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Original Article

Implementation of the Comparison of Outcomes and Access to Care for Heart Failure (COACH) Trial

Christine Fahim, PhD, MSc,[a,b] Ayaat T. Hassan, MSc,[a] Elikem Togo, MPH,[a] Heather Ross,[b,c] Sharon E. Straus, MD, Msc,[a,b,d] and Douglas S. Lee, MD, PhD[b,c,e]

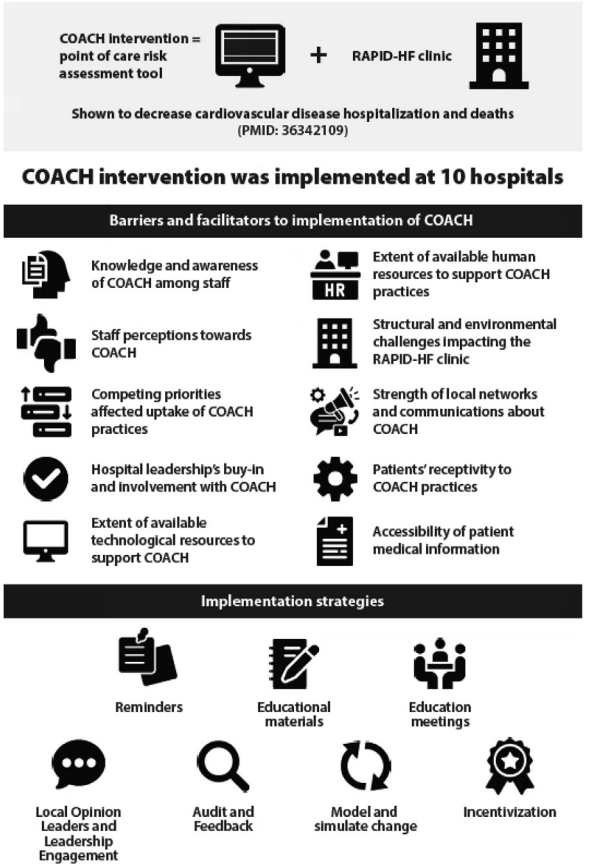
[a] *Li Ka Shing Knowledge Institute, St Michael's Hospital, Unity Health Toronto, Toronto, Ontario, Canada*

[b] *University of Toronto, Toronto, Ontario, Canada*

[c] *Ted Rogers Centre for Heart Research and Peter Munk Cardiac Centre, University Health Network, Toronto, Ontario, Canada*

[d] *Department of Medicine, St. Michael's Hospital, Toronto, Ontario, Canada*

[e] *ICES (formerly Institute for Clinical Evaluative Sciences), Toronto, Ontario, Canada*



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ABSTRACT

Background: The Comparison of Outcomes and Access to Care for Heart Failure (COACH) trial demonstrated that use of a point-of-care risk assessment tool and a rapid ambulatory transitional heart failure clinic led to significant reductions in death and cardiovascular hospitalisation among patients with acute heart failure. We report a process evaluation of COACH intervention and strategy implementation.

Methods: We conducted longitudinal interviews with staff to assess barriers and facilitators to COACH implementation. Factors were coded according to the Theoretical Domains Framework (TDF) and the Consolidated Framework for Implementation Research (CFIR). Intervention mapping was conducted to identify theory-rooted strategies to address barriers and influence facilitators toward implementation. We used interviews, document reviews, and check-in calls with implementation teams to describe uptake of these strategies and their impact on implementation success over time.

Results: A total of 29 interviews were conducted across 10 sites. We identified 10 factors that affected COACH implementation, which corresponded to 6 TDF and 5 CFIR domains. Some barriers were resolved within the study period, but others persisted over time. Seven implementation strategies were recommended to sites. Participants identified ample preparation time, site-specific personnel support, structural and social characteristics conducive to the intervention needs, and implementation experience as factors that facilitated implementation success.

Conclusions: We supported implementation of the COACH intervention in 10 acute care hospital sites and describe the factors impacting implementation. We recommend a rapid implementation assessment to sites wishing to implement COACH, and suggest strategies that can be used to mitigate barriers and aid facilitators to improve implementation success.

RÉSUMÉ

Contexte : L'essai COACH (Comparison of Outcomes and Access to Care for Heart Failure) a démontré que l'utilisation d'un outil d'évaluation des risques aux points de service et l'accès à des soins de transition dans une clinique ambulatoire spécialisée en insuffisance cardiaque réduisaient considérablement le taux de mortalité et d'hospitalisation pour cause de maladie cardiovasculaire chez les patients atteints d'insuffisance cardiaque aiguë. Nous avons évalué le processus de mise en œuvre d'interventions et de stratégies COACH.

