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Introductory Chapter: Developing Patient Safety Champions

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1. Introduction

Despite tremendous progress in improving their safety performance, modern healthcare systems still have a long way to go compared to other high-risk, low-error industries such as banking or air transportation. To that end, it has been proposed that adoption of the aviation industry's high-reliability models (HRMs) by healthcare systems may help reduce the occurrence of medical errors. These HRMs are based on in-depth analyses of failure modes and are characterized by their inherent focus on team approaches and the commitment to identifying often complex solutions to existing problems [1]. Within the highly complex environment of modern healthcare, the process of improving patient safety (PS) is certainly a long and arduous journey. This chapter is intended to serve as a framework to the broader discussion of strategies to improve PS outcomes. The overarching themes of this book series revolve around continually institutionalizing and further refining a culture of safety within modern healthcare systems.

The emphasis on both individual and team excellence, backed by well-established, system-based support structures and mechanisms, provides the most optimal substrate for further enhancements in PS [2, 3]. The organizational quest for improving PS revolves around embracing continuous self-improvement, effective change management, realistic goal setting, and rewarding positive individual and team behaviors [4, 5]. Only when all of the above elements are present in "correct proportions" and harmoniously interact to produce synergies can our healthcare systems enter the state of sustainable culture of safety. The goal of the

Vignettes is to expose our readers to a broad range of key PS concepts that will cumulatively provide a foundation for building safe systems and synergies required for continued progress in this critical area.

Important and formidable challenges exist within the broader domain of PS. The development of HRMs in those key areas, summarized in the subsequent sections of this chapter, will help bring about the desired, optimal systemic outcomes. In aggregate, our healthcare systems need to become more effective in proactively addressing preventable harm, with a focus on reducing primary occurrences and minimizing any recurring or subsequent (e.g., secondary) adverse events [6]. Also, despite progress in multiple areas amenable to harnessing the full power of technological advances to the benefit of our patients and their safety, the human factor continues to be the “weakest link” when it comes to sustainable reduction in iatrogenic harm.

2. Why is patient safety important?

While it is easy to advocate for the establishment of a universal framework for improved patient outcomes, practical implementations are not as easy as it might superficially appear. In fact, well-intended initiatives that are designed to help improve PS can often be met with substantial resistance by those who inherently feel that their “...way of doing it is better...,” that “...rules do not apply to them...,” that their “...patients never have such problems...,” or the most concerning of excuses “...institutional leadership does not feel that such activities are worthwhile or justified in terms of the time, resources, changes to existing institutional cultures and structures, and costs” [7–9]. Nevertheless, there are more practical and clearly less altruistic reasons to focus on PS—specifically, the quickly growing number and types of complications that are deemed “avoidable,” “never events,” or “hospital acquired” and are becoming attributable to “actual or perceived lapses” in standards or processes aimed at their prevention. As such, the value-based healthcare paradigm is leading to diminished reimbursement for cases complicated by preventable—or potentially preventable—events.

If there is one overarching theme that has become clear throughout the different clinical scenarios discussed in the *Vignettes in Patient Safety*, it is that adverse patient events have broad-ranging and far-reaching consequences. From physical and emotional harm to the patient, to significant added healthcare expenses, to medico-legal sequelae, and finally to financial penalties imposed by third-party payers, patient safety events are among the most impactful negative occurrences for patients, practitioners, institutions, and health systems [10, 11]. In addition to the abovementioned “direct” effects of PS occurrences, there are numerous “indirect” by-products that are often difficult to appreciate and/or quantify. For example, the increase in publically available patient safety reports both directly and indirectly affects the hospital’s external perceptions and the ability to attract new patients [12]. The overall patient experience and the risk of medical liability litigation also tend to correlate with

institutional commitment to patient safety [13, 14]. Within this complex “value” equation, hospital finances and reputation can also be significantly affected [15].

