innovation incubator.</p> <p>Study aim: To describe the rationale for and spectrum of leadership development programs, highlighting experience at a large healthcare institution.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>1. <i>Off-site didactic and participatory training:</i> The program begins with 4 full-day training “retreat” sessions, with in-depth instruction on relevant quality improvement and patient safety topics, through a combination of didactic content, group exercises, and role-play scenarios.</p> <p>2. <i>Longitudinal and interactive learning:</i> Following the initial training retreats, interactive educational webinars and in-person sessions are held to continue instruction about quality leadership, quality improvement tools and techniques, and relevant and timely health care issues. Fellows complete 5 homework assignments during the program, which include individual and group work.</p> <p>3. <i>Applied project and mentorship:</i> Fellows are required to design and lead a quality improvement project—the capstone. The project is conducted with an interdisciplinary team of clinicians at the fellows’ home institutions to advance organizational or departmental quality or patient safety goals.</p>	Yes	<p>Of the 89 fellows during the period, 75 (84%) were physicians, and the remainder were nurses. Seventy-four physician fellows represented multiple medical specialties as follows: The 89 fellows represented 45 hospitals or organizations affiliated with hospitals across the greater New York region. The annual number of fellows by year was as follows: 16 (in 2010), 15, 18, 20, and 20 (in 2014).</p>	<p>Among program participants completing self-assessment evaluations, significant improvements were observed across all quality improvement skill areas. Capstone project categories included inpatient efficiency, transitional care, and hospital infection. Fifty-six percent of participants obtained promotions following program completion.</p>
<p>The curriculum of the course is highly participatory and is organized around three themes:</p> <p>1. Organizational mission, vision, and values, as informed by a series of conversations with organizational leaders and discussions about organizational history and culture.</p> <p>2. Fundamentals of health care finance (including how to develop a formal business plan).</p> <p>3. Organizational development, which includes emotional intelligence, teambuilding, strategic planning, conflict resolution, and executive presentation skills, among others.</p> <p>In addition to the skill-based sessions listed above, 360° feedback evaluations provide insight to each attendee, while also providing an opportunity to receive executive coaching on the same.</p> <p>Teams developing a full business plan over 10 months.</p>	Yes	<p>As originally offered, the course enrolled physicians.</p> <p>The course was expanded to its current interdisciplinary cohort of approximately 70 physicians, nurses, and administrators.</p> <p>Leading in Health Care is currently in its 13th year.</p>	<p>Perhaps the greatest indicator of the program’s impact and success is that 43% of participants have been promoted to leadership positions at Cleveland Clinic over the ensuing decade, and an analysis that shows that the baseline emotional intelligence correlates of longterm promotion are having self-confidence, being a change catalyst, and having an achievement orientation.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
4	Cohen, 2019	The Crucible	United Kingdom	No	1 day	<p>LDP goal: To help develop clinical leadership skills and understanding of the new NHS structure .</p> <p>Study aim: This study aims to test for first time if participation in a behavioral simulation is an acceptable and effective modality to improve clinical management and leadership capability and the understanding of health care reforms.</p>
5	Daniels, 2014	Afya Bora Fellowship	Botswana, Kenya, Uganda, Tanzania	No	6 weeks of classroom-based training, a 6-month practicum experience and mentoring.	<p>LDP goal: To effect leadership behavior change among participants who would catalyze and support the long-term improvement of health institutions.</p> <p>Study aim: To identify and describe evidence of individual health leadership behavior change among training participants during and shortly after the pilot year of the program.</p>
6	Monroe-Wise, 2016	Afya Bora Fellowship	Botswana, Kenya, Uganda, Tanzania	No	1-year (Involves three classroom learning blocks each lasting three weeks, separated by two five month experiential attachment site rotations)	<p>LDP goal: To provide future global health leaders with practical leadership and management skills that are not part of traditional health professional training.</p> <p>Study aim: The purpose of this study was to assess what career changes, if any, the Afya Bora Fellowship's alumni have experienced since completing the fellowship, and to describe those changes.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>A single-day behavioral role-playing simulation. Participants are told in their briefing pack that the poor performance of health services in the boroughs has been highlighted in a recent television documentary in which stakeholders were interviewed to provide a synopsis of current tensions and challenges facing health care in the region. Statements from stakeholders describing their positions and concerns are provided to participants. The local council and health groups are keen that this escalating situation is resolved and plans to improve health care delivery are developed; this is the setting for The Crucible simulation.</p>	No	<p>Of the 69 participants, 32 were currently working at Consultant grade and 35 at Registrar grade. Two participants did not identify their current grade. Participants came from a wide range of specialties, including medicine, surgery, public health, dentistry, psychiatry, and anaesthetics.</p>	<p>Significant improvements were shown in perceived knowledge, capability, attitudes, subjective norms, intentions, and leadership competency following the program. Nearly one third of participants reported that they had implemented knowledge and skills from the simulation into practice within 4 weeks.</p>
<p>The classroom-based training component was offered at African partner academic institutions and included the following weeklong modules: Leadership, Communication, Project Management, Health Information Systems, Monitoring and Evaluation, and Implementation Science. The practicum included projects in the four African host countries.</p>		<p>19 African and three US medical post-graduates, post-residency physicians and master's-level nurses were selected.</p>	<p>In the short term, fellows demonstrated increased leadership development and shortly after the intervention. However, expanded interventions and/or additional time may be needed to support behavior change toward the maintenance stages.</p>
<p>Learning block 1: Leadership, Communication, Monitoring & Evaluation.</p> <p>Learning block 2 Implementation Science, Health Informatics, Effective Grant Writing.</p> <p>Learning block 3: Human Resources & Budget Management, Global Health Policy & Governance.</p> <p>Attachment site 1: Attachment Site Rotations, Structured Mentorship, Online Modules, Responsible Conduct in Research, Research Methods.</p> <p>Attachment site 2: Attachment Site Rotations, Structured Mentorship, Online Modules, HIV/AIDS as a Global Health Challenge, Project Management.</p>	Yes	<p>Between January 2011 and June 2013, 42 fellows from five countries participated in the Afya Bora Fellowship. This included 22 fellows in the pilot year (January–July 2011), and 20 fellows in the first full year of the program (June 2012–July 2013). Twenty-one fellows were nurses, and 21 were physicians. The fellows were employed in various health sectors.</p>	<p>Twenty-one (68 %) reported changes to their position at work; of those, sixteen (76 %) believed the change was due to participation in the fellowship. All alumni reported improved performance at work, and cited the application of a wide range of fellowship skills, including leadership, research, communication, and mentoring. Twenty-six (84 %) alumni spearheaded improvements in their workplaces and almost all (97 %) remained in contact with colleagues from the fellowship.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
7	Nakanjako, 2015	Afya Bora Fellowship	Botswana, Kenya, Uganda, Tanzania	No	1 year (a total of 8 weeks of didactic lectures offered as three classroom learning blocks. Two 4.5-month long experiential trainings)	<p>LDP goal: To respond to the increased need of innovative experiential leadership training for nurses and doctors in an African setting.</p> <p>Study aim: To guide further development of in-service training opportunities to enhance leadership skills of nurses and doctors in Uganda and other developing countries.</p>
8	DeRusso, 2020	Leadership program	United States	Yes	10 months (9 didactic sessions that alternated between a half-day session (n = 5) and a full-day session (n = 4))	<p>LDP goal: To strengthen the skills of emerging clinical leaders and to develop a pipeline of physician leaders.</p> <p>Study aim: unclear.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The didactic modules were designed to equip fellows with skills in communication, leadership, monitoring and evaluation, implementation science, health informatics, research methods, grant writing, human resources, and budgeting, as well as global health policy and governance. The classroom-based modules employ case- based discussions in small groups and are draw on Africa focused case studies.</p> <p>Two 4.5-month long experiential trainings at identified local governmental and non-governmental organizations involved in health-related activities including the Ministries of Health in the four African countries. The curriculum included four additional online modules, namely responsible conduct of research, research methods, project management, and HIV/AIDS updates.</p>	Yes	<p>Between January 2011 and January 2015, out of 51 applications, 15 fellows (nine doctors and six nurses) participated in the program [Uganda].</p>	<p>New responsibilities assigned to fellow due to skills acquired during the fellowship.</p> <p>Improvements in quality of work.</p> <p>New projects/ innovations/changes developed after the Afya Bora fellowship.</p> <p>Dissemination conferences attended.</p> <p>Other ways in which fellowship experience has improved health care delivery.</p>
<p>The leadership program lasted 10 months and included several types of learning experience: individual assessments (eg, 360-degree evaluation), executive coaching, sharing of personal leadership experiences by physician leaders, description of the organization by hospital administrators, didactic sessions, experiential learning through a leadership project, career mentoring, readings, and up to 55 Continuing Medical Education (CME) credit hours (Table I).</p> <p>The full-day sessions included topics on emotional intelligence, negotiation and conflict resolution, leadership in all life domains, and organizational culture. Half-day sessions included presentations by leaders on strategy development, organizational structure, enterprise initiatives, stakeholder analyses, identifying mentors, and experiential learning through leadership projects.</p>	Yes	<p>A total of 125 physicians have completed the program. Among these individuals, 52% were female, 60% were from the department of pediatrics, and 49% were associate professors. Many were medical directors leading hospital clinical programs or hospital units or were clinical directors within their department/ division.</p> <p>4 cohorts of participants in fiscal years 2016, 2017, 2018, and 2019.</p>	<p>Survey results indicated that all 125 participants from the 4 cohorts agreed their leadership skills were enhanced, they felt more connected to the institution, and they were committed to contributing to the enterprise-wide mission.</p> <p>Participants used learnings from program sessions to create a vision, motivate others, resolve conflict, provide feedback, and improve communication.</p> <p>Information from 93 participants in the first 3 cohorts showed that since completion of the program, 53% were in a new leadership role at CHOP.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
9	Ennis-Cole, 2019	Physician leadership development program	United States	Yes	6 months. Twice a month for two hours over six consecutive months (24 h of classroom instruction)	<p>LDP goal: Strengthening the succession pipeline to increase the number of candidates who were ready for leadership roles.</p> <p>Study aim: Explore the goals of physician leadership programs, models of leadership, cost reduction initiatives associated with physician leadership, information technology use, physician leadership program curricula, organizational challenges, and participant perceptions after an in-house leadership development program).</p>
10	Fassiotto, 2018	Stanford Leadership Development Program (SLDP)	United States	Yes	9 months (six one-and-one-half day sessions)	<p>LDP goal: Focusing on basic leadership skills for Stanford Medicine faculty (somewhat unclear).</p> <p>Study aim: To undertake a long-term, mixed-methods evaluation of an academic physician leadership program to understand impacts on both individual participants and on the organization.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The content of the program was modeled after a previously implemented program that had been successful at the center. Activities in the physician leadership program included orientation, six months of training/exposure to curriculum content, monthly meetings with an Executive Team Leader, and mentoring and evaluation.</p> <p>A different topic was presented each month of the program, and it was based on the center's Performance Standards. The topics were communication, development and learning, management and planning, relationship and team building, innovation and change, and patient centrality. For each topic there were learning goals, program, individual, and site metrics. There were two-hour classroom sessions with national speakers, a 60-min book club, and homework.</p> <p>The program utilized a blended learning approach which included instructor-led classes, assigned readings, self-directed learning via a binder used as a resource guide, case studies, and online experiences.</p>	<p>Yes</p>	<p>10 physicians</p>	<p>Nine out of the 10 participants graduated from the program and moved into new or enhanced leadership positions. Participants reported that their capacity for collaboration increased and their new leadership skills were utilized in their new leadership roles.</p>
<p>The curriculum was comprised of competencies recommended for healthcare leaders including personal development as a leader, managing people and relationships, managing groups and projects, managerial finance and accounting, and understanding the organizational system. Sessions were taught using interactive teaching methods based on adult learning principles. During the program, participants led interdisciplinary teams to complete action learning projects related to their leadership role.</p>	<p>Yes</p>	<p>[Included in analysis] 131 participants, 82 (control-group). 2006 (n=23), 2007 (n=23), 2008 (n=11), 2009(n=22), 2010 (n=26), 2011 (n=26)</p>	<p>Program participants rated higher than non-participants across 25 of 30 items measuring leadership knowledge, skills, and attitudes, and were more likely to hold regional/national leadership titles and to have gained in leadership since program participation. Asian program participants were significantly more likely than Asian non-participants to have been promoted, and women participants were less likely to have left the institution than non-participants. Finally, qualitative interviews revealed the long-term impact of leadership learning and networking, as well as the enduring, sustained impact on the organization of projects undertaken during the program.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
11	Hopkins, 2018	Stanford Leadership Development Program (SLDP)	United States	Yes	9 months (six one-and-one-half day sessions)	<p>LDP goal: To strengthen implementation of quality, safety, patient-centered and cost effectiveness projects; create common physician behavior expectations; and improve participatory decision-making.</p> <p>Study aim: To design a leadership program using established models for continuing medical education and to assess its impact on participants' knowledge, skills, attitudes, and performance.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The curriculum was created based on competency models, institutional needs assessments, and recurring topics found in other programs.</p> <p>Personal development as a leader: Assessments, Leadership styles.</p> <p>Managing people and relationships: Performance management, Power, influence, and authority, Managing Conflict, Negotiation, Recruiting and developing talent, mentoring, Team dynamics, Diversity in appointments and promotions, Difficult conversations, Legal land mines in human resource management.</p> <p>Managing groups and projects: Project planning and management, Organizational alignment, Change management, Meeting management, Managing teams.</p> <p>Managerial finance and accounting: Financial statements, funds accounting, Revenue cycles, cost accounting budgets, Incentives, Business plans.</p> <p>Understanding the system: Organizational Structure – school, hospital, Planning and decisions, Finances, Decision makers in the organization.</p> <p>Each participant carried out an active learning project leading a multidisciplinary team.</p>	Yes	<p>Between 2008 and 2011 (four cohorts), 113 individuals were enrolled. Nineteen of those enrolled in the program were high-level staff leaders in the school and hospital; the remaining 94 were faculty members. Multiple medical disciplines.</p>	<p>Reaction: The program was rated highly by participants (mean = 4.5 of 5). Learning: Significant improvements were reported in knowledge, skills, and attitudes surrounding leadership competencies. Behavior: The majority (80%–100%) of participants reported plans to use learned leadership skills in their work. Improved team leadership behaviors were shown by increased engagement of project team members. Results: All participants completed a team project during the program, adding value to the institution.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
12	Fernandez, 2016	The American College of Obstetrics and Gynecologists Robert C. Cefalo National Leadership Institute (ACOG NLI)	United States	No	3.5 days	<p>LDP goal: To help ACOG leaders understand transformation and change in the context of understanding oneself and others; create effective teams and organizational cultures; understand the critical issues of cost-effective care and using epidemiological evidence to guide policy recommendations; learn skills to negotiate effectively; lead change; and become translators of complex scientific medical findings into simple, understandable language for the media as well as other physicians.</p> <p>Study aim: To examine whether such a short-burst, intensive, experiential leadership development approach positively impacts physician's perceived skill level and application of a targeted set of leadership skills and whether participants perceived that the skills learned at the ACOG NLI remained strong even 6 months postprogram.</p>
13	Ferris, 2018	The International Palliative Care Leadership Development Initiative (LDI)	United States	No	2 years (3 weeklong residential courses)	<p>LDP goal: To expand the global network of palliative care leaders in low- and moderate-resource countries who are well positioned to apply their new leadership skills.</p> <p>Study aim: describing the program (somewhat unclear).</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The ACOG NLI is comprised of a series of interactive skills-building workshops and includes completing a series of leadership and psychological assessment tools, including a 360-degree assessment. Participants meet with an executive coach to debrief their individual assessment findings, while small and larger group sessions teach boundary spanning leadership skills in organizational settings as a physician leader.</p> <p>Skills Targeted in the ACOG NLI:</p> <ol style="list-style-type: none"> 1. Creating collaborative organizational cultures 2. Leading others and empowering their success 3. "Selling" a change message 4. Leading change successfully 5. Motivating others at work 6. Applying advocacy skills using a science-based approach 7. Managing media communications 8. Negotiation skills 9. Women's health policy and high level leadership 10. Maximizing my personal leadership success while avoiding derailment 	Yes	<p>37 physicians who attended the eighth cohort (2013) of the ACOG NLI.</p> <p>To date, 360 ACOG Fellows have completed the ACOG NLI through 10 annual cohorts of approximately 36 participants.</p>	<p>Course completion and 6-month postcourse scores indicated statistically significant improvements in scores on all 10 competency areas. Qualitative data gathered at the 6-month postcourse survey provide examples of how participants had applied their skills.</p>
<p>The two-year curriculum that included three thematic residential courses, mentorship, and site visits by senior global palliative care leaders and personal projects to apply their new leadership skills. Focus on self-reflection, leadership behaviors and practices, strategic planning, high-level communication, and teaching skills.</p>	Yes	<p>39 leaders representing 25 low-and moderate-resource countries</p>	<p>The leaders are using their new leadership skills to grow palliative care capacity through significant changes in policy, improved opioid/other medication availability, new and enhanced educational curricula and continuing education activities, and development/ expansion of palliative care programs in their organizations and regions.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
14	Gholipour, 2018	The district health management fellowship training programme	Iran	No	9 months (11 courses over 24 days)	<p>LDP goal: To build managerial capability in Iranian district health managers.</p> <p>Study aim: To evaluate the district health management fellowship training programme in the north-west of Iran.</p>
15	Hackworth, 2018	Core Leadership Program (CLP)	United States	Yes	10 months (4 days and 7 monthly 4-hour meetings)	<p>LDP goal: To develop a cadre of outstanding faculty leaders across the career continuum, foster peer mentorship and coaching among participants, and encourage faculty leaders to create a culture of service, appreciation, inclusion, teamwork, and collaboration.</p> <p>Study aim: describing the program (somewhat unclear).</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>Educational courses:</p> <ol style="list-style-type: none"> 1. Management, leadership (2 days) 2. Managing the district (2 days) 3. Quality improvement (3 days) 4. Planning and evaluation (3 days) 5. Health information management (2 days) 6. Health resources management and economics (3 days) 7. Community participation (2 days) 8. Epidemiology (2 days) 9. Research in health systems (3 days) 10. Human resources and organisational creativity (1 day) 11. Rules and ethics (1 day) 	Yes	72 participants (46 medical doctors), 2 cohorts. (2015-2016)	An improvement in knowledge of health system management. The courses on managing the district (51%), research in the health system (42%), and human resources and creativity (37%) had the most positive differences between pretest and post-test scores.
<p>The structure of the program included 68 hours of learning activities occurring over a 10-month time frame:</p> <ol style="list-style-type: none"> 1. Two 1-day onsite seminars with experiential activities, presentations, videos, case studies, small group cohort discussions (exploration teams), learning triads, and 360° feedback on emotional intelligence. 2. A 2-day offsite session with experiential activities (eg, high ropes course), team-building activities to practice new leadership behaviors, "life stories" sharing, and personal strengths feedback. 3. 7 monthly 4-hour meetings with presentations on core skills by senior faculty leadership team members and exploration team breakout sessions to discuss leadership foundational skills and lessons learned from assigned readings and practice. 4. Reading assignments based on Discover Your True North and How Full is Your Bucket? 5. A half-day for "leadership profile" presentations by each participant. 	Yes	A total of 99 faculty leaders participated in the first 4 cohorts of the program. The participants were multidisciplinary, including physicians, psychologists, biostatisticians, basic scientists, and others.	Significantly improved confidence, self-awareness, and relational skills. Qualitative data analysis demonstrated the positive impact of the CLP on the development of social networks, improved communication, and engagement.

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
16	Howell, 2019	Pathology Leadership Academy	United States	No	1.5 days year one, and 1 day year two	<p>LDP goal: [...] aid in development of faculty leaders for departments of pathology and laboratory medicine, increase the diversity of faculty within the specialty, and enhance the functionality of diverse teams.</p> <p>Study aim: The purpose of this report is to: (1) describe the PLA's development, curriculum, and evaluations from its first 2 years; (2) illustrate how the program has met leadership development needs of academic pathology departments and individual faculty participants; and (3) share how experiences to date could be used to improve the PLA, as well as benefit other leadership programs.</p>
17	Leggat, 2016	Clinical Leadership in Quality and Safety Course	Australia	No	1 year (somewhat unclear)	<p>LDP goal: To educate current and potential clinical leaders in the knowledge, skills and competencies required to successfully lead the healthcare quality and safety agenda, incorporating both an organisational and system-wide perspective.</p> <p>Study aim: To develop clinical leadership among health professionals working in public sector organisations to improve their skills in ensuring high quality and safe health services.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>Drexel University's Executive Leadership Program in Academic Medicine (ELAM) served as a major inspiration for the PLA.</p> <p>The PLA curriculum for both years also reflects topics identified in the 2014 chairs' survey and included speakers external to the APC, in addition to speakers who were active and former chairs and members of APC. Pathology Leadership Academy provided lunch programs with networking opportunities and informal table discussions with senior fellows (previous chairs of pathology departments) and active chairs.</p> <p>Topics curriculum year 2: Leadership styles, Finding strengths as leader, Pathways to leadership, Negotiating for what you need.</p>	Yes	<p>In the first year of the PLA, there were 58 participants from 43 departments in 19 different states.</p> <p>In the second year of the program, there were 37 participants from 22 departments in 17 different states.</p>	<p>Chairs reported that Pathology Leadership Academy provided value to their faculty through preparation for a future leadership role, enhancing skills for a current role, and enhancing understanding of opportunities and challenges in academic medicine.</p>
<p>The curriculum comprised a quality and safety simulation and a workplace project, which were supported by online materials, face-to-face workshops and regular communication with other participants and the program faculty.</p>	No	<p>The program was targeted to clinicians, and of the 62 total participants, 15 (24%) clinicians reported a management role. All health professions were represented with seven (11%) medical, 22 (35%) allied health and 33 (54%) nursing participants. (2011/12 and 2013).</p>	<p>Significant improvements in the leadership practices inventory, emotional intelligence, psychological empowerment, and patient safety skill score. Patient safety attitudes did not change significantly. Qualitative results showed strengthened quality and safety knowledge and skills, and developments in organizational and systems literacy. Participants reported that many projects had resulted in distinct and recognizable changes to practice.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
18	Levine, 2015	Johns Hopkins University School of Medicine Leadership Program for Women Faculty (LPWF)	United States	Yes	10 months (9 half-day interactive session)	<p>LDP goal: The LPWF was developed to enhance leadership skills and networking opportunities for women faculty.</p> <p>Study aim: To present a description and evaluation of a longitudinal, cohort-based, experiential leadership program for women faculty at the Johns Hopkins University School of Medicine.</p>
19	Lewis, 2021	The Hedwig von Ameringen Executive Leadership in Academic Medicine program (ELAM)	United States	No	1 year	<p>LDP goal: to help address ongoing underrepresentation of women among the ranks of senior leaders in academic medicine.</p> <p>Study aim: To explore the experience of ELAM Fellows and leaders from one institution to elucidate how institutional factors influence project implementation and outcomes.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The LPWF focuses on specific gender and leadership content areas as well as the institutional culture and uses both to accomplish curricular goals.</p> <p>The LPWF includes 8 modules (Table 1). Each session begins with unstructured time for participants to network. The LPWF includes opening and closing events that highlight current women leaders in the SOM as guest speakers. The modules are designed to promote experiential learning by incorporating interactive case studies, facilitated discussion, skills building using role-play, and reflective practice.</p> <p>Modules:</p> <ol style="list-style-type: none"> 1. Working Together: 2. Crucial Conversations 3. Speak Like a Pro 4. Influencing for Impact: 5. Creating Agreement and Managing Conflict 6. Leadership Challenges for Women: Overview of Decision-Making and Risk-Taking Strategies 7. Leadership Challenges for Women: Facilitating Group Decision-Making 8. Total Leadership 	Yes	<p>Since the inception of the LPWF in 2009, 174 women have participated in the LPWF.</p> <p>Cohort 1 (2009-2010) n=40 Cohort 2 (2011-2012) n=45 Cohort 3 (2011-2012) n=50 Cohort 4 (2012-2013) n=39</p> <p>Multiple medical disciplines</p>	<p>Significant improvements in skills across 11 leadership domains with the exceptions of 2 domains, Public Speaking and Working in Teams. The greatest increase in rankings occurred within the domain of Negotiation Skills. Qualitative results identified two major themes: (1) Networking and reflecting with other women is valuable, and (2) Negotiation skills are important and can be developed.</p>
<p>ELAM offers intensive leadership training, coaching and mentoring. A core component of the curriculum is the Institutional Action Project (IAP), through which fellows incorporate and translate curricular objectives into tangible outcomes. [focus of the article].</p>	Yes	<p>11 faculty from the institution who enrolled in ELAM between 1999 and 2017, 6 physicians.</p>	<p>Project work had bidirectional impact fellows and the institution. Leading indicators of institutional outcomes included contributions to institutional leadership and culture, and mutual enhancement of the reputation of the fellow and of the institution.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
20	Macphail, 2014	Clinical leadership program (CLP)	Australia	Yes	9 to 10 months (one 2-hour session on-site once per month)	<p>LDP goal: To foster leadership capability and encourage engagement of staff in decision-making within their team and department.</p> <p>Study aim: To appraise whether an in-house CLP is feasible and effective.</p>
21	Maddalena, 2015	Physician Management and Leadership Program (PMLP)	Canada	No	1 year (10 modules)	<p>LDP goal: To provide current or aspiring physician leaders with an introduction to the kinds of skills they will need to function within the health-care administrative environment.</p> <p>Study aim: To document the process the province of Newfoundland and Labrador used to develop an innovative Physician Management and Leadership Program (PMLP).</p>
22	McCray, 2018	postgraduate medical leadership development programme	United Kingdom	Yes	1 year, monthly meetings	<p>LDP goal: It was hoped that this group of people would be the first to begin to initiate a change in the organizational culture, which would impact positively on performance, establish new networks for collaboration and the integration of services, and improve the quality and resilience of care delivery needed at organizational, team and individual level.</p> <p>Study aim: To explore the influence of one cycle of a learning set experience in a postgraduate medical leadership development programme.</p> <p>[action learning (AL) and critical action learning (CAL) perspective]</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The framework for appraisal considered three aspects of the CLP, leadership development, multidisciplinary teamwork and leadership learning. The key elements of the CLP programme were: one 2-hour session on-site once per month for nine to ten months (equivalent to 20 hours), with a guest speaker and group discussion; one self-organised external site visit and one mini-project, both completed in small, interdisciplinary groups; and a presentation to peers and executive staff of their learning from the site visit and the mini-project. Nine on-site sessions were completed in the pilot programme.</p>	<p>2011 Yes 2012 No</p>	<p>In 2011, 17 participants, 3 medical. In 2012, 22 participants, 3 medical.</p>	<p>The CLP significantly increased willingness to take on leadership roles. Five of the 11 participants from the 2011 programme had taken on a new leadership role 18 months later. Senior executive feedback was positive especially around the engagement and building of staff confidence.</p>
<p>Of the PMLP's ten modules, three are delivered online (asynchronous) and seven are delivered in a classroom setting. In-class modules range in length from 4 to 7 hours:</p> <ol style="list-style-type: none"> 1. A Self-Discovery Approach to Leadership 2. Strategic Planning 3. Managing Competing Priorities 4. Project & Change Management 5. Organizational Structures 6. Evaluation Methods 7. Public Relations & Communications 8. Patient Safety 9. Recruiting & Performance Development 10. Leading vs. Managing 	<p>Unclear</p>	<p>In the 2012-2013 PMLP Pilot (n=35 physicians; n=2 non-physicians). In the 2013-2014 PMLP (n=33 physicians; n=1 non-physician).</p>	<p>Significant pre-/post-increases in knowledge and confidence. 95.07% reported feeling more prepared for their leadership responsibilities. 95% also agreed that it enhanced their interest in a leadership position. Data demonstrates application of the knowledge/skills obtained from PMLP in the workplace.</p>
<p>The programme was held on one day a month for one year and comprised three events: (1) a reflective commentary and discussion led by the Trust's chief executive; (2) learning sets of five to six people; (3) lecturer-led input to support a work-based project centred on integration of services that formed a key area for learning set discussion on progress.</p>	<p>Unclear</p>	<p>Participants are nine members from an 11-member senior medical doctor cohort enrolled in a postgraduate leadership programme; [Study participants].</p>	<p>The paper affirms other study findings that CAL in the development of participants' collective reflexivity has the potential to deal with emotions and power relations in organizational life. An original contribution lies in advancing the idea that CAL can help build resilience in doctor leaders and groups in uncertain conditions such that they are able to challenge current care delivery and effect change in organizational performance.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
23	Miani, 2013	Barking, Havering and Redbridge University Hospitals NHS Trust Fellowships in Clinical Leadership Programme	United Kingdom	Yes	1 year	<p>LDP goal: To develop (or strengthen) individual leadership skills while learning about change implementation and organisational management.</p> <p>Study aim: To better understand the impact of the Fellowships in Clinical Leadership Programme, both on individual and group behaviours as well as on service quality improvement or organisational development, NHS London commissioned RAND Europe, in collaboration with Improvement Science London, to conduct an evaluation of the Programme.</p>
24	O'Neil, 2019	Applied Physician Leadership Academy™ (APLA)	United States	Yes	18 months, 8 modules	<p>LDP goal: To grow the talent of its existing leaders to manage change alongside THS's health system executives.</p> <p>Study aim: To illustrate the incorporation of an evidence-based management approach in support of evidence-based organizational development practice.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The Fellowships in Clinical Leadership Programme (the Programme), introduced in March 2012 for a period of 12 months, involved the appointment of clinicians (doctors, nurses, midwives) on a one-year contract at the Trust to lead on a range of diverse quality improvement (QI) projects. The combination of learning activities, clinical duties and QI project work sought to enable participants to transfer and manifest new competencies in their QI projects, and improve the quality of care within the Trust.</p>	Yes	<p>Two schemes, with Scheme A (10 external Fellows, 20 senior clinicians) involving clinicians from a variety of specialties while Scheme B (4 external Fellows, 8 internal Fellows, 6 neonatal nurses, 12 senior clinicians) focused on maternity services in particular and involved mainly midwives and nurses.</p>	<p>The Programme had notable impacts at individual and organizational levels. Individual impact included enhanced communication and negotiation skills or increased confidence. At the organizational level, participants reported indications of behavior change among staff, with evidence of spill-over effects to non-participants towards a greater focus on patient-centered care.</p>
<p>The academy utilizes multiple learning strategies including learning and application modules, 1:1 assessment and coaching, and Action Learning teams and projects to foster rapid leadership development. The APLA's multi-modality approach is designed to build physician engagement and strengthen physician leadership capability.</p> <p>Leading Self, Leading Others, Leading Change, Leading for Results</p>	Unclear	<p>Unclear</p> <p>Twenty-six emerging physician leaders joined together from across the organization to kick off a second cohort of the APLA in January 2017.</p>	<p>Post-APLA results demonstrated an increase in the frequency with which the participants reported they exhibit these competencies. Leadership behavior change (approaching leadership tasks, giving feedback, importance attributed to management role).</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
25	Pradarelli, 2016	Leadership Development Program	United States	Yes	8 months (1 full day per month)	<p>LDP goal: To train surgical faculty to enhance their leadership abilities.</p> <p>Study aim: To evaluate critically a Leadership Development Program for practicing surgeons by exploring how the program's strengths and weaknesses affected the surgeons' development as physician-leaders.</p>
26	Rao, 2017	Partners Clinical Process Improvement Leadership Program	United States	Yes	4 months (3 sessions ranging from 1 to 2 days each followed by one final day of project presentations.)	<p>LDP goal: to develop a longitudinal, local, interdisciplinary, team-based QI educational program for active clinicians and administrators to align with institutional priorities in QI and engage frontline clinical teams.</p> <p>Study aim: This article describes the Partners Clinical Process Improvement Leadership Program (CPIIP).</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>Surgeon-participants gathered in-person for 1 full day per month for 8 consecutive months for didactic and experiential learning. Examples of curricular content that was surgeon-specific included surgery-oriented business case studies (eg, Harvard Business School case on building an ambulatory surgery center) and finance sessions, where departmental and division administrators shared financial statements from the Department of Surgery. Participants also conducted longitudinal team projects that focused on improving clinical care, education, or research processes within the Department of Surgery. Each participant underwent baseline, 360-degree evaluations by colleagues and supervisors and by direct reports regarding their leadership performance.</p> <p>Four domains: Leadership, Team-building, Business acumen/finance, Health care context.</p>	Yes	21 surgical faculty members (2012).	<p>surgeons reported personal improvements in the following 4 areas: self-empowerment to lead, self-awareness, team-building skills, and knowledge in business and leadership. Surgeons felt “more confident about stepping up as a leader” and more aware of “how others view me and my interactions.” They described a stronger grasp on “giving feedback” as well as a better understanding of “business/organizational issues.” Overall, surgeon-participants reported positive impacts of the program on their day-to-day work activities and general career perspective as well as on their long-term career development plans.</p>
<p>The Partners Clinical Process Improvement Leadership Program (CPIP) is a 6-day experiential program. Interdisciplinary teams complete a QI project framed by didactic sessions, interactive exercises, case-based problem sessions, and a final presentation.</p> <p>Besides project work, session topics included: History of QI, Change concepts, Using SCP in Healthcare.</p>	Yes	<p>From March 2010 to July 2015, 13 cohorts consisting of a total of 239 teams and 516 individuals participated in CPIP. Forty-five percent (233/516) are practicing physicians; 35% (179/516) are registered nurses/other clinicians; and 20% (104/516) are administrators.</p>	<p>A total of 239 teams composed of 516 individuals have graduated CPIP. On completion, participant satisfaction scores average 4.52 (scale 1-5) and self-reported understanding of QI concepts improved. At 6 months after graduation, 66% of survey respondents reported sustained QI activity.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
27	Rask, 2011	P1. Leadership for Healthcare Improvement Course P2. Practical Methods for Healthcare Improvement Course	United States	Yes	P1. 2 days P2. 4-months, 12 days	<p>LDP1 goal: To equip leaders and supervisors with a basic understanding of QI concepts and vocabulary, along with a clearly articulated vision of the quality culture that EHC seeks to engender. The expectation is that leaders completing the course will be able to actively promote the desired attributes of culture and will engage, enable, and sustain frontline staff in their QI activities.</p> <p>LDP2 goal: To develop frontline employees capable of leading quality initiatives and department managers capable of managing improvement processes in their local clinical service areas.</p> <p>Study aim: We describe the design and evolution of a unique two-pronged, internally delivered QI training program that targeted both health system leaders and frontline staff around a central mission to improve health system performance.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>P1. Lectures and small group discussion. The Case for Quality: Current state of health care, Current state of Emory's health care system, Emory's strategy and structure of the Office of Quality, Public reporting of quality data and public accountability.</p>	<p>P1. Yes P2. No</p>	<p>P1. 545 leaders participated, 44 (8.1%) of the participants were physicians, and 136 (25.0%) had a nursing background, multi-disciplinary. (9x, 2008 and 2009).</p>	<p>P1 participants significantly improved knowledge in all content areas, and self-assessments revealed high comfort levels with QI principles following the training.</p>
<p>Processes Have Behaviors: Distribution and variation.</p>		<p>P2. 85 participants of whom 16 (18.8%) were physicians and 18 (21.2%) were nurses. Multiple medical disciplines. (4x, 2008-2009).</p>	<p>All P2 participants were able to initiate and implement QI projects. Participants described significant challenges with team functionality, but a majority of the QI projects made progress toward achieving their aim statement goals. A review of completed projects shows that a significant number were sustained up to one year after program completion.</p>
<p>Health Outcomes Result from Processes: Human factors and reliability science, Health care processes, Quality and cost.</p>			
<p>Tools for Process Management: Improvement techniques.</p>			
<p>P2 Didactic, group discussion, group exercises, case studies, role play, experiential, small group breakout sessions, panel discussion.</p>			
<p>Content examples: Contributing factors and important roles in highly functioning teams, barriers to team function, negotiating areas of conflict, history of modern PI, examples of successful PI practice in our system, introduction to Lean, introduction to 5S, 5S exercise, experiences doing test of change, examples of PI.</p>			
<p>Project presentations, the context for improvement, health information technology, data warehouse, culture transformation, leading change, sustainment and spread.</p>			