Méthodologie : Nous avons réalisé des entrevues longitudinales avec des membres du personnel afin d'évaluer les facteurs influant positivement et négativement sur la mise en œuvre d'interventions COACH. Les facteurs ont été codés d'après le cadre TDF (Theoretical Domains Framework) et l'étude CFIR (Consolidated Framework for Implementation Research). Une cartographie des interventions a permis de dégager des stratégies ancrées dans la théorie visant à éliminer les obstacles et à favoriser la mise en œuvre. Nous avons réalisé des entrevues, étudié la documentation et fait des appels de suivi aux équipes de mise en œuvre afin de décrire l'adoption de ces stratégies et leur incidence sur le succès à long terme de leur mise en œuvre.

Résultats : Nous avons réalisé au total 29 entrevues dans 10 centres. Nous avons relevé 10 facteurs ayant une incidence sur la mise en œuvre d'interventions COACH qui correspondaient à 6 domaines du cadre TDF et à 5 domaines de l'étude CFIR. Certains obstacles ont pu être éliminés durant la période de l'étude, tandis que d'autres ont persisté. Sept stratégies de mise en œuvre ont été recommandées aux centres. Parmi les facteurs favorisant la réussite de la mise en œuvre, les participants ont mentionné un délai de préparation suffisant, le soutien offert au personnel de chaque centre, des caractéristiques structurales et sociales adaptées aux besoins en matière d'intervention et l'expérience de mise en œuvre.

Conclusions : Nous avons pu favoriser la mise en œuvre d'interventions COACH dans 10 hôpitaux de soins actifs et décrit les facteurs ayant une incidence sur leur mise en œuvre. Nous recommandons de faire une évaluation rapide de la mise en œuvre aux centres qui souhaitent adopter des interventions COACH, et suggérons des stratégies pour réduire les obstacles et favoriser la réussite de la mise en œuvre.

Patients experiencing acute heart failure are at increased risk of hospitalisation, readmission, and mortality.[1,2] Physicians typically use clinical judgement to determine whether patients presenting to emergency departments with acute heart failure are hospitalised vs discharged home. Clinical judgement alone may result in unnecessary admission of low risk patients as well as the discharge of high risk patients who can experience serious adverse events after discharge.[3] To meet this need, a risk-assessment tool was created and validated to provide decision support to emergency department clinicians to identify patients at high risk of adverse events who may need hospital admission vs those who could be discharged home safely with outpatient follow-up.[3,4] The Comparison of Outcomes and Access to Care for Heart Failure (COACH) trial used a stepped-wedge, cluster-randomised trial method to evaluate implementation of this tool. Patients with acute heart failure who were deemed safe for discharge from hospital or the emergency department were referred to a rapid ambulatory transitional care (Rapid-HF) clinic. The trial demonstrated a significant reduction in all-cause death or cardiovascular hospitalisation at 30 days and 20 months after patient presentation to hospital. Early hospital discharge or direct discharge from the emergency room was reduced from 28.1% to 18.9% ($P = 0.009$), with no increase in mortality, and patients visited ambulatory clinics more quickly after implementation of the COACH intervention.[2,5,6]

The Knowledge to Action (KTA) cycle was used as the guiding model for the study.[7] The KTA is based on a review of theories of planned action and emphasises the need to use an adapted, iterative approach to implementation that accounts for local context and facilitates the design and implementation of strategies to address barriers and help facilitators to implement an evidence-based intervention (Table 1). Guided by the KTA, we conducted needs assessments with study sites before implementation of the COACH trial and

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Corresponding author: Dr Christine Fahim, Knowledge Translation Program, St Michael's Hospital, Unity Health Toronto, 30 Bond Street, Toronto, Ontario M5B 1W8, Canada. Tel.: +1-416-360-4000 x77300.

E-mail: christine.fahim@unityhealth.to

Twitter: @kt_program

See page 1318 for disclosure information.

Key Findings

- We systematically assessed the barriers and facilitators to implementing a point-of-care risk assessment tool and a rapid ambulatory transitional heart failure clinic for patients with acute heart failure.
- We provide guidance on the use of theory-rooted strategies that can be used to influence facilitators and address barriers to implementation of these interventions.

developed an adaptable, comprehensive implementation strategy to support study sites to implement the COACH interventions (risk-assessment tool and RAPID-HF clinics). Next, we assessed barriers and facilitators to implementation of the COACH interventions at baseline (ie, within 2-4 months after implementation) and again at 6 months after implementation. We mapped these barriers and facilitators to implementation strategies, tailored to the context of each study site and monitored routinely.

Process evaluations of implementation efforts are important to understanding the factors that lead to success or failure of an intervention.[8] Given the success of the COACH intervention, we determined that it would be important to describe the processes by which COACH was implemented, including the barriers and facilitators to implementation. This evaluation can inform scale-up of the COACH intervention to additional sites and inform plans to sustain the COACH intervention beyond the study period.

