

Movement Matters, and So Does Context: Lessons Learned From Multisite Implementation of the Movement Matters Activity Program for Stroke in the Comprehensive Postacute Stroke Services Study

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Abstract

The purpose of this Special Communication is to discuss the rationale and design of the Movement Matters Activity Program for Stroke (MMAP) and explore implementation successes and challenges in home health and outpatient therapy practices across the stroke belt state of North Carolina. MMAP is an interventional component of the Comprehensive Postacute Stroke Services Study, a randomized multicenter pragmatic trial of stroke transitional care. MMAP was designed to maximize survivor health, recovery, and functional independence in the community and to promote evidence-based rehabilitative care. MMAP provided training, tools, and resources to enable rehabilitation providers to (1) prescribe physical activity and exercise according to evidence-based guidelines and programs, (2) match service setting and parameters with survivor function and benefit coverage, and (3) align treatment with quality metric reporting to demonstrate value-based care. MMAP implementation strategies were aligned with the Expert Recommendations for Implementing Change project, and MMAP site champion and facilitator survey feedback were thematically organized into the Consolidated Framework for Implementation Research domains. MMAP implementation was challenging, required modification and was affected by provider- and system-level factors. Program and study participation were limited and affected by practice priorities, productivity standards, and stroke patient volume. Sites with successful implementation appeared to have empowered MMAP champions in vertically integrated systems that embraced innovation. Findings from this broad evaluation can serve as a road map for the design and implementation of other comprehensive, complex interventions that aim to bridge the currently disconnected realms of acute care, postacute care, and community resources.

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Stroke survivors are at high risk for physical inactivity and subsequent cardiovascular events, injurious falls, loss of upper-limb function, and decline in activities of daily living.^{1,2} Those discharged directly home with seemingly mild poststroke disability often experience motor and cognitive deficits that go undetected during acute hospitalization.³ Approximately 20% transition to a more intensive level of care (eg, inpatient facility, rehospitalization) soon after discharge.^{4,5}

Physical and occupational therapists play key roles in the rehabilitation of stroke and transient ischemic attack (TIA) survivors with motor and cognitive impairments and may help minimize risk of complications after discharge home. Therapists provide education on stroke recovery and secondary prevention and create strategies for safe mobility and self-management of physical activity and exercise. These interventions can promote better health and well-being.⁶⁻⁹ In multiple studies, patients with stroke discharged home who received early and more intense contact (eg, more visits/time) with a therapist in the community setting experienced improved recovery.¹⁰⁻¹² Still, approximately 45% of all patients with stroke discharged home and 65% of those younger than 65 years in the United States receive no postacute services.¹³ Even among Medicare beneficiaries, only 40% receive physical and/or occupational therapy during the first 30 days after discharge home.¹⁴ Effective transitional care (TC) management that includes a thorough assessment of functional and cognitive deficits and coordination of rehabilitative care is needed.

The Movement Matters Activity Program for Stroke (MMA) is a key interventional component of the Comprehensive Postacute Stroke Services (COMPASS) Study, a Patient-Centered Outcomes Research Institute-funded, cluster-randomized large pragmatic clinical trial of TC management for patients with stroke and TIA discharged directly home from their index hospitalization. The full design and methodology of the COMPASS-TC model has been published.^{2,15,16} The COMPASS Study's pragmatic design and quality metrics support measurable best practices for comprehensive postacute stroke care across the span of patient and caregiver postacute care needs. Findings from an intention-to-treat analysis of the COMPASS Study found that while COMPASS-TC did not improve patient functional outcomes or 90-day survival compared with usual care, it did yield a clinically meaningful improvement in blood pressure monitoring, which has been shown to be associated with better blood pressure control and outcomes.^{17,18} Also and importantly, post hoc analysis comparing treated with nontreated patients within intervention hospitals demonstrated that patients who received COMPASS-TC had better satisfaction with care and less disability, depression, falls, and mortality than those who did not receive COMPASS-TC.¹⁸

List of abbreviations:

APP	Advanced Practice Provider
CFIR	Consolidated Framework for Implementation Research
COMPASS	Comprehensive Postacute Stroke Services
COMPASS-CP	Comprehensive Postacute Stroke Services Care Plan
CMS	Centers for Medicare and Medicaid Services
EBP	evidence-based practice
MMA	Movement Matters Activity Program
PAC	postacute care
TC	transitional care
TIA	transient ischemic attack

In this Special Communication, we discuss the rationale for and design of the MMA and explore the successes and challenges of its implementation in real-world clinical practice. The MMA was specifically designed to maximize survivor health, recovery, maximize functional independence in the home and community, and promote evidence-based poststroke rehabilitative care. Given that rehabilitation interventions are complex, requiring behavior change at multiple levels, we outline the specific implementation strategies that were selected and used in alignment with the Expert Recommendations for Implementing Change project.¹⁹ Lastly, we present analysis of the contextual factors under which this model of care may be effective using the Consolidated Framework for Implementation Research (CFIR), a conceptual framework that was developed to guide systematic assessment of multilevel implementation contexts to identify factors that may influence intervention implementation and effectiveness.²⁰ Findings from this broad evaluation can inform the design and implementation of other comprehensive, complex interventions that aim to bridge the currently disconnected realms of acute care, postacute care, and community resources.

Methods

MMA intervention

COMPASS Study

In the COMPASS Study, 40 acute care hospital units across the stroke belt state of North Carolina were randomized to either deliver the COMPASS-TC model or continue their usual care.^{2,15,16} COMPASS-TC is a multidimensional model supporting education, secondary prevention, rehabilitation, and recovery across 4 directional components: Numbers (eg, know your blood pressure, glycosylated hemoglobin), Engage (eg, move your body, monitor your mood), Support (eg, seek community support services), and Willingness (eg, self-manage modifiable risk factors, medications). The MMA is the key component of the COMPASS "Engage" domain (fig 1).