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
28	Sanfey, 2011	Leadership in Academic Medicine (LAM)	United States	Yes	10 weeks (10 3 to 7-hour sessions)	<p>LDP goal: To further develop faculty members who had demonstrated leadership potential within the School of Medicine.</p> <p>Study aim: The purpose of this study is to elicit faculty perspectives on their leadership skills before and after participation in a Leadership in Academic Medicine (LAM) Program.</p>
29	Shah, 2013	Sailing a Safe Ship" (SASS)	United Kingdom	Yes	2 days (8 sessions)	<p>LDP goal: to facilitate ophthalmologists' understanding and analysis of their personal learning needs in relation to the task ahead, and so be more proactive in accelerating their transition period.</p> <p>Study aim: to describe a 2-day program focused on new and prospective consultant specialist ophthalmic surgeons entitled "Sailing a Safe Ship" (SASS).</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The LAM curriculum is based on the women-only Executive Leadership in Academic Medicine program at Drexel University, which focuses on departmental and institutional fiscal planning, emerging issues, and personal and professional development. Transformational leadership and emotionally competent is a priority of the curriculum. All participants engage in extensive self-analysis using standardized tests such as the Myers Briggs personality test and the Leadership Skills Inventory 360°. The instructional sessions focus on key professional development areas, such as managing organizational change, making strategic decisions, assessing the dynamics of successful leaders, financial management, and finding life balance in a growing career.</p>	Yes	<p>18 of the 32 participants were male (56%), and 22 (69%) held an M.D. degree. (2008).</p> <p>Post-survey to 110 prior participants (2004-2007).</p>	<p>All participants reported improved leadership skills, but the percentages were lower for Long-Term Post-LAM participants than for the Immediate Post-LAM participants. In addition, although 58% of Immediate Post-LAM women, compared with 19% of Immediate Post-LAM men ($p < .05$), were actively seeking leadership roles, this was reversed in the long-term group (26% of women vs. 66% of men; $p < .05$).</p>
<p>The program used gaming, team challenges, meta-planning, role play and professional actors, interactive presentations, and self-analysis tools.</p> <p>Sessions:</p> <ol style="list-style-type: none"> 1. Role-playing session using case scenarios of challenging clinical and managerial situations. 2. Focusing on leadership and the power of the team 3. Risk management strategies 4. It's all about communication 5. Repeat role-play sessions. 6. How the consultants can maximise support and collaboration within the wider team 7. Understanding the General Medical Council and National Clinical Assessment Service agenda 8. Summary and close 	Unclear	<p>Unclear, consultant specialist ophthalmic surgeons.</p>	<p>Participants' insights reflected 4 key themes: admitting vulnerability and uncertainty, taking responsibility for managing risk, being self-aware and reflexive, and internalizing authentic leadership.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
30	Smith, 2014	Faculty Leadership Academy (FLA)	United States	Yes	2 years (quarterly seminars)	<p>LDP goal: To assist physicians in successfully navigating the difficult complexities facing healthcare today.</p> <p>Study aim: The purpose of this study was to describe and analyze the perspectives of physicians who attended the Faculty Leadership Academy (FLA) to determine their perspectives on program effectiveness in developing leadership competencies and skills, successful instructional strategies and the impact of the FLA on their intentions to pursue leadership opportunities.</p>
31	Smith, 2019	The Radiology Leadership Academy (RLA)	United States	Yes	9 months (one full day per month)	<p>LDP goal: To develop highly engaged leaders who offer innovative solutions to adaptive challenges within the department, institution, and community.</p> <p>Study aim: To share our experience in developing and implementing an interprofessional leadership development program within a large academic radiology department.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The academy is a two year program where participants attend quarterly seminars focused on skill development of competencies required to face critical issues in healthcare. Academy I modules are Negotiation Skills and Principles, Quality Improvement Imperative, Drivers of Financial Performance, and Problem Solving Using Analytic Tools. Academy II modules are Clinical Capital Investing, Managing Disruptive Behavior, Towards a Higher Standard of Patient Safety, and Mediating Medical Staff Conflict.</p>	Yes	<p>Approximately 30 members are enrolled into the FLA program each year. A total of four cohorts and 113 graduates have completed the coursework.</p> <p>A total of 11 physicians were interviewed.</p>	<p>Participants indicated finding the course effective, especially the negotiations and finance modules. These modules provided new language, a better understanding of processes and an opportunity to develop skills through interactive class exercises such as case studies. Participants described an increased self-awareness of their interpersonal skills and expressed a desire for greater exposure to emotional intelligence principles. Participants experienced a transformational shift in how they constructed their identity as a physicians and leaders, and questioned assumptions about the physician's role in healthcare.</p>
<p>Principles central to the curriculum design were (1) broadening awareness and understanding of our department's multifaceted role within the academic health center and (2) building key leadership competencies. One important design consideration was cohort composition. We chose to include both faculty and non-faculty in each cohort to offer the best opportunity for shared awareness, meaningful learning, and positive organizational outcomes. With a core curriculum as the program foundation, individual course modules may be revised annually based on participant feedback regarding relevance to and impact on the learning experience, current environment or industry shifts, and organizational needs.</p>	Yes	<p>109 participants (physicians, nurses, administrators), 9 cohorts (2009-2010, 2010-2011, 2011-2012, 2012-2013, 2014-2015, 2015-2016, 2016-2017, 2017-2018).</p> <p>75 participants from cohort 1/8 participated in study.</p>	<p>Over the past decade, 100 participants have completed the program with 80% retention, substantial professional growth, and increased capacity for mentoring others.</p> <p>RLA team projects emphasized four areas: (1) improving the patient or customer (eg, referring physician) experience, (2) improving the employee experience, (3) business process improvement, or (4) improved safety or quality of images or services. Nearly all of the team projects that were developed and piloted within the RLA have been partially or fully implemented in the department.</p>
<p>Key competency areas:</p> <ol style="list-style-type: none"> 1. Leadership theory and concepts 2. Self-awareness and management 3. Leading teams and developing others 4. Leading an organization 5. Business concepts 6. Communication skills 			

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
32	Steele, 2020,	Association of American Medical Colleges (AAMC) Council of Deans (COD) Fellowship Program	United States	No	1 year	<p>LDP goal: Support medical school deans in their role (somewhat unclear).</p> <p>Study aim: The purpose of this study was to determine the outcomes of the COD Fellowship Program with respect to participants' achieving the goals of becoming a medical school dean and developing leadership skills.</p>
33	Throgmorton, 2015	Physician Leadership Academy (PLA)	United States	Yes	9 month (10 sessions)	<p>LDP goal: To strengthen leadership skills and help physicians thrive in the ever-changing, fast paced world of healthcare.</p> <p>Study aim: To outline the evaluation strategy and outcomes of the inaugural year of a Physician Leadership Academy (PLA) developed and implemented at a Michigan-based regional healthcare system.</p>

Linking leadership development programs for physicians with organization-level outcomes

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The yearlong program has 4 main components: (1) dean mentoring; (2) an introduction to the strategic goals and activities of the COD through attendance at COD meetings; (3) completion of a leadership project that addresses an issue of importance to the fellow's institution; and (4) attendance at the AAMC Executive Development Seminar for Deans, an executive leadership development program for new deans.²¹</p>	Yes	<p>Of the 37 COD fellows invited to participate in the survey, 27 (73%) responded. Multiple medical disciplines.</p>	<p>The web-based search found that 27% (10/37) of the fellows became medical school deans (average tenure 5.6 years); 2 fellows became deans of other types of schools. The majority (88%, 23/26) indicated their fellow experience persuaded them to pursue being a dean; 2 (8%) indicated it did not.</p>
<p>The organizational needs assessment and best practice research resulted in a program that sequenced topics and experiences to build self-awareness/ intra-personal, interpersonal, and organizational effectiveness.</p> <p>Topics:</p> <ol style="list-style-type: none"> 1. Introduction 2. Intra & Interpersonal Effectiveness 3. Personal Resiliency 4. Coaching 5. Communication 6. Teamwork 7. Change Management 8. Business Acumen 9. Quality Focus 10. Wrap Up Session 	Unclear	<p>21 physicians (2021 cohort). Multiple medical disciplines.</p>	<p>Four themes emerged from the interview data: increasing self-awareness; building relationships; applying new skills; and building confidence.</p> <p>Completions of the program activities outlined in Level 2 results were also indicative of behavior change and engagement.</p> <p>Organization based results were evaluated via survey from a stakeholder audience to whom PLA participants presented their team based project work, 97 percent agreed the work of the teams illustrated alignment with the organization's stated strategies.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
34	Toma, 2020	Scottish Quality and Safety Fellowship (SQSF)	United Kingdom	No	10 months	<p>LDP goal: To develop clinicians with advanced quality improvement knowledge, technical ability and essential leadership skills.</p> <p>Study aim: The evaluation explores four levels of educational and practice outcomes associated with (1) the reaction of fellows to SQSF participation, (2) learning gained, (3) subsequent behaviour changes and (4) the overall impact on national and international level capability and capacity building.</p>
35	Torbeck, 2018	Leaders Growing Leaders	United States	Yes	<p>Program with 4 tiers (T)</p> <p>T1. During 2014 to 2016 (7-modules, once every 3 months)</p> <p>T2. 1 year (monthly)</p> <p>T3. 1 year (monthly)</p> <p>T4. 3 to 6 months</p>	<p>LDP goal: To cultivate an interest in leadership education and to enhance faculty members' capabilities as leaders, especially as it pertains to their administrative skills.</p> <p>Study aim: The purpose of this paper is to describe the structure of a tier-based leadership development program called Leaders Growing Leaders, to identify the major curricular components to each tier including measures and outcomes, and to share lessons learned for those who may want to begin a similar leadership development program.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The educational programme content consists of interactive learning sessions focusing on developing leadership skills and promoting QI principles and values, as well as residential workshops to facilitate learning from global experts, and practical opportunities to apply and spread the learning in the workplace setting and beyond.</p> <p>Main topics:</p> <ol style="list-style-type: none"> 1. Understanding of Quality Improvement Methodology 2. Demonstrate ability to design and deliver a QI project 3. Deepen understanding of Leadership skills 4. Develop networking capability 	Unclear	<p>Of the 222 participants in cohorts 1 to 10), the majority were Scottish based (n=143, 64.0%), female (n=129, 58.1%) and medical doctors (n=138, 62.0%).</p>	<p>Most participants reported improved social, behavioural and emotional skills, knowledge and attitudes and, with sustained support of their host organisations, were able to apply and share learning in their workplace. The impact of the SQSF on a wider national and international level capability and capacity was both mediated and moderated by a widerange of interrelated contextual factors.</p>
<p>T1: (1) Introduction to leadership: the art of changing the conversation, (2) strategic planning, (3) negotiation and conflict management, (4) strategic marketing of health care, (5) creating change, (6) creating and communicating a compelling vision, and (7) managing difficult people (especially junior faculty).</p>	<p>T1. No T2. Yes T3. Yes T4. Yes</p>	<p>T1. Average attendance was ~20 to 25 faculty (20% of faculty) at each session; 57 out of 121 faculty attended at least 1 session T2. 6 faculty</p>	<p>The “deliverables” from the Tier II and III leadership sessions were very insightful and indicated being impactful on both the learning and behavior outcome levels.</p>
<p>T2. Action learning. (1) What makes a great leader?, (2), Goal setting: spending time in quadrant II, (3) Culture and office politics, (4) The role of trust and accountability, (5) Managing your time and managing failure (junior faculty who had leadership roles).</p>		<p>T3. 9 faculty T4. 5 senior leaders</p>	<p>Additionally, in the last 5 years, 5 of the 6 division chiefs have turned over and all have been replaced by internal candidates whom we have groomed through various leadership skill building programs.</p>
<p>T3. Action learning. (1) Principles of decision-making, (2) The role of emotional intelligence, (3) Evaluating performance, (4) Preparing a program budget, (5) The role of trust and accountability, (6) Crucial conversations, (7) The science and art of recruitment, (8) Changing the culture, (9) Managing time, (10) Managing conflict (faculty who had demonstrated leadership success in junior roles).</p>			
<p>T4. Strategies for development included 360° leadership evaluation and feedback, executive coaching for 3 to 6 months with targeting of issues identified in the 360° evaluation, and monthly coaching sessions with the chair. (senior leadership roles).</p>			

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
36	Tsoh, 2019	UCSF-Coro Faculty Leadership Collaborative (FLC)	United States	Yes	20 weeks (10 sessions)	<p>LDP goal: To catalyze individual and collective change to benefit both the participants and the broader UCSF community.</p> <p>Study aim: To describe perspectives from our 12-year experience cultivating a formal faculty LDP within an academic health center and longitudinal outcomes of our LDP.</p>
37	Vitous, 2019	Leadership development program (LDP)	United states	Yes	Unclear, 1 year cohort	<p>LDP goal: Unclear</p> <p>Study aim: To explore the impacts of implementing a leadership development program on the culture of the Department of Surgery at University of Michigan, Ann Arbor.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>Coro's design of curriculum and learning activities encourages participants to accept new tools introduced in the training, apply the tools, and to then adapt the tools, as needed, based on one's experiences and relevancy after a process of reflection. Coro uses an array of tools to focus on developing six core leadership competencies: 1) self-awareness, 2) critical thinking, 3) effective communication, 4) inclusion, 5) collaboration, and 6) empowered professionalism (confidence to represent oneself consistently in many different environments), rather than following a specific leadership model.</p>	Yes	<p>137 participants: 108 Medicine, 14 Dentistry, 8 Nursing, 6 Pharmacy (7 cohorts, 2005-2012)</p>	<p>The proportions of graduates attaining leadership positions within UCSF such as deans or department chairs among all, URM, and women URM graduates were 9.6%, 33.3% and 45.5%, respectively. Graduates' perceived impacts from 8 months to 8 years after program completion and showed 91.7% of survey respondents felt the program both increased their understanding of UCSF as an organization and demonstrated the University's commitment to foster faculty development. Qualitative results indicated that graduates perceived benefits at individual, interpersonal, and organizational levels.</p>
<p>The program was structured around four domains: leadership, team building, business acumen, and health care context.</p>	Yes	<p>A total of 21 surgeons participated in the program: 15 men and 6 women.(2012-2013). Multiple surgical clinical areas.</p>	<p>The program influenced surgical culture in the following ways: (1) promoted a more participative leadership style, providing tools for surgeons to create a more collaborative environment; (2) increased the culture of diversity, with leaders in the department valuing a more inclusive and wide range of skill sets; and (3) strengthened the collegial environment as evidenced by improved morale and relationships within the department.</p>

No.	First author, year	Name LDP	Country LDP	In-house LDP (Yes/No)	Duration LDP	Main goal LDP and study aim
38	Vreeling, 2019	Mindful leadership for medical specialists	Netherlands	No	10-weekly 5-hour sessions	<p>LDP goal: To become a better leader (unclear)</p> <p>Study aim: To explore how a 'Mindful leadership for medical specialists' course affected medical specialists' leadership.</p>

Content and learning methods LDP	Participants selected (Yes/No)	Participants LDP	Main outcomes
<p>The course included the original Mindfulness-Based Stress Reduction (MBSR) programme developed by Jon Kabat-Zinn. In addition to the MBSR, the course consisted of experiential teaching sessions on cognitive behavioural therapy, compassion and three frameworks relevant to becoming a better leader.</p>	No	<p>In total, five cohorts attended the mindful leadership course, totalling 52 medical specialists overall. Multiple medical disciplines. Seventeen invitees agreed to participate</p>	<p>Themes were defined within these categories: awareness of self, open mind, insight and appreciation of self (A), emotional and cognitive self-regulation, letting go of unhelpful behavior and developing helpful behaviour (B), differences in attitude to others such as awareness of (impact on) others, keeping an open mind about others, allowing difficult emotions associated with others, appreciating of others (C), and communicating more effectively, providing direction, empowering and caring for others (D).</p>

Supplementary material D – Evidence backing up MRPT

Note: we do not exhaustively give all possible available fragments from studies that might support our MRPT

Note: we included studies in this table if they included information on the C and M, or C and O, or M and O, of the proposed CMO.

Acquiring self-insight and people skills (CMO1)	
<p>If LDPs include constructive feedback on physicians’ personality traits and leadership behavior [C], physicians become more self-aware and obtain insight into the needs and preferences of the people they lead. Accordingly, they adopt a people-oriented leadership style which benefits communication and collaboration [M], and thereby the organization’s culture [O].</p>	
<p>Studies that provide (partial) evidence</p>	<p>DeRusso, 2020; Ennis-Cole, 2019; Fernandez, 2016; Ferris, 2018; Hackworth, 2018; Hopkins, 2018; McCray, 2018; Miani, 2013; O’Neil, 2019; Pradarelli, 2016; Sanfey, 2011; Shah, 2013; Smith, 2014; Throgmorton, 2015; Toma, 2020; Tsoh, 2019; Vitous, 2019; Vreeling, 2019.</p>
<p>Illustrative supporting evidence (text fragments, descriptions, data)</p>	<p>Individual assessments and the one-on-one coaching were essential attributes of the program. The 360-degree evaluation, the dominance, influence, steadiness, and conscientiousness (DiSC) behavior assessment tool, and the emotional intelligence assessment provided feedback that created an opportunity for change in behavior. Coaches assisted in interpreting the feedback and developing an action plan. [C/M] - DeRusso, 2020</p> <p>Participants used learnings from program sessions to create a vision, motivate others, resolve conflict, provide feedback, and improve communication. [C/M] - DeRusso, 2020</p> <p>The physicians who accepted the invitation received two self-assessments: an in-house 360-degree assessment and an insights profile. [C] - Ennis-Cole, 2019</p> <p>Participants stated that they started to develop team-building skills, work toward consensus, and build others’ trust prior to starting the physician leadership development program. Their participation in the program only enhanced these skills. [M] - Ennis-Cole, 2019</p> <p>Through coaching and learning, this same participant realized that he needed to be deliberate about using these same skills 24/7 and transferring them outside of the clinic when he interacted with nurses and administrators. He learned that this would make him a more effective leader. [C/M] - Ennis-Cole, 2019</p> <p>The ACOG NLI is comprised of a series of interactive skills-building workshops and includes completing a series of leadership and psychological assessment tools, including a 360-degree assessment. Participants (hereafter referred to as Fellows) meet with an executive coach to debrief their individual assessment findings. [C] - Fernandez, 2016</p>

Twenty-three of the 26 Fellows (88.5%) completing the 6-month follow-up survey provided qualitative data, which provided examples of how skills from the course were utilized. Eighty-three percent of respondents cited improved communications skills, and 91% cited creating a team-based culture. [M/O] - Fernandez, 2016

"This course definitely was a life-changing experience. I have used many of the skills I learned to organize/run meetings, communicate more effectively with people, and seek out opportunities that fit my style better." [M] - Fernandez, 2016

Participants indicated that the mentorship and coach interactions were an important part of their learning experience. They helped me, the mentors with leadership experience. They helped me, the mentors with leadership in palliative care. Able to ask for guidance. The coach help me understand myself better and get emotionally stronger. It was a great experience for me especially since my mentor taught me how to analyze or assess my perceptions/feeling or attitude towards issues or people and make unbiased decisions about different issues. This has greatly improved my ability to work with a team and value every member. I think that the interaction with the mentors and the coaches is one of the most important aspects of the RC. In the lobbies, during breaks and lunches, there is a parallel curriculum that is as interesting as the programmed course. I learned a lot through the advice and conversations I had with my mentor and the rest of the LDI team. [C/M] -

Ferris, 2018

The program was designed to (1) provide opportunities for self-reflection, peer support, and practice over an extended period; (2) use multiple learning formats, including onsite and offsite learning settings, 360° feedback, small groups, experiential learning, and guest speakers, to maintain energy and excitement; (3) initially focus on helping participants discover their personal strengths, limitations, and values before focusing on leadership competencies and core skills; (4) connect to participants' experiences with leadership at work as well as in their homes and communities; and (5) help participants acknowledge how personal viewpoints can positively or negatively impact their leadership influence. [C] - Hackworth, 2018

Participants also reported that the program increased their awareness of the impact of their leadership behaviors on others, increasing their utilization of positive leadership styles and behaviors; increased their ability to engage and empower members of their clinical/research teams; increased self-confidence in their leadership skills and better prepared them for future leadership roles; enhanced their emotional intelligence (eg, self-awareness and self-regulation); and increased their awareness of the importance of directly acknowledging others' accomplishments and contributions. [C/M] - Hackworth, 2018

Analysis of qualitative survey data provided by division directors indicated that on completion of the CLP, participants demonstrated improvements in leadership ability, confidence as a leader, listening skills, conflict management skills, and cross-disciplinary collaboration. [M/O] - Hackworth, 2018

Leadership program participants completed baseline assessments of their leadership competence and received 360-feedback from a supervisor, peers, and direct reports to identify strengths and improvement opportunities. They also completed the Myers Briggs Type Indicator and the Thomas Kilmann Conflict Mode Instrument. [C] -Hopkins, 2018

In terms of actual changes in leadership behavior, the self-reported distribution of work within project teams gradually shifted from the leader more to team members, as leaders acquired more team leadership skills. [M] - Hopkins, 2018

AL / CAL approach. Action learning (AL) is an experiential learning method in which participants learn by doing and then reflecting on what they have done. [C] - McCray, 2018

Not just listening for the sake of listening or paying lip service or pretending to listen or just. . .you know. But actually listening and listening to the detail and the importance and judging the importance of that detail and internally processing that in a way that is helpful to me and to the organization and the patients that I treat, and it comes back to that (AL4). - [M/O] - McCray, 2018

Figure 4 illustrates how some learning activities were considered to be especially useful and there was some suggestion that components such as 'self-understanding and interpersonal side of leadership' increased in perceived value over time. Participants emphasised the importance of self-understanding in order to improve working with others: The module where they tried to understand people, their personalities and the way they behave and how to interact with people was very useful because sometimes somebody may have difficulties, so [understanding] how to approach people and why they are reacting the way they are was very useful. (Int15) [C/M] - Miani, 2013

Participants reported that the taught modules mostly contributed to developing their leadership in areas such as confidence, communication skills, negotiation skills and team management skills. [C/M] - Miani, 2013

Skills were further developed by means of one-to-one coaching sessions delivered by QFI, alongside more informal coaching provided by mentors. One interviewee noted how individual coaching had 'helped understand yourself; and this is part of being a leader' (Int4), while another Fellow commented on the value of coaching being 'flexible' and tailored to the needs of the individual (Int1). [C/M] - Miani, 2013

This finding was supported in interviews, with mentions of opportunities to work better as a team (Int7) and to improve people management considered a strength of the Programme: The team work, the group work, I mean talking about different people and how we impact, how we think about making changes for the benefit of the patient. All this is happening as well and I think this is a good change and if we keep doing that it will make a huge difference in the communication and eventually it will make a great difference to the patient. (Int15) [M/O] - Miani, 2013

There was an overarching view that a perceived proactive and positive attitude of Fellows may have contributed to cultural change in the Trust. Interviewees reported that they tried to share what they had learned and so influence the work culture at the Trust (Int1, 5 and 7): I have been able to pass these skills on to my colleagues too. (Int7) [M/O] - Miani, 2013

In the CI interviews, participants also noted that the EI learning module, and the associated assessment and coaching provided by the session facilitator, helped them gain greater insights into their strengths and weaknesses. For example: I think that the emotional intelligence part really helped me... coaching me to really challenge myself to do things that the people in the room may not be happy with, but to do it in such a way... that you actually can walk away having disagreed and still having everyone say 'Okay, that was the right decision.' [C/M] - O'Neil, 2019

Surgeons also reported an increased level of self-awareness after participating, particularly referring to the 360-degree personal evaluations they underwent. One surgeon said the program "helped me understand how others view me and my interactions." Surgeons identified certain aspects of their behavior in leadership roles that they had not recognized previously, with 1 participant realizing that he/she always "appear busy, frazzled, unapproachable." These "self-revelations" were considered an effective portion of the program, enhancing surgeons' understanding of their own strengths and weaknesses as leaders in surgery. [C/M] - Pradarelli, 2016

Next, the satisfaction of having a coach to assist participating surgeons in developing a personalized leadership plan appeared to depend on both the individual coach and the individual participant. We found that a few surgeons perceived their coach to be less effective and felt that "the coaching was expensive and did not pay off." Some of the coaches with less experience tended to not be able to "make an impression, [and were] too generic." In contrast, surgeons who had more experienced and reputable coaches found the coaching sessions "insightful and nice to have [C] - Pradarelli, 2016

In line with the team-building curricular domain, participants reported an improved ability to foster collaborative relationships among team members. Some reported specific changes in behavior, such as “giving feedback, both positive and negative,” and exercising patience. Other comments focused on the collegial environment that the leadership program created among the participating surgeons themselves. For example, one participant perceived the program to be a “morale-boosting event, bringing people together to bond over a common goal.” [M/O] - Pradarelli, 2016

All participants engage in extensive self-analysis using standardized tests such as the Myers Briggs personality test³⁴ and the Leadership Skills Inventory 360°. [C] - Sanfey, 2011

Participants commented about gaining personal insight into strengths (25% of participants) weaknesses (22% of participants), or generally becoming more self-aware (25% of participants). [C] - Sanfey, 2011

Twenty-six (94%) participants indicated that they had changed their professional behavior as a result of LAM. Comments about a change in relationship behavior dominated, for example, becoming more encouraging (18% of participants): “I have tried to reach out more to others, to bring them into what I do and find out what they do” (M). Six (21%) people commented about gaining insight into oneself (2 participants), “I find I am much more reflective about my interactions with others” (W), or into others (4 participants). Sixteen (57%) respondents had made a change in their personal life. These changes included a change in communication with friends or family, “Listening more to what the other person is saying” (M), or taking up a hobby or activity. [M] - Sanfey, 2011

This change was expressed as a need for personal growth (36% of participants): “I realize the responsibility I have to act better, as I am the example” (W), “I am less concerned about being forceful as a leader or right, and more focused on leading group to a consensus that everyone is comfortable with” (W), and “Prior to course, I thought a good leader was someone who was good at getting people to do something by force of will. Now I see that someone is a good leader if they are aware of how they and others operate” [M] - Sanfey, 2011

Establishing a supportive, nonjudgmental environment allowed participants to release their feelings and anxieties about the task ahead of them: “I feel extremely vulnerable about what I’m getting into, but sharing your experience is very comforting.” However, nurturant effects may be discomfiting, for example, by shaking complacency: “I was quite happy before I came here, now I’m stressed!” [C] - Shah, 2013

Heightened self-awareness helped participants to examine their existing self-perceptions, and also realize that success in their leadership role would depend on others’ perceptions of them: “I never thought about how others see me. It has helped me to learn to know my limits.” [C] -Shah, 2013

Miller; “I personally have done a number of EI measures and always learn something about myself and ways to improve the way I interact with people.” [C/M] - Smith, 2014

The interviews and survey responses yielded several ideas to enhance the next PLA session: topic areas, timing of team projects, better explanations of how to work with a coach, how to make the most of a 360 evaluation process, and how to enhance usage of the SharePoint site. [C] - Throgmorton, 2015

The DiSC 360 was pretty enlightening to show me about myself and how to interact with different types of people [C/M] - Throgmorton, 2015

Biggest encompassing thing actually gets back to the personalities. I don’t walk around saying oh there’s a C and there’s an S and there’s a D, but I do think that I am a little more aware of where there is a different personality in front of me and I think that as physicians and surgeons specifically that if you paint us with a brush, okay this is how we do it and come along, what is it going to take for me to convince you, and I do think that I am a little more aware of having to chance my communication [...] tailoring how the conversation is going to go (depending on differing needs). [C/M] - Throgmorton, 2015

Summary of what was shared in an interview: A participant shared how she applied skills and encouraged a partner to do as well and it led to better cross departmental communication and problem solving. [M/O] -

Throgmorton, 2015

While interviewees valued the domain knowledge/skills relating to practical QI approaches, many reported the content and practice opportunities relating to social, behavioral and emotional skill development as being the most impactful aspect. This has helped them become more confident clinicians who are now willing to take appropriate risks, make mistakes and learn from failures: I’m much more philosophical when there’s problems at work so I’m trying to give people time and space to reflect on the problems that they’ve encountered. It’s something developed in the Fellowship that’s gone into my clinical arena and made me a better clinician overall (I7, Hospital Consultant). [C/M] - Toma, 2020

The training centers on self-reflection, critical evaluation, and basic leadership skills (e.g., how to run a meeting, how to take and give feedback, public speaking, etc.). [C] - Tsoh, 2019

At an individual level, the program fostered development of leadership skills in conflict resolution, team management, and giving and receiving feedback. Since completion of the FLC, a majority indicated noticeable changes in leadership skills (98.6%), and attitudes or behaviors related to leadership (91.7%). [C/M] - Tsoh, 2019

Qualitative responses supported impacts of participation in the FLC on personal growth, particularly in increasing self-awareness, confidence, and aspiration. [M] - Tsoh, 2019

Another participant indicated, '... [it] made me more confident as a leader and yet more willing to listen to others and give credit to them for their ideas.' [M] - Tsoh, 2019

Some graduates described experiencing increased collaboration across and increased cohesion within departments or units. One graduate commented, '... helping me be a better leader within my unit, and helping my unit by serving as a bridge to other people across UCSF.' [M/O] - Tsoh, 2019

When asked to reflect on how the LDP affected leadership style, many participants perceived that their approaches have become more collaborative and cited personal growth in a variety of areas, including the following: paying greater attention to strengths and weaknesses of colleagues, improving listening skills, decreasing agenda setting, and improving the ability to delegate. This transition has contributed to a more participatory approach to how decisions are made in the Department of Surgery at the University of Michigan. [M/O] - Vitous, 2019

Participants also described how relationships with colleagues in the department have changed since participating in the LDP. When prompted to reflect on how these relationships have changed, some surgeons pointed to areas of personal growth, such as becoming less sarcastic and having improved communication with colleagues. [M/O] -

Vitous, 2019

A more prevailing theme, however, was how these areas of personal growth translated to an improvement in the collegial environment, including an increase in morale and strengthened relationships. In discussing how the LDP influenced relationships, one surgeon asserted that the program "changed the environment" and "the framework with which I bring conversation" (participant 3). [M/O] - Vitous, 2019

Thematic analysis demonstrated that participation in a leadership development program influenced surgical culture in the following ways: (1) promoted a more participative leadership style, providing tools for surgeons to create a more collaborative environment; (2) increased the culture of diversity, with leaders in the department valuing a more inclusive and wide range of skill sets; and (3) strengthened the collegial environment as evidenced by improved morale and relationships within the department. [M/O] - Vitous, 2019

Mindfulness Leadership Course: These theories were chosen because of their relatedness to mindfulness. Each introduces overlapping themes of becoming more aware of self and others, being more in the present (instead of in the past or future), being more in the being-mode (vs the doing-mode), practicing more conscious (instead of automatic) decision making, listening more carefully and becoming more sensitive to employees' needs. [C/M] - Vreeling, 2019

The leadership program enhanced the following outcome categories:

- A. Self - Attitude: Psychological attitude towards self.
- B. Self - Behaviour: Behaviour towards self.
- C. Other - Attitude: Psychological attitude towards others.
- D. Other - Behaviour: Behaviour towards others. [C/M] - Vreeling, 2019

No. 14 – “...then it’s listening, isn’t it, really just listening and nothing else, just listening.” No. 16 – “...being more open towards that and asking more questions. Asking ‘why,’ ‘can you pinpoint why exactly you aren’t doing well?’ ‘Can you articulate what you want, what you need?’ That I guess, asking more questions and more, well that means not drawing your own conclusions, but getting more to the bottom of things.” No. 3 – “(...) then I just show there’s nothing wrong with admitting you don’t know something. Or that you’d like to use someone else’s expertise.” [M] - Vreeling, 2019

Intentionally building professional networks (CMO2)

If LDPs stimulate interaction between program participants [C], physicians build professional networks [M], which may impact the organization’s culture [O₁], quality improvement [O₂] and the leadership pipeline [O₃]. When participants are from the same organization, professional networks seem most effective for realizing organization-level outcomes [C].

- Due to building professional networks, physicians gain understanding in the perspectives of others (e.g., administrators, other medical disciplines) and collaborate better. Networks also function as support structures [M], benefitting the organization’s culture [O₁].
- Professional networks mobilize resources: physicians know where to go for collaborations or when facing challenges [M], leading to more effective quality improvement [O₂].
- Due to building professional networks, physicians become more visible within the organization and are more likely to be promoted [M], strengthening the organizations’ leadership pipeline [O₃].

Studies that provide (partial) evidence

Fassiutto, 2018; Ferris, 2018; Hopkins, 2018; Howell, 2019; Levine, 2015; Lewis, 2021; Maddalena, 2015; Miani, 2013; Monroe-Wise, 2016; O’Neil, 2019; Sanfey, 2011; Throgmorton, 2015; Toma, 2020; Tsoh, 2019; Vitous, 2019.