Increasingly, both government payers and private health insurance companies decline to reimburse healthcare systems and providers for the care involving, or resulting from, such lapses in patient safety (or complications thereof). The financial burden of managing various adverse event-related complications is often substantial—and frequently exceed the numerical costs of managing the initial problem for which the patient was hospitalized. Given the trend toward payer cost-avoidance and value-driven approaches, now more than ever, those additional expenses are being shifted toward hospitals and providers. Along the same lines, there is growing impetus by both the public and third-party payers to provide reimbursement based on outcomes and quality of care, and not necessarily for “work performed.” Furthermore, payers are now looking toward financial models that consider not only the patient outcomes but provider- and institution-specific outcomes as well [16, 17]. Within the value-based healthcare paradigm, unusually high wound infection rates or failures to use (or even document the use) of best-practice therapies such as prophylactic antibiotics, pre-procedural beta-blockers, and appropriate DVT prophylaxis are now becoming publically reported data and potential quality metrics for which insurance payers might withhold or adversely adjust payments [18, 19]. In some situations, failure to use or document “best practices” that are focused on patient safety can even result in institutional financial and nonfinancial penalties [20, 21].

Compensation and incentive models at the level of physician practices and individual physicians are also being linked to outcomes that consider patient safety [22]. In addition, as previously mentioned, in the era of transparency and public reporting of outcome data, patients can now seek out hospitals—and even specific providers—that have the best outcomes across multiple domains of performance, from complications to hospitalization lengths of stay and patient safety event rates [23, 24]. Hence, an obvious reason for such growing interests in PS is that it makes good business sense. Furthermore, public reporting of key clinical metrics and safety indicators has transformative effect on institutions, providers, and patients [25]. Finally, adverse events often result in medical-legal discussions regarding “deviations from the standard of care” or even “malpractice” and can result in considerable financial consequences for all involved stakeholders. In brief, fostering patient safety is the right thing to do!

In addition, as our collective experience in achieving a culture and climate of safety grows, organizations should liberally utilize this growing body of knowledge to create and reinforce a framework for delivering safer care, establishing process improvement plans, and emphasizing “best practices” and evidence-based institutional guidelines [26–28]. The primary goal of the chapters in this volume of *Vignettes in Patient Safety* is to provide a solid conceptual foundation for accomplishing a truly formidable task of providing the highest quality care for our patients while ensuring that treatments take place efficiently and safely. As we concentrate our efforts on some of the pressing challenges and barriers to achieving a culture of safety, we should carefully and humbly follow Bagian et al. [29] in the realization that patient safety is a continuous learning process and that in order to “develop and deploy a patient safety program,” we must first accept that we “can’t fix what [we] don’t know....”

3. Focus on challenges

There are several important reasons why challenges remain in the general area of patient safety. Starting with deeply ingrained institutional cultural patterns that are exceedingly difficult to change [4, 30], the immense number of potential ways and contributing factors that may be associated with unintentional harm is beyond any one person's ability to effectively comprehend or influence, either directly or indirectly [31–33]. Lack of awareness, combined with inadequate education and training, continues to create highly unpredictable “blind spots” within the patient safety paradigm [34, 35]. With increasing emphasis on the importance of the patient as an instrumental factor in the overall healthcare safety equation [2, 36], potential exists for both beneficial and harmful effects of the added complexity of the resultant “safety matrix.” For example, a patient may be able to help identify the correct anatomic site before he or she undergoes an invasive procedure, yet the same patient may communicate incorrect medication dosage for their regularly prescribed antihypertensive.

Among potential “safety blind spots” mentioned above, team communication and the patient “handoff” process are associated with the greatest risk of healthcare associated errors. The “handoff” or handover process (HOP) refers to the formal procedure of transferring the clinical care of a patient from a departing provider to an incoming provider and involves targeted transfer of critical information, oversight responsibility, and decision-making authority [37, 38]. Also called the “transition of care” process, the HOP may involve various time schedules (e.g., shift based, daily, weekly) and provider levels, further increasing the potential for miscommunication and potential error(s). The HOP is also the standard operating procedure in both inpatient and outpatient medical settings, as well as during transitions between those two realms [39–42]. The HOP is highly variable and often dependent upon the provider's level of training, the scope of responsibility, area of specialty, and time constraints associated with daily workload [43–45]. Yet, the HOP is often overlooked as a source of miscommunication that potentiates adverse outcomes [46–48]. Of note, in both 2003 and 2011, the Accreditation Council for Graduate Medical Education (ACGME) mandated a decrease in the number of continuous duty hours for house officers [49]. Training programs have acclimated to shorter shift hours from the more classic long call demands. Therefore, there are many more HOPs to cover the increased number of shifts [48, 50–52]. Although the struggle to balance resident work hours and the continuity of care is likely to persist [51], some have suggested that providing “protected handoff environment,” free of distractions and based on predetermined, standardized communication guidelines and EMR-based solutions, may help reduce HOP-related errors [52, 53]. Given this new reality, the healthcare industry must learn from areas where HRMs are the norm, not the exception [1, 54].