Patient with stroke or TIA from the 20 hospital units assigned to the intervention arm (fig 2) discharged home were called within 2 business days post discharge by a postacute care (PAC) nurse coordinator and seen in a follow-up clinic visit targeted to occur within 7-14 days post discharge by the PAC coordinator and an Advanced Practice Provider (APP) (ie, nurse practitioner, physician assistant, or physician). At this visit, an individualized electronic care plan (COMPASS-CP) was generated based on standardized assessments of medical, social, and functional determinants of health that identified areas of need, including physical and occupational therapy, to address functional and cognitive impairments.¹⁵

MMA goals

The goals of the MMA are to promote fitness and health, upper-extremity dexterity and function, and safe mobility and independence among stroke survivors at home and in the community. A key step toward meeting those goals is empowering rehabilitation providers to optimize their delivery of value-based care through the implementation of best-practice evidence. The MMA provides training, tools, and resources to enable

COMPASS-TC MODEL → COMPASS DIRECTIONS → MMAP for STROKE RECOVERY

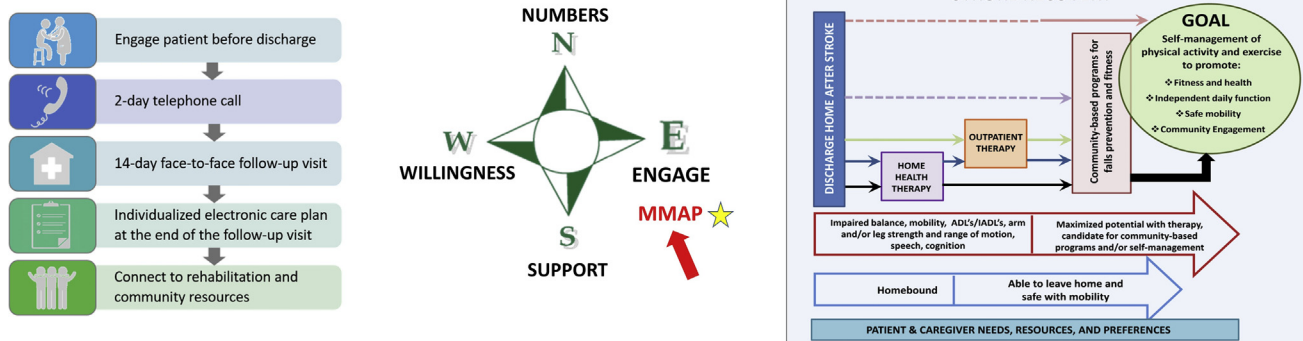


Fig 1 Overview of COMPASS-TC model, COMPASS directions, and MMAP for stroke recovery. COMPASS-TC is a multidimensional model supporting education, secondary prevention, rehabilitation, and recovery. In this model, patients diagnosed as having with stroke/TIA and discharged directly home from the intervention hospital were called within 2 two business days post -discharge by a post-acute nurse coordinator and seen in a follow-up clinic visit targeted to occur within 7-14 days post -discharge by the coordinator and an Advanced Practice Provider. At this visit, an individualized electronic care plan was generated based on standardized assessments of medical, social, and functional determinants of health that identified areas of need, including physical and occupational therapy. The MMAP for Stroke is the key component of the COMPASS “Engage your body and mind” domain of the COMPASS Directions. The MMAP promotes fitness and health, upper- extremity dexterity and function, and safe mobility and independence among stroke survivors at home and in the community. The MMAP for stroke recovery is used across the continuum of care, wherein survivors should be provided with the most suitable service(s) that align with their specific needs, resources, level of physical function, and personal preferences. COMPASS, COMprehensive Post-Acute Stroke Services (COMPASS) Study; TC, transitional care; MMAP, Movement Matters Activity Program.

rehabilitation providers across the continuum of care to (1) prescribe physical activity and exercise according to evidence-based guidelines and programs, (2) match service setting and episode parameters (intensity, duration) with survivor function and health benefit coverage, and (3) align treatment with quality metric reporting to demonstrate value-based care (see [fig 1](#)).

MMAP design and content

There are 6 design elements of the MMAP.

Physical activity and exercise recommendations

Per American Heart Association/American Stroke Association guidelines,²¹ the MMAP recommends structured and progressive multimodal exercises for improving muscle strength, balance and/or coordination, and cardiovascular fitness. Physical activity is endorsed, as often as possible, in the home and/or community. The MMAP recommends using evidence-based, self-directed exercise programs that incorporate functional rehabilitative tasks into activities of daily living, including (1) Graded Repetitive Arm Supplementary Program for upper-extremity function,²² (2)

COMPASS Phase 1 Intervention Hospitals

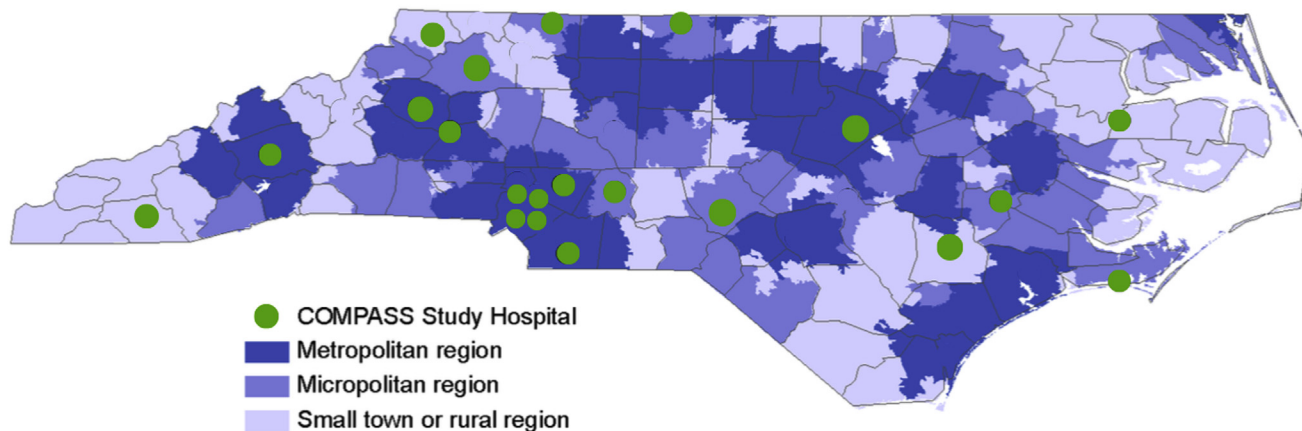


Fig 2 COMPASS intervention hospital sites. Map of intervention hospital sites across North Carolina counties.

Otago Exercise Program,^{23,24} and (3) Lifestyle-Integrated Functional Exercise Program²⁵ for strength, balance, and coordination.

Practical implementation strategies

The MMAP provides practical implementation strategies for therapists. Physical activity and exercise progression are individually tailored to patients' stroke-specific deficits and function. Strategies include modifying exercises to enable pain-free and enjoyable performance; incorporating motivational counseling to foster confidence and autonomy; and for low-functioning individuals or those at risk of falling, focusing on strength, balance, and coordination, which are prerequisites for safe walking. To prevent falls, the MMAP also recommends assessing postural hypotension, safe footwear, and hazards in the home environment²⁶ (supplemental 1, available online only at <http://www.archives-pmr.org/>).²⁷

Rehabilitation across the continuum of care

Timely, consistent, and sustained rehabilitation is crucial to optimize recovery. Some survivors progress through all service settings (home health, outpatient, community), while others start somewhere along the care continuum. With the MMAP, survivors are provided service(s) that align best with their individual needs and resources, with the goal of progressing the patient to self-management of physical activity and/or exercise independently or through participation in community exercise programs.