Illustrative supporting evidence (text fragments, descriptions, data)

I met people who I still have interactions with. That was the best. I made connections helpful from both work and personal perspectives. After 3 or 4 of the meetings, people were comfortable with each other and could say whatever (Female, Professor). [C/M] - Fassiutto, 2018

Finally, one of the most lasting pieces of the program beyond projects was the networking opportunity provided: The most lasting thing about [SLDP] is that meeting the other people helped me going forward. I learned how our interests were mutually beneficial. During the downtimes you get to know each other. Going forward, it has helped me because now I know these contacts and who to go to for different things (Male, Assistant Professor). [C/M/O₂] - Fassiutto, 2018

Participants were also asked which of the school's tripartite mission areas their projects impacted. A total of 18 of the 20 projects had impacts on patient care. Overall, ten projects impacted all three mission areas. Participants noted that projects were valuable both as a learning tool as well as a way to gain visibility within the institution. [C/O₃] - Fassiotto, 2018

The International Palliative Care Leadership Development Initiative (LDI) was a model demonstration project that aimed to expand the global network of palliative care leaders in low- and moderate-resource countries who are well positioned to apply their new leadership skills. [C/M] – Ferris, 2018

It is nearly impossible to capture and summarize the exhaustive details of what this energetic and powerful group has accomplished. Graduates of LDI have already demonstrated that they are the next generation of local, national, and global palliative care leaders. They have taught, published, networked, and served as visionary directors and/or coordinators of university pain and palliative care units, foundations, international, and national associations. [M] – Ferris, 2018

The program consisted of six sessions, each lasting one and one-half days, spread over 9 months, and held at a conference facility away from the institution. This supported participant networking and interspersed periods of learning with practice of newly acquired approaches. [C/M] -

Hopkins, 2018

The networking component of the PLA is a popular and key component of the program and includes an unparalleled opportunity for networking with pathology chairs at a variety of institutions nationwide, as well as fellow participants, and the APC's senior fellows, who are former pathology chairs. This latter group is a unique and valuable asset providing broad perspective and a safe non-power-based source of advice. [C/M/O,₁O₃] - Howell, 2019

The LPWF emphasizes networking within cohorts and with guest lecturers who include women institutional leaders and school of medicine deans. This provides participants with the opportunity to practice important networking skills and expand networks as they gain exposure to a diverse group of women colleagues and institutional leaders. Levine [C/M/O₃] - Levine, 2015

The program provides a safe environment for women to network with other women interested in leadership and for participants to explore their own leadership identity through the content and educational activities. An underlying theme of the program is to raise awareness of gender stereotypes and their impact on women's careers. [C/M] - Levine, 2015

I enjoyed this time to develop skills and reflect and interact with others facing similar challenges. I learned how important networking is. The program put me in touch with other women in similar places. Most important was networking with other women in the institution. The contacts that I have made are important to me. Allowed me a broader perspective of my role in the organization and helped me to feel more connected to the organization itself. Being part of a group of bright women who are considering these and other issues together was very helpful. [C/M/O₁,O₃] - Levine, 2015

Successful IAP implementation helped fellows enhance their visibility and reputation. Projects that aligned with institutional priorities enhanced the reputation of both the institution and fellow, either directly through project outcomes, or indirectly through development of the fellow as a future leader. When projects enhanced institutional missions and organizational culture, fellows had new leadership opportunities and their IAPs were more likely to achieve intended goals. [C/O₃] - Lewis, 2021

Several participants reported that the opportunity to network and collaborate with other physician leaders and managers was one of the most valuable aspects of PMLP. Several participants indicated that they had, in fact, participated with colleagues whom they work with on a regular basis and reported that this level of team involvement added to the experience as they could directly collaborate on projects during the program, and could see how/why they can collaborate in future. [C/M/O₃] - Maddalena, 2015

Several participants commented on the value of being offered, by the Program, in relation to the opportunity to meet and work with other staff they had not previously worked with. Improved collaboration was seen by some participants as one way to maximize efficiency through understanding how other staff in the Trust operate (Int5, 9), overcoming silos (Int4, 9, 12) or avoiding duplication of efforts (Int6). [C/M/O₁,O₂] - Miani, 2013

In the same way, some Fellows reported to having had difficulties in accessing relevant datasets for their projects; however, some acknowledged that networking opportunity provided by the Program had provided means to overcome this challenge. [M/O₂] - Miani, 2013

Almost all (97 %) Afya Bora alumni remained in contact with colleagues from the fellowship. Of these, alumni were most frequently still in contact with other Afya Bora fellows (90 %). Primary mentors were the next most common type of colleague that alumni were in touch with (71 %), followed by attachment site mentors (65 %). Additionally, 21 alumni (70 %) remained directly involved in Afya Bora-related activities, such as ongoing research or other projects with attachment site personnel. [M/O₂] - Monroe-Wise, 2016

With its interactive, case-based didactic curriculum, experiential attachment site rotations rooted in strong mentorship, and cultivation of interprofessional networks through multidisciplinary cohorts, the Afya Bora training program embodies these important principles. Indeed, in describing the professional successes they have enjoyed since completing the fellowship, Afya Bora's alumni frequently cite skills learned during both didactics and attachment site experiences, multidisciplinary cohorts, mentorship and networking as valuable aspects of the training curriculum [C/M] - Monroe-Wise, 2016

I think the connection, the forming of mentorship and bonds, and being able to talk with people who I wouldn't ordinarily interact with because in [my department] we're part of our own little unit and don't really interact with a lot of others. And being able to get different perspectives of what's going on in the whole health system - I think that was invaluable. [C/M] - O'Neil, 2019

The sponsors noted that the opportunity to work on team projects related to organizational topics of interest had a positive impact on the participants' networking and interpersonal relationships and improved trust and collaboration amongst the team members. [C/M/O₁] - O'Neil, 2019

Career advancement. When asked to list additional benefits received from LAM, "networking" was identified by 12 people: "Connections with faculty outside my own orbit" (M) and "The ability to meet my peers in other departments was very valuable" (M). Two people identified the significance of networking in terms of "Making valuable career contacts" (M), but 6 people identified the significance of networking in terms of "Building a sense of community" (W) or support, "We support each other" (W). Sixty-seven percent of the participants have been offered a leadership position since completing LAM. Sixty-six percent of men, compared with only 26% of women, were seeking leadership opportunities, $\chi^2(1) = 8.124, p < .05$. [M/O₁, O₃] - Sanfey, 2011

I had no idea what to expect when we started and I was pleasantly surprised that there were so many doctors from different specialties and different locations that I had never met before. It was a nice opportunity for us to discuss issues that were common between units and specialties even though we all work in very different fields. [C] - Throgmorton, 2015

Overall, what I liked is that it seemed like there was a strong administrative presence throughout the PLA that was very encouraging, very respectful, and very helpful [...] Going through it, it was a great opportunity to meet with and bond with other healthcare professionals as well as get to work on a level playing field with administration and to see that we are all in this for a common good. [C/M] - Throgmorton, 2015

I know there is a support network. [M] - Throgmorton, 2015

I am really looking forward to taking that from class and then with these contacts, with these friends, being able to do things in the hospital later on. [M/O₂] - Throgmorton, 2015

The opportunity to network and make connections, the comrade support from an ever-expanding family of fellows and experts assisted with personal growth in terms of breaking down professional boundaries and removing stereotypes so I would say, stick your head above the parapet and forget about the impostor syndrome. (I4, Allied Healthcare Professional) [C/M/O₁] - Toma, 2020

The FLC aims to facilitate networking among its participants within the AHC through a cohort-based model of training. [C] - Tsoh, 2019

Graduates described how the program led to new collaborations. Most (90%) reported increased interpersonal leadership skills and 85% indicated their participation helped build a network of faculty leaders transcending internal departmental boundaries. Two-thirds (67%) said their participation gave them better understanding of group dynamics. Post FLC completion, 69% and 50% said they continued to interact with participants from their or other cohorts, respectively." [C/M] - Tsoh, 2019

Another way in which the LDP helped to shift the collegial environment was the increased opportunities to network and interact with colleagues. Participants described how one of the greatest advantages of the LDP was the guaranteed protected time that offered participants the opportunity to interact in ways that are often not possible in clinical settings. Although these interactions offered personal benefits, such as opening the doors to unique research opportunities, it also led to a change in how communication happened both within and outside of the department. [C/M/O₁,O₃] - Vitous, 2019

Surgeons also described the ways in which the department has become more diverse as a result of LDP. Specifically, participants reflected on how their divisions felt more inclusive, with a more diverse range of skill sets being deemed as valuable or important. Contrast this to how participants reflected on the culture post LDP, where sentiments reflected a shift in the culture of diversity, "There's been an increased sort of very public recognition of the value of diversity in the department, right? So, I guess I would say that the culture of the department has probably been more publicly pro diversity and pro, you know, promotion of people, of a variety of people" (participant 4). [O₁] - Vitous, 2019

Supporting quality improvement projects (CMO3)

If LDPs include well-supported quality improvement projects (i.e., coaching, project management support, funding, protected time, facilities) endorsed by the organization [C], this allows physicians to create buy-in and be more perseverant when facing challenges [M]. This increases the likelihood of successful implementation of the project and quality improvement [O].

Studies that provide (partial) evidence	Berghout, 2020; Bhalla, 2018; Christensen, 2016; Daniels, 2014; DeRusso, 2020; Fassiotto, 2018; Hopkins, 2018; Leggat, 2016; Miani, 2013; Nakanjako, 2015; O'Neil, 2019; Rao, 2017; Rask, 2011; Smith, 2019; Throgmorton, 2015.
Illustrative supporting evidence (text fragments, descriptions, data)	<p>In addition to the collective sessions, every participant carried out a hospital-based improvement project (see Appendix 1 for project examples and content of the programme). [C/O] - Berghout, 2020</p> <p>Many interpreted the leadership programme as a means to deal with colleagues 'who do not want to change' and to learn 'how to cope with frustration' and to 'keep going'. [M] - Berghout, 2020</p> <p>In addition, they were not always granted the extensive time required for executing improvement projects because the daily pull of clinical work was perceived as too strong. [M] - Berghout, 2020</p> <p>Fellows are required to design and lead a quality improvement project—the capstone. The project is conducted with an interdisciplinary team of clinicians at the fellows' home institutions to advance organizational or departmental quality or patient safety goals. The capstone is intended to be the practical application of coursework and must be endorsed by the leadership of the fellow's organization. Each fellow is assigned to a faculty member who serves as a mentor to guide him or her through the capstone process, and to navigate potential organizational challenges. [C] - Bhalla, 2018</p> <p>Another participant could not fulfill the capstone project requirement largely because of lack of leadership support. [C/M] - Bhalla, 2018</p> <p>Time spent by fellows on capstone projects was not formally quantified as part of the present evaluation, fellows noted that the commitment was significant, encompassing several hours per month, both during work and off-hours. [C] - Bhalla, 2018</p> <p>A descriptive summary of the 87 (74 physicians and 13 nurses) fellow capstone projects completed during the 5-year period is summarized in Table 3. Projects were highly varied in nature and scope. They encompassed efforts to improve safety, effectiveness, efficiency, timeliness, and patient-centeredness. Three categories comprised 51% of all capstone projects: (1) improving efficiency in inpatient or emergency department settings; (2) improving transitional care among inpatient, primary care, or other settings; and (3) reducing hospital-acquired infections or improving sepsis care. [O] - Bhalla, 2018</p> <p>This course is also designed as an innovation incubator, with each attendee invited at course inception to propose an idea that he/she would like to implement. The top 12 ideas that the group most prefers are culled from the 70 submissions, and multi-disciplinary teams then form around each idea, with each team developing a full business plan over 10 months for implementation that is ultimately presented to Cleveland Clinic leadership at the final session. [C] - Christensen, 2016</p>

Success as an innovation incubator is supported by the fact that 61% of the business plan ideas either have been implemented or have extinguished an idea that the team itself felt was infeasible based on fuller analysis. [O] - Christensen, 2016

This participant identified course materials from the intervention that informed her ongoing development in health leadership, and she referenced the important ongoing support her mentor provided in helping her implement the project. She stated that 'My primary mentor was an obstetrician like myself... he would sit down with me to figure out what needed to be done [on the project]'. [C/M] - Daniels, 2014

Nominations were reviewed to confirm that individual and departmental goals were aligned with the program and the institution. [C] - DeRusso, 2020

The experiential learning involved the development of a project focused on the area of expertise and the current leadership role of the individual participant. [C] - DeRusso, 2020

Several projects led to hospital funding based on their impact on clinical care and potential for innovative discoveries. [O] - DeRusso, 2020

Participants had coaches and sponsors for their projects. See evaluation survey in article and paper Hopkins (same program). [C] - Fassiotto, 2018

Participants were also asked which of the school's tripartite mission areas their projects impacted. A total of 18 of the 20 projects had impacts on patient care. Overall, ten projects impacted all three mission areas. Participants noted that projects were valuable both as a learning tool as well as a way to gain visibility within the institution. [O] - Fassiotto, 2018

Participants were asked to estimate how many individuals their projects had impacted since program completion: 8 (40 percent) estimated that their project had impacted 10s of individuals; 5 (25 percent) estimated 100 s; and 7 (35 percent) reported that their SLDP projects had impacted 1000 s of individuals since implementation. This impact continues to grow: [My project] was fairly successful [at the time] – but the continued progress went beyond that. It's mushroomed. Now the benefit is an order of magnitude greater (Male, Assistant Professor). [O] - Fassiotto, 2018

In-house leadership development programs offer the advantage of greater alignment between program competencies and institutional priorities. [C] - Hopkins, 2018

An executive sponsor was required for each project, and a coach skilled in team process management worked with the leader. Projects were monitored at several points during the program both by the coach and through project progress reports submitted by participants. [C/M] - Hopkins, 2018

Over the full four program years (2008-2011), participants completed projects across a wide variety of areas including quality and process improvements (51%), new clinical programs (24%), business plans (10%), new research programs (9%), and new educational programs (7%). A number of important results were achieved including improvements in quality of care, patient safety, and efficiency of care processes; enhanced patient satisfaction; and new program development (Table 5). [O] - Hopkins, 2018

The program participants far exceeded expectation with 58% reaching level 3.0 (moderate improvement in process measures) and over one fifth of participants (22%) attaining level 4.0 or greater, indicating significant improvement in outcome measures. [O] - Hopkins, 2018

The workplace project required the participants to identify, plan, implement and evaluate a quality or safety initiative in their workplace. The project evolved and was progressively implemented in parallel with the simulation, online learning space and face-to-face workshops. The final workshop required the participants to present their projects in a scenario revolving around a 'minute' with the State Minister of Health. [C/M] - Leggat, 2016

Participants reported that many projects, with their focus on practical improvement and change, had resulted in distinct and recognizable changes to practice. They addressed a wide range of clinical practice and service provision and often focused on areas of practice highlighted in the Australian National Safety and Quality Health Service Standards. [C/O] - Leggat, 2016

In most cases, participants perceived the workplace projects to have a significant impact in terms of early outcomes, impact and reach. The majority had plans to extend the project or use it as a starting point for other quality improvement initiatives. Almost all participants and sponsors indicated they would continue to work on or support the project and its extension or evolution and many had specific plans to do so. Some organizations had the projects already built into their strategic and operational program indicating evidence of early embedding. This suggests the program has contributed to the type of capacity building that results in sustainable outcomes. [C/O] - Leggat, 2016

Projects that aligned with institutional priorities enhanced the reputation of both the institution and fellow, either directly through project outcomes, or indirectly through development of the fellow as a future leader [C] - Lewis, 2021

Project work had bidirectional impact on the fellows in the program and on the institution itself. Project enablers included: focusing projects on institutional priorities, obtaining sustainable support, and navigating institutional complexity. Leading indicators of institutional outcomes included contributions to institutional leadership and culture, and mutual enhancement of the reputation of the fellow and of the institution. [M/O] - Lewis, 2021

One core feature of the program was protected time for participants to engage in quality improvement activities, which was perceived as one of the key enablers of program success, along with the strong support by members of senior management. Other reported enablers included dedicated project management support, and the commitment of the program participants. Key challenges included financial and time constraints, staff resistance to change, and short program duration. [C/M] - Miani, 2013

As part of the scheme, clinical Fellows were paired with established senior staff (clinical leads or clinical directors) of whom some acted as mentors to support the implementation of Fellows' projects. [C/M] - Miani, 2013

When asked about the value of the program activities in relation to the delivery of QI projects (Figure 5), some features of the program were seen as very useful. These included the dedicated project management support and the taught sessions on project management and business planning. [C/M] - Miani, 2013

Participants identified a number of key enablers and challenges to delivering their QI projects. The most frequently mentioned enablers included: dedicated time to conduct the project, the contribution of motivated individuals, availability of resources, support from other staff, senior buy-in, teamwork or collaboration with other Fellows and participants, and QFI support. The main identified challenges mirrored the enablers, including time constraints, lack of financial resources, resistance of other staff, lack of middle and/or senior management support, limited duration of the program, and staff shortages (Table Interviewees further highlighted the role of mentors in supporting the delivery of QI projects, with two participants commenting how mentors were able to facilitate relationships between members of the Trust and to link with senior staff or non-clinical departments (Int5, 10). [C/M] - Miani, 2013

Duration of the program was closely linked to the sustainability of program outputs. Most participants expressed concerns over the sustainability of their initiatives and the possibility that with the end of the program, focus and resources which facilitated progress might be diverted: It's about how we maintain that through... But I am conscious of workload, and because we do not have time to do it... I hope it's not going to fall apart; all the things that they've put in place will hopefully stay here, but it is about how we embed that process. (Int12). [C/M/O] - Miani, 2013

Participants reported on a series of key outputs from their QI projects; these included better team-working and increased communication within and across teams (see Section 'Working better as teams'). It was beyond the scope of the evaluation to systematically collect data on quantifiable outcome measures of individual QI projects. However, program participants did report on measurable clinical outputs that contributed to improvements in the quality of care. Given the nature of the evaluation and to maintain respondents' confidentiality, we here refrain from directly citing individuals' experiences, and instead document a small selection of high-level experiences. For example, one internal Fellow noted how their QI project had substantially enhanced patient experience in maternity services, which was seen as an important achievement by Scheme B participants. Other QI projects in maternity were also reported by some participants to have equally led to tangible measures of success, such as relieving some of the pressures in the maternity ward through greater use of ambulatory services. Similar successes were reported by scheme A participants. [O] - Miani, 2013

There appeared to be a relative lack of external dissemination of QI project findings (Figure 8), which was noted by one interviewee as presenting one of the weaknesses of the program (Int15), in particular against the perceived aims of the program to contribute to improving the Trust's reputation (see Appendix B). While overall the level of external dissemination of QI project findings was lower compared to internal dissemination mechanisms (Figure 7), Figure 8 highlights that dissemination activities did increase as the program evolved, with around one third of participants reporting to have given external presentations towards the completion of the program. [O] - Miani, 2013

Matching fellows to projects that were mutually beneficial to the fellow and institution was considered extremely important to the success of the attachment site experience although it required time, in some cases up to 8 weeks [C/M] - Nakanjanko, 2015

To qualify for accreditation, attachment institutions had to demonstrate availability of suitable infrastructure (e.g., office space to host the fellow and a variety of projects in which fellows could participate) as well as potential mentors to support fellows' training. Attachment site rotations allow learners to apply concepts and skills learned in the classroom to real-world problems faced by local health organizations. [C/M] - Nakanjanko, 2015

Having the fellows as leaders of their own attachment site experience required a paradigm shift from most in-service training programs that detach trainees from a work environment in a search for protected time. Mentorship by attachment site mentors from the respective sites and primary mentors from the Afya Bora program was critical to development of locally relevant projects. [C/M] - Nakanjanko, 2015

Overall, 14 (93%) of the 15 fellows conducted mentored projects, covering a wide spectrum of HIV/AIDS care and health system challenges, as highlighted in Table 1. [O] - Nakanjanko, 2015

President and CEO at THS, stated that, “Our physician leaders worked collaboratively to tackle some of the most pressing issues, and the recommendations they made during their Capstone presentations were among the most innovative ideas I’ve heard all year.” The AL teams have continued to work together to advance their projects into the broader organizational system. [C/O] - O’Neil, 2019

While more time in AL team meetings would have resulted in more in-depth project outcomes and opportunities for personal development, results shown from follow-up and evaluation demonstrated AL has impact even in a short time period. [M/O] - O’Neil, 2019

Teams with sponsors who kept the momentum going tended to continue working on their projects; whereas teams without a ‘push’ from their sponsors, tended to lose steam on their projects. As such, we learned that designing a structured process for AL teams to continue project work post-graduation is crucial to sustaining the learning and momentum of the program. [M/O] - O’Neil, 2019

Second, course directors need to determine how participants will apply their QI skills during the course. Real-world projects immerse participants in the challenges of stakeholder engagement and rapid cycle testing. If successful, this work can produce tangible results. However, these projects often present unexpected challenges for QI learners. CPIP augments learning from team projects with case studies that reinforce key concepts by removing some of the unpredictable features of real-world projects. [C/M] - Rao, 2017

Quality leaders review applications from their respective sites and select applicants based on the candidates’ leadership potential, the alignment of the project proposal with the institution’s goals, and the degree of support the candidates have from their sponsor. [C] - Rao, 2017

Additionally, each CPIP team has a coach to help participants master the skills taught in the course and also to help keep projects moving between teaching sessions. Coaches are assigned 1 to 2 teams. Their responsibilities include reviewing homework prior to each session and supporting teams to develop their final presentations. Previous CPIP graduates serve as coaches for current attendees, which helps broaden the learning resources for new students and reinforce previous training for coaches. [C/M] - Rao, 2017

Sixty-six percent (90/136) reported continued work on their course project, with 28% (38/136) having published their findings or presented their work externally. Sixty-two percent (84/135) reported working on another QI project utilizing the tools taught in the course, while 64% (87/137) taught the concepts to others. See table for example project and results. [O] - Rao, 2017

A key component of the training program is the design and implementation of a QI project. During the first year of the April 2011 program, project topics were open ended, allowing participants to select any priority area in their operating units. As the course evolved, however, teams were matched with topics that were a high priority for the health system. Project teams are formed after the first learning session and begin weekly meetings to advance their project work. Attendees are paired with a mentor who has experience in improvement methodologies and team leadership. The mentor relationship was designed to facilitate the process improvement project and assist with team dynamics. Leaders from the participant's department are engaged to serve as a resource for identifying and overcoming implementation barriers. [C/M] - Rask, 2011

Nineteen (86.4%) of the 22 participants reported that their project had been fully implemented as originally planned. One participant never received the necessary resources to implement it, while two other projects became obsolete because of concurrent system changes that eliminated the original target. Some 13 (68.4%) of the 22 projects remained active. In addition to the 2 projects that became obsolete because of concurrent system changes, 2 projects ended because of a lack of sufficient resources, and 2 projects were dropped because of a lack of interest on the part of the implementation team. The 4 projects that were not sustained addressed some aspect of patient clinical outcomes. Of the 13 projects that were sustained, the majority (8) addressed changes in work flow—for example, altered appointment templates, standardized phone policies, restructured work responsibilities, and standardized processes—that facilitated patient access or operational efficiency. Of April 2011 the remaining sustained projects, 1 project obtained additional resources to meet documentation needs, and 4 led to permanent prompts or reminder systems that affect patient care processes (for example, falls, restraint use, newborn care). [C/M/O] - Rask, 2011

Initially, as stated earlier, participants were encouraged to identify any QI project relevant to their operating unit. An advantage of this approach was that participants could identify a topic about which they were passionate. However, a disadvantage was that many early projects were narrow in scope, and it was challenging for participants to engage other staff and the resources required for effective implementation. Participants are now encouraged to identify QI projects that align with institutional priorities, as identified by the yearly strategic plans. Participants and instructors report that aligning projects with institutional goals has facilitated buy-in and promoted mentorship by supervisors, increasing the likelihood of both sustainability and spread. [C/M/O] - Rask, 2011

In addition to classroom learning and assessment tools, each participant was assigned to a four-person team to design, plan, and execute a real-world project aligned with a departmental strategic priority. The decision to include such a project was based on the knowledge that leadership programs may fall short of their intended impact if they are decoupled from real-life work settings. [C/M] - Smith, 2019

RLA team projects emphasized four areas: (1) improving the patient or customer (eg, referring physician) experience, (2) improving the employee experience, (3) business process improvement, or (4) improved safety or quality of images or services. Nearly all of the team projects that were developed and piloted within the RLA have been partially or fully implemented in the department (Table 3). "Partially implemented" means the project was implemented within a subsection of the department, such as a single site or modality, or is currently in the full implementation phase. Projects often expanded into a sustainable process or program with positive business or cultural impact. Highlighted next are four such projects. [O] - Smith, 2019

Coursework is supplemented with the following experiences to enhance learning: working as a learning cohort, completing a behavioral style assessment, completing a 360 degree feedback process, working with a coach, participating in online discussion via a PLA SharePoint site, accessing self-directed online learning resources, and working on a team project in a small group. [C] - Throgmorton, 2015

Organization based results were evaluated via survey from a stakeholder audience to whom PLA participants presented their team based project work, 97 percent agreed the work of the teams illustrated alignment with the organization's stated strategies. Project work yielded results after the completion of the program by offering some timesaving communication tips and through the production of a physician communication video now used to orient new providers. [C/O] - Throgmorton, 2015

Tailored LDP content prepares physicians (CMO4)

If LDPs' content is tailored to physicians' leadership needs and expertise [C], physicians perceive the LDP content as relevant, and the learning experience prepares (i.e., knowledge, skills, attitudes, confidence, self-efficacy, identity as leader) them for current or future leadership roles [M]. They are more willing to assume leadership roles and considered competent, leading to new leadership roles and strengthening the leadership pipeline [O].

Studies that provide (partial) evidence

Berghout, 2020; Bhalla, 2018; Cohen, 2019; DeRusso, 2020; Ennis-Cole, 2019; Fassiotto, 2018; Fernandez, 2016; Gholipour, 2018; Hackworth, 2018; Hopkins, 2018; Leggat, 2016; Levine, 2015; Macphail, 2014; Maddalena, 2015; Miani, 2013; Monroe-Wise, 2016; Pradarelli, 2016; Rask, 2011; Sanfey, 2011; Smith, 2014; Throgmorton, 2015; Toma, 2020; Torbeck, 2018; Tsoh, 2019; Vitous, 2019.

Illustrative supporting evidence (text fragments, descriptions, data)

Physicians are known for safeguarding their professional identities against organisational influences. However, this study shows how a medical leadership programme enables the reconstruction of professional identities that work with rather than against organisational and institutional contexts to improve quality and efficiency of care. [M] - Berghout, 2020

Our findings reveal that when 'new' (organisational) responsibilities, such as multidisciplinary collaboration, are not backed-up by a supportive environment this may lead to identity violations causing stress and work dissatisfaction. Although the MLDP offered an important supportive space to discuss these identity violations, physicians also needed a supportive space within the hospital environment itself to not become 'isolated' leaders with unrealized collaborative ambitions. [O] - Berghout, 2020

The CQFP application process is competitive. It requires hospital leadership to nominate eligible clinicians and to commit to allowing participants time off from clinical and administrative responsibilities to satisfy program requirements. The program is tailored to physicians and nurses with limited experience conducting quality improvement and patient safety initiatives. Applicants are not required to have a prior or current quality or safety position, or training. [C] - Bhalla, 2018

All pre-post $p < .05$

"Use quality improvement tools"

"Measure quality/use quality data"

"Implement quality improvement initiatives"

"Use health information technology to improve quality and patient safety"

"Organize teams/teamwork" [M] - Bhalla, 2018

"The relevance of the simulation was also commented upon. It was a brilliant introduction to the reality (P50) as was the contextualization of the issues. It really encourages active learning and understanding (P54)." [C] - Cohen, 2019

“Changes in behavior post-simulation. Forty-seven participants completed the behavior questionnaires in full pre- and post-simulation (Table 2). Capability was the only construct that showed a large and significant change post-simulation ($p < .001$, Cohen’s $r = 0.619$). There was a moderate but significant change in Behavioral Intentions, Attitudes and Subjective Norms post-simulation, although there was no significant change detectable in Opportunity.” [M] - Cohen, 2019

“Self-efficacy in clinical leadership. Forty-six participants completed the General Self-Efficacy Scale both pre- and post-simulation. There was an increase in perceived self-efficacy post-simulation (This difference was significant at $p < .005$, but only at medium levels of impact (Cohen’s $r = 0.43$, z value = 2.794).” [M] - Cohen, 2019

In the short time between the simulation and feedback, 22 clinicians stated that their experiences in The Crucible simulation had directly influenced their leadership practice. For example, one participant explained how understanding integrated care had directly impacted; As a community paediatrician, I am now keen to be part of the discharge planning process for children with neurodisability and enable a seamless transfer of care closer to home (P30). Others expressed that they were able to contribute more to departmental strategy; I feel more confident that I understand NHS changes, and that many of my colleagues are unlikely to have more knowledge than me. This has given me confidence in expressing my views in management meetings (P24).[M] - Cohen, 2019

In 2014, the Children’s Hospital of Philadelphia (CHOP) assessed the needs of physician leaders across the institution, including individuals in academic department leadership positions and individuals in hospital administrative leadership roles. [C] - DeRusso, 2020

To be eligible, candidates had to be a strong performer in an existing leadership position or recently selected for a new leadership role, committed to enhancing personal leadership skills, and available to attend all program sessions. [C] - DeRusso, 2020

The experiential learning involved the development of a project focused on the area of expertise and the current leadership role of the individual participant. [C] - DeRusso, 2020

Survey results indicated that all 125 participants from the 4 cohorts agreed their leadership skills were enhanced, they felt more connected to the institution, and they were committed to contributing to the enterprise-wide mission. [M] - DeRusso, 2020

Information from 93 participants in the first 3 cohorts showed that since completion of the program, 53% were in a new leadership role at CHOP, 38% were in a new leadership role nationally or internationally, 43% chaired a division or departmental committee, 14% chaired a hospital committee, 31% participated in a hospital enterprise plan, and 17% were promoted to a division chief or vice chair role. [O] - DeRusso, 2020

Executive Team Leaders used pre-program activities to select participants, collect information that shaped the program, determine physician's work preferences, establish curriculum, and help participants make the most of the program. Pre-program activities included nominations, assessments (360-degree and the Insight Profile), and pre-program interviews. Each of these items will be briefly discussed. [C] - Ennis-Cole, 2019

Following the leadership development program, nine out of the 10 participants graduated from the program and moved into new or enhanced leadership positions. Participants reported that their capacity for collaboration increased and their new leadership skills were utilized in their new leadership roles. [M/O] - Ennis-Cole, 2019

SLDP participants rated themselves higher than non-participants on 8 of 14 skills items. Of these items, participants rated their skills significantly higher than non-participants in ability to create and articulate a vision ($p=0.02$) and ability to carry out performance evaluations and provide constructive feedback ($p=0.01$). [M] - Fassiotto, 2018

SLDP offered participants an opportunity to learn about and work on their strengths and weaknesses, preparing them for current leadership roles: I thought it was an incredible gift. It gave me basic tools I didn't have before to be a leader within every team I work on. It helped me to understand myself better too (Female, Assistant Professor at time of SLDP participation). [M] - Fassiotto, 2018

Participants rated themselves higher than non-participants across all ten items on leadership attitudes. Across three of the ten items, focused on perceptions of support from the School and colleagues, ratings were significantly higher ($p<0.05$) for participants. [M] - Fassiotto, 2018

Recurrent interview themes included: the overall program value for current leadership roles. [M] - Fassiotto, 2018

The skills I learned were immediately transferrable to my leadership position. The program prepared me very well for my current role as department chair (Female, Associate Professor). [C/M] - Fassiotto, 2018

Program expenses were jointly covered by the School of Medicine and Hospitals and both School and Hospital leadership nominated individuals for the program based on their potential for leadership. [C/M] - Fassiotto, 2018

Asian program participants were significantly more likely than Asian non-participants to have been promoted, and women participants were less likely to have left the institution than non-participants. [O] - Fassiotta, 2018

Respondents from 2009 to 2011 cohorts were also asked about current leadership roles (Table III). A higher percentage of participants reported current roles across all leadership levels, although differences were not significant across School leadership positions. [O] - Fassiotta, 2018

Participants were, however, significantly more likely to hold regional or national leadership titles ($p=0.02$) and to have taken on new leadership titles since SLDP nomination ($p<0.01$). [O] - Fassiotta, 2018

We also sought to analyze whether program participation impacted retention. Overall, 24 (18 percent) of 131 SLDP participants departed Stanford since their nomination, compared with 16 (20 percent) of 82 non-participants ($p>0.72$). [O] - Fassiotta, 2018

And thus, it is desirable to both avoid redundancy with other learning opportunities and avoid teaching skills not relevant to the practical needs of the participant as that would result in poor use of scarce training resources. When the ACOG NLI course was initially conceived, the 10 skills evaluated were chosen because they were recognized as important or core skills for physician leaders by the planning team and were used successfully in the FSLI program. [C] - Fernandez, 2016

Fellows endorse the selection of the course content in the following ways: Fellows reported that the course was beneficial to their practice as physician leaders, the course allowed them to provide better healthcare for their patients, and indicated the communication skills and leadership approaches learned in the ACOG NLI were incorporated into their day-to-day work responsibilities (see Table 5). [C/M] - Fernandez, 2016

"This course definitely was a life-changing experience. I have used many of the skills I learned to organize/run meetings, communicate more effectively with people, and seek out opportunities that fit my style better." [M] - Fernandez, 2016

Interestingly, a large majority of respondents reported receiving a promotion or other similar expansion of role opportunity since completing the course, and all who reported such a job expansion indicated that the skills learned in the course helped prepare them for the new opportunity (see Table 5). [M/O] - Fernandez, 2016

Of the 26 respondents, 16 (62%) indicated that they had received a promotion, had a change of job, or had taken on new leadership opportunities since completing the course. [O] - Fernandez, 2016

The Tabriz health management fellowship training program was developed based on the educational need assessment of the district health managers in the north-west of Iran and for training them; it was supported by the Ministry of Health, Treatment and Medical education as well as the health deputy of the Tabriz University of Medical Sciences. [C] - Gholipour, 2018

Based on the findings, most specialized areas of knowledge met the health managers' training needs including quality improvement, managing the district, planning and evaluation, epidemiology and advocacy, and community participation (table 5). [C] - Gholipour, 2018