Colvin et al. [37] examined the HOP in the intensive care unit (ICU), where errors or omissions of important history can greatly impact critically ill patients. Given the high acuity of care being provided in the ICU, the overall situational complexity makes the HOP extremely important and closely enmeshed with a broad range of PS considerations. Types of communication

breakdowns identified by Colvin et al., during the HOP included (a) critical content omissions, (b) sharing of inaccurate or conflicting information, (c) the provision of irrelevant or distracting information, (d) failure to discuss anticipated problems or plans, (e) “illegible or unclear” HOPs, and (f) failure to communicate rationale behind overnight decisions [37]. The authors highlight the lack of standardization and education regarding the HOP across the healthcare system. Published in 2005, a survey of the Internal Medicine Sub-Internship Clerkship Directors based on input from 125 US Medical Schools showed that <10% of institutions taught students how to perform HOPs in a formal didactic setting [55]. Given the above factors, and the associated inconsistencies in the HOP across organizations, an urgent action is required to rectify this state of affairs and ensure that both training and implementation of HOP-related skills are standardized.

Other barriers to effective teamwork in the healthcare setting involve psychosocial and organizational structure-related factors encountered in the workplace. Weller et al. [56] reviewed roadblocks to communication in the setting of multidisciplinary caregiver teams. The success of information sharing is a primary predictor for the overall performance of any team in any workplace. It was found that the “hierarchical structure” in medicine may be associated with poorer safety outcomes. Less experienced individuals, such as medical students and junior residents, may lack confidence when reporting patient concerns or diagnostic information, potentially withholding important data “out of concern for being wrong.” This pyramidal organizational style can contribute to increased risk of adverse events across a broad range of settings, from medicine to aviation or banking industries. As noted by Malcolm Gladwell in a well-known example from aviation, disastrous consequences may result when junior pilots fail to challenge misguided decisions of more veteran pilots [56, 57]. Areas of systemic vulnerability are more likely to become exposed (or exaggerated) when quick decisions must be made during high-risk situations or procedures [2, 58]. In an important study of episodes of “escalation of care” on surgical wards, failure at any step of the “escalation” process (e.g., from nurse to junior resident to senior resident to attending/consultant) has the potential to result in increased morbidity and mortality [59]. Healthcare systems in general have relatively little redundancy of resources, and when compared to other “high-risk” fields like aviation and the military, the ability to compensate for any systemic error (e.g., dual tasking, debriefing, “backup behaviors”) is very limited [59].

Additional concerns regarding patient safety pertain to the physical plant and/or the geographical location of the healthcare team in relation to specific “points of care” [60–62]. Many hospitals and other healthcare facilities have expanded or branched to many communities, effectively making geography a barrier to direct communication [63, 64]. Outcomes resulting from the complex interplay between variables related to regionalization of care can become problematic when staffing levels fail to adequately match local institutional needs [65–67]. At times, the ability to effectively schedule and coordinate various teams for rounds, meetings, patient care coordination, case management discussions, family meetings, etc., are limited by the physical separation of facilities and stretching of the same resources across multiple sites. As a result, poorly organized meetings and more random encounters occur, resulting in potentially impaired transfers of vital patient information from provider to provider [56].

Another challenging area that affects patient care and safety is the evolution of the electronic medical record (EMR). Advantages of EMR include improved legibility, completeness of record, direct transmission, security and safety of information transfer, and access to large volumes of information [68]. However, the mere presence of EMR does not guarantee enhanced patient outcomes or safety. The built-in safety features like order sets, drug interactions, electronic verification and timing of results/studies, meaningful use, coding, etc., are only helpful and effective if the provider adopts and accesses the system proficiently. Significant education is required to reduce any potential barriers to proper EMR utilization. Among notable “stumbling blocks” in this domain are typing proficiency, motivation and personal initiative, comfort level with workarounds, and on-the-job practice. Other system challenges include physical space, ergonomics, electricity, wireless connectivity, and interinstitutional integration of data [68]. Thus, both personal and systemic limitations of EMRs have the potential to affect the quality and timeliness of patient care.