Insurance coverage

Recognizing that insurance benefits affect access to rehabilitation, the MMAP provides concise provider- and patient-facing summaries (in English and Spanish) of Medicare, Medicaid, and private benefit coverage policies regarding rehabilitation and durable medical equipment needs, with considerations for underinsured and uninsured (supplemental 2, available online only at <http://www.archives-pmr.org/>).²⁸ COMPASS-CP also links patients with community-based resources based on needs,

preferences, insurance, and zip code. Further, the COMPASS website (www.nccompass-study.org) includes an extensive database of North Carolina regional service resources that do not require medical referral (eg, community-based programs for social support, transportation, meals, medications, and physical activity) and are often minimal to no cost to the patient.

Alignment with quality reporting

The MMAP outlines how to align rehabilitation activities with incentive payments to encourage health care professionals to meet Centers for Medicare and Medicaid Services (CMS)-mandated quality reporting and billing requirements. Several of the Physician Quality Reporting System measures (now part of the Merit-based Incentive Program) are addressed in the MMAP (eg, falls risk assessment). The MMAP also aligns with CMS Home Health Quality reporting requirements used to derive star ratings (supplemental 3, available online only at <http://www.archives-pmr.org/>).²⁹

Stakeholder vetting

The design and content of the MMAP and health insurance summaries were vetted by health care providers and patient stakeholders prior to implementation. Dedicated study staff (MMAP facilitators) assisted with MMAP implementation and included the Director of Implementation with a background in nursing, her Research Coordinator, 2 physical therapists, and 2 nurse practitioners. All had extensive clinical and research experience in stroke care. All sites were trained by this team.

MMAP implementation strategies

MMAP implementation occurred over 3 waves of hospital enrollment. For each wave, implementation strategies started after hospital randomization but before patient enrollment began and continued through the end of patient enrollment. We used 7 specific implementation strategies that aligned with Powell et al¹⁹ in the Expert Recommendations for Implementing Change project and are outlined below and in fig 3.

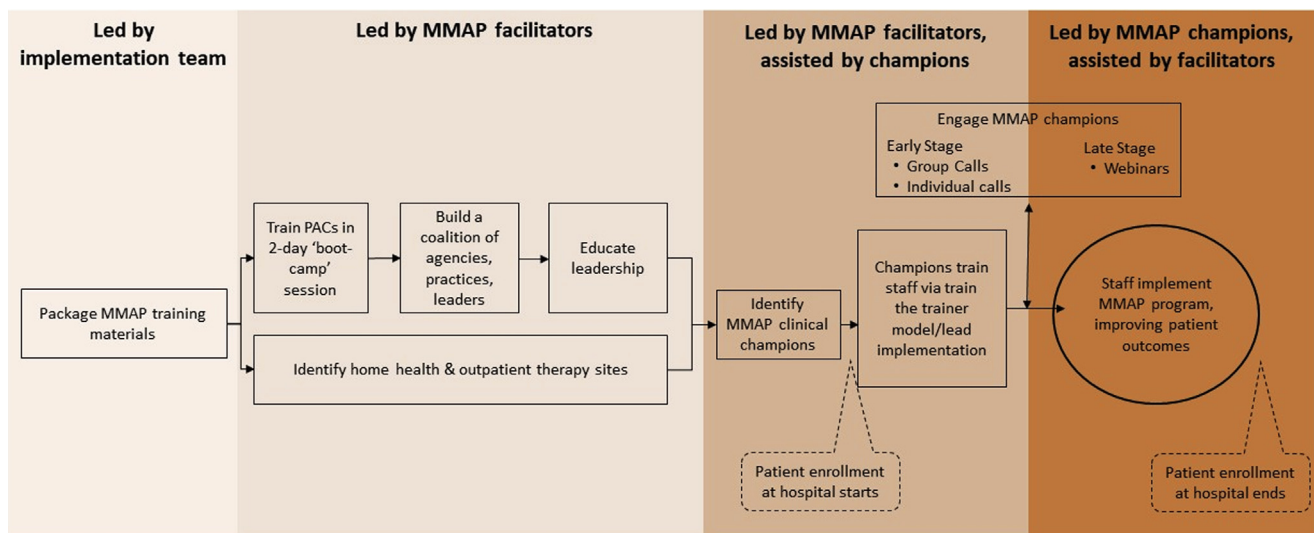


Fig 3 MMAP implementation process. Conceptual model of the MMAP implementation process. Abbreviation: PAC, post-acute care coordinator.

Table 1 Home health agency and outpatient practice participation

Participation	Value
A. Hospitals (N)	20
Hospitals with affiliated home health agency & outpatient therapy practice (%)	65
Hospitals with affiliated home health agency only (%)	30
Hospitals with affiliated outpatient therapy practice only (%)	5
B. Agencies & facilities (N)	44
Mean agencies/facilities per hospital	2.2
Champions (N)	72
Mean champions per agency/facility	1.6
C. Preteleconference survey and teleconference call participation	
Teleconferences held (N)	52
Preteleconference survey completion rate (%) [*]	14.7
Champions per call (%)	23.7
D. Satisfaction survey participation	
Completed midintervention satisfaction surveys (%) [†]	11.1
Completed final satisfaction surveys (%) [‡]	15.3

* One champion per agency/facility asked to complete survey. All champions asked to complete survey.

Develop and package user-friendly educational and training materials

Materials included brief voice-over slide presentations (12-25min), Portable Document Format documents, and videos available to providers through the COMPASS website. Patient- and accompanying provider-facing materials were available in English and Spanish. All materials are available at: <https://www.nccompass-study.org/hospitals-and-providers/therapists/>.

Train PAC coordinators

Each hospital's PAC coordinator was required to participate in a 2-day educational "boot camp" that provided in-depth training on the COMPASS-TC model, including details of MMAP (2h). Other training covered an explanation of the PAC coordinator's role, engagement with other key agencies and stakeholders (eg, home health and outpatient providers, community-based program leaders), and expectations. PAC coordinators were also trained on using the patient assessment software application that generated the individualized COMPASS-CP during the clinic visit.

Build coalition of local home health and outpatient provider agencies and practices

Once intervention hospitals were identified, MMAP facilitators identified home health and outpatient provider agencies and practices that served each of the hospital's catchment areas. Identification methods included working with the PAC coordinator and other hospital staff to determine agencies/practices to which they currently referred patients, communicating with regional agency/practice leaders, and conducting Internet searches to identify additional resources. Identified agency/practice leaders were then invited to partner in MMAP implementation.

Educate clinical leadership

Receptive home health and outpatient provider agencies/practices were asked to send a clinical leader to a 6-hour educational

session at the affiliated hospital. At this session, they were provided with an overview of the COMPASS-TC model and MMAP with guidance on implementation. Participants learned how to access and use training materials and the community-based resource directory. Representatives from local community-based organizations (eg, Area Agency on Aging, FaithHealth) also attended to encourage engagement.