According to pretest and post-test results, after training, district health managers obtained the highest scores in managing the district (77 out of 100), planning and evaluation (69), chronic disease management (69), human resources and creativity (68), and epidemiology (67). Also, health information (44) and health resources management and health economics (53) gained the least score among health managers. Finally, the courses on managing the district (51%), research in the health system (42%), and human resources and creativity (37%) had the most positive differences between pretest and post-test scores (figure 1). [M] - Gholipour, 2018

The impetus for program development was a needs assessment conducted by the OAACD that identified an urgent need for faculty leadership development, as well as the institutional strategic plan that identified a need to invest in structured leadership development at all levels. [C] - Hackworth, 2018

Analysis of qualitative survey data provided by division directors indicated that on completion of the CLP, participants demonstrated improvements in leadership ability, confidence as a leader, listening skills, conflict management skills, and cross-disciplinary collaboration. [M] - Hackworth, 2018

The mean scores for all 4 cohorts combined for the items assessed were as follows: "Overall, I was satisfied with the quality of this educational program," 6.5; "This training program will significantly enhance leadership and/ or management capabilities at my organization," 6.6; "I will be able to apply the knowledge and skills learned from this training to my job," 6.5; "I learned new knowledge and skills from this training," 6.5; and "This training was a worthwhile investment for my career development," 6.7. When asked if they would recommend the program to others, 94% responded yes, 6% not sure, and 0% no. [C/M] - Hackworth, 2018

Analysis of qualitative survey data provided by division directors indicated that on completion of the CLP, participants demonstrated improvements in leadership ability, confidence as a leader, listening skills, conflict management skills, and cross-disciplinary collaboration. [M] - Hackworth, 2018

The curriculum (Table 1) was created based on competency models, institutional needs assessments, and recurring topics found in other programs. [C] - Hopkins, 2018

Table 4 shows significant improvements in respondents knowledge, skills, and attitudes throughout the program. [M] - Hopkins, 2018

The intervention was designed with a focus on enquiry-based learning (EBL), as recent research suggests that deeper learning that is more applicable to practice takes place when learners are presented with a scenario enquiry and are encouraged to understand the context and reflect on the wider implications. Given that the participants were senior clinicians, EBL seemed appropriate given that "EBL differs from problem-based learning (PBL) in that it is less directive and empowers students to take ownership of the course".²¹ (p. 85) Participants already had high levels of expertise. [C] - Leggat, 2016

The program was regarded by the clinicians who participated and their organizational sponsors as exceptionally valuable. They viewed it as making a significant difference in two major ways. First, it strengthened their knowledge and skill in the field of quality and safety, their understanding of the thinking and rationale behind quality and safety initiatives and the evidence regarding their importance and impact. In addition, the interview participants reported a new-found appreciation for the importance of the patient and consumer in assuring quality and safety. It completely changed the way I practice medicine and interact with each patient. – Participant, metropolitan health service [C/M] - Leggat, 2016

Consistent with the quantitative results, the interview participants reported that the participants had acquired skills in strategic thinking and planning, communication, project management, reflective practice and change management. [M] - Leggat, 2016

With respect to the second broader system outcomes, the interview participants reported that the participants had developed an organisational and systems literacy that enabled participants to understand the bigger picture and engage constructively with the imperatives contained within it. This enabled them to collaboratively influence outcomes, rather than avoiding or resisting involvement or giving up when encountering barriers. This was identified as a critical factor in both clinician engagement and promoting projects that had clear organisational impact. [M] - Leggat, 2016

Has helped me see how my work and leadership fits with strategic plan; that I am working to something bigger, how the health service works and how I can work in it. – Participant, rural health service [M] - Leggat, 2016

The curriculum was developed after conducting a review of the literature on the status of women in academic medicine and then tailored to the specific environment of the JHUSOM. [C] - Levine, 2015

We found a significant improvement in participant's self-rated skills across a majority of leadership domains following participation in a longitudinal, cohort-based, experiential leadership program for women. Our findings suggest that for our population, we correctly identified important areas for development and that the content was delivered in a format that enhanced perception of learning for participants. [C/M] - Levine, 2015

Participant evaluation of the CLP: learning, value and willingness to take on leadership roles (2012 cohort). Of the 20 participants, 14 (70 per cent) completed the CLP evaluation survey (Table III). Respondents reported the duration of individual sessions and the program as a whole to be "just right" and were overwhelming positive about the quality of information, the speakers and the value of the program. [C/O] - Macphail, 2014

The CLP significantly increased willingness to take on leadership roles. Most participants (93 per cent) reported that they were more willing to take on a leadership role within their team. Fewer were willing to lead at the level of department (79 per cent) or organization (64 per cent). Five of the 11 participants from the 2011 program had taken on a new leadership role 18 months later. [M/O] - Macphail, 2014

Participant follow-up (2011 program). Of the 11 participants who completed the pilot CLP in 2011, 9 (82 per cent) remain employed at the HCO 18 months after completing the program. Four had been promoted to more senior or managerial roles, including one who was redeployed to another section to assist in facilitating change to practice. Another member of the group has since participated within two separate quality improvement projects within the organization. [O] - Macphail, 2014

Also, creating the PMLP at Memorial University allowed the program to be tailored to meet the unique needs of physician leaders in NL. [C] - Maddalena, 2015

Between January and April 2011, a Provincial Needs Assessment was conducted to gauge interest, seek input on learning needs and provide guidance for program development. [C] - Maddalena, 2015

Subject matter experts were engaged to develop module content which addressed identified educational needs and presented information from the health authority and provincial perspectives. [C] - Maddalena, 2015

They report observing increased application of skills in areas such as conflict resolution, problem-solving (i.e. ability to solve more issues themselves) and quality care initiatives. They also report observing a broader understanding of the administrative system at the RHA level. [M] - Maddalena, 2015

The majority of participant survey respondents (95.07 per cent) reported feeling more prepared for their leadership responsibilities as a result of their participation in PMLP. [M] - Maddalena, 2015

Feedback about the learning activities delivered by QFI Consulting was, overall, very positive. Most of the interviewees found it useful, appropriate, context relevant and directly applicable to work. [C] - Miani, 2013

While generally positive about the program, participants identified several areas for its future development. For example, some participants commented that the leadership course was 'basic' and perhaps more appropriate for junior staff. This was a particular concern among more senior staff who had previously participated in leadership courses. [C] - Miani, 2013

On a personal development level, almost all program participants who were interviewed reported feeling more empowered. They spoke about feeling 'braver', 'more daring', being 'better equipped' to achieve goals, and being 'more persistent': I have the tools with which to do the job, so that's empowerment. (Int7) [M] - Miani, 2013

Participants reported that the taught modules mostly contributed to developing their leadership in areas such as confidence, communication skills, negotiation skills and team management skills. [M] - Miani, 2013

The program was also seen to have contributed to improving the 'marketability' of a cohort of Fellows by enhancing their managerial skills and developing their abilities as clinicians. Interviewees noted that the Trust sought to capitalize on this achievement by offering positions to several of the external Fellows (two in scheme B, one in Scheme A, locum positions for two other Scheme A external Fellows under consideration; Int8). Other external Fellows were reported to be able to secure consultant level posts in other NHS trusts. It would therefore seem that the program has had a positive impact on the career of most of the external Fellows. One respondent noted that such an achievement could be seen to enhance the reputation of the Trust within the NHS. Career perspectives appeared more limited for internal participants as they were not systematically offered promotions or new roles within the Trust (Int8, 12), but it was reported that two internal Fellows (Scheme B) were promoted by the end of the Programme (Int8). [M/O] - Miani, 2013

Program based on adult learning theory. All classroom-based modules employ case-based, small group discussions and draw on Africa-focused examples to maximize relevance to the learners. [C] - Monroe-Wise, 2016

The clinical leaders program has assisted me to recognize and accept that some of my instinctual behaviors can be considered leadership qualities and it has provided me with the confidence to act upon them (Participant 2). [M] - Monroe-Wise, 2016

Twenty-one (68 %) of 31 responding alumni reported that their positions at work had changed since completing the fellowship. Of those who had experienced changes to their position at work, 16 (76 %) believed that the change was due to experience gained through participation in Afya Bora. Promotions or new jobs were the most common types (75 %) of career advancement mentioned. Others had taken on more responsibilities at work, and two had enrolled in higher academic degree programs. [O] - Monroe-Wise, 2016

Several program alumni commented on how their training during Afya Bora led to promotions in their workplaces. Specifically, they cited both skills learned during didactic modules and during experiential attachment site blocks, underscoring the importance of both modalities in adult learning theory. The leadership and management skills obtained from the modules as well as the project on PMTCT [Prevention of mother-to-child transmission] [that] I undertook during my attachment enabled me to be recognized to fill the position of PMTCT program manager, which was a promotion. [M/O] - Monroe-Wise, 2016

The Leadership Development Program was designed based on a comprehensive needs assessment conducted using prior interviews with faculty surgeons who were selected for participation in the program, described in greater detail elsewhere. Based on leadership skills and knowledge that surgeons indicated would benefit their real-world practice, the inaugural program curriculum was structured around 4 major domains: leadership, team building, business acumen, and health care context (Table I, with representative quotes of impact in these four domains). [C/M] - Pradarelli, 2016

Lastly, the program helped faculty surgeons become more knowledgeable regarding leadership concepts, such as business acumen and organizational structure. [M] - Pradarelli, 2016

Many participants described self-empowerment for leadership roles as a strength of the program. Faculty surgeons across levels of academic rank felt not only enabled but also capable of effecting change in their local environments. One participant reported, "I'm more confident about stepping up as a leader," demonstrating an empowered perspective. [M] - Pradarelli, 2016

Principles guiding curriculum development:

- Building a QI project into the training program enhances learning and increases the likelihood of subsequent implementation.
- On-site training can reach more employees than off-site training opportunities.
- On-site training is more likely to be effectively integrated into local work environments, thus facilitating the success of QI projects. [C] - Rask, 2011

Participants initially correctly answered only 14.0 (46.7%) of the 30 knowledge questions. After completing the course, the average participant answered 24.5 (81.7%) of the questions correctly, reflecting an absolute improvement of 35.0 percentage points. [M] - Rask, 2011

The RLA was an important vehicle to prepare and promote women for intra- departmental leadership progression, creating role models in leadership positions and thus enhancing the value and culture of the organization. [M/O] - Rask, 2011

Leadership skills and attributes. Comments about interpersonal and relationship attributes dominated in this group, in response to the request to list the most important attributes of a leader. Comments about interpersonal skills included "Listening" (43% of respondents); the ability to relate to people, "understanding others/all sides of a situation" (M); and "Recognize certain folks will not change and move on" (M). Once again, the highest percentages of participants agreed that the skills improved by LAM were ability to recognize weaknesses and strengths (91% and 82%; Tables 7 and Figure 3). Only 42% agreed that LAM improved their ability to take risks. Fifty- four percent of respondents indicated that their perspectives about leadership had changed as a result of LAM. Eleven people referred to acquiring a better understanding of leadership: "Realizing what it takes to be a leader" (M), "Gathered an appreciation for skills required for effective leadership" (M), and "I better understand the differences between leading and managing" (W). Ten participants commented about a change in their interpersonal relationships: "I have a greater appreciation for how difficult it is at home" (M). Fourteen percent said that their perspectives had not changed, and 1 individual said prior knowledge was reinforced: "LAM redefined things I had learnt in other settings" (M). [M] - Sanfey, 2011

Career advancement. Sixty-six percent of respondents (75% of men, 53% of women) were invited to apply for or offered positions post-LAM. Comments were grouped as follows: people who were already in leadership positions (11%); those who were looking for leadership opportunities in general (25%), "I am interested in expanding my role in some of the projects in which I am currently involved." (W); and those with a specific position in mind (7%), for example, "division chief" (W). Fifty-eight percent of women, compared with 19% of men, $\chi^2(1) = 4.68, p < .05$, were actively seeking leadership roles (Table 5). [O] - Sanfey, 2011

Participants experienced a transformational shift in how they constructed their identity as a physicians and leaders, and questioned assumptions about the physician's role in healthcare. [M] - Smith, 2014

While there were a couple of physicians attending the FLA for a specific purpose of enhancing their current performance and positions and are not considering advancing into greater leadership roles, most of the group was interested in developing their leadership acumen further. - Smith, 2014

End of course evaluations for the eight content sessions yielded averages of 4.3 or higher on a five-point agreement scale across ten questions, with five of ten questions receiving a score of 5 for all sessions. Participants rated facilitators, content, location, meals, and applicability of content to their job. [C] - Throgmorton, 2015

I found it to be an overwhelming positive experience that was helpful to me. The only downside was all the information and trying [...] to remember it all and bring it into the way that you do things every day. [C] - Throgmorton, 2015

I came in with a minimal foundation of leadership and I left with tools [...] I took something away from every session [...] There are so many great things. I could give you a take home message on each session. The PLA made it clear that there are so many resources for us [...] Teaching us that foundation [...] I can't even put into words how helpful it is. [M] - Throgmorton, 2015

There were some feelings expressed by more experienced physicians that much of the PLA content was not new to them. One stated: I have been in leadership positions for a lot of years. So I think over the years I developed a pretty good level of understanding of my style and so forth. Like when we did the DiSC, I thought it was interesting, but it did not tell me something I was not already aware of [...]. [C] - Throgmorton, 2015

End of session responses to the survey question "I learned new knowledge and skills during this developmental session" yielded an average 4.5 response on a five-point agreement scale. [M] - Throgmorton, 2015

I do think the PLA has giving me a little bit of confidence to understand that while I may not be the most experienced one in the room that I have got something to offer. [M] - Throgmorton, 2015

Self-awareness gave me more confidence [...] I am much more reserved and it allows me to put myself out there just a little bit more. [M] - Throgmorton, 2015

Stakeholders targeted increased committee participation as an organization-impact result. This PLA cohort all served on a committee prior to the start of the PLA. [O] - Throgmorton, 2015

Practical application of acquired knowledge within interactive team-based learning during the residential components was mostly valued. [C] - Toma, 2020

SQSF was successful at consistently increasing awareness, knowledge and skills for most participants. Between 89%–96% of survey respondents indicated very strong agreement with statements regarding impacts on capability and confidence to practice (table 3). [M] - Toma, 2020

My skills around using QI methodology have massively improved. I've moved from being quite narrowly focused on my specific clinical area to having much broader horizons, and having the knowledge, skills and confidence to work on bigger service developments in areas that have been notoriously unimproved and unimprovable. (I14, Nurse) [M] - Toma, 2020

Several participants described how taking part in SQSF reinvigorated their career through attaining a more senior position with a designated QI national or organizational role, which often involved a change from 'doing' to 'leading' others: I am now able to influence more system wide change and will continue to inspire a network of improvers and innovators who have knowledge, skills and contacts to lead change and drive QI agenda in Scotland and beyond. (I07, Hospital Consultant) [M/O] - Toma, 2020

A minority of fellows have established or scaled national or international projects. Some examples include becoming active partners in strategic international collaborations with the aim of improving health and social care, at a significant scale and pace: I became a National Clinical Lead shortly after I finished my Fellowship. I am now advising a wide range of international partners in development of QI strategies, including Brazil, Canada and Australia. Allegedly I am now viewed as a QI expert and I feel like I am the 'go to' person for QI advice. (I16, Hospital Consultant). [M/O] - Toma, 2020

"Leaders Growing Leaders" became the name of our leadership development program comprised of 4 tiers (Table 1). For the cohort-based faculty learning communities in Tiers II and III, the leadership team (department chair, associate chair, and vice chair) carefully selected potential faculty participants and requested that they submit a brief declaration of their interest and commitment in the program. [C] - Torbeck, 2018

The decision to then become "selective" and form cohorts for Tiers II-IV is a strategy that we plan to continue because it allowed us to work on the "transfer of knowledge" in a more focused manner with people who we thought and hoped were most ready to engage. [C] - Torbeck, 2018

Reaction (satisfaction data)—Feedback from each post-session survey of our surgeons as leaders Tier I workshops indicated that respondents' overall reaction to the workshop was positive to extremely positive. Most respondents indicated that they were able to think about their current leadership style as it applied to the topic and planned to use some of the knowledge and skills learned in the future. Both the Tier II and III Leadership post series surveys showed all respondents valuing the topics as well as indicating that the timing was right for them in their careers. [C/M] - Torbeck, 2018

In terms of the Results (impact) outcome level, 2 out of the 3 faculty who recently interviewed for a vacant education leadership position in the department were participants of Tier II. Additionally, in the last 5 years, 5 of the 6 division chiefs have turned over and all have been replaced by internal candidates whom we have groomed through various leadership skill building programs. [O] - Torbeck, 2018

The UCSF-Coro FLC is a program administered within UCSF by Coro. Coro experiential training model was developed in the 1940s. The training model shares similar concepts of Kolb's experiential learning model [15], which was refined from Dewey's educational principles emphasizing concepts such as experience, experiment, observation and reflection, and purposeful learning [16]. Coro's design of curriculum and learning activities encourages participants to accept new tools introduced in the training, apply the tools, and to then adapt the tools, as needed, based on one's experiences and relevancy after a process of reflection. [C] - Tsoh, 2019

At an individual level, the program fostered development of leadership skills in conflict resolution, team management, and giving and receiving feedback. Since completion of the FLC, a majority indicated noticeable changes in leadership skills (98.6%), and attitudes or behaviors related to leadership (91.7%). [M] - Tsoh, 2019

A majority (91.7%) said the program had increased their understanding of UCSF as an organization; 79.2% credited the FLC to an increased ability to navigate UCSF as an organization. [M] - Tsoh, 2019

Specifically, the most commonly endorsed individual changes include a positive effect on ability to lead or manage through challenging times (93.1%), increased confidence in handling leadership roles or responsibilities (80.6%), and increased effectiveness in leadership roles (77.8%). [M] - Tsoh, 2019

As of 2017, 9.6% (n = 13) of the graduates attained leadership position at UCSF, defined as Dean (including Vice and Associate Dean positions), Department Chair, and Director of Organized Research Unit. [O] - Tsoh, 2019

Post completion of the FLC, while only 29% indicated volunteering more for committee service, 62.5% reported seeking out new leadership opportunities, and 61.1% were appointed to one or more committees as an outgrowth of the program. More women than men agreed their program participation encouraged them to expand their leadership roles in professional or volunteer organizations outside of UCSF (72.7% vs. 47.8%; $\chi^2(1) = 4.1, p = 0.04$). [O] - Tsoh, 2019

Two-thirds (66.2%) perceived a positive impact on recruiting or retaining faculty or agreed that participating in FLC increased their commitment to UCSF. [O] - Tsoh, 2019

The content of the program was based on a needs assessment conducted with faculty surgeons who were selected for participation. A full description of methods can be found in Jaffe et al. [C] - Vitous, 2019

When asked to reflect on how the LDP affected leadership style, many participants perceived that their approaches have become more collaborative and cited personal growth in a variety of areas, including the following: paying greater attention to strengths and weaknesses of colleagues, improving listening skills, decreasing agenda setting, and improving the ability to delegate. This transition has contributed to a more participatory approach to how decisions are made in the Department of Surgery at the University of Michigan. [M] - Vitous, 2019

Valuing physician leaders and organizational commitment (CMO5)

If LDPs reflect that hospitals value physician leaders by facilitating program participation and taking the program seriously [C], physicians feel appreciated, commit to the organization, and are more willing to adopt new leadership roles [M]. This strengthens the leadership pipeline [O], which seems especially true for underrepresented groups in the organization's leadership pipeline [C].

Studies that provide (partial) evidence

DeRusso, 2020; Ennis-Cole, 2019; Fassiotto, 2018; Hopkins, 2018; Levine, 2015; Macphail, 2014; Miani, 2013; Sanfey, 2011; Smith, 2019; Throgmorton, 2015; Tsoh, 2019.

Illustrative supporting evidence (text fragments, descriptions, data)

Participants felt honored to be selected for the program and indicated that protected time, sessions with senior physicians, training by experts in the business community, and the inclusion of only physicians were critical elements of the program. [C/M] - DeRusso, 2020

Survey results indicated that all 125 participants from the 4 cohorts agreed their leadership skills were enhanced, they felt more connected to the institution, and they were committed to contributing to the enterprise-wide mission. [M] - DeRusso, 2020

Across interviews, the participants stated that they felt their involvement in the leadership development program was an investment by the Center in their personal development and growth. They perceived that the investment meant that the Center believed in them. The participants agreed that their engagement was positively impacted by this perception. This is important to physicians because they do not like to stay in the wrong or be unappreciated. Cullum (2016) indicated that physician P08 commented: I'm going to stick around to see what it is like for people to invest in me other than clinical productivity and revenue. I'm staying as long as I'm feeling that investment. I'm going to be very loyal and very engaged and I have been because there is a continuous investment. [C/M/O] - Ennis-Cole, 2019

Following the leadership development program, nine out of the 10 participants graduated from the program and moved into new or enhanced leadership positions. Participants reported that their capacity for collaboration increased and their new leadership skills were utilized in their new leadership roles. [O] - Ennis-Cole, 2019

Three items from 'Attitudes: perceptions of institutional support' were significantly higher than non SLP participants. [M] - Fassiotta, 2018

I thought it was an incredible gift. It gave me basic tools I didn't have before to be a leader within every team I work on. It helped me to understand myself better too (Female, Assistant Professor at

time of SLDP participation). [M] - Fassiotta, 2018

Given the literature on effects of the "bamboo ceiling" in career advancement for Asian professionals and the dearth of Asian healthcare leaders in academic medicine, this result is meaningful as it provides one potential mechanism, inclusive leadership training, by which Asian health professionals may advance in their careers (Hyun, 2006; AAMC, 2017). Additionally, our data revealed that women program participants had significantly higher odds than their non-participant counterparts of remaining at the institution. This finding highlights the importance of perceived organizational support for retention and its potentially greater impact on women's turnover intentions (Eisenberger et al., 2002; Jawahar and Hemmasi, 2006; Rhoads and Eisenberger, 2002). [C/O] - Fassiotta, 2018

Invitations to participate in the program were highly selective. [C] -

Hopkins, 2018

Learning: Significant improvements, were reported in knowledge, skills, and attitudes surrounding leadership competencies. Including: connected to the institution [M] - Hopkins, 2018

The specific goals of the LPWF are to develop Johns Hopkins University School of Medicine women leaders who will contribute to future initiatives throughout the school, retain emerging female leaders by providing a prestigious and challenging learning experience that may lead to new opportunities and promotion, and advance the school of medicine's core values of diversity and inclusion. [C] - Levine, 2015

Finally, women may be more likely to value themselves as leaders because the institution, through support of the LPWF, demonstrates that it values women leaders.[Discussion]. [C/M] - Levine, 2015

Executive and line manager support was believed to contribute to achieving the feasibility of the program. This imbued the program. with a greater sense of credibility and demonstrated that the CLP and its participants were valued by the HCO. [C/M] - Macphail, 2014

The CLP significantly increased willingness to take on leadership roles. Most participants (93 per cent) reported that they were more willing to take on a leadership role within their team. Fewer were willing to lead at the level of department (79 per cent) or organization (64 per cent). Five of the 11 participants from the 2011 program had taken on a new leadership role 18 months later. [M/O] - Macphail, 2014

Participant follow-up (2011 program). Of the 11 participants who completed the pilot CLP in 2011, 9 (82 per cent) remain employed at the HCO 18 months after completing the program. Four had been promoted to more senior or managerial roles, including one who was redeployed to another section to assist in facilitating change to practice. Another member of the group has since participated within two separate quality improvement projects within the organization. [O] - Macphail, 2014

There appeared to be consensus among programme participants that the level of support provided by senior management in the Trust was instrumental in the development and achievements of Programme goals. Interviews in particular highlighted the role of the chief executive officer (CEO) whose support was reported to be perceived as strong and visible, demonstrated in her attending some of the training sessions (Int12) and adopting an 'open door policy' for external Fellows (Int10). Other members of senior management were also acknowledged to provide important support. [C] - Miani, 2013

The program was also seen to have contributed to improving the 'marketability' of a cohort of Fellows by enhancing their managerial skills and developing their abilities as clinicians. Interviewees noted that the Trust sought to capitalize on this achievement by offering positions to several of the external Fellows (two in scheme B, one in Scheme A, locum positions for two other Scheme A external Fellows under consideration; Int8). Other external Fellows were reported to be able to secure consultant level posts in other NHS trusts. It would therefore seem that the program has had a positive impact on the career of most of the external Fellows. [O] - Miani, 2013

The percentage of women participating in LAM has been steadily increasing, and the age of women participants has been decreasing. This reflects the changing institutional policy to target women and emerging or potential leaders, instead of more-established leaders as in the earlier years. [C/O] - Sanfey, 2011

Seventy-four of the 110 (67%) participants were male. This is the opposite of the more recent 2008 cohort, which reflected an increased institutional effort to target emerging women leaders. [O] - Sanfey, 2011

Although minimal gains have been demonstrated nationally over the past decade, during the period described in this article, our department faculty gender composition went from 27% to 39% women. Of unique importance, dramatic changes in the makeup of faculty leadership positions of vice chairs, chiefs of service, and division directors were seen: from 6% at the inception of the RLA program to the 32% current representation of women faculty leaders. The RLA was an important vehicle to prepare and promote women for intra-departmental leadership progression, creating role models in leadership positions and thus enhancing the value and culture of the organization [C/O] -

Smith, 2019

All those interviewed shared something of value to them personally and professionally. I thought it was a good program. I was very honored and flattered to be asked [...].[C/M] - Throgmorton, 2015

Of the 16 interviewed, 13 reported an enhanced connection to (organization)'s strategic plan (1 reported a strong connection already and 1 a minor connection). [M] - Throgmorton, 2015

Stakeholders targeted increased committee participation as an organization-impact result. This PLA cohort all served on a committee prior to the start of the PLA. [O] - Throgmorton, 2015

Most respondents (91.7%) agreed that the sponsorship of the FLC demonstrated the University's commitment to foster faculty development. [C] - Tsoh, 2019

'It is an important symbol to me, personally, of the university's interest in "growing its own" and, in particular, of this public institution's continued interest in trying to assure that its leaders look like the public the university serves.' [C/M] - Tsoh, 2019

When selecting applicants for admission to the program, the committee made a conscious effort to address issues of equity and inclusion (e.g., by gender, URM status, school, and department). [C] - Tsoh, 2019

'I feel more engaged with the university as a whole, and more interested in collaborating with others outside of my department.' [M] - Tsoh, 2019

As of 2017, 9.6% (n = 13) of the graduates attained leadership position at UCSF, defined as Dean (including Vice and Associate Dean positions), Department Chair, and Director of Organized Research Unit. [O] - Tsoh, 2019

Post completion of the FLC, while only 29% indicated volunteering more for committee service, 62.5% reported seeking out new leadership opportunities, and 61.1% were appointed to one or more committees as an outgrowth of the program. More women than men agreed their program participation encouraged them to expand their leadership roles in professional or volunteer organizations outside of UCSF (72.7% vs. 47.8%; $\chi^2(1) = 4.1, p = 0.04$). [O] - Tsoh, 2019

	Two-thirds (66.2%) perceived a positive impact on recruiting or retaining faculty or agreed that participating in FLC increased their commitment to UCSF. [O] - Tsoh, 2019
The interconnectedness of organizational culture, quality improvement, leadership pipeline	
Studies that provide (partial) evidence	Berghout, 2020, Lewis, 2021, Miani, 2013, Rask, 2011, Smith, 2014 Smith, 2019
Illustrative supporting evidence (text fragments, descriptions, data)	<p>It was not always a smooth transition when physicians returned to their own hospital. Physicians particularly experienced a lack of support from peers and hospital administrators with regard to their project and personal developments. In addition, they were not always granted the extensive time required for executing improvement projects because the daily pull of clinical work was perceived as too strong. This arguably hindered some physicians from wholeheartedly embracing their preferred identity as collaborative leader as the following quote illustrates: I experienced difficulties in finding my role. You're not a medical manager, you're not part of the (hospital/ medical) board. So what's your role then? But there's expected a lot from you. You receive no formal support or feedback while you do need that. (Respondent 10, z in-house session 18 June 2018) [O culture - O leadership] - Berghout, 2020</p> <p>Successful IAP implementation helped fellows enhance their visibility and reputation. Projects that aligned with institutional priorities enhanced the reputation of both the institution and fellow, either directly through project outcomes, or indirectly through development of the fellow as a future leader. When projects enhanced institutional missions and organizational culture, fellows had new leadership opportunities and their IAPs were more likely to achieve intended goals. [O culture - O quality - O leadership] - Lewis, 2021</p> <p>This finding was supported in interviews, with mentions of opportunities to work better as a team (Int7) and to improve people management considered a strength of the Program: The team work, the group work, I mean talking about different people and how we impact, how we think about making changes for the benefit of the patient. All this is happening as well and I think this is a good change and if we keep doing that it will make a huge difference in the communication and eventually it will make a great difference to the patient. (Int15) [O culture - O quality] - Miani, 2013</p> <p>The two-pronged approach was designed to reach multiple levels of the organization to more rapidly achieve culture change and promote QI adoption. The courses were initially offered four times a year to build a critical mass of trained employees and are now offered twice a year (in the spring and the fall), with a cohort of approximately 30 in each class to reach new employees and employees in clinical areas of strategic importance to the organization. [O culture - O leadership] - Rask, 2011</p>

leadership positions of vice chairs, chiefs of service, and division directors were seen: from 6% at the inception of the RLA program to the 32% current representation of women faculty leaders. The RLA was an important vehicle to prepare and promote women for intra- departmental leadership progression, creating role models in leadership positions and thus enhancing the value and culture of the organization. [O culture - O leadership] - Smith, 2019

Projects often expanded into a sustainable process or program with positive business or cultural impact. Highlighted next are four such projects. [O culture - O quality] - Smith, 2019

Some physicians struggled with the decision to pursue leadership and the personal mental cost associated both internally and externally with their peers. This is a cultural barrier that is not easily traversed. In the medical culture, physicians who choose to move to a leadership position as opposed to continuing to practice in a clinical capacity are often negatively viewed. Mentoring would be an important addition for these physicians with physician leaders both inside the organization as well as outside of the region. [O culture - O leadership] - Smith, 2014

Leadership ecosystems

Studies that provide (partial) evidence

Berghout, 2020, Bhalla, 2018, Christensen, 2016, Daniels, 2014, DeRusso, 2020, Fernandez, 2016, Hopkins, 2018, Howell, 2019, Macphail, 2014, Miani, 2013, O’Neil, 2019, Pradarelli, 2016, Rao, 2017, Sanfey, 2011, Shah, 2013, Smith, 2014, Smith, 2019, Steele, 2020, Toma, 2020, Torbeck, 2018, Tsoh, 2019

Illustrative supporting evidence (text fragments, descriptions, data)

Although the construction of the collaborative self was a key development in the MLDP trajectory, it was not always a smooth transition when physicians returned to their own hospital. Physicians particularly experienced a lack of support from peers and hospital administrators with regard to their project and personal developments. In addition, they were not always granted the extensive time required for executing improvement projects because the daily pull of clinical work was perceived as too strong. This arguably hindered some physicians from wholeheartedly embracing their preferred identity as collaborative leader as the following quote illustrates: I experienced difficulties in finding my role. You’re not a medical manager, you’re not part of the (hospital/medical) board. So what’s your role then? But there’s expected a lot from you. You receive no formal support or feedback while you do need that. (Respondent 10, z in-house session 18 June 2018). - Berghout, 2020

A lack of support by others led to identity violations as this obstructed some participants to be their preferred collaborative self. These identity violations caused participants stress and work dissatisfaction and hindered some participants from fully realizing their collaborative ambitions. - Berghout, 2020

However, from its inception, the CQFP curriculum has evolved each year based on changes in health care delivery models, health policy and payer priorities, and shifts in consumer demand. The passage of the Affordable Care Act (ACA) and the state health policy environment have had a significant impact on the curriculum, which now includes performance-based programs developed as part of the ACA and within the region. Refinements to the curriculum also are made annually based on feedback from the fellows and faculty. - Bhalla, 2018

The CQFP program actively continues. In addition to curriculum evolution related to new federal and state policy initiatives, regional faculty composition is being expanded. It is anticipated that interest in the program will continue to grow, as it has been associated with career progression. CQFP fellow alumni have expressed interest in becoming faculty or mentors for future classes. An annual “culminating dinner” for each class brings together graduating and prior fellows. A network of fellows is developing, all of whom receive UHF and GNYHA mailings on issues of health care policy and quality, and for whom a more formal social media networking vehicle is being evaluated. GNYHA and UHF also are exploring the option of connecting the CQFP with an academic institution to allow fellows interested in obtaining advanced degrees to receive credits for completing the CQFP. - Bhalla, 2018

Attendees are aided by executive coaches, connect with the broader network of course alumni through an electronic portal and network, and prepare a brief address framing their vision for their colleagues as a capstone experience of the course. To date, 114 individuals from 21 countries (including Australia) have attended the Samson Global Leadership Academy. - Christensen, 2016

At this time, Afya Bora includes web resources and professional networking for participants intended to foster further development and maintenance of positive health leadership practices. - Daniels, 2014

Our analysis showed limited evidence that participants reached the maintenance stage of the health leadership model. It is possible that the evaluation activities at three months post-fellowship did not allow fellows enough time to reach this stage. Alternatively, it may suggest that the ability to effect sustainable organizational change may require expanding the post-training interventions to support. - Daniels, 2014

The program has evolved in response to feedback and experiences from year to year. - DeRusso, 2020

It is important to note that the cohort surveyed completed the course prior to the initiation of a structured post-course skills support system, which was incorporated into the curriculum with the 2014 cohort. Thus, the Fellows in the analysis received no such ongoing learning supports made available to them from the course. - Fernandez, 2016

Minor adjustments were made to the curriculum and presenters over the 4 years of the program based on participant feedback. - Hopkins, 2018

Even though there were significant improvements at the end of the program in perceptions of institutional support and connectedness, participants still had concern about support for career development and general hospital support. In addition to a training program, organizations wanting to develop physician leaders need to look at how this role will be supported. - Hopkins, 2018

Pathology Leadership Academy will use participant and chair feedback for ongoing curricular development to ensure topics continue to address major needs of academic pathology. - Howell, 2019

Based on these considerations, it was considered practicable and valuable to continue the program on an ongoing basis. The HCO plans to expand the program to incorporate additional staff from other clinical departments (e.g. staff employed in nursing homes). The results of participant surveys in 2013 and 2014 will be considered by the executive to determine the need for a more comprehensive evaluation. Follow-up in five years of these two cohorts will be of interest to determine if there is any enduring effect. - Macphail, 2014