4. Human factors: individuals, teams, and institutional culture

Within the area of patient safety, human factors feature prominently as direct or indirect contributors to adverse events [69, 70]. A broad spectrum of variables to be considered here includes behavioral, cognitive, sensory, and other personal modulators of individual performance [70–73]. In their interim assessment of progress achieved following the landmark *To Err Is Human* report, Leape and Berwick point out that although the overall “... efforts are affecting safety at the margin, their overall impact is hard to see in national statistics...” [74]. This was one reason for the implementation of duty hour restrictions for residents in 2011; however, in 2017, the pendulum has swung back toward a more “hybrid on-call model” partly because the restriction on hours which was supposed to help prevent errors related to fatigue perhaps did not account for system errors in hand-offs [75–77].

Increasing awareness of the importance of team and system errors shifted the “safety focus” from individual providers to clinical teams, patient care units, and institutions in general [78, 79]. A recent study nicely demonstrated that great majority of patient safety events related to unintentional surgical item retention involved team or system errors and that isolated human factors were involved in fewer than 10% of instances [3]. The complexity of the overall system-wide consideration is further highlighted by the fact that two or more safety omissions were involved in >52% of cases of retained surgical items in the same study [3]. A less recognized aspect of patient safety, yet perhaps the most dramatic, and one that can have lasting deleterious effects on all stakeholders when it occurs, is self-harm in the general hospital setting. Inpatient suicide is the second most common sentinel event (12% of all sentinel events) according to the Joint Commission on Accreditation of Healthcare Organizations, yet research on this is sparse [80]. As we read each chapter in

the *Vignettes in Patient Safety*, it becomes apparent how important effective teamwork and institutional system design are to ensuring that our healthcare facilities and teams are setup for success [79, 81].

A final obstacle to improving safety in healthcare is the very culture of healthcare itself. In the high-risk environment of medicine, a tendency may emerge for quality review processes to employ “culture of blame” instead of a “just culture” or other, more collaborative models [82–85]. Many healthcare professionals are concerned about corrective and punitive actions related to unintentional errors. This fear of failure can lead to under-reporting of medical errors and therefore diminished ability to prevent future correction/remediation for the individual physician as well as their peers [86, 87]. Learning from mistakes is not a common adage that is comforting to a physician. Fear of error should not be thought of as an individual’s failure but rather a “collective responsibility” for future education and improvement [82].

5. Overcoming challenges: embracing effective solutions and evidence-based interventions

Each new patient safety event represents a setback, and many such setbacks occur each and every day. Despite this, it is our hope that the number of patient safety events will show a downward trajectory as the collective awareness of various mechanisms and risks involved improves. We believe that the ultimate goal of “zero incidence” can, and will, be achieved. After all, each setback is an opportunity to learn, self-reflect, and ultimately improve. The complexity of the healthcare industry, with multiple distinct specialties that deal with diverse patient populations, is far greater than that of most other industries. This may be one of the reasons why HRMs that work so well for the aviation industry are only the beginning of a long and challenging process of healthcare safety improvement. Further, the limited scope of the current efforts to improve patient safety, including lack of a truly comprehensive nationwide monitoring and surveillance system, severely hinders the progress of large-scale efforts in this critically important area [74].

Given the above considerations, as well as the heterogeneity of factors that contribute to patient safety events, our editorial team felt it was critically important to direct the reader to some of the most prominent recent studies in patient safety. Instead of reverting to the traditional collection of “classics,” we opted to limit our search to the past 5 years (2012–2017) and present information that may help refocus and redirect global patient safety efforts. These articles are summarized in **Table 1**. Among the most important topics reviewed here are interventions centered on hospital-acquired infections, surgical checklists, patient handoffs, other human factors/team considerations, and the use of EMR to reduce errors. In addition, an outline of recommendations made by the American Medical Informatics Association (AMIA) is provided in **Table 2** [88].