Identify and prepare MMAP champions

MMAP facilitators encouraged home health and outpatient provider clinical leaders to identify individual(s) with the capacity and authority to lead MMAP implementation within their organization (ie, "champions"). Champions were responsible for training their staff on the COMPASS-TC model and MMAP, tailoring interventions to fit contextual needs and facilitating organizational change. Champions for outpatient agencies were therapists; home health agencies identified both nurse and therapist champions. To incentivize champions to complete training, continuing education credit was offered.

Train-the-trainers

Champions were responsible for leading clinical staff (individually or as a group) through registration and training modules on the COMPASS website and through a tour of MMAP training materials, particularly those related to home health and outpatient providers ([supplemental 4](#), available online only at <http://www.archives-pmr.org/>).³⁰ Training took approximately 2 hours.

Keep champions engaged

Four main strategies were used to keep MMAP champions engaged in the implementation process.

Group conference calls. When hospitals in each wave started enrolling COMPASS patients, MMAP facilitators scheduled recurring, 1-hour group conference calls with their respective MMAP champions. Initially, calls were held bimonthly, then monthly based on feedback from MMAP champions that monthly calls were sufficient after the initial implementation. Group conference calls were recorded for later review.

Preconference call surveys. Before each call, surveys assessing progress toward staff training and MMAP implementation with patients were e-mailed to MMAP champions. Specifically, champions were queried regarding the extent to which COMPASS training modules were completed by staff, the number of COMPASS patients seen each week, access to and use of COMPASS-CP, and use of resources on the COMPASS website. Survey responses were reviewed by MMAP facilitators and informed the call agenda. Call topics included staff training, barriers to MMAP implementation, perceived benefits of the MMAP, administrative/leadership support of the MMAP, quality of communication and referral rates with PAC coordinators/APPs from affiliated hospitals, and referrals to medical and community-based resources.

Individual calls. MMAP facilitators conducted individual calls with MMAP champions as needed to address training needs, address site-specific problems, and facilitate communication between home health and outpatient providers and their site PAC coordinator/APP.

Webinars. Once calls were reduced to monthly, MMAP facilitators and key community-based program leaders provided webinars on advanced clinical topics (eg, cognition, falls) relevant to stroke care. Webinars and accompanying summaries were placed on the COMPASS website.

Evaluating MMAP implementation

Data sources and data collected

In addition to the preconference call surveys and group conference call recordings described above, we distributed satisfaction surveys and conducted facilitator interviews.

MMAP satisfaction surveys. Home health and outpatient provider champions were asked to complete MMAP evaluation and satisfaction surveys in the Research Electronic Data Capture web application at the middle and end of intervention implementation. Surveys asked champions to rate how useful the MMAP implementation strategies were on a 5-point, ordinal scale and to provide suggestions for improvement in free text responses. Surveys also queried perceptions of how the MMAP affected patient care.

MMAP facilitator interviews. All MMAP facilitators were interviewed to discuss their experience with all stages of implementation. Group conference call recordings and home health and outpatient provider champion survey responses guided interviews.

Analysis

We examined data from our surveys, conference calls, and interviews to identify successes and challenges of MMAP implementation. Findings from preteleconference and satisfaction surveys were summarized qualitatively because of low response rates (table 1). A researcher not actively involved in MMAP development or implementation reviewed and identified themes from group teleconference call recordings and MMAP facilitator interview notes. Themes were reviewed and discussed with the

study team, and results were organized into the CFIR model, a commonly used implementation science framework to facilitate design, evaluation, and implementation of evidence-based interventions.²⁰ The CFIR is comprehensive and multifaceted in nature, making it well suited to capture the complexities of transformative interventions of care model redesigns.³¹

Results

Home health and outpatient provider agency/ practice participation

Participation of home health and outpatient provider agencies/practices by hospital varied with 65% of hospitals having both an affiliated agency/practice (see table 1). In some cases, identifying both a home health agency and an outpatient therapy practice for each hospital was not possible. However, every hospital had at least 1 affiliated site, regardless of type, and each affiliated site had at least 1 champion (see table 1). A total of 72 providers were designated as site champions for a mean of 1.6 champions per agency/practice. A total of 52 teleconferences were held with a 14.7% preconference teleconference survey response rate and 23.7% of champions participating per call (see table 1). MMAP satisfaction surveys were distributed to champions at mid- and end-intervention implementation, with 11.1% and 15.3% response rates, respectively (see table 1). As indicated by these data, completion of preteleconference and satisfaction surveys and attendance on teleconference calls were low overall (see table 1).