At the same time, there appeared to be a trend for negative attitudes from staff outside the program to have fallen over time, with the number of respondents reporting not having experienced disapproval from others increasing from under 20 percent to almost 40 percent as the program evolved. Reported reasons for lack of support and resistance towards program participants included a perceived general resistance to change and skepticism towards new ideas that some considered to be inherent in clinicians' culture. - Miani, 2013

The success of the APLA has generated a reinvigorated sense of organizational connection and physician engagement, and sparked further development of physician-led initiatives including the development of future cohorts of physician leaders at the director level as well as high potentials. In fact, twenty-six emerging physician leaders joined together from across the organization to kick off a second cohort of the APLA in January 2017. Several of the APLA participants from the first cohort served as AL sponsors to provide guidance and mentorship throughout the process. THS has only just begun their journey of developing physician leaders as change agents, but the results of the APLA program suggest great promise for positioning the organization for success in the future of value-based care delivery. - O'Neil, 2019

Finally, one of the most important aspects in designing a leadership development program is to ensure organizational systems are in place for graduates to continually apply their learnings and that there are opportunities for leadership growth in the form of promotion and career trajectory. Otherwise, future leadership development initiatives are met with apathy and skepticism – creating a sort of why bother if nothing comes out of it? The APLA participants in this program demonstrated a range of continued involvement in working together on their projects once the formal AL component was completed. Teams with sponsors who kept the momentum going tended to continue working on their projects; whereas teams without a ‘push’ from their sponsors, tended to lose steam on their projects. As such, we learned that designing a structured process for AL teams to continue project work post-graduation is crucial to sustaining the learning and momentum of the program. - O’Neil, 2019

The second iteration of the Leadership Development Program was changed in several ways based on feedback from the inaugural program described here. These immediate changes focused mainly on reformatting the curriculum to enhance the integration and delivery of information. Speakers who were thought to be less effective based on participants’ responses were replaced. - Pradarelli, 2016

Previous CPIP graduates serve as coaches for current attendees, which helps broaden the learning resources for new students and reinforce previous training for coaches. - Rao, 2017

The two-pronged approach was designed to reach multiple levels of the organization to more rapidly achieve culture change and promote QI adoption. The courses were initially offered four times a year to build a critical mass of trained employees and are now offered twice a year (in the spring and the fall), with a cohort of approximately 30 in each class to reach new employees and employees in clinical areas of strategic importance to the organization. - Rao, 2017

Finally, there are curricular gaps in the related themes of sustainability of performance improvement and spread of interventions. When the course ends, participants typically have insufficient data to discern statistical signals that their interventions are having an impact; addressing sustainability at that time is somewhat premature. However, extending the duration of the course would require more time of the physicians. To address this, the research team is piloting a program in which select teams are supported for a postgraduate period during which they are exposed to a curriculum focused on these topics and continue to work on their project with faculty coaching. - Rao, 2017

The LAM faculty made a number of modifications to the program content and format in response to institutional needs and participant feedback. - Sanfey, 2011

The comments by the long-term Post-LAM participants emphasize the ongoing struggle faced by people who have the ability to lead but are not nurtured: “Not at all successful due to lack of support, still just putting out fires” and “Still have difficulty saying No to things and getting overloaded.” - Sanfey, 2011

Although the benefits of LAM participation are sustained for some years, there is a need for reinforcement to prevent skill attrition. - Sanfey, 2011

The researcher suggests the course co-directors identify opportunities to be the bridge for successful clinicians engaging in leadership while still maintaining their identities as physicians. Some physicians struggled with the decision to pursue leadership and the personal mental cost associated both internally and externally with their peers. This is a cultural barrier that is not easily traversed. In the medical culture, physicians who choose to move to a leadership position as opposed to continuing to practice in a clinical capacity are often negatively viewed. Mentoring would be an important addition for these physicians with physician leaders both inside the organization as well as outside of the region. - Smith, 2014

Notably, 60% of RLA alumni continued their involvement with the program in one or more ways, such as serving as a presenter or panelist, team project coach, program planning contributor, or mentor to RLA participants. - Smith, 2019

Projects often expanded into a sustainable process or program with positive business or cultural impact. Highlighted next are four such projects. - Smith, 2019

A continuous improvement culture allowed the program to keep up with new challenges in the environment and changing organizational needs. - Smith, 2019

Over time, changes to the program have been implemented based on informal interviews with fellows. For example, leadership project guidelines were revised in 2018 such that the project needs to be beneficial to the fellow's home institution, address a fellow's self-identified leadership gaps, and be submitted to the COD Administrative Board for review (List 1 provides examples). Other changes that have been implemented include increasing the number of dean mentor shadowing opportunities from 1 to 2 (2013); providing recommended reading on leadership (2017); and providing information about the executive search, recruitment, and interview processes (2017). - Steele, 2020

Other fellows described how they contributed to establishing QI infrastructures such as QI academies that drive further related capability and capacity opportunities. - Toma, 2020

Key strengths included a strong historical commitment from the SQSF leadership and support team to routinely collect and collate good quality programme and evaluation data, which was made available for this study. - Toma, 2020

Third, our evidence suggests that despite overwhelmingly positive reactions and learning, similar to other comparable QI educational programmes,^{7 11} the extent to which participants were able to transfer training into the workplace was mediated by a wide range of interrelated situational factors such as internal motivations, supportive organizational culture, available resources and further coaching and feedback on an ongoing basis. - Toma, 2020

Consolidating post- fellowship mechanisms can also be useful so that participants can continue to network and collaborate with peers and colleagues about successes or challenges in creating and sustaining improvements. - Toma, 2020

Interestingly, several Tier III faculty were sorry to see the leadership series end and most indicated that they would like to continue on in some fashion with their leadership cohort. To that end, each Tier III faculty receives a "Weekly Leadership Pearl (WLP)" in the form of an e-mail. - Torbeck, 2018

While subsequent iterations continue to evolve both content and structure, more can be done to sustain these multi-level impacts. Strategies might include (1) additional support beyond the program to maintain cross-institutional connections and peer support, (2) reinforcement and further skill-building (e.g., booster sessions to bring graduated cohorts together), and (3) support for graduates in accelerating transitions to new leadership positions (e.g., 'follow-on experiences' to sustain or reinforce new skills and move the graduates more swiftly towards efficacy in various leadership roles). - Tsoh, 2019

This article describes perspectives from our 12-year experience cultivating a formal faculty LDP within an academic health center and

longitudinal outcomes of our LDP.

More Full Professors agreed to the statement that the program improved the climate for UCSF than Associate or Assistant Professors (78.8% vs. 45.0%; $\chi^2(1) = 7.8, p = 0.005$). - Tsoh, 2019



9

General discussion

The ultimate purpose of this thesis is to support physicians in hospitals to deliver high-quality care, thereby benefitting patients, physicians and society as a whole. An essential precursor of high-quality care is physicians' professional performance, for which physicians' well-being and leadership qualities are important determinants. This thesis builds on the existing research covering these two determinants to investigate physicians' professional performance more in-depth, thereby aiming to advance the scientific understanding of the construct as well as to uncover strategies to enhance physicians' professional performance in practice. I conducted seven studies to answer the overarching research question: How do physicians perceive and enhance their professional performance with regard to well-being and leadership?

In this discussion, I will first answer the above research question by presenting the main findings of this thesis in relation to the identified knowledge gaps (Table 1). Then, I will consider the main findings in a broader context by reflecting on physicians' professional performance, discussing physicians' psychological ownership of their professional performance, and why it is beneficial to bring well-being and leadership together in order to enhance physicians' professional performance. After this discussion, I will describe the strengths and limitations of this thesis, present recommendations for future research and practice, and end with a brief conclusion.

Table 1. Identified knowledge gaps (KG) and chapters that address them.

KG	Description	Ch.
<i>Enhancing professional performance through the lens of well-being</i>		
1	There is limited knowledge of the predictors of positive indicators of physicians' well-being, such as work engagement and professional fulfillment, and the relationships of these positive well-being indicators with physicians' professional performance.	2,3,4
2	There is limited confirmatory evidence validating JD-R theory among physicians in various hospital settings, which is needed as job demands and resources are context dependent. Validating previous findings pertains to confirming or disconfirming relevant job demands and resources as well as uncovering theoretical mechanisms linking job demands and resources with well-being and performance.	2,3,4,6
3	There is limited knowledge of the differences in physicians' perceptions of job demands and the subsequent consequences for their well-being and professional performance.	5
4	There is limited knowledge of developing and conducting well-being interventions for physician teams that aim to enhance physicians' well-being by addressing job demands and resources.	6
<i>Enhancing professional performance through the lens of leadership</i>		
5	There is limited knowledge of the strategies and instruments physicians with formal leadership roles use to enhance the professional performance of the physicians they lead to consistently provide high-quality care.	7
6	There is limited knowledge of the working mechanisms of leadership development programs for physicians to achieve hospital outcomes.	8

MAIN FINDINGS

Enhancing physicians' professional performance through the lens of well-being

Knowledge gaps 1 and 2 are intertwined, and thus the findings for these two gaps are discussed together. While **Chapter 6** reports on developing and piloting a well-being program and mainly attends to *knowledge gap 4*, it also provides information on *knowledge gap 2*. In this study, we conducted a needs assessment among physicians to identify which job demands and resources they considered most relevant. The most important job demands were administrative burdens and workload, and the most frequently mentioned job resources were appreciation by patients, learning and professional development opportunities, and inspirational leadership.

Using the data gathered by the developed well-being program, in **Chapter 2**, we investigated relationships between job demands and resources, physicians' well-being (burnout and work engagement), and physicians' work ability. Work ability can be considered an aspect of physicians' professional performance and refers to their ability to perform tasks with attention and concentration. Work engagement was positively and burnout negatively related to work ability, although burnout related the strongest to work ability. The findings of this study suggest that excessive workloads were detrimental to physicians' professional performance by increasing burnout levels. This study also indicates that learning and development opportunities and good collegial relationships enhanced physicians' work ability through work engagement. Of the job resources, learning and development opportunities showed the strongest associations with physicians' work engagement and work ability. Participation in decision-making was positively related to physicians' work engagement but not to their work ability. In addition, we found that workload and administrative burdens moderated the positive relationships of participation in decision-making and relationships with colleagues on work engagement, with higher workloads and administrative burdens reducing the strengths of the positive relationships.

These findings address *knowledge gap 1* by providing information on the predictors of physicians' work engagement and its relationship with professional performance. Also, the results address *knowledge gap 2* by confirming the primary pathways of the JD-R model – the health impairment and motivational process – by which job demands and resources relate to physicians' well-being and professional performance in Dutch hospital settings.

Chapter 3 addresses *knowledge gap 1* by providing information on another positive indicator of physicians' well-being: professional fulfillment. Professional fulfillment refers to the degree of intrinsic positive rewards physicians derive from their work. This study found that personal resilience and work-home balance predicted physicians' professional fulfillment. A self-kind attitude of physicians, alternative to a critical or perfectionistic self-attitude, was positively and indirectly related to professional fulfillment through enhancing personal resilience and work-life balance. In line with JD-R theory and attending to *knowledge gap 2*, this study suggests that physicians' personal resources are indeed related to their well-being, potentially via obtaining job resources that may assist in establishing a healthy work-life balance or reducing the effect of detrimental job resources.

The qualitative interview study presented in **Chapter 4** explored how patients and physicians understand the concept and practice of compassionate care, an important aspect of good professional performance. Regarding well-being, this study revealed that physicians derived professional fulfillment from providing compassionate care and the gratification they received from patients (*knowledge gap 1*). Job demands such as excessive workloads, time constraints, and distractions in the consultation room, such as beepers, seemed to predict physicians' professional performance by hindering physicians from providing compassionate care (*knowledge gap 2*), potentially through reduced well-being. In line with the findings on the professional performance outcome work ability, this qualitative study suggests that reducing excessive workloads is critical to enhance physicians' professional performance.

The study in **Chapter 5** addressed *knowledge gap 3*. In this study we investigated different perceptions of physicians' well-being and performance in the challenging setting of night shifts. The study showed that not every physician perceived the impact of night shifts similarly and suggests that some physicians may be affected more by night shifts than others. Specifically, we found that physicians could be clustered into three groups based on their alertness, contentedness, and calmness before the commencement of the night shift, labeled as: Indifferent, Ready, and Engaged. These pre-shift profiles distinguish themselves on relatively low, average, and high scores on all three outcome measures. After the night shift, we found four physician profiles which we labeled: Lethargic, Tired but Satisfied, Excited, and Mindful. Compared to the pre-shift profiles, an additional profile was identified after the night shift, and the alertness, contentedness, and calmness scores varied more within the post-shift profiles. The more differentiated manifestations within the post-shift profiles indicate that physicians perceived the impact of the job demand 'night shift work' differently. Variations in working circumstances during night shifts could not entirely explain this. The results of this study imply that

exploring whether physician subgroups benefit from tailored interventions to attenuate the adverse effects of night shifts is worthwhile.

Chapter 6 mainly attends to *knowledge gap 4* and reports on developing and piloting a well-being program for physician teams to improve their working environment. The final program included a feedback tool to assess physicians' working conditions and well-being, a facilitated team dialogue, and a team communication and job crafting training session. The preparatory needs assessment provided insight into physician preferences about participating in a well-being intervention. For instance, physicians prefer a feedback tool that is easily accessible and time friendly, and an intervention preferably provides a psychologically safe environment in which team members' shared workplace issues can be addressed. Our critical reflections on developing and piloting a well-being program and resulting recommendations support the effective design of team-based well-being interventions that address job demands and resources for physicians in hospital settings.

Enhancing physicians' professional performance through the lens of leadership

Chapter 7 attends to *knowledge gap 5* by investigating what strategies boards of Medical Specialist Companies (MSCs) used to address physicians' professional performance in order to consistently achieve high-quality care. We identified five strategies: (1) actively managing and monitoring performance, (2) building a collective mindset, (3) professionalizing selection and onboarding procedures (4), improving occupational well-being, and (5) harmonizing working procedures. The study also revealed that MSC boards felt most comfortable at addressing organizational structures, processes or policies, and physician behaviors that unanimously qualified as 'good' or 'bad'. However, the collegial boards hesitated to intervene in cultural issues or ambiguous unprofessional behaviors. Particularly, building a collective mindset among MSC physician members was a critical cultural challenge in MSCs. Physicians (MSC physician members and in some cases MSC board members) still insufficiently considered the consequences of their professional performance for the broader hospital and MSC. Instead, they tended to think from the perspective of their medical discipline or group, a practice that dates back to pre-MSC ways of organizing the profession. MSC boards acknowledged that more leadership knowledge, skills, and tools to address the professional performance of physician members in a company among equals would help them. The findings of this study emphasize the importance of leadership skills for physicians with a formal leadership role, but also for those without such a formal role, as it would help them better understand how their professional performance can contribute to the performance of the hospital and MSC.

Chapter 8 presents a realist review exploring the working mechanisms of leadership development programs (LDPs) for physicians to achieve hospital outcomes, hereby addressing *knowledge gap* 6. Realist reviews aim to formulate a program theory that explains the working *mechanisms* [M] of interventions in specific organizational *contexts* to [C] generate *outcomes* [O]. Hence, program theories consist of context-mechanism-outcome (CMO) configurations.

The identified program theory comprised five CMO configurations explaining why, how, and under which circumstances LDPs can impact three hospital outcomes categories that we defined: organizational culture, quality improvement, and the leadership pipeline. Here I discuss the identified CMOs by outcome category. Note that CMO2 includes each identified outcome category.

In contexts where LDPs offered constructive feedback [C], physicians acquired more self-insight, leading to physicians enacting people management, which improved communication and collaboration [M], impacting the hospital's culture [O] (CMO1). In particular, in-house LDPs that intentionally stimulated participant interaction [C] facilitated physicians to build professional networks, contributing to an improved mutual understanding between various hospital actors and better communication and collaboration [M], benefitting the organizational culture [O] (CMO2). Professional networks also contributed to this outcome category by establishing support networks for physicians [M] (CMO2).

Professional networks contributed to quality improvement by mobilizing resources within hospitals as physicians knew where to go for collaborations or when facing challenges [M] (CMO2). LDPs that included well-supported quality improvement projects (e.g., project management support) endorsed by the organization [C], allowed physicians to create buy-in and be more perseverant when facing challenges [M], increasing the likelihood of successful project implementation and quality improvement [O] (CMO3).

Furthermore, due to building professional networks, physicians gained visibility within the hospital [M], which increased their chances of being promoted, thereby strengthening the hospital's leadership pipeline [O] (CMO2). We also found that when the LDP's content was tailored to physicians' needs [C], this led to relevant learning experiences, which helped to prepare them for [M] and assume leadership roles in hospitals [O] (CMO4). Finally, when LDPs reflected that the hospital genuinely valued physician leadership [C], this led to organizational commitment amongst physician participants [M], which increased their willingness to assume new leadership roles, strengthening the hospital's leadership pipeline [O] (CMO5).

The five identified CMOs operated within a wider organizational context, the leadership ecosystem. A supporting leadership ecosystem – which could include having established career trajectories with coaching after the program – contributed to the potential of hospitals to sustain and realize organization-level outcomes via their LDPs. This study contributes to the literature by providing a program theory explaining why, how, and under which circumstances LDPs can impact hospital outcomes (*knowledge gap 6*).

To summarize the main findings, JD-R theory helps to explain linkages between job demands and resources, physicians' well-being, and professional performance and can be instrumental in designing well-being interventions for physicians. While different hospital settings have shared and unique job demands and resources, reducing excessive workloads and having sufficient learning and development opportunities seem almost universally relevant to enhance physicians' well-being and professional performance in contemporary medical practice. One could argue that 'what' is needed to strengthen physicians' well-being and professional performance is well-known. However, knowledge is limited on the 'how', including 'who' feels responsible for taking action.

FINDINGS IN CONTEXT

To delve deeper into this lack of knowledge on 'how' to strengthen professional performance and 'who' is responsible for action that needs to be taken, I will place the findings of this thesis in context using scientific literature. First, I will reflect on physicians' perceptions of professional performance using the three pillars of professional performance and the CanMEDS roles, followed by discussing the psychological ownership physicians perceive for the roles and tasks that come with being a high performing medical professional. The last theme concerns the potential reinforcing positive effect that physician well-being and leadership can have on physicians' professional performance.

A reflection on physicians' professional performance

In the introduction of this thesis, I defined physicians' professional performance using three pillars: striving for excellence, humanistic practice, and accountability for one's actions [1]. To more precisely comprehend what roles and tasks physicians' professional performance in contemporary medical practice includes, I used the CanMEDS Physician Competency Framework. The framework identifies seven roles that delineate the tasks and behaviors expected of physicians to effectively meet the healthcare needs of the patients they serve [2]. These roles are the medical expert, communicator, collaborator, leader, health advocate, scholar, and professional.

In the studies conducted in this thesis, physicians reported behaviors and responsibilities within all three pillars of professional performance and all seven roles of the CanMEDS framework. However, under high workloads and time pressures (resident) physicians perceived tensions between striving for excellence and humanistic practice (Chapter 4). While both patients and physicians considered compassion to be essential for high-quality care, physicians tended to strive for excellence by focusing on the technical quality of their clinical performance rather than by taking a more holistic approach – including the technical as well as the humanistic aspects of healthcare provision – to their patients' care. A study investigating the three pillars of professional performance found that in particular excessive workloads and poor teamwork hindered physicians' humanistic practice [3]. At the same time, our findings show that the perceived tensions between the technical and humanistic side of clinical performance are partially based on misconceptions or misunderstandings of compassion [4-6], e.g., 'it costs too much time' and 'it requires performing additional (medical) actions'. Previous studies showed that small acts of kindness, such as providing comfort, cost no or limited additional time and can enhance patient outcomes [6, 7]. Our findings suggest that a better understanding of the concept and practice of compassion as well as patients' compassion needs, may foster physicians' ability to attend to those needs (Chapter 4). If medical education programs provide explicit attention to compassionate care, physicians may less frequently miss opportunities to show empathy to patients and provide compassionate care to them [6-8]. However, teaching the science and practice of compassion in (graduate) medical education is not widespread, and the evidence base of compassion interventions is often limited [6, 8, 9].

Fortunately, most physicians in demanding hospital settings are able to put the patient first. Prioritizing the patient could mean to temporarily surpass or neglect other crucial aspects of being a good professional. This thesis, for example, shows that physician teams did not regularly discuss and reflect on their working environment and well-being as they perceived little time for this due to patient care responsibilities (Chapter 6). Notably, reflective practice and self-care are part of the CanMEDS role of 'professional'. Clearly, if physicians do not take time for self-care, their well-being may gradually decline, hence their ability to care for patients [10-12]. Also, when teams do not sufficiently reflect on their workplace and well-being, they may not be able to address the working circumstances that prevent them from reflecting in the first place. Moreover, MSC boards indicated that selecting qualified physicians to participate in quality and safety committees (in line with the CanMEDS leader role) was challenging because they found themselves completely absorbed by patient care responsibilities (Chapter 7). It should be acknowledged that by participating in these committees, physicians contribute to the improvement of patient care by allocating resources to resolve unsafe or inefficient

practices. Thus, on the one hand, physicians' commitment to patient care and the 'primary process' at the cost of dropping 'secondary' or 'indirect' patient tasks can be an effective strategy to ensure high-quality care in demanding working environments [13]. On the other hand, in the long run, when this strategy is consistently pursued and endures, physicians may lose sight of (parts of) performing other CanMEDS roles needed to sustainably realize high-quality patient care. Complying with all CanMEDS roles will likely contribute to physicians' ability to shape their working environment, as by doing so, physicians acquire knowledge, skills, and relationships that they can use to influence their working environment positively [14-16].

Research shows that a sense of (perceived) control and autonomy is vital as it can contribute to physicians' well-being and their ability to organize professional work proactively [17-19]. The literature, however, also shows that many physicians perceive their working environments as unsupportive, experience little room and efficacy to change the situation themselves, and externalize non-clinical tasks as a matter of 'the organization' [10, 18, 20-22]. This is worrisome since physicians' knowledge of clinical practice, specialized medical expertise, and professional values – always putting the patient's needs and interests first – are required for navigating healthcare change for optimal patient outcomes and working conditions that support physicians' professional performance [16, 23-26]. Therefore, it is crucial that physicians develop and take ownership of all aspects of professional performance and that healthcare organizations support them in this endeavor.

In the next theme in this general discussion, I will elaborate on physicians' psychological ownership of the multifaceted construct of professional performance. I consider this an essential step towards a more holistic healthcare practice in which the professional performance of physicians more closely meets the needs of modern healthcare and society.

Physicians' psychological ownership

The discussion to engage physicians beyond immediate patient care responsibilities is long-standing and still ongoing [1, 15, 27-30]. That this discussion is still ongoing does not imply that no progress has been made. On the contrary, almost all hospitals in Western healthcare systems invest in leadership development for physicians [14, 31]. Curricula in medical education increasingly train future physicians how to best communicate with patients and other healthcare professionals [32], care for their well-being [33], and pay attention to costs while providing patient care [34]. At the same time, despite the consensus in the literature and among leading medical professional bodies on professional performance, our findings suggest some physicians still lack the confidence and resources to fulfill all aspects of professional performance and therefore mainly stick to

performing patient care tasks (Chapter 7). Other physicians may feel that new roles and responsibilities have been imposed on them that do not entirely match their motivation to enter the profession: helping patients [10, 27]. While many physicians know what constitutes excellent professional performance in contemporary practice, they may not feel all facets of professional performance 'fit' in their view of their professional role [21, 27]. Such a lack of perceived psychological ownership may cause a loss of intrinsic motivation and responsibility [35, 36] and hence reduce the likelihood of performing several tasks that are part of the professional performance of a modern medical professional.

Therefore, in this and the coming sections, I aim to contribute to the debate of engaging physicians to enact all roles and tasks of professional performance by using the concept of psychological ownership. Psychological ownership is "the feeling of possession over a target – an object, concept, organization, or other person – that may or may not be supported by formal ownership" [37]. Psychological ownership is a state of mind in which individuals perceive that the target or piece of the target is 'theirs' [35]. In this case, the ideal target is professional performance defined by an appropriate balance between all seven CanMEDS roles [2], so physicians can live up to the professional performance pillars of continuously striving for excellence, humanistic practice, and accountability [1]. Some physicians already perceive high levels of psychological ownership for all the roles and tasks that are part of a modern professional. Others, however, might lack the confidence or resources to fulfill all these roles and tasks resulting in a lack of psychological ownership of their professional performance – and therefore have to develop this ownership.

Psychological ownership in organizations is related to and can co-exist with concepts such as organizational commitment and identity, but differs in its conceptual nature of 'possessiveness' and the resulting responsibilities [35, 36]. Individuals who become invested in the target of ownership have a personal stake in the target and wish to contribute to this target by maintaining or enhancing it [35]. Therefore, if physicians have psychological ownership of their professional performance, they feel responsible for maintaining or enhancing their professional performance by complying with all CanMEDS roles. However, if physicians have strong psychological ownership of only one or a few roles, they also aim to maintain and protect this. In line, MSC boards said that the emergence of the MSC – which requires a shift in roles and tasks – was perceived by some physician members as a threat to their professional autonomy, causing them to withhold their performance information or protect the interests of the specialty group (Chapter 7). One could argue that these physicians misuse the concept of professional autonomy to protect what is 'theirs', as the privilege of autonomous practice comes with the duty to open up to peer performance review [38]. Thus, psychological ownership in

organizations can manifest positively – e.g., work engagement, organization based-self-esteem, knowledge sharing, and job and organizational performance – and negatively – e.g., territorial behaviors and reluctance to share knowledge – depending on individuals' psychological ownership levels and the definition of the target [36].

The findings of this thesis suggest that physicians' psychological ownership for proactively organizing their professional work is somewhat limited, which is part of several CanMEDS roles, e.g., the 'leader' and 'collaborator' roles. For example, MSC boards indicated that it was challenging to motivate MSC members to participate in non-clinical tasks within the MSC and aimed to stimulate *"the transition to actively participating medical specialists"* who are aware and acknowledge *"that this is also their company, their nest, and that you have to keep it very good"* (Chapter 7). Also, during the development and piloting of the well-being program (Chapter 6) and the interviews on compassionate care (Chapter 4), we identified that physicians perceived little efficacy in addressing disadvantageous working conditions such as high workloads. Physicians, for example, talked about high workloads as if they were an accomplished fact. In a group session of the well-being program, one physician said *"we feel like glorified shrimp peelers"*. These findings reflect limited feelings of ownership as physicians do not speak of their working conditions as something that belongs to their professional realm over which they have control [35, 39]. However, studies suggest that this perceived lack of ownership does not have to become true in practice because physicians have some leeway to change their working environments and organizations, especially if they work together with each other and others outside the profession [15, 18, 28].

Psychological ownership in a context of competing values

During medical training, physicians (traditionally) are socialized to internalize and prioritize medical professional values, such as advocating for the individual patient's interests, providing the highest quality of care, and appreciating high levels of professional autonomy, and associated tasks and behaviors [40-43]. Healthcare organizations, on the other hand, tend to prioritize values such as cost-efficiency and standardization to ensure high-quality, accessible, and cost-effective care for patients collectively [28, 44]. These different 'belief systems' may lead to tensions. In fact, the origins of resistance among some physicians to expand their professional role beyond healthcare provision can be found in clashing medical professional and organizational values [22, 23, 28, 44-47]. For example, an organization's cost restraints may conflict with providing the highest quality of care [28, 44]. Similarly, hierarchical structures and standardized workflows that aid the healthcare organization may restrict physicians' professional autonomy [28, 44].

Although there may be conflicts between medical professional and organizational values, physicians are expected to take ownership of their professional performance, which includes organizing professional work and dealing with conflicting values [16, 28]. Indeed, physicians increasingly assume leadership positions in hospitals [25]. Moreover, due to the growing size and complexity of physician practices and hospitals, role differentiation is likely to occur, necessitating some physicians to take on administrative tasks and formal leadership roles [48, 49]. These physician leaders constantly balance their role as 'physician' and 'leader' to make sure they make impact as a leader, without losing the credibility or support of the medical staff [22, 45, 46, 50, 51], which is a critical success factor for medical leadership [52]. At the same time, physician leaders – at least those who think organizing professional work is part of professional performance and needed to achieve high-quality care – challenge and aim to reconstruct their peers' traditional or narrowly defined perceptions of professional performance [22, 45, 51]. In other words: they aim to redefine the target of psychologic ownership.

To achieve this physician leaders should build on the strengths of medical professional values and culture [22, 53, 54]. For example, in a study among physicians in managerial positions in the British National Health Service, physicians aimed to challenge their peers' view of the mono-disciplinary professional working on individual patients by explaining why and how inter-professional teamwork aids in providing the best service for a larger number of patients [22]. Moreover, in a project in the Netherlands, medical culture was used (e.g., emphasizing patient benefits, aligning with physicians' ways of working and speaking) to engage physicians in quality improvement [53]. Within this project, similar approaches were observed, such as physicians explaining to each other that individual autonomy is not disappearing but is being replaced with collective autonomy, i.e., the autonomy physicians collectively have to organize patient care within the hospital [53]. Indeed, psychological ownership theory suggests that feelings of ownership are most likely to develop if individuals identify with its end goal and feel like this goal belongs to their territory or space [35].

Furthermore, psychological ownership theory provides several routes that facilitate the development of psychological ownership for a particular target or goal. As discussed, for different physicians, the desired qualities to be developed, i.e., the goal, may vary to meet the standard of a high performing professional.

Routes to physicians' psychological ownership

In their seminal work 'Toward a theory of psychological ownership in organizations', Pierce et al. identified three routes or mechanisms that may facilitate developing psychological ownership: (1) controlling the target, (2) coming to intimately know the

target, (3) and investing the self into the target [35]. The ability to control the target and perceptions of being able to achieve positive results is fundamentally linked to a sense of ownership, with increased control leading to a stronger sense of ownership [35, 55]. Hence, providing physicians with opportunities to exercise control over the roles and tasks they ought to perform can enhance psychological ownership. Job design literature reports that greater levels of autonomy can enhance control [56]. This implies that it is important not to force physicians into new roles and tasks but provide them some with room to organize their work according to their needs and preferences. While autonomy is critical to physicians' professional fulfillment, studies show that physicians' autonomy has reduced over the years due to the introduction of different reimbursement models and standardized ways of working [57-61].

Also related to control in the working environment is the ability to express voice and participate in decision-making [36]. In this thesis, physicians' participation in decision-making enhanced their work engagement (Chapter 2). Furthermore, MSC boards said that when they proactively asked physician members' viewpoints on certain organizational issues, the physicians were more willing to participate (Chapter 7). Previous findings underline this as they report associations between leadership approaches that actively solicit physicians for input and psychological safety [62], well-being, and participation in decision-making [63-65].

Pierce et al.'s second route in developing psychological ownership suggests that if physicians obtain more knowledge on the roles and tasks they are expected to perform, their feeling of ownership towards it will be stronger [35]. Communication and information about the organization's vision, mission, and strategic objectives may also develop feelings of ownership to act in line with the organization's goals [35, 63]. In line with this, we found that leadership development programs can enhance physicians' organizational literacy and self-efficacy as a leader (Chapter 8), meaning that they view issues at work as challenges that should be managed rather than avoided due to self-perceptions of inadequacy [17, 66, 67]. Self-efficacy seems a crucial mechanism to perceive ownership as it provides a sense of control and ability [17]; self-efficacy may be fostered by reflection and obtaining knowledge on the target, e.g., via training [14, 17, 68]. Incorporating adult learning principles when designing learning and development activities can facilitate relevant learning experiences by building on physicians' prior knowledge and expertise and ensuring practical relevance [69-71].

According to the third route towards more psychological ownership, individuals develop feelings of ownership if they invest energy, time, and attention in the roles and tasks the

target of ownership includes. This can be achieved through learning and development or, for instance, by developing and executing quality improvement plans.

Besides these three routes to psychological ownership as defined by Pierce et al. in 2001, evolving evidence shows a fourth route: psychological safety [36]. Aspects of psychological safety that predict psychological ownership are organizational justice (e.g., fair decision-making and treatment), trust, perceived organizational support, including valuing and recognizing employees' contributions, and relational closeness [36]. If working environments meet physicians' psychological safety needs, physicians are more likely to perceive themselves as part of the organization and will develop a sense of ownership [36]. In the intervention studies on well-being (Chapter 6) and leadership (Chapter 8), we found that psychological safety was crucial for the effectiveness of such interventions. Psychological safety also positively contributes to physicians' professional performance as it facilitates receiving performance feedback [72], increases social support and teamwork effectiveness [73], as well as the reporting of medical errors [74, 75].

Based on the routes delineated above, psychological ownership thus does not develop in itself. Physicians should be adequately supported and facilitated to live up to their professional performance. Otherwise, novel roles and tasks may be perceived as yet another job demand (Chapter 6, 7, 8).

Taking ownership at the individual and collective level

To conclude the theme of psychological ownership, I will now discuss how physicians may claim psychological ownership and live up to their professional performance standards individually and collectively based on this thesis' findings and the literature. As the behaviors and tasks that comprise excellent professional performance may differ between hospital settings, I cannot and do not intend to be exhaustive; nevertheless this discussion may be instrumental for individual physicians and their collectives. In my view, not every physician needs to be an organizational expert, but all physicians can and do need to contribute to the organization. Individual medical professionals can contribute to their working environments in various ways depending on their interests and unique qualities [29, 78].

Physicians' primary task will always remain to provide high-quality, compassionate care to all the patients they may serve. In my modern interpretation of what it means to be a good performing professional, and in line with the findings of my studies (Chapter 7, 8), this includes a basic understanding of the hospital organization as well as of some leadership and management principles, as this will likely enhance physicians' professional performance. Therefore, individuals can take ownership by enhancing their understand-

ing of the organization or leadership principles, e.g., by participating in leadership interventions. Research shows this may also benefit physicians who are not aiming to fulfill a formal leadership position, as it helps create awareness of the complexities of managing a hospital, and appreciation for the work conducted by hospital administrators and physicians in formal leadership positions [53]. Such an appreciation has been found to reduce resistance to change and may, at times, allow physicians to ‘take the back seat’ and let others lead them [79], which is crucial for collective ways of working and shared leadership approaches [78, 80].