Author (year)	Title/topic	Study details	Summary/comment
Aiken et al. (2012) [89]	Patient safety, satisfaction, and quality of hospital care: cross-sectional surveys of nurses and patients in 12 countries in Europe and the United States	Cross-sectional survey of >33,600 nurses and >11,300 pts. in Europe as well as >27,500 nurses and >120,000 pts. in the United States	The study involved nursing surveys from 488 hospitals in 12 European countries and 617 hospitals in the United States. Patient surveys were administered in 210 European hospitals and 430 US hospitals. The authors found an association between nursing environment (staffing, teamwork, and managerial support) and patient satisfaction, quality, and safety of care
Arriaga et al. (2013) [90]	Simulation-based trial of surgical checklists	Operating room teams from three institutions participated in a series of surgical-crisis scenarios. Each team managed half using a checklist and half by memory	A total of 17 teams participated in 106 simulations. Only 6% of "steps" were missed when checklist is used versus 23% when teams utilized memory without checklist(s). Study findings suggest that checklist may enhance surgical care protocol compliance during crisis scenarios
Borchard et al. (2012) [91]	A systematic review of the effectiveness, compliance, and critical factors for implementation of surgical safety checklists in surgery	The authors performed a meta-analysis of 22 source manuscripts. The study examined outcomes including checklist effectiveness and compliance	The use of surgical safety checklists reduces the relative risk for both mortality (OR 0.57, 95% CI 0.42–0.76) and complications (OR 0.63, 95% CI 0.58–0.67). Overall "checklist compliance" varied between 12 and 100%, although compliance for "time out" procedures was notably better (70–100%)
Climo et al. (2013) [92]	Effect of daily chlorhexidine bathing on hospital-acquired infection	The authors performed a multi-center, cluster-randomized, non-blinded crossover trial that included 7727 patients in 6 hospitals (ICUs or bone marrow transplantation units) between August 2007 and February 2009. Authors compared chlorhexidine-impregnated washcloths with nonantimicrobial washcloths	The study demonstrated that the rate of multidrug-resistant organism acquisition was 23% lower in the chlorhexidine bathing group. It was also noted that the rate of hospital-acquired bloodstream infections was 28% lower with chlorhexidine versus nonantimicrobial washcloth use
Fan et al. (2016) [93]	Association of safety culture with surgical-site infection outcomes	The authors examined 12 dimensions of safety culture and colon surgical-site infection rates in surgical units of Minnesota community hospitals. Adjustments for surgical volume and ASA classification were made	The study suggest that positive surgical unit safety culture, teamwork, and engaged hospital management significantly correlate with lower colon surgical-site infection rates
Kwan et al. (2013) [94]	Medication reconciliation during transitions of care as a patient safety strategy: a systematic review	The authors conducted a meta-analytic exploration incorporating 18 studies evaluating 20 interventions in the area of medication reconciliation	The authors noted that while medication reconciliation is intended to avoid potentially significant errors during transitions of care, clinically significant discrepancies affect only a few patients. They further point out that although hospital-based medication reconciliation alone does not reduce post-discharge hospital utilization within 30 days, it may do so when combined with other interventions designed specifically to enhance discharge coordination. Finally, the authors emphasize the critical importance of pharmacists in the transitions of care process