Our objectives were as follows: 1) Describe the barriers and facilitators that sites experienced, over time, when implementing the COACH intervention; 2) describe the implementation strategies that were suggested to COACH sites to overcome barriers and help facilitators with implementation; and 3) describe the factors that may facilitate scale-up and sustainability of the COACH intervention.

Methods

A process evaluation using the KTA and Durlak and Dupre framework was conducted.[9]

The COACH trial

The COACH trial has been described in detail elsewhere.[6,10] Briefly, the stepped-wedge design included 5 sequences and 6 periods, with each step length having a 4-month duration; sites were randomised to begin implementation from May 2017 to September 2018 (Supplemental Fig. S1). Patients aged $\geq$ 18 years were eligible to participate if they presented with acute heart failure and if they were able to attend outpatient clinic visits. The COACH intervention included access to the validated point-of-care Emergency Heart Failure Mortality Risk Grade (EHMRG) tool, which was made accessible to hospital staff via a secure platform and guided physicians to categorise patients as having low, intermediate, or high risks of heart failure mortality at 7 and 30 days.[6] Facilitation of the COACH intervention required implementation of 3 elements: patient risk score calculation using the EHMRG, referral to the RAPID-HF clinic, and patient management in the RAPID-HF clinic (Supplemental Fig. S2).

Table 1. COACH intervention

Evidence-based clinical practices
Risk-assessment tool
• Physicians should use clinical judgement when interpreting the EHMRG scores.
• If EHMRG score indicates *low* risk for 7-day and 30-day mortality and the patient has no exclusion criteria, consider patient for discharge or short-stay (< 48 h) hospital admission.
• If EHMRG score indicates *intermediate* risk for 7-day or 30-day mortality (or both), consider patient for admission to hospital for long-stay or short-stay (< 48 h)
• If EHMRG score indicates *high* risk for 7-day or 30-day mortality, admit to hospital.
RAPID-HF clinic
• Typically on-site clinics (same building as emergency department); off-site in some cases.
• Patients can be referred to RAPID-HF clinic at any time from emergency room, observation unit, or medical short stay unit.
• Clinic schedules and assesses patients within 48-72 hours after discharge
• Clinic provides transitional care for up to 30 days after discharge, followed by transfer to primary or specialist care.
Core implementation strategies (offered to all sites)
Educational materials and tools
• Calculating EHMRG risk score
• Setting up RAPID-HF clinic (referral forms, clinic checklists)
Demonstrations
• How to calculate EHMRG risk score
• Reviewing clinical scenarios
Restructuring physical and digital environment
• Setting up RAPID-HF clinic via on-site visits from COACH implementation team
• Incorporation of risk score and clinic referrals in hospital EMRs
Implementation coaching
• Biweekly check-in calls with implementation experts to identify ongoing challenges to implementation and guidance on how to tailor strategies to facilitate implementation

COACH, Comparison of Outcomes and Access to Care for Heart Failure; EHMRG, Emergency Heart Failure Mortality Risk Grade; EMR, electronic medical record; RAPID-HF, rapid ambulatory transitional care.

Once sites were randomised to implement COACH, the COACH central team (ie, the study leads, who worked closely with the implementation experts) conducted an introductory teleconference with COACH site leads (which included staff from emergency and cardiology departments). During this teleconference, the COACH central team conducted an education session to provide an overview of the COACH trial and supplied corresponding implementation materials (Table 1). The team asked site leads about their initial perceptions of the trial, identified ways to integrate the trial within existing clinical processes, and discussed strategies to implement the COACH practices (eg, reminders) based on identified barriers and facilitators. Following this teleconference, each site was responsible for appointing a site-level implementation team (which included a site lead, a navigator, and supporting staff members, eg, those who could support referrals to the RAPID-HF clinic). The COACH central team then offered to conduct site visits to facilitate an introduction to the site implementation team, conduct demonstrations, and review clinical scenarios on how to use the risk-assessment tool, assign roles for COACH implementation, and assess the clinical environment in preparation for COACH implementation—to ensure that processes were in place to integrate use of the risk-assessment tool (eg, integration into the electronic medical record) and the

Table 2. COACH teams

COACH central team
• Consists of the COACH study investigator team
• Responsible for providing an overview of the COACH study components to each site, and provides high-level ongoing support related to the COACH practices such as referral to the RAPID-HF clinic and using the calculator
COACH implementation team
• Consists of implementation experts and team responsible for day-to-day implementation
• Responsible for providing ongoing implementation support to COACH site team throughout the study
COACH site team
• Consists of nurse navigator and physician lead, who are further supported by RAPID-HF clinic staff, and department staff in general internal medicine and emergency department
• Responsible for ensuring site is properly calculating patient risk, and for referring patients to RAPID-HF clinic

COACH, Comparison of Outcomes and Access to Care for Heart Failure; RAPID-HF, rapid ambulatory transitional care.