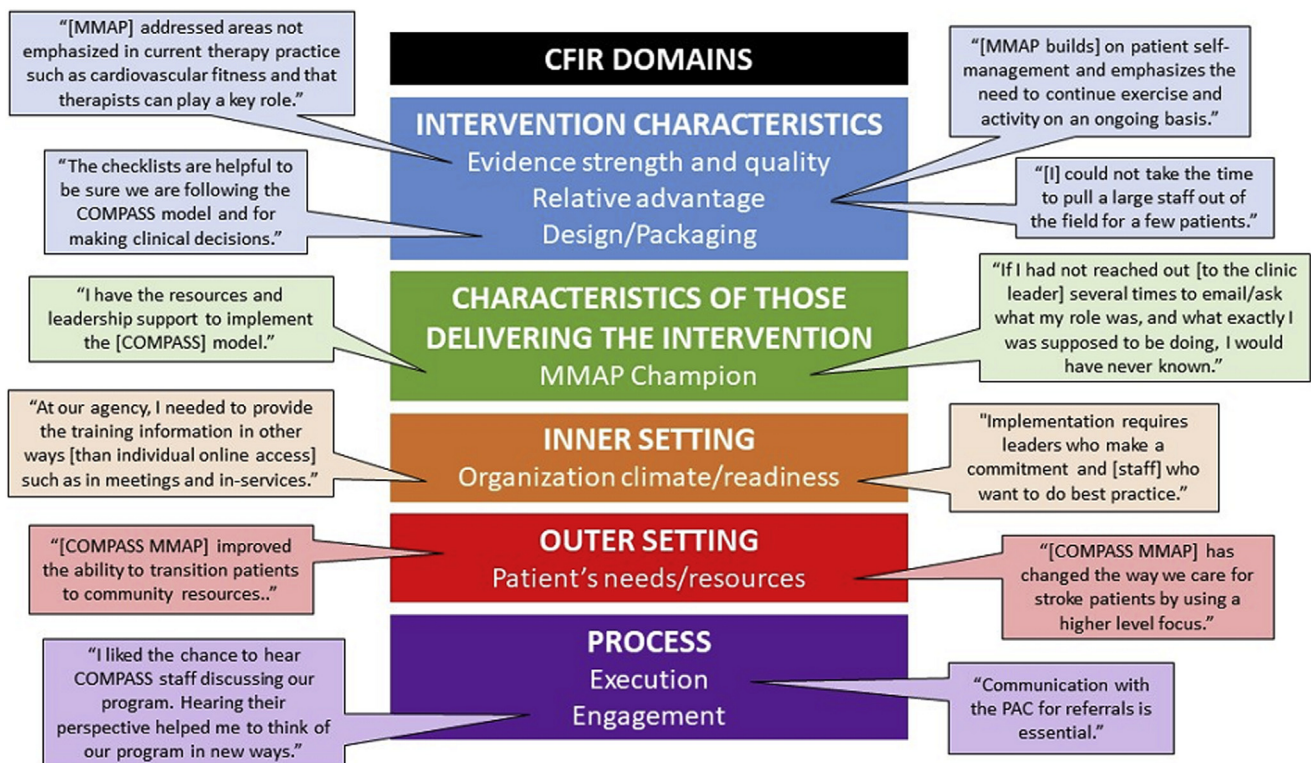


Fig 4 HHOP quote examples by CFIR domain constructs. CFIR domains and examples of HHOP champion quote by domain construct. Abbreviations: HHOP, home health and outpatient therapy; CFIR, Consolidated Framework for Implementation Research.

MMAP implementation by CFIR domain

The CFIR taxonomy consists of 5 domains and multiple constructs within each domain.^{20,32} MMAP implementation was evaluated according to applicable constructs within the 5 main CFIR domains of implementation effectiveness: (1) intervention characteristics, (2) characteristics of the individuals directly implementing the intervention, (3) the inner setting, (4) the outer setting, and (5) the implementation process. Figure 4 provides an overview of the specific CFIR domains and examples of home health and outpatient provider champion quotations within each of the domain constructs.

CFIR Domain 1. MMAP intervention characteristics

Intervention source, evidence strength, and quality. Perceptions of alignment of MMAP principles with current standards of care were mixed; some felt that MMAP provided a valuable addition to current practices, while others felt it was duplicative.

Training materials most commonly accessed or considered useful were the COMPASS Welcome and Overview slide presentation, the MMAP summary for home health and outpatient providers slide presentation, the APP Information slide presentation, and the home health and outpatient providers Checklist, which outlined the process of implementing MMAP within the context of the COMPASS model (supplemental 5, available online only at <http://www.archives-pmr.org/>).³³ In addition, information on the Otago and exercise programs were more likely to be accessed than information on the Lifestyle-Integrated Functional Exercise Program. Many of the resources on the website were used minimally.

Relative advantage. Several champions did not consider across-the-board training of staff on MMAP advantageous because their clientele rarely included patients with stroke diagnoses. Others, however, felt that the comprehensiveness of MMAP was vitally important and relevant for the care of individuals post stroke and their transition toward sustained physical activity and long-term self-management.

Design quality and packaging. A recurring theme on teleconferences was the need to simplify MMAP training and implementation resources on the COMPASS website. However, some felt the website was well-labeled, easy to navigate, and user-friendly and that the checklists were helpful for reference and clinical decision making. Two champions noted that patient/family-facing resources were easily accessible and user-friendly but that not all of their patients had computer access.

Solutions/modifications. Training was streamlined to reduce champion burden, and a condensed summary of slide presentations was constructed to include essential MMAP components and a review of suggested workflow processes. A page on the website was created specifically for home health and outpatient providers with all pertinent resources in 1 central location. MMAP facilitators encouraged champions to identify and train those clinicians most likely to treat patients with stroke and to focus on elements of MMAP that would support patients' transition toward self-management and cardiovascular fitness.

CFIR Domain 2. Characteristics of those delivering MMAP intervention

Champion identification within the organization. MMAP facilitators reported that it was often difficult for home health and outpatient provider agencies/practices to identify a champion, particularly during earlier waves. Data gathered from

preconference surveys and teleconferences also indicated that communication between the clinical leader (who attended the training session) and champion about the purpose of the COMPASS Study and MMAP intervention was often lacking. Some champions reported being appointed without their input and/or being entirely unfamiliar with COMPASS-TC and the MMAP intervention, causing resentment or lack of participation in teleconferences.

Solutions/modifications. MMAP facilitators engaged hospital staff to identify key clinical leaders as potential home health and outpatient provider partners rather than "cold calling" agencies/practices. These leaders were encouraged to identify potential champions early and to bring them to their affiliated hospital site visit. MMAP facilitators found this strategy facilitated a more collaborative approach between leadership and clinical staff, which resulted in earlier and more effective communication, implementation planning and, ultimately, execution.

CFIR Domain 3. Inner setting

Implementation climate and readiness for implementation. The implementation climate varied among participating sites. While some were receptive to MMAP implementation, others reported competing priorities (eg, electronic health record transition, productivity standards) limiting staff's capacity to absorb additional workflow changes or limiting their time to engage in MMAP training.

Solutions/modifications. MMAP facilitators collaborated with champions during group and individual conference calls and identified ways to minimize burden on champions and clinical staff. One strategy included using staff meetings to conduct group training. Champions who reported having resources and leadership support were able to train clinical staff in a timely manner, attend all teleconference meetings, participate in calls with MMAP facilitators, and tailor implementation to optimize the intervention in their environment. However, some barriers could not be addressed, such as organizational priorities that outranked MMAP objectives.

CFIR Domain 4. Outer setting

Patients' needs and resources. Several champions reported a low volume of COMPASS patient referrals and questioned the significant time commitment for a few, if any, COMPASS patients. One champion reported that many of their patients who had sustained a stroke also had limited health insurance with high copayments and, therefore, chose not to receive rehabilitation services. Another noted that, even if patients had the financial means of attending rehabilitation or community-based programs, they often lacked the social support to attend such appointments, particularly when physical limitations precluded them from driving. When neither financial nor social barriers existed, some champions reported having patients who simply preferred to see medical and rehabilitation providers with whom they were familiar, regardless of those providers' involvement in the COMPASS Study.

Solutions/modifications. MMAP facilitators encouraged champions to explore potential avenues that might facilitate patient attendance when feasible (eg, providing pro bono and/or organization-affiliated transportation services and referral to community-based resources).

CFIR Domain 5. Process

Engagement. The degree of success with engaging MMAP champions varied. For example, some champions participated in

nearly all group teleconferences and MMAP facilitator calls. Others rarely participated in calls or surveys (see [table 1](#)). MMAP facilitators reported that a key factor in determining level of engagement during this midimplementation phase was productivity expectations for patient care; champions with high productivity standards reported that they did not have time to participate in MMAP implementation processes, satisfaction surveys, or teleconferences because of large patient caseloads.

The perceived benefit of the teleconferences was a common strength highlighted by those who completed the preteleconference and satisfaction surveys. Several champions reported that teleconferences provided a forum to problem-solve implementation barriers, share solutions, and hear different perspectives. Several champions noted the value of MMAP facilitators, who provided an atmosphere of enthusiasm and teamwork and did an excellent job facilitating the implementation process.