Author (year)	Title/topic	Study details	Summary/comment
Lau et al. (2015) [95]	Individualized performance feedback to surgical residents improves appropriate venous thromboembolism prophylaxis prescription and reduces potentially preventable VTE: a prospective cohort study	Prospective cohort study evaluated the effect of performance feedback to general surgery residents regarding safe venous thromboembolism (VTE) prophylaxis prescription practices and compliance in the context of patient outcomes	The authors found that personalized “clinical effectiveness feedback” including data and peer-to-peer coaching improved residence compliance and reduced preventable VTE. Resident performance was assessed at three study periods: (a) baseline, (b) scorecard implementation, and (c) scorecard plus coaching. Both interventions resulted insignificantly improved resident prescription practices, ultimately reducing patient harm
Magill et al. (2014) [96]	Multistate point-prevalence survey of healthcare-associated infections	The authors conducted a 1-day survey of randomly selected inpatients in participating hospitals. Healthcare-associated infections (HCAI) were defined in accordance to the National Healthcare Safety Network criteria. The survey included nearly 11,300 patients in 183 hospitals	The study estimated that HCAI affected 4.0% of surveyed patients (95% CI, 3.7–4.4%). The authors point out that there were approximately 648,000 patients with 721,800 HCAI in the United States acute care hospitals in 2011. Most common types of HCAI, according to the study, included pneumonia (~22%), surgical-site infections (~22%), and gastrointestinal (~17%) infections
De Meester et al. (2013) [97]	SBAR improves nurse-physician communication and reduces unexpected death: a pre- and postintervention study	The study involved the training of 16 hospital ward nurses in the use of SBAR technique to enhance communication with physicians in cases of patient clinical deterioration	Out of more than 37,200 admissions, 207 serious adverse events (SAE) occurred. These events were checked for SBAR-related items, including 425 associated nurse interviews. The study found that the post-intervention use of SBAR during SAE increased markedly, from 4 to 35%. Although the number of unplanned ICU admission increased, the number of unexpected deaths decreased as a result
Middleton et al. (2013) [88]	Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA	Report outlining recommendations from the task force dedicated to addressing errors associated with the use of electronic health records (EHR); AMIA = American Medical Informatics Association	After comprehensively reviewing and analyzing existing literature, in combination with expert-based experiences, the AMIA task force proposes 10 recommendations regarding HER use and human factors, policy, industry, and clinical practice. These recommendations are further outlined in Table 2 of this chapter
Moffatt-Bruce et al. (2014) [98]	Risk factors for retained surgical items: a meta-analysis and proposed risk stratification system	A meta-analytic study of the best available evidence on risk factors for retained surgical items (RSI). Three retrospective, case-control studies were included	The authors found substantial synergies between existing studies, with seven out of ten parameters common to the three source studies becoming significantly associated with RSI risk in the meta-analysis. These factors included operative blood loss >500 mL, incorrect or absent surgical count(s), more than one sub-procedure, more than one surgical team, longer duration of surgery, and the presence of unexpected intraoperative factor(s)
Morello et al. (2013) [99]	Strategies for improving patient safety culture in hospitals: a systematic review	The authors performed a meta-analysis of 21 articles utilizing quantitative measures of patient safety climate in a hospital setting	The effect of patient safety climate strategies, including leadership rounds, educational programs, simulation, and team-based approaches, remains controversial. Further studies are needed to better define the impact of comprehensive programs designed to enhance institutional patient safety culture

Author (year)	Title/topic	Study details	Summary/comment
Randmaa et al. (2014) [100]	SBAR improves communication and safety climate and decreases incident reports due to communication errors in an anesthetic clinic: a prospective intervention study	The article describes the result of an implementation of the SBAR communication tool in anesthesia clinics at two hospitals in Sweden	The introduction of SBAR enhanced staff member perception of communication and safety climate and decreased incident reports related to communication errors (from 31 to 11%)
Richter et al. (2014) [101]	The influence of organizational factors on patient safety: examining successful handoffs in healthcare	Over 515,600 participants from more than 1050 hospitals completed Hospital Survey on Patient Safety Culture Perceptions. Organizational factors that influenced patient safety were assessed, including data from institutional staff and management respondents	The perception of teamwork was the best predictor of perceived successful handoffs among hospital units. Management and staff encouragement of safe practices also strongly correlated with positive outlook on patient handoffs
Sheth et al. (2016) [102]	Changes in efficiency and safety culture after integration of an I-PASS-supported handoff process	Prospective intervention to determine the efficacy of I-PASS (illness severity, patient summary, action list, situation awareness and contingency plans, and synthesis by receiver) handoff process	The implementation of the I-PASS tool improved transfer efficiency, safety culture scores, and satisfaction of providers and families transferring from the cardiovascular ICU to the acute care unit
Starmer et al. (2014) [103]	Changes in medical errors after implementation of a handoff program	The authors conducted a prospective interventional study involving 10,740 patients in 9 hospitals. Study intervention included (a) mnemonic to standardize verbal and written handoffs, (b) handoff and communication training, (c) faculty development and observation program, and (d) sustainability campaign. Active surveillance of error rates was conducted	As a result of the study intervention, the rate of medical errors decreased by 23% and the rate of preventable AEs decreased by 30%. Of note, the authors did not observe any negative effects on work flow
Stawicki et al. (2013, 2014) [3, 104]	(1) Retained surgical items: a problem yet to be solved (2) Natural history of retained surgical items supports the need for team training, early recognition, and prompt retrieval	(1) A retrospective, case-control study of risk factors for retained surgical items (RSI) (2) Post hoc analysis of data from the original RSI study, descriptive in nature	The original study [104] demonstrated that longer duration of surgery, safety variances, and incorrect surgical counts all independently elevated RSI risk. Of note, the study also demonstrated that lack of documentation was associated with RSIs—an indirect validation of patient safety documentation compliance efforts. The post-hoc analysis demonstrated that most RSI events involved team or system errors and that more than 50% of occurrences featured two or more safety omissions—an indirect validation of the “Swiss cheese” model of patient safety