RAPID-HF clinic (Supplemental Fig. S2). The Knowledge Translation Program (KTP) at St Michael's Hospital (led by S.E.S.) also provided coaching and implementation support (including development of implementation strategies to support COACH implementation) to implementation teams via telephone/videoconference for the duration of the study period.

Coaching was structured as a facilitation process that included problem solving, enablement and support for site leads/staff, and identification of strategies and processes to incorporate the COACH interventions into routinized practice. The COACH central team (Table 2) held biweekly implementation calls with each of the study sites; during those calls, sites provided updates on implementation efforts, outcomes (eg, number of clinic referrals), and challenges. The COACH central team iteratively shared resources and strategies to overcome implementation challenges.

Study setting and participants

The COACH trial was implemented at 10 acute care hospitals in Ontario, Canada (population 14.6 million).[6,11] Seven sites were large academic hospitals, and 3 sites were non−university-affiliated community hospitals. Each study site had a physician site lead and a nurse navigator who were the local implementation team leads. Local implementation teams also included cardiologists, internists, and physicians, nurses, and managers from the sites' emergency departments.

Assessing barriers and facilitators to COACH intervention implementation

Site navigators and leads were invited to participate in interviews at baseline (T1; ∼ 2-3 months after implementation) and ∼ 6 months after implementation (T2) to assess barriers and facilitators to implementation over time. Site navigators and leads were also asked to identify staff members who could share additional insights on COACH implementation. Key informant interviews were conducted by research staff who were implementation experts and members of the COACH central team. The interviews were 45-60 minutes long and were conducted by phone/virtual platform. The interviews were semistructured and rooted in the Theoretical Domains Framework (TDF) and Consolidated Framework for Implementation Research (CFIR).[12,13] Two interview guides were developed: one for the site leads (ie, navigators and site lead physicians), and one for other staff members affected by the COACH implementation (eg, staff in the RAPID-HF clinic or emergency department). Following participant consent, key informant interviews were digitally recorded, transcribed, and analysed with the use of NVivo 11.[14]

Interviewers were research coordinators and assistants from the KTP at St Michael's Hospital. All interviewers had experience using mixed methodology to conduct health services and implementation science research. The COACH team and research participants were not known to the interviewers before the start of the COACH trial. Our approach to implementation was rooted in co-creation and integrated knowledge translation. Our preliminary work engaging patients to support the design of the COACH intervention is detailed elsewhere.[4] In this article, we describe our ongoing engagement with knowledge users, mainly clinicians representing multiple disciplines, in order to design implementation strategies in real time based on user-identified barriers and facilitators to COACH intervention implementation.[15,16]

Two researchers analysed transcripts using the framework approach, which is a qualitative analysis method that allows for the organisation and charting of data.[17] The 4 steps of the framework approach are 1) familiarisation (immersion in interview transcripts to identify key ideas and initial themes); 2) identification of a thematic framework (we used the TDF and CFIR as the guiding frameworks to categorise data); 3) coding (we conducted inductive coding to organise data into the TDF/CFIR frameworks, then deductive coding to identify emergent themes within and across the domains); and 4) charting (arrangement of data into emergent themes). Our thematic coding framework is shown in Supplemental Figure S3.[12,13] The coding framework was independently piloted on 4 baseline key informant interviews by 2 experienced research staff and iteratively revised to refine or expand the codes. A total of 8 interviews (representing 20% of the data sample) were double-coded by 2 researchers, and an interrater reliability score was calculated to assess agreement between coders. The remaining interviews were single-coded. We report barriers and facilitators across all sites and describe changes over time.

Identification of strategies to support implementation of COACH interventions

Using the themed barriers and facilitators data, 2 staff with expertise in implementation science methods used the Cochrane Effective Practice and Organisation of Care (EPOC) intervention classification scheme and the Expert Recommendations for Implementing Change (ERIC) implementation interventions to identify relevant strategies to help facilitators and address barriers at the individual and organisational levels, respectively, and then compared levels of agreement.[18-20] Barriers and facilitators data were mapped to corresponding implementation strategies at baseline and 6

months after implementation.[20-22] Sites received this information along with suggestions on how to tailor and operationalise identified strategies to address unique site needs during the biweekly coaching calls. For example, staff forgot to use the calculator while busy in the emergency department. We mapped this to the TDF domain of "memory, attention, and decision making," which mapped to the implementation strategy of "reminders" (identified via EPOC and ERIC). Therefore, we suggested that reminders be implemented at sites with staff experiencing challenges remembering to use the calculator. During the biweekly coaching calls and via the site navigator interviews, study staff collected data on implementation challenges and successes.