Another way in which individual physicians can show psychological ownership is by the practice of giving feedback to peers and by speaking up against (suspect) unprofessional behaviors and (potential) patient safety threats (Chapter 7). A study amongst Dutch physicians reported that physicians often are the ones to first observe when their peers show deviant behaviors, that is, that they act differently from what they normally are seen to do in practice. These so-called ‘soft signals’ should be taken seriously, as they may reflect a patient safety or a physician’s well-being issue; both relate to professional performance and the quality of patient care [81]. Observed ‘soft signals’ may demand from physicians that they start a collegial conversation [82]. Speaking up requires the right attitude and skills which, preferably, should be developed as early on in the medical career as possible, and be part of medical training and lifelong learning [82, 83].

Furthermore, physicians can take ownership by participating in learning and development opportunities, including assessments and reflections on various aspects of their professional performance [84-87]. This thesis found that physicians considered assessment of and reflection on their well-being and working environment as valuable to identify improvement actions (Chapter 6). Also, in leadership development programs, this led to insight into strengths and weaknesses and accompanying adjustments in physicians’ leadership behaviors (Chapter 8).

Moving from the individual practitioner to physicians collectives – by which I refer to (boards of) physician entities within hospital settings (e.g., boards of medical staff) – physicians as a group may claim ownership by formulating a vision on how physicians’ professional performance can be best supported. Adequately, facilitating physicians is sometimes forgotten when new or different behaviors or tasks are expected of them. For example, MSCs wanted to obtain insight into ‘soft signals’ by technically facilitating a system where physicians could report them (Chapter 7). However, little attention was devoted to training physicians on how to report soft signals or difficulties that come with reporting peers, due to which these systems were less often used. Under-facilitation is also a common caveat when aiming to involve physicians in decision-making [65, 88].

One way physicians can be facilitated to participate in decision-making is by actively inviting them and appreciating their contributions [65].

Based on this thesis, an obvious way to take collective ownership is to take physicians' well-being seriously and address job demands and resources. The literature, and our findings (Chapter 6), provide recommendations for designing well-being programs and policies [89-93]. While there may be concerns about financing these initiatives, the costs associated with burnout related turnover and reduced clinical hours is estimated at \$7600 per employed physician annually in the American context [94]. In the Netherlands, absenteeism due to work stress on average costs €11.000 per absent employee; extrapolated to the average income of a medical specialist, these costs will be at least more than four times as high [95, 96]. A study in the American context shows that if physicians unite and collaborate with hospital management to design an effective well-being program based on physicians' needs, this may lead to a positive return on investment of around 12% due to turnover costs alone [91].

For formal leaders of physician collectives, it is also essential to consider 'the total' of their leadership styles, activities, and strategies. If approaches unintendedly communicate inconsistent or opposing messages to physicians, this may lead to adverse outcomes [12, 97]. This can happen, for example, when pressuring physicians to realize high production volumes while simultaneously stating that their well-being is important.

The concept of high-performance work systems (HPWS) can be used to characterize physician collectives' total activities [98, 99]. Broadly two types of HPWS can be distinguished: control-based and commitment-based systems [98, 99]. Where control-based systems are characterized by compliance to rules, supervision, and autocratic decision-making, commitment-based approaches, in contrast, aim to enhance performance by facilitating employees, investing in relationships at work, providing autonomy, and long-term employment perspectives with extensive training efforts [98-100]. In line with our findings (Chapter 7,8), previous studies have found that commitment-based systems fit better with medical professional values and enhance physicians' professional performance more effectively than control-based systems [53, 101]. However, research suggests that some forms of 'control' may be needed within commitment-based systems to achieve optimal performance [102]. The challenge is to find the 'right middle' between commitment and control: an approach that respects professional ambitions of striving for excellence and humanistic practice while being sufficiently accountable to other stakeholders and society.

In the first theme, I have reflected on physicians' professional performance using the pillars of professional performance and the CanMEDS roles. Then, I discussed physicians' psychological ownership of their professional performance. In the last theme, I will reflect on the two lenses employed in this thesis to study physicians' professional performance. While multiple lenses can be used, considering well-being and leadership together may benefit physicians' professional performance.

Bringing well-being and leadership together to enhance physicians' professional performance

Researchers are pleading for a more holistic understanding of how well-being and leadership interact in order to enhance physicians' well-being and professional performance in hospitals [103-105]. In this final theme, I therefore discuss how well-being and leadership relate and can reinforce each other. Afterward, I will discuss how well-being and leadership interventions can have a bigger impact by respectively including well-being or leadership concepts or aligning them with other training approaches for these topics.

Leadership to impact the well-being of the workforce

Leaders at different organizational levels impact the perceived balance of job demands and resources of the workforce, and thereby impact well-being and performance [12, 19, 89, 90, 106]. Higher-level leadership, such as hospital board members or heads of divisions or departments, can contribute to physicians' well-being, for example, by creating supportive work environments [63, 89, 93, 105]. As positive role models they can set the 'tone at the top' and help build a healthy organizational culture [12, 107]. Moreover, determining the hospital's mission, vision, strategy and governance, and allocating budgets may translate in more positive perceptions of job demands and resources on lower levels, e.g., physician teams [19, 97]. For example, the hospital board may decide on a particular HRM strategy and allocate a substantial budget to physicians' professional development activities. This may affect how physicians in teams perceive their learning and development opportunities, which we found was a critical predictor of physicians' well-being and professional performance (Chapter 2).

Physicians who are being led by physician leaders with higher leadership scores report fewer burnout symptoms and are more satisfied with their job [108]. Physicians who perceive their direct leaders as supportive are more likely to retain their job in public hospitals [109]. These leaders usually succeed in creating a compelling vision, motivating, inspiring, challenging, and supporting the personal growth of the people they lead [110]. Such transformational leadership behaviors have been found to enhance healthcare workers' (including physicians) motivation and coping styles and, through this, their professional performance [111]. Therefore, it is surprising that we did not find

a relationship between physicians' well-being (exhaustion and work engagement) and their ratings of their supervisors' 'inspirational leadership' (Chapter 2). Based on previous research findings, we expected that physicians being led by more inspirational leaders would experience lower levels of exhaustion and be more work engaged. As discussed in Chapter 2, this may be explained by cultural and contextual differences and the leadership preferences and needs of physicians working in the Netherlands, e.g., compared to the preferences and needs of physicians in the American [108] or Chinese [111] context.

Leadership to impact leaders' own well-being and leadership performance

Leadership can also be used as a tool to impact a leader's own well-being. The realist review study in this book showed that due to the skills and experiences obtained from participating in leadership development programs, physicians did better understand the hospital's objectives, were able to identify quality improvement opportunities, and knew how to obtain support and resources (Chapter 8). Therefore physician leaders may be better able to reduce job demands and obtain resources within the organization, potentially enhancing their own well-being and ultimately professional performance [19].

The scientific literature also discusses whether having a formal leadership role benefits one's well-being. In a study among emergency physicians in the United States, physicians with a formal leadership role reported to experience more job satisfaction than those without a formal leadership role [112]. One explanation may be that physician leaders perceive more autonomy and control in their work [105]. However, it has also been argued that the benefits of enhanced autonomy and control are, to a large extent, outdone by the additional job demands of assuming a new leadership position [113].

A large study among the German total working population also found that the well-being levels of workers in leadership positions were higher than those of non-leaders [113]. However, in that study, this difference in experienced well-being could be largely ascribed to a selection effect, meaning that workers with qualities such as extraversion, emotional stability, and self-efficacy performed better and therefore were more likely to be selected as a leader [113]. This thesis (Chapter 7, 8) and previous findings [22, 45, 54, 113] show that when physicians assume a new leadership role, they may be confronted with specific novel job demands, such as role conflicts or unsupportive peers, potentially adversely affecting their well-being. Understanding and explicitly addressing these challenges is vital as the behaviors of physician leaders not only relate to their own well-being, but also and maybe even more, to the well-being of the physicians they lead and the healthcare workforce in general.

Physician leaders' well-being presumably relates to their leadership performance. Meta-analytic findings among other (non-medical) occupational groups show that leaders' positive well-being (e.g., happiness, positive affect) relates to leadership behaviors aimed at helping employees to fulfill tasks, improving collegial relationships at work, and supporting and empowering employees [114]. In other words: those that feel well, are better leaders. In comparison, leaders' negative well-being (e.g., emotional exhaustion, negative affect) relates to passive and avoiding leadership behaviors, not supporting employees, and even abusive and hostile behaviors [114]. For physicians specifically, not much is known about the association between physician leaders' well-being and their leadership behaviors. One study at Stanford University School of Medicine found that professionally fulfilled physicians were rated as more effective leaders by the people they lead, compared to those leaders reporting burnout symptoms [115]. One mechanism that may explain the relationship between physicians' well-being and their leadership effectiveness is that leaders who feel well are likely to have more mental resources to attend to the needs and preferences of the people they lead [114, 116]. The realist review in this thesis further illustrates that physicians who adjust their leadership styles to the needs and preferences of the people they lead, are seen to be more effective due to enhanced collaboration and communication (Chapter 8).

Bringing well-being and leadership together in developing interventions

Based on the above, I propose that leadership interventions may benefit from including well-being concepts, and vice versa, that well-being interventions may benefit when leadership knowledge and skills are included. Here I will stick to the type of interventions investigated in this thesis: well-being interventions aimed at empowering physicians to actively address their job demands and resources (including job crafting) and leadership development programs.

The developed well-being program in this thesis included a job crafting intervention (Chapter 6). The evaluation showed that physicians valued this intervention but, at the same time, found it challenging to identify (realistic) improvement opportunities and ways to effectuate the improvement actions. As discussed, leadership knowledge and skills can help with this, e.g., by teaching physicians about the hospital organization's objectives, operations, facilities and available resources for improvement actions. Indeed, meta-analytical findings show that job crafting interventions in which participants focused on individual and organizational objectives were more effective in enhancing healthcare employees' work engagement and task performance than those focusing on individual goals [117]. Therefore, the effectiveness of job crafting interventions, and potentially other well-being interventions, may be enhanced by also paying attention to physicians' leadership qualities, e.g., devoting attention to physicians' leadership

qualities in selection procedures or by incorporating modules on the hospital's strategic objectives and governance.

Likewise, leadership development programs may ultimately 'produce' better leaders when trainees are made aware of the important linkages between their well-being and leadership behaviors, and the well-being of the people they lead, as previously suggested by researchers [114]. Leadership programs may be further strengthened, and made more effective, by explicitly including modules on creating supporting working environments [91, 118], for which JD-R theory may be an instrumental framework [19]. The realist review in this thesis revealed that most leadership development programs do not pay or only pay limited attention to the concept of well-being, and do not provide leaders with the tools they need to lead towards maintaining or building a healthy workforce; physically, emotionally and mentally (Chapter 8). This seems a missed opportunity not only given the alarming burnout levels reported among physicians, and other healthcare providers [119, 120], but also because professionally fulfilled physicians perform better [11, 115, 116, 121].

STRENGTHS AND LIMITATIONS

The specific strengths and limitations for each study are discussed in the respective chapters. I will now discuss the most important overarching strengths and limitations of this thesis.

Strengths of this thesis pertain to the variety in research methods, analytical approaches, research participants, and backgrounds of the research teams involved in the individual studies. In conducting the studies, we applied both constructivist and post-positivistic research paradigms. Different data collection methods (i.e., interviews, focus groups, surveys) and analytical approaches were employed (i.e., template analysis, grounded theory like coding and analysis, various statistical approaches such as structural equation modelling, and a realist review). Patients, residents, and medical specialists from multiple professional disciplines and academic and non-academic hospital settings participated in the included studies in this thesis, as well as entire boards of MSCs. Researchers' professional and educational backgrounds included strategic human resources management, health sciences, organizational and occupational psychology, sociology, medical ethics and medicine, including physicians with and without formal leadership positions. I consider the multidisciplinary composition of the research team as a strength because it challenged me to consider the research questions from multiple perspectives, and it helped in triangulating the research findings; ultimately

it contributed to building a more holistic approach in investigating the multifaceted construct of physicians' performance. Moreover, it allowed us to conduct research in various contexts, and this was relevant as strategies to enhance physicians' professional performance are context-dependent. The different methodological approaches and the variety of samples in our research contributed to the literature by better understanding how various strategies to enhance physicians' professional performance interact with the specific organizational contexts; in this thesis we investigated physicians in hospital settings.

This thesis also has several limitations. One limitation is the inclusion of self-perceived measures to assess physicians' professional performance. This is a weakness as the studies cannot ascertain whether physicians' perceptions of professional performance correspond with more objectively assessed professional performance measures. However, investigating physicians' perceptions is valuable since they are known to predict their behavior [122]. Another limitation is the cross-sectional nature of most studies in this thesis because job demands and resources and leadership approaches vary over time [19, 106]. The employed cross-sectional research designs prevent obtaining insight into how workplace factors relate to physicians' well-being and professional performance over time.

The final limitation of this thesis is the Dutch healthcare setting in which the individual studies were conducted. This can be considered a limitation because hospital settings in the Netherlands may not be one-on-one comparable to hospital settings in other healthcare contexts. For example, MSCs and their governance are unique to the Dutch setting, although international service configurations also demand physicians elsewhere to reorganize their organizational structures [16, 48, 49]. The focus on the Dutch hospital settings may limit the generalizability of this thesis' findings to other healthcare settings.

IMPLICATIONS FOR RESEARCH

Based on the findings of this thesis I propose several directions for future research that may help to advance the research on enhancing physicians' professional performance with regard to well-being and leadership.

A first suggestion is to study approaches to enhance physicians' professional performance with specific attention to their organizational contexts and working mechanisms. This is important as the understanding of 'what' is needed to enhance physicians' professional performance seems relatively well-known, especially regarding well-being

and also, but to a lesser extent, for leadership. However, knowledge of the 'how' is more limited. As strategies to enhance physicians' professional performance are often heterogeneous and implemented in complex hospital settings, methodological approaches that go beyond solely assessing effectiveness and include explicitly operationalizing the context are needed [123, 124]. Research and evaluation designs using 'theory of change' or 'realist' principles aim to explain why, how, and for whom certain approaches, strategies, or interventions work (or not) in their respective organizational contexts [123, 124].

A second suggestion for future research is to validate self-rated and cross-sectional findings by using longitudinal research designs and more objective professional performance measures. For example, physicians' professional performance can be measured by 360 degrees assessments [85] or by investigating electronic health records, although this requires high-quality data [125]. Such independent assessments of physicians' professional performance are valuable because self-rated and independently assessed performance scores do not always show strong correlations [126]. Longitudinal research designs can confirm existing findings on 'what' is needed to enhance physicians' professional performance with regard to well-being and leadership, and also provide more insight into the 'how' by investigating relationships of job demands and resources and leadership with physicians' well-being and professional performance over time.

Considering the two suggestions above, another recommendation for researchers on this thesis' topic is to consider multi-level analyses and involve multiple stakeholders. More specifically, more knowledge is needed on how leadership at a particular level, e.g., executive level, influences the perception of job demands and resources at a different level, e.g., middle management or the work floor [104, 105]. Multilevel JD-R theory may provide a useful analytical framework to guide such research projects [19]. Moreover, in this thesis, we investigated physicians' professional performance from physicians' perspectives. In practice, many stakeholders, such as nurses, hospital administrators, and support staff, influence physicians' ability to perform in hospital settings. Incorporating multiple stakeholders in studies may provide more comprehensive insight into the possibilities of enhancing physicians' professional performance in hospital settings.

Researchers could also further investigate individual and subgroup differences based on physicians' perceptions of their well-being and professional performance in response to relevant job demands. Such more in-depth and fine-grained analyses are worth exploring now that the body of knowledge on physicians' well-being has reached a certain maturity. Several studies, including our study among physicians performing night shifts, provide valuable groundwork in which different subgroups are identified based on physicians' perceptions of their well-being and professional performance [127,

128]. Future research could confirm these findings and investigate whether particular subgroups benefit from tailored interventions, potentially enhancing physicians' professional performance.

The last suggestion is to further explore the concept of physicians' psychological ownership. While there are a few studies on physicians' psychological ownership [129, 130], the concept has not been applied in the context of enhancing professional performance. Worthwhile directions to explore are how psychological ownership develops, how to re-frame targets of ownership, and relationships with professional performance outcomes [131].

STRATEGIES FOR PRACTICE

So far, I have already provided several suggestions to enhance physicians' professional performance. Here, I will further describe three broader improvement strategies for clinical practice. Within these strategies I will provide more specific recommendations for physicians with and without leadership positions and others involved in supporting the profession.

Frame and address physicians' well-being from a professional performance perspective

This thesis confirms that both positive (i.e., work engagement, professional fulfillment) and negative indicators (i.e., burnout) of physicians' well-being predict their professional performance [81, 116]. Hospital administrators and physician leaders are therefore strongly recommended to make a serious and continuous effort to address physicians' well-being. To guide those efforts, multiple concrete recommendations and guidelines are available [89, 91, 132]; however, their implementation can only be successful when acknowledging and taking into account the prevailing medical professional culture and its ruling professional norms, both explicit and tacit. Some physicians may still perceive well-being as 'soft' and only relevant for those suffering from burnout complaints; an attitude which may prevent well-being initiatives from getting traction among physicians in hospital settings [12]. Therefore, the preferred strategy is to approach well-being from a professional performance perspective. By this I mean that well-being is understood as relevant to, and indeed inherent part of, the professional performance of all physicians; it therefore deserves to be included in regular clinical practice performance management, rather than it being a 'management issue' only for those suffering from reduced well-being. More concretely, one could consider to include physicians' well-being as a topic of review in the legally required performance evaluations of individual medical

specialists in the Netherlands (known as IFMS-evaluations) [133]. These evaluations aim to monitor and encourage the continuous professional development of all medical specialists. The core of the procedure is a supportive (peer) coaching interview, in line with principles of positive psychology. The confidential character of the conversation would allow for openly discussing well-being issues.

Another way to make well-being a more common aspect of becoming and being a good physician is by integrating the science and skills of physicians' well-being in medical training. This strategy is already gaining momentum in healthcare institutions [33], including in the Amsterdam UMC where residents are offered evidence-based workshops (Discipline overstijgend onderwijs (DOO)) on well-being in which physicians' well-being is presented as conditional for high-quality patient care.

Addressing well-being ideally is not limited to the individual level. In addition to individual approaches, such as IFMS, physicians may want to work on enhancing well-being within their department or team. Conversations could create awareness of the relationships of well-being with professional performance outcomes, e.g., less medical errors, more proactive and innovative behaviors [81, 116]. To start a conversation on well-being in a physician team (faculty members and/or residents), including the experienced wellness culture and the organizational structures or personnel arrangements (not) supporting well-being, it could be helpful to first map how the well-being situation is experienced by all the team members. One validated tool to use is the so-called WellNext Scan (WNS), developed for this specific purpose by our research group Professional Performance & Compassionate Care. Physician groups have successfully used the WNS results to guide their well-being conversations and define and plan their own improvement actions.

Lastly, addressing well-being can also be framed in terms of organizational development or improving the workplace. Then, physicians may focus on reducing those job demands that most team members experience as a burden. When reducing job demands is challenging in particular hospital settings, or if this leads to a wearing, unconstructive atmosphere, a focus on enhancing job resources is recommended. Research shows enhancing job resources can improve physicians' well-being and is also relevant for those not suffering from particular job demands [92, 134]. Also, discussing shared job demands and resources is likely more psychologically safe than discussing individual, potentially intimate well-being issues [12, 73].

Enhance physicians' professional performance by using commitment-based rather than control-based leadership approaches

In the section 'taking ownership at the individual and collective level', I have already discussed the difference between commitment-based and control-based approaches to enhance physicians' professional performance. In line with the literature, our findings (Chapter 2,7,8) suggest that leaders can encourage physicians' commitment to the organization by supporting collegial relationships in the workplace, offering opportunities to participate in decision-making, and providing learning and development opportunities [10, 18, 98, 135, 136]. The leadership skills of physician leaders are critical to ensure physicians' commitment, for example, by attending to their individual needs and preferences and inviting all to share viewpoints in a psychologically safe setting [62]. This thesis indicates that adequate facilitation and support are essential to foster organizational commitment in physicians. As previously noted, participation in decision-making does not automatically occur by offering opportunities; it requires actively inviting physicians to participate, appreciating their contributions, and following up on their input [65, 88].

With a commitment-based approach, I do not imply that leaders can refrain from addressing underperformance or ambiguous unprofessional behaviors. The opposite is true. While complicated, addressing underperformance, unprofessionalism, and unfairness in the organization facilitates a healthy culture and trusting relationships and it also facilitates perceptions of organizational commitment [98, 117, 137]. To this end, it is also important to ensure a psychologically safe environment in which there is room for making mistakes and for learning from failure [62]. This requires courage from hospital administrators and physician leaders, as the common reaction to incidents seems to have become to introduce more control, registrations or procedures [138]. Although understandable in a highly regulated and high-risk sector like healthcare, this may create a vicious cycle that negatively impacts physicians' well-being and professional performance [138, 139].

When physicians do not recognize their medical professional values in the organizations in which they work, this may lead to physicians dissociating themselves from the organization [18, 21]. In such situations, it is even more critical that hospital administrators or physician leaders support physicians, and thereby foster feelings of organizational commitment and enhance professional performance [89, 98, 100]. The literature also shows that approaches that aim to control physicians' professional performance, e.g., autocratic leadership or punishments, are less effective among physicians and can have adverse consequences such as reduced well-being [53, 101, 139].

Recognize and value different facets of physicians' professional performance and provide aligned educational activities

Many things are expected from physicians, often in domains they have not been (traditionally) trained for, e.g., leadership and management [21, 27, 140, 141]. While physicians' medical expertise and clinical skills remain the core of their professional performance, other qualities are also needed to deal with challenging healthcare developments and provide high-quality care [15, 28]. Healthcare leaders can value different facets of physicians' professional performance by implementing performance management approaches that include various metrics such as patient outcomes, patient satisfaction, physicians' well-being and a culture of wellness, the quality of teamwork, leadership, quality improvement efforts, and ensuring that compensation and incentives are aligned with these diverse aspects of performance. Undergraduate and postgraduate medical education training programs may devote more explicit attention to compassionate care [9] or physicians' well-being [33] as these topics are often not yet embedded within the standard curriculum.

Within hospitals, educational or professional development initiatives can address the multiple facets of professional performance, such as providing care with compassion, taking care of well-being, and quality improvement. Then it is wise to create learning ecosystems in which educational activities are aligned with each other and organizational systems, processes, and objectives, as this contributes to realizing and sustaining positive outcomes [76, 77, 142]. This thesis showed that such an ecosystem is crucial for leadership development programs for physicians to realize and sustain organizational impact in hospitals. From the perspective of the individual physician, this may translate into a portfolio training approach. Such a training portfolio would allow every physician in the workforce to access those educational activities that suit their needs, role, and interests at a particular moment in their professional career [143, 144].

CONCLUDING REMARKS

It is challenging for physicians to maintain or enhance their professional performance in contemporary medical practice. I hope this thesis' findings find their way into medical practice to inform strategies that physicians and others involved in the profession can use to enhance physicians' professional performance and achieve high-quality patient care in hospital settings.

This thesis confirms the necessity of physicians who are fit to perform and have skills beyond caring for individual patients and their families to formulate an adequate answer to daunting healthcare developments, such as aging populations and an increase in care demand. While physicians are not solely responsible for their professional performance and working environments, they could also individually and collectively take ownership for creating supportive working environments that may help to meet expectations 'as defined' in the social contract. In today's complex, multi-stakeholder healthcare context, where conflicting values and interests are ever present, physicians meeting their end of the social contract is essential. Regardless of the specific context, gaining patients' trust can never be negotiated. In ultimo, physicians prime responsibility is to be the patient's advocate.

REFERENCES

- Lombarts K. Professional performance van artsen: tussen tijd en technologie. 2016. 20/10 Uitgevers, Rotterdam.
- CanMEDS Physician Competency Framework [accessed June 2023] (<https://www.royalcollege.ca/content/rcpsc/ca/en/canmeds/about-canmeds.html>).
- Van den Goor M, Boerebach B, Bindels E, Heineman M, Lombarts K. The Doctor's Heart: A Qualitative Study Exploring Physicians' Views on Their Professional Performance in Light of Excellence, Humanistic Practice and Accountability. 2020.
- Neff K. Self-compassion: Theory, method, research, and intervention. *Annu Rev Psychol.* 2023;74:193-218.
- Sinclair S, Norris J, McConnell S, Chochinov H, Hack T, Hagen N, et al. Compassion: a scoping review of the healthcare literature. *BMC Palliat Care.* 2016;15(1):1-16.
- Malenfant S, Jaggi P, Hayden KA, Sinclair S. Compassion in healthcare: an updated scoping review of the literature. *BMC Palliat Care.* 2022;21(1):1-28.
- Trzeciak S, Mazzarelli A, Booker C. Compassionomics: The revolutionary scientific evidence that caring makes a difference. Florida: Studer Group; 2019.
- Patel S, Pelletier-Bui A, Smith S, Roberts M, Kilgannon H, Trzeciak S, et al. Curricula for empathy and compassion training in medical education: a systematic review. *PLoS One.* 2019;14(8):e0221412.
- Sinclair S, Kondejewski J, Jaggi P, Dennett L, des Ordon A, Hack T. What is the state of compassion education? A systematic review of compassion training in health care. *Acad Med.* 2021;96(7):1057.
- West C, Dyrbye L, Shanafelt T. Physician burnout: contributors, consequences and solutions. *J Intern Med.* 2018;283(6):516-29.
- Wallace J, Lemaire J, Ghali W. Physician wellness: a missing quality indicator. *Lancet.* 2009;374(9702):1714-21.
- Shanafelt T, Schein E, Minor L, Trockel M, Schein P, Kirch D. Healing the Professional Culture of Medicine. *Mayo Clin Proc.* 2019;94(8):1556-66.
- Montgomery A, Panagopoulou E, Esmail A, Richards T, Maslach C. Burnout in health-care: the case for organisational change. *BMJ.* 2019;366:l4774.
- Lyons O, George R, Galante J, Mafi A, Fordwoh T, Frich J, et al. Evidence-based medical leadership development: a systematic review. *BMJ Lead.* 2021;5(3):206-13.
- Noordegraaf M. Protective or connective professionalism? How connected professionals can (still) act as autonomous and authoritative experts. *J Prof Organ.* 2020;7(2):205-23.
- Rothman D, Blumenthal D, Thibault G. Medical Professionalism In An Organizational Age: Challenges And Opportunities. *Health Aff.* 2020;39(1):108-14.
- Bandura A, Freeman W, Lightsey R. Self-efficacy: The exercise of control. Springer. 1999.
- Shanafelt T. Physician well-being 2.0: where are we and where are we going? *Mayo Clin Proc.* 2021;96(10):2682-93.
- Bakker A, Demerouti E, Sanz-Vergel A. Job Demands-Resources Theory: Ten Years Later. *Annu Rev organ.* 2022;10(1):25-53.
- Kopacz M, Ames D, Koenig H. It's time to talk about physician burnout and moral injury. *The Lancet Psychiatry.* 2019;6(11):e28.
- Agarwal S, Pabo E, Rozenblum R, Sherritt K. Professional dissonance and burnout in primary care: a qualitative study. *JAMA Intern Med.* 2020;180(3):395-401.
- McGivern G, Currie G, Ferlie E, Fitzgerald L, Waring J. Hybrid Manager-Professionals' identity work: the maintenance and hybridization of medical professionalism in managerial contexts. *Public Admin.* 2015;93(2):412-32.

23. Savage M, Savage C, Brommels M, Maz-zocato P. Medical leadership: boon or barrier to organisational performance? A thematic synthesis of the literature. *BMJ Open*. 2020;10(7):e035542.
24. Denis J, Van Gestel N. Medical doctors in healthcare leadership: theoretical and practical challenges. *BMC Health Services Res*. 2016;16:45-56.
25. Kaiser F, Schmid A, Schlüchtermann J. Physician-leaders and hospital performance revisited. *Soc Sci Med*. 2020;249:112831.
26. Sarto F, Veronesi G. Clinical leadership and hospital performance: assessing the evidence base. *BMC Health Services Res*. 2016;16:85-97.
27. Smith R. Why are doctors so unhappy? *BMJ*. 2001;322(7294):1073-4.
28. Noordegraaf M. Hybrid professional-ism and beyond:(New) Forms of public professionalism in changing organiza-tional and societal contexts. *J Prof Organ*. 2015;2(2):187-206.
29. Spurgeon P, Long P, Clark J, Daly F. Do we need medical leadership or medi-cal engagement? *Leadersh Health Serv*. 2015;23(3):173-84.
30. Federatie Medisch Specialisten. Visied-ocument Medisch Specialist 2025: ambitie, vertrouwen, samenwerken. 2017.
31. Lucas R, Goldman E, Scott A, Dandar V. Leadership development programs at aca-demic health centers: results of a national survey. *Acad Med*. 2018;93(2):229-36.
32. Henry S, Holmboe E, Frankel R. Evidence-based competencies for improving communication skills in graduate medical education: a review with sug-gestions for implementation. *Med Teach*. 2013;35(5):395-403.
33. Ripp J, Privitera M, West P, Leiter R, Logio L, Shapiro J, et al. Well-being in graduate medical education: a call for action. *Acad Med*. 2017;92(7):914-17.
34. Varkey P, Murad M, Braun C, Grall K, Saoji V. A review of cost-effectiveness, cost-con-tainment and economics curricula in graduate medical education. *J Eval Clin Pract*. 2010;16(6):1055-62.
35. Pierce J, Kostova T, Dirks K. Toward a theory of psychological ownership in organiza-tions. *Acad Manage Rev*. 2001;26(2):298-310.
36. Zhang Y, Liu G, Zhang L, Xu S, Cheung M. Psychological ownership: A meta-analysis and comparison of multiple forms of attachment in the workplace. *J Manage*. 2021;47(3):745-70.
37. Campbell Pickford H, Joy G, Roll K. Psycho-logical ownership: Effects and applications. Said Business School WP. 2016;32.
38. Walter Z, Lopez M. Physician acceptance of information technologies: Role of per-ceived threat to professional autonomy. *Decis Support Sys*. 2008;46(1):206-15.
39. Pierce J, Kostova T, Dirks K. The state of psychological ownership: Integrating and extending a century of research. *Rev Gen Psychol*. 2003;7(1):84-107.
40. Cruess R, Cruess S, Boudreau J, Snell L, Steinert Y. A schematic representation of the professional identity formation and socialization of medical students and residents: a guide for medical educators. *Acad Med*. 2015;90(6):718-25.
41. Sarraf-Yazdi S, Teo Y, How A, Teo Y, Goh S, Kow C, et al. A scoping review of profes-sional identity formation in undergraduate medical education. *J Gen Intern Med*. 2021;36(11):3511-21.
42. Hafferty F. Beyond curriculum reform: confronting medicine's hidden curriculum. *Acad Med*. 1998;73(4):403-407.
43. Hafferty F, Franks R. The hidden curriculum, ethics teaching, and the structure of medi-cal education. *Acad Med*. 1994;69(11):861-71.
44. Reay T, Hinings C. Managing the rivalry of competing institutional logics. *Organ Stud*. 2009;30(6):629-52.

45. Witman Y, Smid G, Meurs P, Willems D. Doctor in the lead: balancing between two worlds. *Organization*. 2011;18(4):477-95.
46. Freidson, E. (2001). *Professionalism: The Third Logic*. Chicago, IL: The University of Chicago Press.
47. Mitra M, Hoff T, Brankin P, Dopson S. Making sense of effective partnerships among senior leaders in the National Health Service. *Health Care Manage Rev*. 2019;44(4):318-331.
48. Muhlestein D, Smith N. Physician consolidation: rapid movement from small to large group practices, 2013–15. *Health Aff*. 2016;35(9):1638-42.
49. Kanter G, Polsky D, Werner R. Changes in physician consolidation with the spread of accountable care organizations. *Health Aff*. 2019;38(11):1936-43.
50. Dickinson H, Ham C, Snelling I, Spurgeon P. Are we there yet? Models of medical leadership and their effectiveness: an exploratory study. Final report, NIHR Service Delivery and Organisation Programme. 2013.
51. Quinn J, Perelli S. First and foremost, physicians: the clinical versus leadership identities of physician leaders. *J Health Organ Manag*. 2016;30(4):711-28.
52. Berghout M, Fabbriotti I, Buljac-Samardžić M, Hilders C. Medical leaders or masters?—A systematic review of medical leadership in hospital settings. *PLoS One*. 2017;12(9):e0184522.
53. Noordegraaf M, Schneider M, Van Rensen E, Boselie J. Cultural complementarity: reshaping professional and organizational logics in developing frontline medical leadership. *Public Manag Rev*. 2016;18(8):1111-37.
54. Andersson T. The medical leadership challenge in healthcare is an identity challenge. *Leadersh Health Serv*. 2015;28(2):83-99.
55. Liu J, Wang H, Hui C, Lee C. Psychological ownership: How having control matters. *J Manag Stud*. 2012;49(5):869-95.
56. Hackman J, Oldham G. Motivation through the design of work: test of a theory. *Organ Behav Hum Perform*. 1976;16(2):250-79.
57. Vilendrer S, Asch S, Anzai Y, Maggio P. An Incentive to Innovate: Improving Health Care Value and Restoring Physician Autonomy Through Physician-Directed Reinvestment. *Acad Med*. 2020;95(11):1702-06.
58. Berwick D. Era 3 for Medicine and Health Care. *JAMA*. 2016;315(13):1329-30.
59. Khan A, Vinson A. Physician Well-Being in Practice. *Anesth Analg*. 2020;131(5):1359-69.
60. Scheepers R, Lases L, Arah O, Heineman M, Lombarts K. Job resources, physician work engagement, and patient care experience in an academic medical setting. *Acad Med*. 2017;92(10):1472-79.
61. Scholten G, Van der Grinten T. The integration of medical specialists in hospitals. Dutch hospitals and medical specialists on the road to joint regulation. *Health Policy*. 2005;72(2):165-73.
62. Nembhard I, Edmondson A. Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams. *J Organiz Behav*. 2006;27(7):941-66.
63. Tawfik D, Profit J, Webber S, Shanafelt T. Organizational Factors Affecting Physician Well-Being. *Curr Treat Options Pediatr*. 2019;5(1):11-25.
64. Dunn P, Arnetz B, Christensen J, Homer L. Meeting the imperative to improve physician well-being: assessment of an innovative program. *J Gen Intern Med*. 2007;22:1544-52.
65. Howard J, Shaw E, Felsen C, Crabtree B. Physicians as Inclusive Leaders: Insights From a Participatory Quality Improvement Intervention. *Qual Manag Health Care*. 2012;21(3):135-45.
66. Paglis L. Leadership self-efficacy: research findings and practical applications. *J Manag Dev*. 2010;29(9):771-82.