Author (year)	Title/topic	Study details	Summary/comment
Tad-y et al. (2016) [105]	Leveraging a redesigned morbidity and mortality conference that incorporates the clinical and educational missions of improving quality and patient safety	Pilot program of system-based morbidity and mortality (M&M) conference model combining educational and clinical goals of enhancing patient safety	The authors' institutional M&M conferences reviewed 27 AEs over a 2-year period. A total of 63 action items were identified, of which 33 were actively pursued. Resident and faculty feedback to this model was positive, and as a result, more departments decided to adopt the same approach
Treadwell et al. (2014) [106]	Surgical checklists: a systematic review of impacts and implementation	The authors conducted a meta-analytic study of 33 source articles. Types of checklists eligible for analysis included the WHO checklist, the Surgical Patient Safety System (SURPASS) checklist, a wrong-site surgery checklist, and an anesthesia equipment checklist	Surgical checklists, adopted in various settings and specialties throughout the world, have been associated with decreased surgical complications and infections. Successful implementation depends on team communication, support of institutional leadership, and continuous feedback
Weaver et al. (2013) [107]	Promoting a culture of safety as a patient safety strategy: a systematic review	The authors performed a meta-analysis of 33 source studies, focusing data extraction on "... health care workers practicing in inpatient settings..." and "...change in patient safety culture or climate after a targeted intervention"	Team-based approaches, executive and interdisciplinary rounding, and the Comprehensive Unit-Based Safety Program have been found to be effective in improving clinician and staff perceptions of patient safety culture

Studies are listed alphabetically, sorted by the first author's last name.

OR = Odds ratio; 95% CI = 95% confidence interval; SBAR = Situation, Background, Assessment, Recommendation

Table 1. Summary of selected studies on patient safety and related topics, published since 2012.

Area of opportunity	AMIA recommendations
Usability and human factors in health IT	Prioritization of standardized use cases
Policy related	Development of a core set of measures for AEs related to health IT use
	Research and promotion of best practices for safe and efficient implementation of EHR
	Standardization and interoperability across HER systems should incorporate "usability" concerns
Industry related	Establishing an AE reporting system for health IT, including voluntary health IT reporting
	Development and dissemination of educational materials and information regarding the safe and effective use of EHR
Clinical end-user related	Development of a common user interface style guide for select (e.g., critical) EHR functionalities
	The performance of formal "usability" assessments on patient safety-sensitive (e.g., critical) EHR functionalities
	Adoption of best practices for EHR system implementation and ongoing management/maintenance
	Monitoring of how IT systems are being utilized and reporting of IT-related AEs

IT = Information technology; AE = Adverse event

Table 2. Summary of recommendations made by the American Medical Informatics Association (AMIA) regarding patient safety and quality of care related to electronic health record (EHR) use [88].

6. Summation and future directions

In the ever-changing healthcare environment, one fundamental principle must remain constant—universal and steadfast commitment to the continued improvements in PS, with corresponding assurances to those who literally entrust their lives to healthcare institutions and systems around the world. Steps to improve PS, as outlined in this chapter and throughout the *Vignettes*, include (a) recognizing current patient safety issues (and patterns); (b) dynamically modifying systems, education, and training related to patient safety; (c) educating healthcare professionals on the significance of PS models and the importance of patient safety culture; and (d) developing collaborations with all stakeholders, including patients, to decrease the incidence of errors and never events [2, 108]. Successful PS paradigms must recognize that humans are fallible and that mistakes in medicine will likely continue to be made, even if our current efforts decrease adverse events by 1–2 orders of magnitude [109]. Whenever identified, “slip-ups” or “near misses” should be promptly identified and addressed with appropriate training, successful communication, and safety checks. Additionally, patient safety systems must foster a culture of safety that emboldens communication, trust, and honesty [110]. This paradigm should include a universal understanding that most sentinel events are not a product of a single individual acting in isolation, but rather of multiple cofactors combining simultaneously and unpredictably to result in a patient safety occurrence.