Recommendations for implementation scale-up and sustainability

From triangulated and categorised data from the key informant interviews, monitoring implementation calls, and administrative documents, we identified factors that affected the implementation of COACH and compiled a list of strategies that should be considered to facilitate scale up and sustainability of COACH.[23]

Results

All sites completed a baseline (T1) interview and 7 of the 10 sites (70%) completed a second interview (T2); reasons for interview noncompletion included time constraints within the study period. A total of 29 interviews with 21 individuals were conducted across T1 and T2 (6 participants in T1; 6 participants in T2; 9 participants in both T1 and T2). Sixteen participants (76%) were from academic hospitals, and 5 (24%) were from community hospitals. Eleven participants (52%) were nurse navigators, 5 (24%) were clinic nurses or nurse practitioners (including those who worked in the RAPID-HF clinics), and 5 participants were physician leads or clinic managers (24%). Coders achieved an interrater reliability of 0.71, which indicates substantial agreement.

Barriers and facilitators to COACH intervention implementation

Table 3 outlines identified barriers and facilitators to the implementation of the COACH practices. A total of 10 factors were identified as affecting COACH implementation during the study period. These included staff's knowledge and awareness of the COACH intervention (staff often used a different risk score calculator or forgot to use the calculator and assessed patients by means of clinical judgement), staff's perceptions toward the COACH intervention's impact and whether the intervention was aligned with their clinical roles, hospital leadership's level of buy-in around COACH practices, and patients' receptivity to COACH practices. Other factors at the organisational level included whether competing priorities overshadowed the uptake of COACH practices, the extent of available human, technologic, and physical resources to support COACH, and the strength of local networks and relationships between hospital departments (eg, relationships among internal and emergency medicine and cardiology). For example, emergency physicians at some sites preferred to refer to general internal medicine or to their own cardiology outpatient clinic rather than the RAPID-HF clinic. Detailed descriptions of the identified barriers and facilitators, along with illustrative quotes, are presented in Table 3.

From an individual perspective (classified according to the TDF), barriers included knowledge; memory, attention, and decision making; beliefs about consequences; beliefs about capabilities; social professional role and identity; and environmental context and resources. Expanding environmental domains with the use of the CFIR, we identified the following factors affecting implementation: relative priority, readiness for implementation (specifically, leadership engagement and available resources), networks and communications, and patient needs.

Many barriers identified at baseline continued to persist for the study period (Table 3). These included competing priorities affecting the uptake of COACH practices and challenges with insufficient physical resources. Patient perceptions of COACH were positive and remained positive for the study duration. Level of buy-in from leadership and staff varied by study site, though individual perceptions remained unchanged throughout the study period. Units with strong communication channels and networks remained collaborative throughout the study period, although strength of communication networks varied between departments/units and study sites. Most sites experiencing initial challenges related to limited human resources or technologic gaps were remedied during the study period. Finally, awareness and knowledge of the COACH intervention increased across all sites over time, suggesting that efforts to raise awareness for the interventions via meetings, rounds, e-mail reminders, presentations, discussions, and pocket cards were helpful.

Implementation strategies

The number of implementation strategies to facilitate COACH implementation varied by site (Table 4). Some strategies, such as the use of reminders, were implemented by all sites, and others, such as use of incentives, were limited to a few sites. Sites that were able to combine multiple strategies simultaneously (eg, disseminating educational materials and demonstrating COACH practices as part of an in-person reminder) reported more successfully overcoming barriers related to knowledge, learning, awareness, skills, social/professional role and identify, and beliefs about capabilities.

Factors impacting scale-up and sustainability

Other implementation success factors included 1) pre-implementation preparation time, 2) the extent of site-specific personnel support available, 3) site-specific structural and social characteristics, and 4) the range and extent of the implementation strategies. Owing to the stepped-wedge nature of the randomised trial, sites with more time to implement the COACH intervention were better equipped to establish relationships with hospital leadership, deliver educational presentations, address technologic constraints, and iteratively refine and improve their implementation strategies. Sites with shorter implementation periods also experienced prolonged challenges related to access of patient information. Site navigator experience and capacity correlated with COACH implementation success. Navigator tasks varied by site and