67. Theard M, Marr M, Harrison R. The growth mindset for changing medical education culture. *EClinicalMedicine*. 2021;37:100972.
68. Stoller J, Taylor C, Farver C. Emotional intelligence competencies provide a developmental curriculum for medical training. *Med Teach*. 2013;35(3):243-47.
69. Mukhalalati B, Taylor A. Adult learning theories in context: a quick guide for health-care professional educators. *J Med Educ Curric Dev*. 2019;6:2382120519840332.
70. Geerts J, Goodall A, Agius S. Evidence-based leadership development for physicians: a systematic literature review. *Soc Sci Med*. 2020;246:112709.
71. Berfield K. How does the adult surgeon learn? *Thorac Surg Clin*. 2019;29(3):233-38.
72. Scheepers R, Van den Goor M, Arah O, Heineman M, Lombarts K. Physicians' perceptions of psychological safety and peer performance feedback. *J Contin Educ Health Prof*. 2018;38(4):250-54.
73. Edmondson A, Lei Z. Psychological safety: The history, renaissance, and future of an interpersonal construct. *Annu Rev Organ Psychol Organ Behav*. 2014;1(1):23-43.
74. Ridley C, Al-Hammadi N, Maniar H, Abdallah A, Steinberg A, Bollini M, et al. Building a collaborative culture: focus on psychological safety and error reporting. *Ann Thorac Surg*. 2021;111(2):683-89.
75. Brimhall K, Tsai C, Eckardt R, Dionne S, Yang B, Sharp A. The effects of leadership for self-worth, inclusion, trust, and psychological safety on medical error reporting. *Health Care Manage Rev*. 2023;48(2):120-29.
76. von Thiele Schwarz U, Nielsen K, Edwards K, Hasson H, Ipsen C, Savage C, et al. How to design, implement and evaluate organizational interventions for maximum impact: The Sigtuna Principles. *Eur J Work Organ Psychol*. 2021;30(3):415-27.
77. Winters R, Chen R, Lal S, Chan T. Six Principles for Developing Leadership Training Ecosystems in Health Care. *Acad Med*. 2022;97(6):793-96.
78. A. West M, Lyubovnikova J, Eckert R, Denis J. Collective leadership for cultures of high quality health care. *J Organ Eff*. 2014;1(3):240-60.
79. Keijser W, Huq J, Reay T. Enacting medical leadership to address wicked problems. *BMJ Lead*. 2020;4(1):12-17.
80. Van der Scheer W. Gedeeld leiderschap in de zorg. Marketing & Communicatie ESHPM. 2023.
81. Hodkinson A, Zhou A, Johnson J, Geraghty K, Riley R, Zhou A, et al. Associations of physician burnout with career engagement and quality of patient care: systematic review and meta-analysis. *BMJ*. 2022;378:e070442.
82. Van den Goor M, Silkens M, Heineman M, Lombarts K. Investigating Physicians' Views on Soft Signals in the Context of Their Peers' Performance. *J Healthc Qual*. 2018;40(5):310-17.
83. William M, Lisa Soleymani L, Eric J, Jason M, Julia T, Gerald B, et al. Speaking up about traditional and professionalism-related patient safety threats: a national survey of interns and residents. *BMJ Qual Saf*. 2017;26(11):869-80.
84. Bindels E, Verberg C, Scherpbier A, Heeneman S, Lombarts K. Reflection revisited: how physicians conceptualize and experience reflection in professional practice—a qualitative study. *BMC Med Educ*. 2018;18(1):1-10.
85. Van der Meulen M, Smirnova S, Heeneman S, Oude Egbrink M, Van der Vleuten C, Lombarts K. Exploring Validity Evidence Associated With Questionnaire Based Tools for Assessing the Professional Performance of Physicians: A systematic Review. *Acad Med*. 2019;94(9):1384-97.
86. Jeong D, Pesseau J, ElChamaa R, Naumann D, Mascaro C, Luconi F, et al. Barriers and facilitators to self-directed learning in continuing professional development for physicians in Canada: a scoping review. *Acad Med*. 2018;93(8):1245-54.

87. Bennett N, Davis D, Easterling W, Friedmann P, Green J, Koeppen B, et al. Continuing Medical Education: A New Vision of the Professional Development of Physicians. *Acad Med.* 2000;75(12):1167-72.
88. Voogt J, Taris T, Van Rensen E, Schneider M, Noordegraaf M, Van der Schaaf M. Speaking up, support, control and work engagement of medical residents. A structural equation modelling analysis. *Med Educ.* 2019;53(11):1111-20.
89. Shanafelt T, Noseworthy J. Executive leadership and physician well-being: nine organizational strategies to promote engagement and reduce burnout. *Mayo Clin Proc.* 2017;92(1):129-46.
90. Shanafelt T, Trockel M, Rodriguez A, Logan D. Wellness-centered leadership: equipping health care leaders to cultivate physician well-being and professional fulfillment. *Acad Med.* 2021;96(5):641-51.
91. Shanafelt T, Trockel M, Ripp J, Murphy M, Sandborg C, Bohman B. Building a program on well-being: key design considerations to meet the unique needs of each organization. *Acad Med.* 2019;94(2):156-61.
92. Schaufeli W. Applying the job demands-resources model. *Organ Dyn.* 2017;2(46):120-32.
93. Shanafelt T, Larson D, Bohman B, Roberts R, Trockel M, Weinlander E, et al. Organization-Wide Approaches to Foster Effective Unit-Level Efforts to Improve Clinician Well-Being. *Mayo Clin Proc.* 2023;98(1):163-80.
94. Han S, Shanafelt T, Sinsky C, Awad K, Dyrbye L, Fiscus L, et al. Estimating the attributable cost of physician burnout in the United States. *Ann Intern Med.* 2019;170(11):784-90.
95. TNO. Kleine daling in burn-out klachten in 2020. [accessed June 2023] (<https://www.tno.nl/nl/newsroom/2021/11/kleine-daling-burn-out-klachten-2020/>).
96. Federatie Medisch Specialisten. FAQ over medisch-specialistische zorg [accessed June 2023] (<https://demedischspecialist.nl/over-ons/faq-medisch-specialistische-zorg#:~:text=Het%20gemiddelde%20salaris%20van%20een,en%2030%25%20in%20vrij%20beroep.>).
97. Wright P, Nishii L. Strategic HRM and organizational behavior: Integrating multiple levels of analysis. Cornell University. 2007: WP07-03.
98. Hauff S, Alewell D, Hansen N. HRM systems between control and commitment: Occurrence, characteristics and effects on HRM outcomes and firm performance. *Hum Resour Manag J.* 2014;24(4):424-41.
99. Su Z, Wright P, Ulrich M. Going Beyond the SHRM Paradigm: Examining Four Approaches to Governing Employees. *J Manage.* 2015;44(4):1598-619.
100. Taylor N, Clay-Williams R, Hogden E, Braithwaite J, Groene O. High performing hospitals: a qualitative systematic review of associated factors and practical strategies for improvement. *BMC Health Serv Res.* 2015;15(1):244.
101. Weske U, Boselie P, Van Rensen E, Schneider M. Physician compliance with quality and patient safety regulations: The role of perceived enforcement approaches and commitment. *Health Serv Manag Res.* 2019;32(2):103-12.
102. Wright P, Essman S. Carrots, sticks, and performance: is it commitment, or commitment plus control? *Acad Manag Perspect.* 2021;35(2):208-18.
103. Gaeta T. Need for a holistic approach to reducing burnout and promoting well-being. *J Am Coll Emerg Physicians Open.* 2020;1(5):1050-51.
104. Kuhlmann E, Larsen C. Why we need multi-level health workforce governance: Case studies from nursing and medicine in Germany. *Health Policy.* 2015;119(12):1636-44.
105. Montgomery A. The relationship between leadership and physician well-being: a scoping review. *J Healthc Leadersh.* 2016:71-80.

106. Tummers L, Bakker A. Leadership and job demands-resources theory: A systematic review. *Front Psychol.* 2021;12:722080.
107. Schwartz M, Dunfee T, Kline M. Tone at the top: An ethics code for directors? *J Bus Ethics.* 2005;58:79-100.
108. Shanafelt T, Gorringer G, Menaker R, Storz K, Reeves D, Buskirk S, et al. Impact of organizational leadership on physician burnout and satisfaction. *Mayo Clin Proc.* 2015;90(4):432-40.
109. Martinussen P, Magnussen J, Vrangbæk K, Frich J. Should I stay or should I go? The role of leadership and organisational context for hospital physicians' intention to leave their current job. *BMC Health Serv Res.* 2020;20(1):400.
110. Bass B, Avolio B, Jung D, Berson Y. Predicting unit performance by assessing transformational and transactional leadership. *J Appl Psychol.* 2003;88(2):207-18.
111. Chu H, Qiang B, Zhou J, Qiu X, Yang X, Qiao Z, et al. The impact of transformational leadership on physicians' performance in China: a cross-level mediation model. *Front Psychol.* 2021;12:586475.
112. Cydulka R, Korte R. Career Satisfaction in Emergency Medicine: The ABEM Longitudinal Study of Emergency Physicians. *Ann Emerg Med.* 2008;51(6):714-22.e1.
113. Asselmann E, Specht J. Climbing the Career Ladder Does Not Make You Happy: Well-being Changes in the Years Before and After Becoming a Leader. *J Happiness Stud.* 2023;24(3):1037-58.
114. Kaluza A, Boer D, Buengeler C, Van Dick R. Leadership behaviour and leader self-reported well-being: A review, integration and meta-analytic examination. *Work Stress.* 2020;34(1):34-56.
115. Shanafelt T, Makowski M, Wang H, Bohman B, Leonard M, Harrington R, et al. Association of burnout, professional fulfillment, and self-care practices of physician leaders with their independently rated leadership effectiveness. *JAMA Netw Open.* 2020;3(6):e207961-e.
116. Scheepers R, Boerebach B, Arah O, Heine-man M, Lombarts K. A systematic review of the impact of physicians' occupational well-being on the quality of patient care. *Int J Behav Med.* 2015;22:683-98.
117. Oprea B, Barzin L, Virgă D, Iliescu D, Rusu A. Effectiveness of job crafting interventions: A meta-analysis and utility analysis. *Eur J Work Organ Psychol.* 2019;28(6):723-41.
118. Bohman B, Dyrbye L, Sinsky C, Linzer M, Olson K, Babbott S, et al. Physician well-being: the reciprocity of practice efficiency, culture of wellness, and personal resilience. *NEJM Catalyst.* 2017;3(4).
119. Rotenstein L, Torre M, Ramos M, Rosales R, Guille C, Sen S, et al. Prevalence of burnout among physicians: a systematic review. *JAMA.* 2018;320(11):1131-50.
120. Shanafelt T, West C, Sinsky C, Trockel M, Tutty M, Wang H, et al. Changes in burnout and satisfaction with work-life integration in physicians and the general US working population between 2011 and 2020. *Mayo Clin Proc.* 2022;97(3):491-506.
121. Trockel M, Bohman B, Lesure E, Hamidi M, Welle D, Roberts L, et al. A brief instrument to assess both burnout and professional fulfillment in physicians: reliability and validity, including correlation with self-reported medical errors, in a sample of resident and practicing physicians. *Acad Psychiatry.* 2018;42(1):11-24.
122. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process.* 1991;50(2):179-211.
123. Moore G, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. *BMJ.* 2015;350:h1258.
124. Pawson R, Greenhalgh T, Harvey G, Walshe K. Realist review - a new method of systematic review designed for complex policy interventions. *J Health Serv Res Policy.* 2005;10(1_suppl):21-34.

125. Chan K, Fowles J, Weiner J. Electronic health records and the reliability and validity of quality measures: a review of the literature. *Med Care Res Rev.* 2010;67(5):503-27.
126. Van der Meulen M, Arah O, Heeneman S, Oude Egbrink M, Van der Vleuten C, Lombarts K. When Feedback Backfires: Influences of Negative Discrepancies Between Physicians' Self and Assessors' Scores on Their Subsequent Multisource Feedback Ratings. *J Contin Educ Health Prof.* 2021;41(2):94-103.
127. Huang R, Hewitt D, Cheung E, Agarwal G, Etkin C, Smink D, et al. Burnout phenotypes among US general surgery residents. *J Surg Educ.* 2021;78(6):1814-24.
128. Mak-van der Vossen M, Van Mook W, Kors J, Van Wieringen W, Peerdeman S, Croiset G, et al. Distinguishing three unprofessional behavior profiles of medical students using latent class analysis. *Acad Med.* 2016;91(9):1276-83.
129. Paré G, Sicotte C, Jacques H. The effects of creating psychological ownership on physicians' acceptance of clinical information systems. *J Am Med Inform Assoc.* 2006;13(2):197-205.
130. Smith T, Grant G, Ramirez A. Investigating the Influence of Psychological Ownership and Resistance on Usage Intention among Physicians. 2014; 47th Hawaii International Conference on System Sciences.
131. Dawkins S, Tian A, Newman A, Martin A. Psychological ownership: A review and research agenda. *J Organ Behav.* 2017;38(2):163-83.
132. Debets M, Lombarts K, Hugenholtz N, Scheepers R. *Perspect Med Educ.* 2021;10:64-9.
133. Bindels E, Boerebach B, Scheepers R, Nootboom A, Scherpbier A, Heeneman S, et al. Designing a system for performance appraisal: balancing physicians' accountability and professional development. *BMC Health Serv Res.* 2021;21(1):800.
134. Seligman M, Steen T, Park N, Peterson C. Positive psychology progress: empirical validation of interventions. *Am Psychol.* 2005;60(5):410-21.
135. Langballe E, Innstrand S, Aasland O, Falkum E. The predictive value of individual factors, work-related factors, and work-home interaction on burnout in female and male physicians: a longitudinal study. *Stress Health.* 2011;27(1):73-85.
136. Verweij H, Van der Heijden F, Van Hooff M, Prins J, Lagro-Janssen A, Van Ravesteijn H, et al. The contribution of work characteristics, home characteristics and gender to burnout in medical residents. *Adv Health Science Educ Theory Pract.* 2017;22(4):803-18.
137. Heponiemi T, Kuusio H, Sinervo T, Elovainio M. Job attitudes and well-being among public vs. private physicians: organizational justice and job control as mediators. *Eur J Public Health.* 2011;21(4):520-5.
138. Hollnagel E. Safety-I and safety-II: the past and future of safety management. *Cogn Tech Work.* 2015;461-4.
139. Smaggus A. Safety-I, Safety-II and burnout: how complexity science can help clinician wellness. *BMJ Qual Saf.* 2019;28(8):667-71.
140. Cruess R, Cruess S. Professionalism, communities of practice, and medicine's social contract. *J Am Board Fam Med.* 2020;33(Supplement):S50-S6.
141. Blumenthal D, Bernard K, Bohnen J, Bohmer R. Addressing the Leadership Gap in Medicine: Residents' Need for Systematic Leadership Development Training. *Acad Med.* 2012;87(4):513-22.
142. Matsas B, Goralnick E, Bass M, Barnett E, Nagle B, Sullivan E. Leadership development in US undergraduate medical education: a scoping review of curricular content and competency frameworks. *Acad Med.* 2022;97(6):899-908.
143. Driessen E, Van Tartwijk J, Van Der Vleuten C, Wass V. Portfolios in medical education: why do they meet with mixed

- success? A systematic review. *Med Educ.* 2007;41(12):1224-33.
144. Menon N, Trockel M, Hamidi M, Shanafelt T. Developing a portfolio to support physicians' efforts to promote well-being: one piece of the puzzle. *Mayo Clin Proc.* 2019;94(11):2171-77.



10

English summary

Dutch summary / Nederlandse samenvatting

Author contributions

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About the author

ENGLISH SUMMARY

Chapter 1

The ultimate aim of this thesis is to support physicians in hospitals to maintain or enhance their professional performance in demanding working environments. To this end, more knowledge is needed of how physicians perceive and enhance their professional performance in contemporary medical practice. In Chapter 1, I describe that physicians' professional performance is defined by three pillars: striving for excellence, humanistic practice, and accountability for one's actions. The tasks and behaviors within these pillars are determined by the implicit relationship between society and the medical profession, which researchers have called the social contract. Physicians meet the social contract if they live up to these pillars and adequately address individuals' and society's healthcare needs. However, demanding working conditions resulting from major developments in society and healthcare challenge physicians to meet this social contract and thereby their professional performance. I discuss three developments that are particularly relevant for physicians' professional performance today: increasing healthcare demands, medical and technological advancements, and the increasing complexity of healthcare organizations.

While professional performance is multifaceted, I chose to study physicians' professional performance through the research lenses of well-being and leadership. I chose these lenses because they are part of the contemporary discussion on professional performance in research and practice, and both concepts are thus crucial to enable excellent professional performance. In the introductory chapter, I define the main concepts of this thesis and employ job demands-resources (JD-R) theory to link workplace factors to physicians' well-being and professional performance. According to JD-R theory, all workplace factors can be classified as a job demand or resource. Job demands are those aspects of the job that require energy, whereas job resources assist in coping with job demands, are functional in achieving work goals, and stimulate personal growth. Job demands and resources relate to performance via the health impairment and motivational process. The health impairment process is triggered when physicians perceive excessive job demands. Without sufficient time to recover, this leads to stress and burnout and, in turn, reduced health and performance. In contrast, the motivational process initiates when physicians perceive abundant job resources, leading to higher motivation, work engagement, and enhanced performance. Therefore, optimizing the balance between job demands and resources can enhance physicians' well-being and professional performance. Building on the previous research on physicians' well-being and leadership, I identified six knowledge gaps to address in this thesis (Table 1).

Table 1. Identified knowledge gaps (KG) and chapters that address them.

KG	Description	Ch.
<i>Enhancing professional performance through the lens of well-being</i>		
1	There is limited knowledge of the predictors of positive indicators of physicians' well-being, such as work engagement and professional fulfillment, and the relationships of these positive well-being indicators with physicians' professional performance.	2,3,4
2	There is limited confirmatory evidence validating JD-R theory among physicians in various hospital settings, which is needed as job demands and resources are context dependent. Validating previous findings pertains to confirming or disconfirming relevant job demands and resources as well as uncovering theoretical mechanisms linking job demands and resources with well-being and performance.	2,3,4,6
3	There is limited knowledge of the differences in physicians' perceptions of job demands and the subsequent consequences for their well-being and professional performance.	5
4	There is limited knowledge of developing and conducting well-being interventions for physician teams that aim to enhance physicians' well-being by addressing job demands and resources.	6
<i>Enhancing professional performance through the lens of leadership</i>		
5	There is limited knowledge of the strategies and instruments physicians with formal leadership roles use to enhance the professional performance of the physicians they lead to consistently provide high-quality care.	7
6	There is limited knowledge of the working mechanisms of leadership development programs for physicians to achieve hospital outcomes.	8

Addressing these knowledge gaps may inform strategies that physicians and others involved in the profession may use to enhance physicians' professional performance. Seven individual studies were conducted to (partly) fill the identified knowledge gaps. These studies were guided by this thesis' overarching research question: How do physicians in Dutch hospital settings perceive and enhance their professional performance with regard to well-being and leadership?

Chapter 2

Chapter 2 details the relationships between workplace factors, physicians' well-being, and professional performance using JD-R theory. In line with JD-R theory, workplace factors were operationalized as job demands and resources and well-being as burnout and work engagement. Professional performance was operationalized as work ability which refers to the ability to perform tasks with attention and concentration. More specifically, we aimed to nuance and validate JD-R theory by answering the following research question: To what extent does work engagement mediate the relationships of job resources with work ability, and to what extent does burnout mediate the relationships of job demands and resources with work ability? We included the job demands 'workload' and 'administrative burden' and the job resources 'professional development opportunities', 'participation in decision-making', 'inspirational leadership', and 'relationships with colleagues'.

In this multicenter observational survey study, including data from 385 physicians, we built a structural equation model to answer our research question. The analysis showed that physicians' work engagement and burnout fully mediated the relationships of various job demands and resources with their work ability. More work engaged and less burned-out physicians reported better work ability, although burnout had a stronger relationship with work ability than work engagement. Professional development opportunities, participation in decision-making, and relationships with colleagues were positively related to work engagement. Professional development opportunities were negatively related, and workload was positively related to burnout. Of all job demands and resources, workload and professional development opportunities related the strongest with work engagement and burnout. Based on these findings, we concluded that hospitals may attenuate excessive workloads and facilitate professional development opportunities, participation in decision-making, and good collegial relationships to enhance physicians' occupational well-being and performance.

Chapter 3

Chapter 3 addresses physicians' well-being in their work by researching the role of the personal resource self-kindness in relation to their well-being. This study was conducted because perfectionism and self-criticism have been found to relate to burnout in physicians, and we expected that a kinder attitude towards the self, i.e. self-kindness, could function as a buffer against stress and burnout and potentially enhance professional fulfillment, which is related to professional performance. According to JD-R theory, self-kindness is a personal resource that may assist in obtaining job resources and therefore enhance physicians' professional fulfillment. In this study, we investigated how self-kindness was related to physicians' professional fulfillment by answering the following research question: To what extent 1) is physicians' self-kindness related to their professional fulfillment? and 2) is this relationship mediated by personal resilience and work-home interference?

In this survey study among 374 physicians working in the Dutch hospital settings, we employed a parallel mediation model to answer our research question. This study found that self-kindness was not directly related to physicians' professional fulfillment but indirectly through individual resilience and work-home interference. While future research needs to confirm these relationships, this study suggests that physicians can be kind towards themselves as it may benefit their professional fulfillment, and through this potentially also their patients.

Chapter 4

Chapter 4 zooms in on another vital aspect of physicians' professional performance: providing care with compassion. The literature shows that while both patients and physicians perceive compassion as essential for high-quality care, it often remains an unmet need of patients. Understanding both patients' and physicians' experiences of compassionate care may foster physicians' ability to better attend to patients' needs. In fact, when physicians are unaware of what compassionate care means for patients, providing compassionate care is complicated. Therefore, this study answered the following research question: What are experiences of patients and physicians regarding compassionate care?

We conducted semi-structured interviews with 8 patients and 10 resident physicians at a University Medical Center in the Netherlands to answer this research question. The employed template analysis revealed four themes that encompassed compassionate care for patients and residents: being there, empathizing, actions to relieve patients' suffering, and connection. For residents, a fifth theme was professional fulfillment resulting from compassionate care. This additional theme for residents suggests compassionate care will not only benefit the quality of patient care but also residents' well-being.

Chapter 5

Chapter 5 reports on exploring how physicians perceived the job demand of night shift work in relation to their well-being and professional performance. This is a particularly relevant topic as night shifts are crucial for high-quality patient care but threaten physicians' well-being and performance. According to the literature, knowledge of how the impact of night shifts varies for groups of physicians is needed to better understand the risks of night shifts for physicians and whether these risks are similar for or can differ between physicians. These insights may be used to inform the design of tailored interventions or flexible night shift policies to attenuate the adverse effects of night shifts. Therefore, we aimed to answer the following research questions (RQ):

- RQ1: What profiles can be identified based on physicians' alertness, contentedness and calmness scores before and after night shifts?
- RQ2: Do physicians' profiles and respective alertness, contentedness and calmness scores before the night shift differ from after the night shift and if so, how?
- RQ3: Which physician demographics and night shift circumstances associate with changes in alertness, contentedness and calmness?

To answer RQ1, we performed a latent profile analysis. This person-centered statistical method can be used to identify subgroups based on physicians' alertness (performance), calmness (well-being) and contentedness (well-being) scores. RQ2 was answered using descriptive statistics, and RQ3 with conducting multiple regressions on physicians' alertness, contentedness and calmness change scores (pre-shift score minus post-shift score).

Data from 211 physicians were used to answer our research questions. The latent profile analysis identified three pre-shift (Indifferent, Ready, Engaged) and four post-shift profiles (Lethargic, Tired but satisfied, Excited, Mindful). Moreover, most physicians changed from the profile 'Ready' to 'Tired but satisfied', with alertness reducing most. In response to RQ3, we found that age, specialty, sleep, shift duration, and the number of consecutive shifts associated with alertness, contentedness, and calmness change. The results of this study contribute to the literature by providing nuanced insight into physicians' state of mind before and after night shifts. Future research may assess whether specific subgroups benefit from tailored interventions.

Chapter 6

Chapter 6 describes developing and piloting a team-based well-being program for physicians. The aim of the program was to empower physicians to maintain or enhance their well-being, thereby their professional performance. Three methodological steps were performed to develop the well-being program: a preparatory phase, needs assessment, and program design. The final program included a feedback tool to assess physicians' working conditions and well-being, a facilitated team dialogue, and a team communication and job crafting training session.

The feedback tool of the program was piloted among 377 physicians from 48 teams in 14 Dutch hospitals. Four teams of different medical disciplines participated in the team dialogue. Two teams performed the team training. Based on our experiences we formulated seven recommendations that may inform the design of team-based well-being interventions for physicians in hospital settings aimed at addressing job demands and resources: (1) involve physicians and stakeholders with diverse backgrounds, (2) consider the implications of recruitment and selection strategies with regard to the intervention's goals, (3) align well-being interventions with existing (online) infrastructure, (4) facilitate physicians while engaging in well-being interventions, e.g., sufficient time and support, (5) create a psychologically safe environment for physicians, (6) early think about methods to implement and evaluate the interventions rigorously, and (7) design interventions with a continuous character.

Chapter 7

This chapter describes exploring the strategies Medical Specialist Companies (MSC) use to address physicians' professional performance and what challenges they encounter when executing these strategies to achieve high-quality and safe care. MSCs are companies of self-employed physicians that usually deliver their medical services within one hospital. MSCs emerged in the Netherlands as physicians started reorganizing after the Dutch government reformed the medical specialist care payment model on January first, 2015. In this context it was worthwhile to explore how physicians perceived and enhanced their professional performance, as physicians within MSCs may have more opportunities to shape their working environments and organization. Moreover, this context provides insight into the impact of healthcare service reconfigurations, such as new payment models, on physicians' professional performance.

In this constructivist exploratory qualitative study, we conducted eight focus group sessions with purposively sampled MSCs. In each session, board members of an MSC participated (n = 33). We found that MSCs used five strategies to address physicians' professional performance: (1) actively managing and monitoring performance, (2) building a collective mindset, (3) professionalizing selection and onboarding, (4) improving occupational well-being, and (5) harmonizing working procedures. The unique MSC context determined which strategies and quality and safety topics deserved the most attention. Having MSC physician members' support, trusting relationships with hospital administrators, and the MSC's organizational maturity seemed critical to the effectiveness of the strategies employed.

Particularly, building a collective mindset among MSC physician members was a critical cultural challenge in MSCs. Physicians (MSC physician members and in some cases MSC board members) still insufficiently considered the consequences of their professional performance for the broader hospital and MSC. Instead, they tended to think from the perspective of their medical discipline or group, a practice that dates back to pre-MSC ways of organizing the profession. MSC boards acknowledged that more leadership knowledge, skills, and tools to address the professional performance of physician members in a company among equals would help them. The findings of this study emphasize the importance of leadership skills for physicians with a formal leadership role, but also for those without such a formal role, as it would help them better understand how their professional performance can contribute to the performance of the hospital and MSC.

Chapter 8

Chapter 8 addresses the topic of leadership development for physicians. The importance of leadership development is illustrated by hospitals worldwide offering leadership development programs (LDPs) to physicians to ensure the delivery of high-quality, accessible, and affordable patient care. Indeed, researchers have listed a wide array of beneficial outcomes of LDPs for physicians, including outcomes relevant to the physicians (enhanced leadership competencies), the organization (quality improvement in organizational processes, benefits to the organizational culture), and patients (enhanced quality of care). However, the problem is that LDPs do not consistently produce these outcomes due to the heterogeneity of LDPs and the organizational contexts in which they are implemented. More knowledge is needed on the working mechanisms of LDPs for physicians in hospital settings. Therefore, this study answered the research question: How, why, and under which circumstances can LDPs for physicians in hospital settings impact organization-level outcomes?

To answer this research question, we conducted a realist review. Realist reviews aim to understand how complex interventions, like LDPs, work (or not) and how intervention components interact to generate outcomes. Following realist methodology, 'program theories' use Context-Mechanism-Outcome (CMO) configurations (CMOs) to explain how specific contexts [C] and mechanisms [M] work together to generate outcomes [O]. Realist reviews use a systematic approach to reviewing the literature, and we screened 3904 titles and abstracts. Subsequently, 100 full-text documents were inspected; 38 documents with LDPs from multiple countries informed our program theory. The identified program theory comprised five CMO configurations explaining why, how, and under which circumstances LDPs can impact three hospital outcomes categories that we defined: organizational culture, quality improvement, and the leadership pipeline. Here I discuss the identified CMOs by outcome category.

In contexts where LDPs offered constructive feedback [C], physicians acquired more self-insight, leading to physicians enacting people management, which improved communication and collaboration [M], impacting the hospital's culture [O] (CMO1). In particular, in-house LDPs that intentionally stimulated participant interaction [C] facilitated physicians to build professional networks, contributing to an improved mutual understanding between various hospital actors and better communication and collaboration [M], benefitting the organizational culture [O] (CMO2). Professional networks also contributed to this outcome category by establishing support networks for physicians [M] (CMO2).

Professional networks contributed to quality improvement by mobilizing resources within hospitals as physicians knew where to go for collaborations or when facing challenges [M] (CMO2). LDPs that included well-supported quality improvement projects (e.g., project management support) endorsed by the organization [C], allowed physicians to create buy-in and be more perseverant when facing challenges [M], increasing the likelihood of successful project implementation and quality improvement [O] (CMO3).

Furthermore, due to building professional networks, physicians gained visibility within the hospital [M], which increased their chances of being promoted, thereby strengthening the hospital's leadership pipeline [O] (CMO2). We also found that when the LDP's content was tailored to physicians' needs [C], this led to relevant learning experiences, which helped prepare them for [M] and assume leadership roles in hospitals [O] (CMO4). Finally, when LDPs reflected that the hospital genuinely valued physician leadership [C], this fostered organizational commitment in physician participants [M] and taking on new leadership roles [O] (CMO5).

The five identified CMOs operated within a wider organizational context, the leadership ecosystem. A supporting leadership ecosystem – which could include having established career trajectories with coaching after the program – contributed to the potential of hospitals to sustain and realize organization-level outcomes via their LDPs.

Our developed program theory may guide the development of LDPs for physicians to realize specific hospital ambitions effectively. This is essential because hospitals need a solid physician leadership pipeline to cope with major developments in healthcare. By valuing physician leaders and investing in their leadership development, hospitals can create a cadre of physician leaders who want to go the extra mile for the organization and the patients they serve.

DUTCH SUMMARY / NEDERLANDSE SAMENVATTING

Hoofdstuk 1

Het doel van dit proefschrift is om artsen die in de veeleisende ziekenhuisomgeving werken te ondersteunen bij het behouden of verbeteren van hun *professionele prestatie* (hierna: *professional performance*). Hiervoor is meer kennis nodig over hoe artsen hun professional performance in de hedendaagse medische praktijk ervaren en verbeteren. In Hoofdstuk 1 definieer ik het concept professional performance van artsen met behulp van drie pijlers: streven naar excellentie, handelen vanuit medemenselijkheid en het afleggen van rekenschap. De taken en gedragingen binnen deze pijlers worden bepaald door de impliciete relatie tussen de samenleving en de medische professie, door onderzoekers ook wel een 'sociaal contract' genoemd. Artsen voldoen aan dit sociaal contract als ze zich weten te verhouden tot de drie pijlers van professional performance en zodoende adequaat inspelen op de zorgbehoeften van individuen en de samenleving. Echter, veeleisende werkomstandigheden als gevolg van ingrijpende ontwikkelingen in de samenleving en de gezondheidszorg zetten artsen onder druk en dit beïnvloedt hun professional performance en hun vermogen om aan het sociaal contract te voldoen. Ik bespreek drie ontwikkelingen die momenteel relevant zijn voor de professional performance van artsen: de groeiende zorgvraag, medische en technologische vooruitgang, en de toenemende complexiteit van zorgorganisaties.

Hoewel professional performance een veelzijdig construct is, heb ik ervoor gekozen om de professionele prestaties van artsen te bestuderen door de onderzoekslenzen van welzijn en leiderschap. Er is momenteel veel aandacht voor het welzijn van artsen en hun leiderschapsvaardigheden, zowel in de literatuur als de praktijk. Beide zijn namelijk gerelateerd aan de professional performance van artsen. In de introductie van dit proefschrift definieer ik de belangrijkste concepten van dit proefschrift en gebruik ik de Job Demands-Resources (JD-R)-theorie om werkomstandigheden te relateren aan het welzijn en de professional performance van artsen. Volgens de JD-R-theorie kunnen alle werkomstandigheden worden geclassificeerd als werkeis (*job demand*) of hulpbron (*job resource*). Werkeisen zijn die aspecten van het werk die energie vergen, terwijl hulpbronnen helpen bij het omgaan met werkeisen, functioneel zijn in het behalen van werkdoelen en persoonlijke groei stimuleren. Werkeisen en hulpbronnen hebben betrekking op de prestaties van artsen via het uitputtingsproces of het motivationele proces. Het uitputtingsproces wordt geactiveerd wanneer artsen te hoge werkeisen waarnemen. Zonder voldoende tijd om hiervan te herstellen kan dit leiden tot stress en burn-out en daarmee tot een verminderd welzijn en slechtere prestaties. Als artsen meer hulpbronnen ervaren dan werkeisen treedt het motivationele proces in werking, wat kan leiden tot een hogere motivatie, bevoegenheid en betere prestaties. Daarom

kan het optimaliseren van de balans tussen werkeisen en hulpbronnen het welzijn en de professional performance van artsen verbeteren. Voortbouwend op bevindingen uit eerder onderzoek naar het welzijn en leiderschap van artsen, heb ik zes kennislacunes geïdentificeerd die in de studies in dit proefschrift behandeld zullen worden (Tabel 1).

Tabel 1. De geïdentificeerde kennislacunes (KL) met bijbehorende hoofdstukken.