During the latter stages of implementation, when champions felt implementation barriers had been addressed, the teleconference calls were replaced by webinar and training opportunities. These were generally well-received by attendees, with positive feedback regarding topics covered, enthusiasm of presenters, and support of the COMPASS team.

Execution. Although implementation planning and training was comprehensive and deliberate, implementation execution success was limited. MMAP facilitators reported that execution challenges largely related to champions' roles, responsibilities, and levels of control within their organizations. Successful implementation of MMAP required changes in workflow processes, and many frontline treating clinicians had neither the time nor the authority to modify workflow. Several champions noted difficulty with identifying COMPASS patients using current patient intake processes. In addition, although COMPASS-CP was available from the web cloud with a unique patient identifier provided on referral letters, champions indicated staff often preferred receiving the care plan by fax or e-mail directly from the PAC coordinator/APP. Use of the Community Resource Directory was also limited. One champion noted there were not many resources in their area, and staff already knew what was available. Another noted that use was limited because of the low volume of COMPASS patients.

Champions reported variability related to availability and knowledge level of the PAC coordinator as well as frequency of communication with them, with some reporting excellent communication, particularly those in vertically integrated systems (ie, the same system as the hospital), and others struggling to make contact throughout the implementation process. Per both MMAP champions and facilitators, communication between agencies/facilities and hospitals was a key factor for successful COMPASS patient referral and identification.

Solutions/modifications. Over time, MMAP facilitators shifted from identifying frontline clinicians to serve as MMAP champions to targeting midlevel clinical leadership (eg, clinic directors), who still had clinical expertise but also more control over workflow processes. MMAP facilitators noted that these individuals were often more engaged in the implementation process and, thus, appeared to be more successful, particularly if they were in a vertically integrated system.

Discussion of Lessons Learned

MMAP implementation within the COMPASS Study was challenging, required modification, and was affected by both provider-

and system-level factors. There was heterogeneity in therapists' perception of alignment of their practice/agency with COMPASS-TC and in home health and outpatient provider practice priorities, productivity standards, and volume of patients with stroke. Sites that selected a champion from midlevel clinical leadership, embraced value-based care, and were part of a vertically integrated system appeared to experience greater successes with implementation.

We identified key elements associated with successful MMAP implementation.

Empowered midlevel administrator champions

Implementing new or altering existing clinical practices is notoriously difficult, even when the targeted practices are evidence-based.³⁴⁻³⁶ Provider-level characteristics such as knowledge, attitudes, and behavior and organizational contextual features such as organizational culture, goals and mission, staffing, and processes are important considerations when implementing evidence-based practices (EBPs) in health care settings.³⁵⁻³⁹ Also, compared with conventional drug interventions, rehabilitation interventions are more complex, given that their components act both independently and interdependently.⁴⁰⁻⁴⁴ Behavior change required for implementation is influenced at multiple levels; therefore, it is not always apparent which factor to target first. A key element is having an engaged champion at midlevel administration.⁴⁵ In our evaluation, personnel at this level had the clinical experience and, with support from senior leaders, the capacity to influence implementation, such as prioritizing the MMAP, adjusting workflow processes to assign and train staff, modifying the intervention to fit their contextual needs, and evaluating outcomes. Also, implementation appeared to be facilitated in vertically integrated systems with processes in place that assisted home health and outpatient provider champion and hospital PAC coordinator communication, particularly in systems where evidence- and value-based care were prioritized.

Engaged stakeholders

Stakeholder engagement research emphasizes the importance of matching stakeholders' needs and goals with research and quality improvement efforts to create sustainable changes in practice.⁴⁶ Involving users is a crucial predictor for ensuring evidence is translated into practice.^{47,48} Thus, we strove to maximize collaboration with stakeholders. Preceding launch, we developed, tested, and refined MMAP with home health and outpatient provider leadership, frontline provider, and patient input. After launch, we continued refinement with champions, who provided input of their own and on behalf of their colleagues.

Emphasis on evidence- and value-based care

Therapists are autonomous practitioners, and their preferred practice methods may not necessarily align with EBP. Previous studies report that clinicians tend to not adhere to EBP if it differs from their typical work operations or when they do not feel involved in decision making.^{37,49-51} We learned that, despite perception of MMAP as credible, the burden of implementation was too great when clinicians experienced heavy workloads, low referral volumes of patients with stroke, and, perhaps most importantly, an organizational culture that emphasized productivity standards as solely billable hours. Incorporating a behavior change framework (ie, making small changes in language and framing to influence

behavior) along with incentives for conference call participation and survey completion may have facilitated champion participation but would likely not have been sufficient to overcome organizational culture barriers for successful implementation.^{52,53}

Study limitations

Champions were often participant volunteers, and overall participation in group conference calls and surveys was low, thus introducing a self-selection bias whereby those with stronger opinions may be overrepresented, and lessons learned should be interpreted with caution. Data were self-reported, thus introducing risk of social desirability bias. However, it was emphasized that surveys were anonymized to encourage candid feedback. Additionally, this evaluation was conducted to explore the successes and challenges of implementation of MMAP in real-world clinical practice from the service provider perspective and did not include perspectives from the patient point of view.

While poor uptake of the intervention may be perceived as a weakness by traditional explanatory randomized controlled trial standards, pragmatic trials like COMPASS are designed to allow for flexibility of the implementation of the intervention as it occurs in real-world settings and among real-world patient populations. Indeed, unlike explanatory trials that are designed to ensure intervention compliance under carefully controlled conditions, pragmatic trials measure real-life compliance with the intervention as an outcome, in an effort to rapidly influence clinical decision making and policy.⁵⁴ Pragmatic trials such as COMPASS are explicitly designed to be inclusive of the general population, minimize the burden of informed consent, limit study resources for implementation and outcome capture, and place little control on the heterogeneity present within usual care.¹⁸ However, this high external validity comes at the expense of factors that contribute to outcome nonresponse, treatment nonreceipt, and missing data.⁵⁵ As such, pragmatic trials do not exclude patients and sites that may not be fully adherent, nor do they provide financial assistance for implementation. Thus, while the uptake of the COMPASS intervention and MMAP in particular may seem low in comparison with traditional explanatory randomized controlled trials, its challenges to uptake are in line with other real-world implementation of complex transitional care interventions.^{56,57} Indeed, the challenges of COMPASS implementation are similar to those reported by the CMS Community-based Care Transitions Program. Receipt of the COMPASS intervention (35%), however, was higher than Transitional Care Management among Medicare beneficiaries nationwide for any condition (7% in 2015).⁵⁷ As intended, the COMPASS pragmatic trial provided a realistic measure of uptake and its effectiveness for stroke and TIA survivors.