Table 3. Barriers to and facilitators of COACH implementation

Factor	Description*	Example quotes	TDF/CFIR domains	Changes over time
Knowledge and awareness of COACH among staff	Staff forgot to use the risk-assessment calculator and continued to assess patients based on clinical judgement (B; n = 9). When staff did use a calculator, they used one that they were more familiar with instead of the validated COACH calculator (B; n = 1).	"Because you're so ingrained in a certain way of functioning. I've been told down in emerg… the physicians are like 'There's so much to remember, it's hard to remember to do this as well'" [501]	Knowledge; Memory, attention and decision making	Awareness and knowledge of the trial increased across all sites over time, suggesting that navigators' and site leads' efforts to promote COACH through meetings, rounds, in person, via e-mail reminders, presentations, 1:1 discussions, and pocket cards were effective.
Staff perceptions towards COACH	Staff felt that COACH practices were beyond the scope of their role, or did not believe there would be uptake of COACH in their setting (B; n = 5). Staff members who had used the risk-score calculator in the past considered it to be a useful tool and were eager to incorporate it into daily practice (F; n = 2).	"I have spoken with a few [staff] that were … straight up saying, you know, it's, it's most likely we're not gonna do your score" [1001]	Beliefs about consequences; Beliefs about capabilities; Social professional role and identity	Overall, perceptions did not change over time, however, staff perceptions varied by sites and within staff groups. For example, at one site, nurses viewed COACH as an additional burden to their challenging workload.
Competing priorities affected uptake of COACH practices	Academic hospitals experienced competing priorities, including a large number of other research trials in the emergency department. This led to staff receiving a high volume of reminders related to various trials. Some participants perceived other interventions to be prioritised over the COACH interventions (B; n = 6).	"We have to almost sell our clinic, in a sense where we have to tell them why it's good and how it helps you and how it helps the patient, and overall we know that this study is good for the general public and also good for the hospital and hospitalisations and also economic burden and all that jazz, but there's just something more tangible about a drug and device than there is about faster clinic appointments." [101]	Relative priority; Social professional role and identity; Beliefs about consequences	Barrier persisted over time.
Hospital leadership's buy-in and involvement with COACH	Some sites had less support from key leaders (namely, chief or nurse educator of emergency department); these leaders were seen as playing an important role in training point-of-care staff to implement COACH (B; n = 3). Some sites had engaged emergency department leadership. These individuals facilitated implementation by sending direct e-mails to staff, supporting tracking of implementation outcomes, and enabling access to emergency department systems (F; n = 6).	"Yeah, because I find if the head is supporting it, it'll be more successful … I just find that when [name] started referring, then the referrals started pouring in." [101]	Beliefs about consequences; Readiness for implementation (leadership engagement)	Trends persisted over time; we did not observe an increase/decrease of leadership buy-in between baseline and 6 months after implementation.

Extent of available human resources to support COACH practices	Some sites experienced fewer COACH referrals when navigators were unavailable to facilitate rapid referrals to the clinic (eg, at night and on weekends) (B; n = 5). At some sites, unit clerks played a key role in tracking patients when navigators were unavailable (F; n = 5).	"Just in general, if I'm gone for a day, I don't necessarily have someone covering for me, so that could contribute [to the referral patterns]." [601]	Readiness for implementation (available resources)	Some sites received additional staff support over time, which alleviated the barrier, but this was not the case across all sites experiencing this barrier. In some cases, implementation fell mostly to the site navigators.
Extent of available technologic resources to support COACH	Computers used to assess the risk score calculator were inconveniently located, reducing its use (B; n = 2); one site was unable to integrate the calculator into their existing systems (B; n = 1). Having access to patient status information once a patient was referred to COACH motivated emergency department physicians to refer patients to the RAPID-HF clinic (F; n = 5).	"Initially, we had to figure out … we wanted to know how to get [the calculator] on our phones and be able to tell the physicians how to get it on their phone … now we have a button, so on our computers there is a COACH button. Physicians can just click on that an its an EHMRG tool. So they have quick access to it, but after it was up and running it's not been a problem." [301]	Environmental context and resources; Readiness for implementation (available resources)	Some sites made modifications to improve access to patient information (eg, incorporated the EHMRG calculator directly into the electronic medical records system to improve ease of use and accessibility). In general, most technologic challenges experienced at baseline were rectified by 6 months, although challenges persisted for a minority of sites.
Structural and environmental challenges affecting the RAPID-HF clinic	Some navigators were unable to work at off-site clinics, which made it difficult to follow up on referrals in a timely manner (B; n = 6).	"Our clinic is off-site … and it's a non-unionised environment, and so there, that's where, not only [geographically] is it far from us—well not far, but a 10-minute drive I would say—it's also a different non-unionised environment, so it's not like I could work there in this current role." [701]	Environmental context and resources	No changes in physical resources were observed over time. These challenges were not rectified over time, because they required organisational or systemic changes. For example, off-site RAPID-HF clinics limited navigator access to patients and patient information and created additional challenges (eg, the need to create site directions for patients to find the off-site clinic).
Strength of local networks and communications about COACH	Navigators not having existing rapport or relationships with staff in other departments (namely, general internal medicine, cardiology) led to more challenges with COACH implementation (B; n = 3). When these relationships did exist, and when there was routine cross-departmental communication, COACH was more easily implemented (F; n = 2).	"I would have to say it would be very difficult for an outside person who doesn't know the docs—I would find. I feel like I, I can't imagine doing this job if I didn't know their personalities or what type of physician they were—I'd just approach them a little bit differently." [701]	Networks and communication	No changes were observed over time; strength of communication and networks varied between departments and sites. Sites that already had strong communication between departments were able to maintain relationships throughout the study period.