There is growing evidence that institutions able to ensure appropriate staffing and balanced workloads can positively affect patient safety, lengths of stay, and organizational finances [111–114]. A retrospective observational study in a large tertiary medical center found that nurse staffing below target levels was associated with increased mortality [115]. Another prospective, randomized, controlled study showed that interns were less likely to make serious medical errors when they worked shorter shifts [116]. There is also data to suggest that patient mortality and resident well-being both improved after the American College of Graduate Medical Education (ACGME) reduced resident work hours in 2003 [117].

Communication errors between providers can adversely affect PS during routine care and even more so during emergency care and in code situations. Training and new processes have been put into place to minimize communication errors. It is also hoped that EMRs will decrease some of the communication errors resulting from poor handwriting. Diagnostic errors could be due to a wrong, missed, or delayed diagnosis. Since a missed or delayed diagnosis can lead to significant downstream costs, implications on both patient well-being and financial expenditures can be dramatic [118]. Encouraging providers to improve their metacognition (or “thinking about thinking”) and awareness of overconfidence can be helpful in reducing diagnostic errors [119]. Recently, there has also been an increased emphasis on systemic changes to minimize diagnostic errors, such as computer-based decision support tools. However, these can be associated with some unintended consequences. These tools can be time-consuming, and they can lead to unnecessary downstream testing. There is also a concern they could lead to provider “deskilling” over time [119].

Over the past two decades, the emergence of EHR/EMR led to a significant paradigm change in healthcare. In addition to diagnostic, communication, and other types of medical errors our systems have grown accustomed to addressing, health IT errors have emerged as a category of patient safety events requiring increasing levels of attention [120, 121]. There are a number of different types of health information technology-related errors, including occurrences resulting from equipment malfunction, incorrect usage, lost data, or unavailable equipment (downtime) [122]. In aggregate, these errors or any resulting clinical decisions could lead to significant patient harm. Having redundant hardware in place for essential patient care activities, improving data displays and user interface, and implementing robust training programs and prerelease testing are just some of the many ways we can reduce the number of health information technology-related errors [122].

Important ways to eliminate human error in medicine are safety checklists and standardized handoffs. A systematic review of safety checklists showed that operating room teamwork and communication greatly benefited from the introduction of these simple tools [123]. Checklists were thought to improve outcomes by opening pre-procedure communication, urging dissemination of valuable case-related materials, promoting teamwork and decision-making, highlighting knowledge gaps, and cultivating camaraderie [123]. The Situation, Background, Assessment, Recommendation (SBAR) handoff tool was created to enhance communication (**Table 1**). Through systemization of communication, healthcare teams have a shared expectation of what information is being exchanged and how it is organized. Implementation of the communication tool in the clinical setting has been shown to enhance the acceptance of patient safety climate, staff members' perception of communication between one another, as well as the number of incident reports associated with communication errors [100].

Finally, it must be acknowledged that our understanding of complex human systems continues to be poor at best. Consequently, our ability to reliably and consistently improve team and individual interactions remains severely limited. For example, the assessment of disruptive behavior(s) and their impact on PS is one of the key areas needing urgent attention and high-quality research [124, 125]. In the area of ineffective communication, significant amount of descriptive information is available, yet research on how to effectively intervene to improve outcomes in this domain continues to be deficient [126–128]. Last, but not least, it is critical for us to better understand the relationship between PS and provider quality of life, emotional intelligence, and mindfulness [129, 130].

7. Conclusion

As we open the second volume of the *Vignettes in Patient Safety*, we hope to provide the reader with a compelling argument for continued need for steadfast patient safety advocacy at all levels of our healthcare organizations. Although scenarios presented in this volume may be different from those presented in the first volume, common threads continue to emerge throughout the *Vignettes*—communication, checklists, teams, standardization, quality improvement, etc. Along those thematic lines, we also compiled a list of some of the most

impactful new (2012–2017, **Table 1**) studies in PS, and although this list is by no means comprehensive, it covers some of the most influential work in this field of scientific and clinical investigation. Your continued patronage and readership are greatly appreciated and will allow us to expand this series of practical and insightful books well into the future.

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