Potential strategies to enhance future implementation uptake

Findings from this evaluation provide and can inform implementation strategies for other comprehensive, complex interventions. Key aspects include the following:

- *Readiness for change.* Completion of readiness to change surveys at the organizational and at the individual engagement level to increase site awareness of facilitators and barriers and to help prepare for incorporation of new practices within their contextual environment. Organizational readiness to change refers to an organization's members' shared commitment to

implementing a change and shared belief in their ability to make that change. High organizational readiness to change has been associated with more effective implementation.⁵⁸

- *Time and effort.* Time allowance to identify the best suited site champion for the site and to provide compensated effort for champion duties and frontline provider training.
- *Clinical knowledge broker/implementation practitioner.* Use of an on-site knowledge broker or implementation support practitioner to support EBP implementation by educating and engaging champions and frontline providers in real-time within their site environmental context.^{59,60}
- *Graduated intervention complexity.* Tailor and streamline intervention training materials for busy frontline providers and gradually build in components and complexity of the intervention based on site readiness and success.⁵⁸

Conclusions

In conclusion, we explored factors that influenced implementation of the MMAP for Stroke, an evidence-based model of postacute rehabilitative care, yielding important insights about the realities of implementing a complex intervention in clinical practice and the contextual factors under which this model of care may be effective. Sites that experienced implementation challenges appeared to have competing practice priorities, high productivity standards, and overall lower stroke volumes, whereas sites that experienced implementation success appeared to have empowered middle manager champions in vertically integrated systems that embraced innovation. The findings from this evaluation, as part of one of the first large-scale pragmatic trials funded by Patient-Centered Outcomes Research Institute, can serve as a road map for the design and real-world implementation of other comprehensive interventions that aim to bridge the currently disconnected realms of acute care, postacute care, and community resources. Interventions such as these have been called for by CMS,⁶¹ and effective solutions are urgently needed with the aging of the population and increasing costs of care.

Keywords

Exercise; Health services research; Implementation science; Recovery of function; Rehabilitation; Secondary prevention; Stroke

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References

1. Benjamin EJ, Muntner P, Alonso A, et al. Heart disease and stroke statistics-2019 update: a report from the American Heart Association. *Circulation* 2019;139:e56-528.

2. Duncan PW, Bushnell CD, Rosamond WD, et al. The comprehensive post-acute stroke services (compass) study: design and methods for a cluster-randomized pragmatic trial. *BMC Neurol* 2017;17:133.
3. Lai SM, Studenski S, Duncan PW, Perera S. Persisting consequences of stroke measured by the Stroke Impact Scale. *Stroke* 2002;33:1840-4.
4. Kind AJ, Smith MA, Pandhi N, Frytak JR, Finch MD. Bouncing-back: rehospitalization in patients with complicated transitions in the first thirty days after hospital discharge for acute stroke. *Home Health Care Serv Q* 2007;26:37-55.
5. Kind AJ, Smith MA, Frytak JR, Finch MD. Bouncing back: patterns and predictors of complicated transitions 30 days after hospitalization for acute ischemic stroke. *J Am Geriatr Soc* 2007;55:365-73.
6. Andrews AW, Li D, Freburger JK. Association of rehabilitation intensity for stroke and risk of hospital readmission. *Phys Ther* 2015; 95:1660-7.
7. Burke JF, Skolarus LE, Adelman EE, Reeves MJ, Brown DL. Influence of hospital-level practices on readmission after ischemic stroke. *Neurology* 2014;82:2196-204.
8. Eng JJ, Pang MY, Ashe MC. Balance, falls, and bone health: role of exercise in reducing fracture risk after stroke. *J Rehabil Res Dev* 2008; 45:297-313.
9. Pang MY, Eng JJ. Fall-related self-efficacy, not balance and mobility performance, is related to accidental falls in chronic stroke survivors with low bone mineral density. *Osteoporos Int* 2008;19:919-27.
10. Horn SD, DeJong G, Smout RJ, Gassaway J, James R, Conroy B. Stroke rehabilitation patients, practice, and outcomes: is earlier and more aggressive therapy better? *Arch Phys Med Rehabil* 2005;86: S101-14.
11. Lang CE, Lohse KR, Birkenmeier RL. Dose and timing in neurorehabilitation: prescribing motor therapy after stroke. *Curr Opin Neurol* 2015;28:549-55.
12. Freburger JK, Li D, Fraher EP. Community use of physical and occupational therapy after stroke and risk of hospital readmission. *Arch Phys Med Rehabil* 2018;99:26-34.
13. Prvu Bettger J, McCoy L, Smith EE, Fonarow GC, Schwamm LH, Peterson ED. Contemporary trends and predictors of postacute service use and routine discharge home after stroke. *J Am Heart Assoc* 2015; 4:e001038.
14. Freburger JK, Li D, Johnson AM, Fraher EP. Physical and occupational therapy from the acute to community setting after stroke: predictors of use, continuity of care, and timeliness of care. *Arch Phys Med Rehabil* 2018;99:1077-89.
15. Duncan PW, Abbott RM, Rushing S, et al. Compass-CP: an electronic application to capture patient-reported outcomes to develop actionable stroke and transient ischemic attack care plans. *Circ Cardiovasc Qual Outcomes* 2018;11:e004444.
16. Bushnell CD, Duncan PW, Lycin SL, et al. A person-centered approach to poststroke care: the comprehensive post-acute stroke services model. *J Am Geriatr Soc* 2018;66:1025-30.
17. Breaux-Shropshire TL, Judd E, Vucovich LA, Shropshire TS, Singh S. Does home blood pressure monitoring improve patient outcomes? A systematic review comparing home and ambulatory blood pressure monitoring on blood pressure control and patient outcomes. *Integr Blood Press Control* 2015;8:43-9.
18. Duncan PW, Bushnell CD, Jones SB, et al. Randomized pragmatic trial of stroke transitional care: the Compass Study. *Circ Cardiovasc Qual Outcomes* 2020;13:e006285.
19. Powell BJ, Waltz TJ, Chinman MJ, et al. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implement Sci* 2015;10:21.
20. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci* 2009;4:50.
21. Billinger SA, Arena R, Bernhardt J, et al. Physical activity and exercise recommendations for stroke survivors: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke* 2014;45:2532-53.
22. Harris JE, Eng JJ, Miller WC, Dawson AS. A self-administered Graded Repetitive Arm Supplementary Program (GRASP) improves arm function during inpatient stroke rehabilitation: a multi-site randomized controlled trial. *Stroke* 2009;40:2123-8.
23. Thomas S, Mackintosh S, Halbert J. Does the 'Otago Exercise Programme' reduce mortality and falls in older adults?: a systematic review and meta-analysis. *Age Ageing* 2010;39:681-7.
24. Shubert TE, Smith ML, Jiang L, Ory MG. Disseminating the Otago Exercise Program in the United States: perceived and actual physical performance improvements from participants. *J Appl Gerontol* 2018; 37:79-98.
25. Clemson L, Fiatarone Singh MA, Bundy A, et al. Integration of balance and strength training into daily life activity to reduce rate of falls in older people (the LiFE study): randomised parallel trial. *BMJ* 2012;345:e4547.
26. Sarmiento K, Lee R, Steadi. CDC's approach to make older adult fall prevention part of every primary care practice. *J Safety Res* 2017;63: 105-9.
27. COMPASS Study Investigators. COMPASS movement matters provider handout. Available at: <https://www.nccompass-study.org/wp-content/uploads/2019/06/COMPASS-MM-v2-1.pdf>. Accessed October 12, 2020.
28. COMPASS Study Investigators. COMPASS insurance matters under-insured patient handout. Available at: <https://www.nccompass-study.org/wp-content/uploads/2019/05/Insurance-Matters-Uninsured-for-patients-v9CR.pdf>. Accessed October 12, 2020.
29. COMPASS Study Investigators. COMPASS home health quality reporting provider handout. Available at: <https://www.nccompass-study.org/wp-content/uploads/2019/06/HH-quality-metricsCR2.pdf>. Accessed October 12, 2020.
30. COMPASS Study Investigators. Movement matters training grid - home health and outpatient therapy providers. Available at: https://www.nccompass-study.org/wp-content/uploads/2019/06/HHOP-Training-Grid_2.pdf. Accessed October 12, 2020.
31. Safaeinili N, Brown-Johnson C, Shaw JG, Mahoney M, Winget M. CFIR simplified: pragmatic application of and adaptations to the Consolidated Framework for Implementation Research (CFIR) for evaluation of a patient-centered care transformation within a learning health system. *Learn Health Syst* 2020;4:e10201.
32. Qualitative data. Consolidated framework for implementation research; 2020. Available at: <https://cfirguide.org/>. Accessed August 30, 2020.
33. COMPASS Study Investigators. COMPASS model of care - checklist for home health and outpatient therapy providers. Available at: <https://www.nccompass-study.org/wp-content/uploads/2019/06/homehealth-checklist-final-2.pdf>. Accessed October 12, 2020.
34. Morris ZS, Wooding S, Grant J. The answer is 17 years, what is the question: understanding time lags in translational research. *J R Soc Med* 2011;104:510-20.
35. Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet* 2003;362:1225-30.
36. Salbach NM, Wood-Dauphinee S, Desrosiers J, et al. Facilitated interprofessional implementation of a physical rehabilitation guideline for stroke in inpatient settings: process evaluation of a cluster randomized trial. *Implement Sci* 2017;12:100.
37. Li SA, Jeffs L, Barwick M, Stevens B. Organizational contextual features that influence the implementation of evidence-based practices across healthcare settings: a systematic integrative review. *Syst Rev* 2018;7:72.
38. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. *Implement Sci* 2012;7:50.
39. Pfadenhauer LM, Gerhardus A, Mozygemba K, et al. Making sense of complexity in context and implementation: the Context and Implementation of Complex Interventions (CICI) framework. *Implement Sci* 2017;12:21.
40. Campbell NC, Murray E, Darbyshire J, et al. Designing and evaluating complex interventions to improve health care. *BMJ* 2007;334:455-9.