Continued

Table 3. Continued.

Factor	Description*	Example quotes	TDF/CFIR domains	Changes over time
Patients' receptivity to COACH practices	Patients were generally receptive to receiving rapid care through the COACH trial (F; n = 3). Some patients did not want to attend their clinic appointment because they did not understand why they would need to return after being discharged by an emergency department physician. Others had short notice for the clinic appointment owing to delays with booking patients into the RAPID-HF clinic (B; n = 5).	"These patients are just so, like, so grateful to have to not go through the [emergency department] or wait weeks to see their [general practitioner]." [1001]	Patient needs	No changes were observed over time. Patients were generally receptive to COACH (minimal no-shows to clinic).
Accessibility of patient medical information	Several sites faced challenges with accessing patients' medical information. For example, some navigators could not access the emergency department system to check patient files and had to wait for the emergency department to flag potential patients for COACH, in contrast to other navigators that had direct access to patient charts in the emergency department. Such challenges resulted in delays in identifying eligible patients for COACH, and in the patient referral and management process (B = 3).	"For people who are discharged over the weekend or things like that … I have no way to backtrack and look this up." [1001]	Environmental context and resources	No changes were observed over time. Overall, sites had consistent access (or limited access) to patient medical information.

CFIR, Consolidated Framework for Implementation Research; COACH, Comparison of Outcomes and Access to Care for Heart Failure; EHMRG, Emergency Heart Failure Mortality Risk Grade; RAPID-HF, rapid ambulatory transitional care; TDF, Theoretical Domains Framework.

*B, barrier; F, facilitator; n = number of sites reporting factor (out of 10 sites total).

Table 4. COACH implementation strategies

Implementation strategy	Recommended for sites experiencing barriers related to:	Description of implementation strategy	Suggestions for operationalisation	No. of sites that implemented strategy	Quality of implementation
Reminders	Staff awareness and memory of COACH; Extent of available staff to support COACH practices	Navigators, site leads, hospital leadership or local opinion leaders to deliver reminders to ED, CD, and GIM staff on a biweekly or monthly basis to prompt use of COACH calculator and referrals	• Sticky notes and stickers on patient charts or computers • Personalised e-mail reminders sent by local opinion leaders • In-person reminders to be combined with other strategies (eg, educational materials or demonstrations of COACH calculator use) • Engage summer students and clerks to facilitate in-person reminders • Consult with ED staff to identify appropriate times to conduct reminders	10	Two sites used email-only reminders, 1 site used in-person reminders, 7 sites used both e-mail and in-person reminders. Frequency of reminders varied by site. Two sites reported challenges regarding instances of missed referrals. These 2 sites implemented additional reminders when they noted the missed referrals.
Educational materials	Staff awareness and memory of COACH; Staff perceptions toward COACH; Extent of available staff to support COACH practices	Navigators, leadership and administrative staff to disseminate educational materials (eg, pamphlets, pocket cards, manual, fact sheets, guidelines, and toolkits) to ED, CD, and GIM staff	• Adapt educational materials to include site-specific information (logos, contact information, etc) • Display materials in strategic locations (eg, near referral forms or cardiac zones in the ED)	9	Implemented on an *ad hoc* basis by 5 sites
Education meetings	Extent of available physical resources to support COACH calculator and referral process	Hold facilitated meetings with ED, CD, and GIM staff to improve knowledge about COACH, demonstrate use of the calculator, and provide feedback on the impact of COACH	• Engage leadership or local opinion leaders to conduct educational presentations • Tailor mode of delivery based on site's context and needs (eg, meet with hospital leadership before launch to identify local opinion leaders) • Hold meetings to provide feedback about COACH impact • Use research rounds to reach ED staff, particularly in sites with high staff turnaround	9	Meetings were implemented at the launch of COACH for the sites.
Local opinion leaders and leadership engagement	Staff awareness and memory of COACH; Staff perceptions toward COACH; Competing priorities that affect uptake of COACH practices; Extent of hospital leadership's buy-in and involvement with COACH; Extent of available physical resources to support COACH calculator and referral process	Selection of influential staff across the ED, CD, and GIM by the implementation team to share ongoing messages related to COACH and to demonstrate use of COACH practices	• Support opinion leaders to generate awareness/excitement for COACH by providing easy-to-use resources to deliver COACH messages (eg, speaking points, slides) • Specifically, provide guidance on how to navigate structural limitations to performing COACH activities and describe how COACH practices can help meet organisational goals for improved patient outcomes	9	Two sites identified and engaged key staff as local opinion leaders on an ongoing basis. Four sites met with hospital leadership at time of study launch.

Continued

Table 4. Continued.