KL	Omschrijving	Hst.
<i>Professional performance verbeteren gezien door de lens van welzijn</i>		
1	Er is beperkte kennis over de voorspellers van positieve indicatoren van het welzijn van artsen, zoals bevlogenheid en professionele voldoening, en de relaties van deze positieve welzijnsindicatoren met de professional performance van artsen.	2,3,4
2	Er is relatief weinig bevestigend onderzoek dat de JD-R-theorie onder artsen in verschillende ziekenhuisomgevingen valideert, wat nodig is omdat de ervaring van werkeisen en hulpbronnen contextafhankelijk is. Het valideren van eerdere bevindingen heeft betrekking op het bevestigen of weerleggen van relevante werkeisen en hulpbronnen, evenals het blootleggen van theoretische mechanismen die werkeisen en hulpbronnen koppelen aan het welzijn en de professional performance van artsen.	2,3,4,6
3	Er is beperkte kennis over de verschillen in percepties van artsen van werkeisen en de daaruit voortvloeiende gevolgen voor hun welzijn en professional performance.	5
4	Er is beperkte kennis over het ontwikkelen en uitvoeren van welzijnsinterventies voor artsteams die gericht zijn op het verbeteren van het welzijn van artsen door werkeisen en hulpbronnen te adresseren.	6
<i>Professional performance verbeteren gezien door de lens van leiderschap</i>		
5	Er is beperkte kennis van de strategieën en instrumenten die artsen met formele leiderschapsrollen gebruiken om de professional performance van de artsen die zij leiden te verbeteren met als doel consistent hoogwaardige zorg te bieden.	7
6	Er is beperkte kennis van de werkingsmechanismen van leiderschapsontwikkelingsprogramma's voor artsen om ziekenhuisresultaten te bereiken.	8

Het adresseren van deze kennislacunes kan inzichten opleveren die artsen en anderen kunnen gebruiken om strategieën te formuleren om de professional performance van artsen te verbeteren. Er zijn zeven studies uitgevoerd om de geconstateerde kennislacunes (deels) op te vullen. Deze studies werden geleid door de overkoepelende onderzoeksvraag van dit proefschrift: Hoe ervaren en verbeteren artsen in Nederlandse ziekenhuizen hun professional performance met betrekking tot welzijn en leiderschap?

Hoofdstuk 2

Hoofdstuk 2 beschrijft de relaties tussen werkomstandigheden, het welzijn, en de professional performance van artsen met behulp van de JD-R-theorie. In overeenstemming met deze theorie zijn werkomstandigheden geoperationaliseerd als werkeisen en hulpbronnen, en welzijn als burn-out (emotionele uitputting) en bevlogenheid. Professional performance werd geoperationaliseerd als werkvermogen, wat verwijst naar het vermogen van artsen om taken met aandacht en concentratie uit te voeren.

Meer specifiek wilden we reeds bestaande bevindingen nuanceren en valideren door de volgende onderzoeksvraag te beantwoorden: In welke mate medieert bevlogenheid de relaties tussen werkeisen en het werkvermogen van artsen, en in welke mate medieert burn-out de relaties van werkeisen en hulpbronnen met het werkvermogen van artsen? In deze studie onderzochten we de werkeisen 'werkdruk' en 'administratieve lasten' en de hulpbronnen 'professionele ontwikkelingsmogelijkheden', 'deelname aan besluitvorming', 'inspirerend leiderschap' en 'relaties met collega's'.

Aan dit vragenlijstonderzoek hebben 385 artsen uit meerdere Nederlandse ziekenhuizen deelgenomen. Op basis van de verzamelde data, hebben we een *structural equation model* gebouwd om onze onderzoeksvraag te beantwoorden. De analyse toonde aan dat bevlogenheid en burn-out de relatie van verschillende werkeisen en hulpbronnen met het werkvermogen van artsen volledig medieerde. Artsen die een hoge mate van bevlogenheid en lage mate van burn-out rapporteerden, gaven ook aan beter in staat te zijn hun werkzaamheden uit te voeren. Burn-out had een sterkere relatie met het werkvermogen van artsen dan bevlogenheid. Professionele ontwikkelingsmogelijkheden, deelname aan besluitvorming, en relaties met collega's waren positief gerelateerd aan bevlogenheid. Professionele ontwikkelingsmogelijkheden waren negatief gerelateerd en werkdruk was positief gerelateerd aan burn-out. Van alle werkeisen en hulpbronnen waren werkdruk en professionele ontwikkelingsmogelijkheden het sterkst gerelateerd aan bevlogenheid en burn-out. Op basis van deze bevindingen concludeerden we dat ziekenhuizen het welzijn en de professional performance van artsen kunnen verbeteren door excessieve werkdruk te verminderen en professionele ontwikkelingsmogelijkheden, deelname aan besluitvorming, en goede collegiale relaties te bevorderen.

Hoofdstuk 3

Hoofdstuk 3 gaat nader in op het welzijn van artsen. Meer specifiek keken we naar het hebben van een zelfvriendelijke attitude, bijvoorbeeld na het maken van fouten, in relatie tot de professionele voldoening van artsen. Professionele voldoening relateert positief aan de professional performance van artsen. Een zelfvriendelijke attitude kan volgens de JD-R theorie gezien worden als een persoonlijk hulpbron, die helpt bij het omgaan met werkeisen of het verkrijgen van hulpbronnen in het werk, en daarmee het welzijn bevordert. Onderzoek toont aan dat perfectionisme en zelfkritiek positief relateren aan burn-out klachten onder artsen. Onze hypothese was dat een zelfvriendelijkere houding zou kunnen fungeren als een buffer tegen stress en burn-out en mogelijk de professionele voldoening van artsen zou verbeteren. In deze studie hebben we onderzocht hoe zelfvriendelijkheid gerelateerd was aan de professionele voldoening van artsen door de volgende onderzoeksvraag te beantwoorden: In welke mate 1) is de zelfvriendelijk-

heid van artsen gerelateerd aan hun professionele voldoening? en 2) wordt deze relatie gemedieerd door persoonlijke veerkracht en werk-privé balans?

In dit vragenlijstonderzoek onder 374 artsen die werkzaam waren in verschillende Nederlandse ziekenhuizen voerden we een parallelle mediatie analyse uit op basis van regressies om onze onderzoeksvraag te beantwoorden. Uit deze studie bleek dat een zelfvriendelijke attitude niet direct gerelateerd was aan de professionele voldoening van artsen, maar indirect door persoonlijke veerkracht en werk-privé balans te bevorderen. Hoewel toekomstig onderzoek deze relaties moet bevestigen, suggereert deze studie dat het belangrijk is dat artsen vriendelijk zijn voor zichzelf, omdat dit hun professionele voldoening ten goede kan komen, en daardoor mogelijk ook hun patiënten.

Hoofdstuk 4

Hoofdstuk 4 bekijkt een ander essentieel aspect van de professional performance van artsen nader: compassievolle zorgverlening. Uit de literatuur blijkt dat patiënten en artsen compassie als essentieel beschouwen voor het leveren van hoogwaardige zorg, maar dat patiënten desondanks regelmatig geen compassievolle zorgverlening ervaren. Inzicht in de ervaringen van zowel patiënten als artsen met compassievolle zorg kan het vermogen van artsen bevorderen om beter in te spelen op de behoeften van patiënten. Immers, als artsen niet weten wat compassievolle zorg voor patiënten betekent, is het ingewikkeld om compassievolle zorg te bieden. Daarom beantwoordt dit onderzoek de volgende onderzoeksvraag: Wat zijn ervaringen van patiënten en artsen met betrekking tot compassievolle zorg?

Om deze onderzoeksvraag te beantwoorden, hebben we semigestructureerde interviews gehouden met 8 patiënten en 10 artsen in opleiding tot medisch specialist in een Universitair Medisch Centrum in Nederland. De gebruikte template analyse resulteerde in vier thema's die aangeven hoe patiënten en artsen compassievolle zorgverlening ervaren: er zijn voor de patiënt, inleven in de patiënt, acties om het lijden van patiënten te verlichten, en het hebben van een persoonlijke connectie. Een vijfde thema voor artsen was professionele voldoening als gevolg van compassievolle zorgverlening. Dit aanvullende thema voor artsen suggereert dat compassievolle zorg niet alleen de kwaliteit van de patiëntenzorg ten goede komt, maar ook het welzijn van artsen.

Hoofdstuk 5

Hoofdstuk 5 beschrijft hoe artsen nachtdiensten – een belangrijke werkeis – ervaren in relatie tot hun welzijn en professional performance. Alhoewel nachtdiensten cruciaal zijn voor hoogwaardige patiëntenzorg, bedreigen ze tegelijkertijd het welzijn en de professional performance van artsen. Om de risico's van nachtdiensten beter te begrijp-

pen en of deze risico's vergelijkbaar zijn voor artsen, is er meer kennis nodig over hoe de impact van nachtdiensten varieert voor artsen. Deze kennis kan worden gebruikt worden voor het ontwerpen van op maat gemaakte interventies of flexibel beleid om de nadelige effecten van nachtdiensten te verzachten. Daarom wilden we de volgende onderzoeksvragen (OV) beantwoorden:

- OV1: Welke profielen kunnen er voor en na de nachtdienst worden geïdentificeerd op basis de gerapporteerde alertheid, tevredenheid en kalmte van artsen?
- OV2: Verschillen de profielen van artsen en hun gerapporteerde alertheid, tevredenheid en kalmte voor en na de nachtdienst, en zo ja, hoe?
- OV3: Welke demografische gegevens van artsen en werkomstandigheden omtrent de nachtdienst gaan gepaard met veranderingen in alertheid, tevredenheid en kalmte?

Om OV1 te beantwoorden, hebben we een *latent profile analysis* uitgevoerd. Deze persoonsgerichte statistische methode kan worden gebruikt om subgroepen te identificeren op basis van de scores die artsen rapporteerden op alertheid (performance), tevredenheid (welzijn) en kalmte (welzijn). OV2 werd beantwoord met behulp van beschrijvende statistieken, en OV3 met behulp van drie multipele regressies. De veranderingen in alertheid, tevredenheid en kalmte zijn gehanteerd als uitkomstmaat in de regressies (score voor de dienst minus score na de dienst).

Data van 211 artsen werden gebruikt om deze onderzoeksvragen te beantwoorden. De 'latent profile analysis' identificeerde drie profielen voor de nachtdienst (Onverschillig, Klaar voor de nachtdienst, Bevlogen) en vier profielen na de nachtdienst (Lethargisch, Moe maar tevreden, Onrustig, Mindful). De meeste artsen veranderende van het profiel 'Klaar voor de nachtdienst' naar 'Moe maar tevreden', waarbij de alertheid het meest afnam. In antwoord op OV3, ontdekten we dat leeftijd, medisch specialisme, slaap, dienstduur en het aantal opeenvolgende diensten geassocieerd waren met veranderingen in alertheid, tevredenheid en kalmte. De resultaten van dit onderzoek dragen bij aan de literatuur door genuanceerd inzicht te geven in de gemoedstoestand van artsen voor en na nachtdiensten. Toekomstig onderzoek kan beoordelen of specifieke subgroepen baat hebben bij interventies op maat.

Hoofdstuk 6

Hoofdstuk 6 beschrijft het ontwikkelen en testen van een welzijnsprogramma voor artsenteams. Het doel van het programma was om artsen in staat te stellen hun welzijn, en daarmee hun professional performance, te behouden of verbeteren. Er werden drie methodologische stappen uitgevoerd om het welzijnsprogramma te ontwikkelen: een voorbereidende fase, een behoeftepeiling onder artsen, en een periode om de materi-

alen van het welzijnsprogramma te ontwerpen. Het uiteindelijke programma omvatte een feedbacktool die de werkomstandigheden en het welzijn van artsen meet, een gefaciliteerde teamdialoog om de resultaten te bespreken, en een training over teamcommunicatie en team job crafting, waarbij artsen binnen een team samen onderzoeken of en hoe ze bepaalde werkomstandigheden of relaties op het werk kunnen aanpassen.

De feedbacktool is getest onder 377 artsen van 48 teams in 14 Nederlandse ziekenhuizen. Aan de teamdialoog namen vier teams van verschillende medische specialismen deel. Twee teams hebben deelgenomen aan de team training. Op basis van onze ervaringen hebben we zeven aanbevelingen geformuleerd die behulpzaam kunnen zijn bij het ontwikkelen van welzijnsinterventies die beogen artsentteams in ziekenhuizen in staat te stellen om werkeisen en hulpbronnen te adresseren: (1) betrek artsen en belanghebbenden met verschillende achtergronden, (2) overweeg de implicaties van werving- en selectiestrategieën met betrekking tot de doelen van de interventie, (3) stem de interventie af op bestaande (online) infrastructuur, (4) faciliteer artsen gedurende hun deelname (bijv. tijd en ondersteuning), (5) creëer een psychologisch veilige omgeving voor artsen, (6) denk in een vroeg stadium na over de evaluatie en implementatie, en (7) ontwerp interventies met een langdurig karakter, waarin feedback en acties worden opgevolgd.

Hoofdstuk 7

In dit hoofdstuk onderzochten we welke strategieën medisch specialistische bedrijven (MSB's) gebruikten om de professional performance van artsen te managen om kwalitatief hoogwaardige zorg te realiseren. Wij onderzochten ook welke uitdagingen zij hierbij tegenkwamen. MSB's zijn de collectieve organisaties van vrijgevestigde artsen die hun medische diensten meestal binnen één algemeen ziekenhuis verlenen. Nadat de Nederlandse regering op 1 januari 2015 de bekostiging van medisch specialistische zorg hervormde, voelden vrijgevestigde artsen, tot dat moment georganiseerd in maatschappen per medisch specialisme, zich genoodzaakt te herorganiseren om hun status als ondernemer, en daarmee hun vrije vestiging als arts, te behouden. Het MSB integreert deze verschillende maatschappen, waaraan een gekozen bestuur van artsen leidinggeeft. In deze context hebben wij onderzocht hoe artsen hun professional performance ervaren en verbeteren, aangezien artsen in MSB's mogelijk meer ruimte ervaren om hun werkomgeving en organisatie naar eigen wens in te richten. Bovendien geeft deze context inzicht in consequenties van hervormingen in het zorgstelsel, zoals nieuwe betalingsmodellen, voor de professional performance van artsen.

In dit exploratie kwalitatieve onderzoek zijn acht focusgroepen gehouden met geselecteerde MSB's (n = 33). Aan elke focusgroep namen bestuursleden van één MSB deel.

We ontdekten dat MSB's vijf strategieën gebruikten om de professional performance van artsen te managen: (1) actief managen en monitoren van prestaties, (2) een collectieve mindset opbouwen, (3) selectie en introductie procedures professionaliseren, (4) het werkgerelateerde welzijn van artsen verbeteren, en (5) het harmoniseren van werkwijzen en procedures. Ook bleek dat de unieke organisatiecontext van ieder MSB bepaalde welke strategieën en onderwerpen de meeste aandacht kregen. Volgens MSB besturen, was de steun van MSB leden, vertrouwensrelaties met ziekenhuisbestuurders, en de organisatorische volwassenheid van het MSB cruciaal voor de effectiviteit van de toegepaste strategieën.

Met name het opbouwen van een collectieve mindset onder MSB leden was een belangrijke culturele uitdaging in MSB's. MSB leden en in sommige gevallen MSB bestuurders stonden soms nog onvoldoende stil bij de gevolgen van hun professional performance voor het ziekenhuis en MSB. In plaats daarvan hadden ze geregeld de neiging om te denken vanuit het perspectief van hun eigen team of medische specialisme, waarschijnlijk mede doordat artsen tot voor kort waren georganiseerd in een maatschap van het eigen specialisme. MSB besturen erkenden dat kennis en vaardigheden op gebied van leiderschap, alsook meer formele instrumenten om de professionele prestaties van MSB leden te adresseren, hen zouden ondersteunen. De bevindingen van dit onderzoek benadrukken het belang van leiderschapsvaardigheden voor artsen met een formele leiderschapsrol, maar ook voor artsen zonder een dergelijke formele rol, omdat het hen zou helpen beter te begrijpen hoe hun professionele prestaties kunnen bijdragen aan het functioneren van het ziekenhuis en MSB.

Hoofdstuk 8

Hoofdstuk 8 behandelt het onderwerp van leiderschapsontwikkeling voor artsen. Ziekenhuizen over de hele wereld bieden leiderschapsontwikkelingsprogramma's (LOP's) voor artsen, omdat ze verwachten dat dit de kwaliteit, toegankelijkheid en betaalbaarheid van zorg ten goede komt. Onderzoekers hebben de uitkomsten van LOP's voor artsen geïnventariseerd en vonden relevante uitkomsten voor artsen (verbeterde leiderschapscompetenties), de organisatie (efficiëntere bedrijfsvoering) en patiënten (verbeterde kwaliteit van zorg). Het probleem is echter dat er veel variatie zit tussen LOP's en de organisatiecontexten waarin ze zijn geïmplementeerd, waardoor het onzeker is of ze universeel leiden tot deze positieve resultaten, met name op het gebied van uitkomsten voor de organisatie. Er is daarom meer kennis nodig over de werkingsmechanismen van LOP's voor artsen en onder welke omstandigheden ze leiden tot uitkomsten op organisatieniveau. Daarom beantwoordde deze studie de onderzoeksvraag: Hoe, waarom en onder welke omstandigheden kunnen LOP's voor artsen in ziekenhuisomgevingen uitkomsten op organisatieniveau beïnvloeden?

Om deze onderzoeksvraag te beantwoorden, hebben we een *realist review* uitgevoerd. Realist reviews zijn bedoeld om te begrijpen hoe complexe interventies, zoals LOP's, werken (of niet) en hoe interventiecomponenten interacteren om uitkomsten te generen. De uitkomst van realist reviews is een programma theorie waarin deze werking wordt uitgelegd aan de hand van *Context-Mechanism-Outcome* (CMO) configuraties. Deze configuraties tonen hoe specifieke contexten [C] en mechanismen [M] samenwerken om uitkomsten te genereren [O].

Realist reviews hanteren een systematische aanpak voor het zoeken, screenen en beoordelen van de literatuur. In dit onderzoek, hebben we 3904 titels en samenvattingen van diverse documenten gescreend en beoordeeld. Vervolgens zijn 100 documenten volledig gelezen; 38 documenten met LOP's uit meerdere landen vormden de basis voor onze programmatheorie. De geïdentificeerde programmatheorie omvatte vijf CMO configuraties. Deze configuraties tezamen illustreren waarom, hoe en onder welke omstandigheden LOP's voor artsen invloed kunnen hebben op drie geïdentificeerde uitkomstcategorieën op ziekenhuisniveau: organisatiecultuur, kwaliteitsverbetering en de leiderschapspijp van het ziekenhuis. Hieronder bespreek ik de gevonden CMO's per uitkomstcategorie.

In contexten waar deelnemers van LOP's constructieve feedback gaven [C] en artsen meer zelfinzicht kregen, waren artsen eerder geneigd om hun leiderschapsstijl af te stemmen op de behoeften en wensen van de mensen die ze leiden met positief resultaat voor de onderlinge communicatie en samenwerking [M], wat uiteindelijk een positieve impact had op de cultuur van de organisatie [O] (CMO1). Met name interne LOP's, d.w.z. voor de artsen van één ziekenhuis, die nadrukkelijk de interactie tussen deelnemers stimuleerden [C], faciliteerden artsen om professionele netwerken op te bouwen, wat leidde tot meer wederzijds begrip tussen diverse ziekenhuisactoren en betere communicatie en samenwerking [M], wat de organisatiecultuur ten goede kwam [O] (CMO2). Ook professionele netwerken droegen bij aan deze uitkomstcategorie door het opzetten van ondersteunende netwerken voor artsen [M] (CMO2). Professionele netwerken droegen ook bij aan kwaliteitsverbetering door middelen binnen ziekenhuizen te mobiliseren; artsen wisten bijvoorbeeld waar ze ondersteuning konden vinden in ziekenhuizen [M] (CMO2).

LOP's met goed gefaciliteerde kwaliteitsverbeterprojecten (bijv. projectmanagement-ondersteuning) waarvan de doelstellingen in lijn waren met die van de organisatie [C], stelden artsen in staat om draagvlak te creëren en volhardender te zijn wanneer hun projecten vastliepen [M], waardoor de kans op succesvolle implementatie en kwaliteitsverbetering toenam [O] (CMO3).

Door het hebben van een professioneel netwerk werden artsen zichtbaarder binnen het ziekenhuis, waardoor hun kans op een nieuwe rol of functie toenam [M] en ze ook daadwerkelijk meer leiderschapsposities binnen ziekenhuizen vervulden [O] (CMO2). We ontdekten eveneens dat wanneer de inhoud van een LOP werd afgestemd op de behoeften van deelnemende artsen [C], dit leidde tot meer relevante leerervaringen, waardoor artsen zich beter voorbereid voelden voor hun huidige en toekomstige leiderschapsrol [M]. Dit versterkte de leiderschapspijplijn van het ziekenhuis [O] (CMO4). Tot slot, wanneer LOP's uitstraalden dat het ziekenhuis de artsen en hun leiderschap echt waardeert [C], leidde dit tot meer betrokkenheid van artsen bij de organisatie [M], waardoor ze bereid waren om nieuwe leiderschapsrollen binnen het ziekenhuis op zich te nemen [O] (CMO5).

De vijf geïdentificeerde CMO's opereerden binnen een bredere organisatorische context, het leiderschapsecosysteem. Een ondersteunend leiderschapsecosysteem - wat onder andere het hebben van loopbaantrajecten met coaching na het programma kon omvatten - droeg bij aan het potentieel van ziekenhuizen om uitkomsten op organisatieniveau te realiseren en behouden via hun LOP's.

Onze ontwikkelde programmatheorie kan richting geven aan de ontwikkeling van LOP's voor artsen om specifieke ziekenhuisambities effectief te realiseren. Dit is essentieel, omdat ziekenhuizen behoefte hebben aan een solide leiderschapspijplijn van artsen om uitdagingen, zoals de stijgende zorgvraag, in de gezondheidszorg het hoofd te bieden. Door artsen in hun rol als leider te waarderen en te investeren in hun leiderschapsontwikkeling, kan de ziekenhuisorganisatie een sterk kader van artsen-leiders creëren die bijdragen aan kwalitatief goede, toegankelijke en betaalbare zorg.

AUTHOR CONTRIBUTIONS

Affiliations reported as per publication or title page of the particular study.

Chapter 2. A structural equation modelling analysis on relationships of job demands and resources with work engagement, burnout and work ability: an observational study among physicians in Dutch hospitals

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Relative author contributions Chapter 2 per Contributor Roles Taxonomy (CRediT).

	C	Fa	Faq	I	M	Pa	S	W-od	W-re
MD	X	X		X	X	X		X	X
RS	X	X	X	X	X	X		X	X
MS	X			X	X				
KL	X		X	X			X		X

Relevant CRediT roles: Conceptualization (C), Formal Analysis (Fa), Funding Acquisition (Faq), Investigation (I), Methodology (M), Project Administration (Pa), Supervision (S), Writing – original draft (W-od), Writing – review & editing (W-re)

Chapter 3. The relationship between physicians’ self-kindness and professional fulfillment and the mediating role of personal resilience and work-home interference: A cross-sectional study

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	C	Fa	Faq	I	M	Pa	S	W-od	W-re
RB	X	X		X	X	X		X	X
MD	X	X			X			X	X
DK				X					X
RH				X					X
JH							X		X
KL			X				X		X

Relevant CRediT roles: Conceptualization (C), Formal Analysis (Fa), Funding Acquisition (Faq), Investigation (I), Methodology (M), Project Administration (Pa), Supervision (S), Writing – original draft (W-od), Writing – review & editing (W-re)

Chapter 4. Compassionate care through the eyes of patients and physicians: an interview study

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Relative author contributions Chapter 4 per Contributor Roles Taxonomy (CRediT).

	C	Fa	Faq	I	M	Pa	S	W-od	W-re
MD	X	X	X	X	X	X		X	X
IJ	X	X	X	X	X	X		X	X
MDi	X	X		X	X				X
RB	X	X		X	X				X
BW	X	X			X		X		X
GW	X	X			X		X		X
KL	X	X			X		X		X

Relevant CRediT roles: Conceptualization (C), Formal Analysis (Fa), Funding Acquisition (Faq), Investigation (I), Methodology (M), Project Administration (Pa), Supervision (S), Writing – original draft (W-od), Writing – review & editing (W-re)

Chapter 5. Doctors' alertness, contentedness and calmness before and after night shifts: a latent profile analysis

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Relative author contributions Chapter 5 per Contributor Roles Taxonomy (CRediT).

	C	Fa	Faq	I	M	Pa	S	W-od	W-re
MD	X	X		X	X	X		X	X
FT	X	X		X	X	X			X
MS	X	X		X	X				X
CH					X				X
KL	X	X					X		X
KB	X	X	X	X	X		X		X

Relevant CRediT roles: Conceptualization (C), Formal Analysis (Fa), Funding Acquisition (Faq), Investigation (I), Methodology (M), Project Administration (Pa), Supervision (S), Writing – original draft (W-od), Writing – review & editing (W-re)

Chapter 6. Developing and piloting a well-being program for hospital-based physicians

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Relative author contributions Chapter 6 per Contributor Roles Taxonomy (CRediT).

	C	Fa	Faq	I	M	Pa	S	W-od	W-re
MD	X	X		X	X	X		X	X
KL	X	X	X	X	X		X		X
NH		X		X	X				X
RS	X	X	X	X	X	X		X	X

Relevant CRediT roles: Conceptualization (C), Formal Analysis (Fa), Funding Acquisition (Faq), Investigation (I), Methodology (M), Project Administration (Pa), Supervision (S), Writing – original draft (W-od), Writing – review & editing (W-re)

Chapter 7. Building organisations, setting minds: Exploring how boards of Dutch Medical Specialist Companies address physicians' professional performance

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Relative author contributions Chapter 7 per Contributor Roles Taxonomy (CRediT).

	C	Fa	Faq	I	M	Pa	S	W-od	W-re
MD	X	X		X	X	X		X	X
MS	X	X		X	X			X	X
KK		X		X					X
KL	X	X		X	X		X	X	X

Relevant CRediT roles: Conceptualization (C), Formal Analysis (Fa), Funding Acquisition (Faq), Investigation (I), Methodology (M), Project Administration (Pa), Supervision (S), Writing – original draft (W-od), Writing – review & editing (W-re)

Chapter 8. Linking leadership development programs for physicians with organization-level outcomes: a realist review

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Relative author contributions Chapter 8 per Contributor Roles Taxonomy (CRediT).

	C	Fa	Faq	I	M	Pa	S	W-od	W-re
MD	X	X		X	X	X		X	X
IJ	X	X		X	X			X	X
KL	X	X		X			X		X
WK		X		X	X				X
KK	X	X		X					X
YS		X		X					X
JD				X					X
MS	X	X		X	X			X	X

Relevant CRediT roles: Conceptualization (C), Formal Analysis (Fa), Funding Acquisition (Faq), Investigation (I), Methodology (M), Project Administration (Pa), Supervision (S), Writing – original draft (W-od), Writing – review & editing (W-re)

PHD PORTFOLIO

Name PhD student: Maarten Debets

PhD period: November 2017 – June 2023

Names of PhD supervisor(s) & co-supervisor(s): Kiki Lombarts, Karen Kruijthof, Milou Silkens

1. PhD training		
General courses (Graduate School Amsterdam UMC)	Year	ECTS
The Amsterdam UMC World of Science	2018	0.7
Practical Biostatistics	2018	1.1
Scientific Writing in English for Publication	2018	1.5
EndNote	2018	0.1
Computing in R	2018	0.4
Project Management	2019	0.6
Qualitative Health Research	2019	1.9
Seminars, workshops and master classes		
Symposium (organizing committee): De Vitale Dokter, Research group Professional Performance and Compassionate Care (PP&CC), Amsterdam.	2017	1.5
Masterdialogen Professional Performance, Research group PP&CC, Amsterdam UMC, Amsterdam.	2017-2018	0.5
Bi-Annual Seminar on Improving People Performance in Health Care. The Future of Health Care Work, Utrecht.	2018	0.3
Symposium: Interprofessioneel samenwerken in de zorgketen, Amsterdam.	2018	0.2
Vitaliteitsnetwerk Nederland: op weg naar een vitale organisatie, Doorn.	2018	0.2
Symposium: Zin in Zorg, Utrecht.	2019	0.1
Workshop (provider): Professional Performance. European Association Physician Health (EAPH) conference, Oslo.	2019	0.6
Workshop (provider): medisch specialist in maatschap of loondienst? Amsterdam UMC, Amsterdam.	2019	0.6
Symposium (presenter & workshop provider): Waanzinnige Zorg, Research group PP&CC, Amsterdam.	2022	0.5
Promovendi Netwerk Estafettes Nederlandse Vereniging van Medisch Onderwijs (NVMO).	2021	0.1
Presentations (Inter)national conferences		
Professionaliteit in Vitaliteit: de ontwikkeling en implementatie van een vitaliteitsprogramma voor medisch specialisten. NVMO Congres, Egmond aan Zee.	2017	0.5
Facilitating physicians' professional performance: policies and practices. Rogano Conference, Basel.	2018	0.5
De invulling van professionele kwaliteit en veiligheid binnen medisch specialistische bedrijven. NVMO Promovendidag, Utrecht.	2019	0.5
Development and pilot of a well-being program for hospital-based physicians. EAHP Conference, Oslo.	2019	0.5
A realist review on leadership development programs for physicians: defining context, mechanisms, and outcomes. Rogano Conference, Vienna.	2019	0.5

The development and pilot of a well-being program for hospital-based physicians to create positive work environments. Association for Medical Education in Europe (AMEE) Conference, Vienna.	2019	0.5
Keynote de zin en onzin van vitaliteit. Symposium de vitale dokter, Deventer ziekenhuis, Deventer.	2019	1
Other		
Research meetings and days of the Department of Medical Psychology, Amsterdam UMC.	2018-2021	4
Journal club	2018-2021	3
Werkgroep duurzame inzetbaarheid A(N)IOS, Amsterdam UMC.	2019-2021	1.5
Amsterdam Public Health (APH) research institute, member of the Program Council of Quality of Care (regular meetings, reviewing grant proposals, giving workshops, and co-organizing the the APH Spring Meeting 2019, APH Annual Meeting 2019, and Junified 2021).	2019-2021	8.5

2. Teaching

	Year	ECTS
Kleinschalig Klinisch Lijnonderwijs. Professional Performance & Vitaliteit, Amsterdam UMC.	2017	0.5
Professionele Ontwikkeling. Professional performance in de praktijk, Research group PP&CC, Amsterdam UMC.	2019-2021	1.5
Discipline Overstijgend Onderwijs (DOO). De Vitale AIOS, Research group PP&CC, Amsterdam UMC.	2019-2021	3.5
Supervising		
Co-supervising master thesis student	2019	2

3. Parameters of Esteem

Grants	Year
Quality of care and quality of caring: developing a compassion training for physicians (APH Quality of Care innovation grant)	2019

4. Publications

Peer reviewed	Year
Conen W, Debets M. Precariousness and social risks among solo self-employed in Germany and the Netherlands. In <i>Self-Employment as Precarious Work</i> (pp. 108-131). Edward Elgar Publishing.	2019
Debets M, Scheepers, R, Boerebach, B, Arah, O, & Lombarts, K. Variability of residents' ratings of faculty's teaching performance measured by five-and seven-point response scales. <i>BMC Med Educ.</i> 20(1).	2020
Debets M, Lombarts K, Hugenholtz N, Scheepers R. Developing and piloting a well-being program for hospital-based physicians. <i>Perspect Med Educ.</i> 10(1).	2021
Debets M, Silkens M, Kruijthof K, Lombarts, K. Building organisations, setting minds: exploring how boards of Dutch medical specialist companies address physicians' professional performance. <i>BMC Health Serv Res.</i> 22(1):155.	2022

Debets M, Scheepers R, Silkens M, Lombarts K. Structural equation modelling analysis on relationships of job demands and resources with work engagement, burnout and work ability: an observational study among physicians in Dutch hospitals. <i>BMJ Open</i> . 12:e062603.	2022
Bogerd R, Debets M, Keuken D, Hassink R, Henriques J, Lombarts, K. The relationship between physicians' self-kindness and professional fulfillment and the mediating role of personal resilience and work-home interference: A cross-sectional study. <i>Plos One</i> . 18(4): e0284507.	2023
Debets M, Lombarts K, Kuijjer-Siebelink W, Kruijthof K, Steinert Y, Daams J, Silkens M. Linking leadership development programs for physicians with organization-level outcomes: a realist review. <i>BMC Health Serv Res</i> . 23(783).	2023
Debets M, Tummers F, Milou S, Huizinga C, Lombarts K, Van der Bogt, K. Doctors' alertness, contentedness and calmness before and after night shifts: a latent profile analysis <i>Hum Resour Health</i> . 21(68).	2023
Submitted	
Debets M, Jansen I, Diepeveen M, Bogerd R, Molewijk B, Widdershoven G, Lombarts K. Compassionate care through the eyes of patients and physicians: an interview study.	
Other	
Debets M, Scheepers R, Lombarts K. Hoe blijf je als arts vitaal? <i>Magma</i> 4-2017.	2017
Diepeveen M, Debets M, Bogerd R, Jansen I, Lombarts K, Molewijk B, Widdershoven G. Development, theoretical framework and content of a compassion training for residents in medicine in the Netherlands (in progress).	
Smits M, Loomans J, Laura R, Loots C, Zeevenhooven J, Frenkel J, Debets M. Promoting physician well-being in a tertiary Dutch pediatric hospital: The BURNIN Program (in progress).	

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ABOUT THE AUTHOR

Maarten Petrus Marcus Debets was born on the 9th of June 1992 in Geleen, the Netherlands. His parents, Peter and Jolanda, raised him in the neighboring picturesque village of Sweikhuizen. In 2010 he graduated from the Graaf Huyn College at the atheneum level. After high school, he went to live and study in Tilburg. He obtained his bachelor's degree in Human Resource Management in 2014, with additional courses in organizational sciences and public administration. His interest in organizational dynamics, governance, and strategic human resource management grew during his bachelor's. Therefore, he applied for the master Strategic Human Resource Management at the Utrecht University School of Governance. In 2015 he moved to Utrecht and finished his master's degree cum laude. During his master's, Maarten deliberated between pursuing an academic career or delving into strategy consultancy. Opting for the former, he joined Utrecht University as a teacher and junior researcher and worked on various projects before transitioning to Amsterdam UMC, AMC. There he worked on a project aimed at enhancing physicians' occupational well-being. After completing the project, the Professional Performance and Compassionate Care research group allowed him to pursue a PhD on physicians' professional performance, focusing on well-being and leadership. Maarten decided to live in Amsterdam, and in his spare time, he also made work of his passion for wine. He completed the WSET2 and WSET 3 courses with great joy, passing both with distinction. During the end phase of his PhD trajectory, Maarten explored his interest in strategy consultancy and started working for AethiQs, his current employer. There he employs his academic and consulting skills to advise societally relevant organizations. He works for clients in multiple sectors, including healthcare, education, and the financial sector.