41. Craig P, Dieppe P, Macintyre S, et al. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ* 2008;337:a1655.
42. Michie S, West R, Sheals K, Godinho CA. Evaluating the effectiveness of behavior change techniques in health-related behavior: a scoping review of methods used. *Transl Behav Med* 2018;8:212-24.
43. Connell LA, Klassen TK, Janssen J, Thetford C, Eng JJ. Delivering intensive rehabilitation in stroke: factors influencing implementation. *Phys Ther* 2018;98:243-50.
44. Luker JA, Craig LE, Bennett L, et al. Implementing a complex rehabilitation intervention in a stroke trial: a qualitative process evaluation of AVERT. *BMC Med Res Methodol* 2016;16:52.
45. Engle RL, Lopez ER, Gormley KE, Chan JA, Charns MP, Lukas CV. What roles do middle managers play in implementation of innovative practices? *Health Care Manage Rev* 2017;42:14-27.
46. Stelfox HT, Niven DJ, Clement FM, et al. Stakeholder engagement to identify priorities for improving the quality and value of critical care. *PLoS One* 2015;10:e0140141.
47. Lomas J. Using 'linkage and exchange' to move research into policy at a Canadian foundation. *Health Aff (Millwood)* 2000;19:236-40.
48. Connell LA, McMahon NE, Redfern J, Watkins CL, Eng JJ. Development of a behaviour change intervention to increase upper limb exercise in stroke rehabilitation. *Implement Sci* 2015;10:34.
49. Ladeira CE, Samuel Cheng M, Hill CJ. Physical therapists' treatment choices for non-specific low back pain in Florida: an electronic survey. *J Man Manip Ther* 2015;23:109-18.
50. Harting J, Rutten GM, Rutten ST, Kremers SP. A qualitative application of the diffusion of innovations theory to examine determinants of guideline adherence among physical therapists. *Phys Ther* 2009;89:221-32.
51. Ladeira CE, Cheng MS, da Silva RA. Clinical specialization and adherence to evidence-based practice guidelines for low back pain management: a survey of US physical therapists. *J Orthop Sports Phys Ther* 2017;47:347-58.
52. Johnson A, Callhan R, Chandler J, Markesich J. Using behavioral science to improve survey response: an experiment with the national beneficiary survey. Princeton: Mathematica Policy Research; 2017.
53. Singer E, Cong Y. The use and effects of incentives in surveys. *Ann Am Acad Pol Soc Sci* 2013;645:112-41.
54. Godwin M, Ruhland L, Casson I, et al. Pragmatic controlled clinical trials in primary care: the struggle between external and internal validity. *BMC Med Res Methodol* 2003;3:28.
55. Ford I, Norrie J. Pragmatic trials. *N Engl J Med* 2016;375:454-63.
56. Centers for Medicare and Medicaid Services. CCTP final evaluation report: evaluation of the community-based care transitions program. Available at: <https://innovation.cms.gov/innovation-models/cctp>. Accessed August 30, 2020.
57. Bindman AB, Cox DF. Changes in health care costs and mortality associated with transitional care management services after a discharge among Medicare beneficiaries. *JAMA Intern Med* 2018;178:1165-71.
58. Weiner BJ. A theory of organizational readiness for change. *Implement Sci* 2009;4:67.
59. Hoens AM, Li LC. The knowledge broker's "fit" in the world of knowledge translation. *Physiother Can* 2014;66:223-7.
60. Albers B, Metz A, Burke K. Implementation support practitioners - a proposal for consolidating a diverse evidence base. *BMC Health Serv Res* 2020;20:368.
61. Centers for Medicare and Medicaid Services. Transitional care management services fact sheet. Available at: <https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Transitional-Care-Management-Services-Fact-Sheet-ICN908628.pdf>. Accessed September 26, 2019.