Implementation strategy	Recommended for sites experiencing barriers related to:	Description of implementation strategy	Suggestions for operationalisation	No. of sites that implemented strategy	Quality of implementation
Audit and feedback	Staff perceptions toward COACH; Competing priorities that affect uptake of COACH practices	Collection of performance data by the implementation team (eg, number of referrals, patient "success" stories). Share data with ED, CD, and GIM staff to generate buy-in for COACH	• Provide COACH patient follow-up care information to the original ED physician so that they are aware of patients' care pathway and outcomes • Work with other sites implementing COACH to share success stories and lessons learned	8	Six sites implemented audit and feedback reports. The implementation team created a template audit and feedback form that can be tailored to sites' preferences. Examples of data metrics included number of patients referred from the ED, GIM, and CD, number of patients seen outside of the RAPID-HF clinic, number of referrals since last report, and number of referrals to RAPID-HF clinic.
Model and simulate change	Extent of available physical resources to support COACH calculator and referral process	Implementation team and opinion leaders demonstrate the use of COACH practices	• Use meetings, research rounds, or in-person interactions to demonstrate the ease, accessibility, and reliability of the EHMRG risk calculator (showing how it can be embedded into existing workflows) and show how clinical judgement can be complemented by the risk calculator score	8	Implemented by 5 sites, often combined with other implementation strategies (eg, during educational meetings, with reminders)
Incentivisation	Staff perceptions towards COACH	Consider the use of an incentive (eg, coffee cards) to staff to motivate early adoption of COACH practice	• Allocate budget for incentives (eg, coffee cards or refreshments during COACH presentations)	3	Two sites distributed coffee cards to staff at launch to encourage uptake of COACH.

CD, cardiology department; COACH, Comparison of Outcomes and Access to Care for Heart Failure; ED, emergency department; EHMRG, Emergency Heart Failure Mortality Risk Grade; GIM, general internal medicine; RAPID-HF, rapid ambulatory transitional care.

included clinical tasks (eg, identifying patients, calculating risk scores, conducting referrals, managing patients in the RAPID-HF clinic) and implementation tasks (eg, delivering implementation strategies such as reminders, modelling use of EHMRG calculator). Navigators who reported implementation success were often familiar with the site's context, had experience with implementation or quality improvement, protected time to dedicate to the COACH intervention, and had clarity in their role. Sites that had engaged leads and supports from other staff (eg, summer students, clinic staff) were better equipped to deliver the COACH intervention and corresponding implementation strategies. The larger, academic hospital sites had more experience with research implementation, yet those sites also had multiple competing priorities and projects. Conversely, community hospitals in our study were less experienced in implementation, but often had stronger informal communication networks across departments that served as implementation facilitators. Some navigators thought that a full-time navigator, or additional staff support, would be needed to sustain the COACH intervention. Sites whose priorities or values aligned with COACH had increased buy-in (eg, one site conducted a needs assessment for patients with heart failure and saw COACH as aligned with their goals; another site aimed to maximise resource efficiency and saw COACH as one way to do so).

Discussion

Process evaluations of implementation efforts provide critical context to understanding the results and outcomes of clinical trials.[8,9] The COACH randomised trial demonstrated fewer serious adverse events for patients with heart failure at low or intermediate risk when physicians used a risk-stratification tool and outpatient transitional clinic, compared with physicians' clinical judgement alone, to inform decisions on early discharge or hospital admission. Our evaluation of implementation processes provides important insights for sites seeking to implement or scale up the COACH intervention to improve care for patients with acute heart failure.

We used a theory-rooted approach to systematically assess barriers and facilitators to COACH intervention implementation over time.[12,13,20-22] We identified individual barriers related to staff's knowledge awareness and perceptions of the COACH intervention and organisational barriers related to competing priorities to implementation, availability of human, technologic, and physical resources, and the strength of networks between and within hospital departments. We iteratively implemented strategies to address these barriers in a manner that was tailored to each site. Some barriers, such as lack of knowledge or awareness, were resolved within the study period, suggesting that navigators' and site leads' efforts to raise awareness for COACH via meetings, rounds, e-mail reminders, presentations, discussions and pocket cards were effective. However, other barriers persisted. Sites that experienced challenges related to resources (eg, lack of physical space to run the referral clinic, lack of technologic resources to integrate the risk assessment tool into hospital electronic records) and team culture continued to experience these barriers for the duration of the study. We observed varied levels of uptake of the implementation strategies, but did not formally assess adherence. We posit, however, that adherence to the theory-rooted recommended strategies may have resulted in improvements to these barriers over time.

Participants highlighted the importance of having leadership buy-in to facilitate implementation of both the COACH interventions and corresponding implementation strategies. Human resources were especially critical to COACH implementation; sites with experienced implementation facilitators who had clear roles and capacity to engage staff in COACH processes more commonly reported successful implementation of the intervention and corresponding implementation strategies.

These findings highlight the importance of sustainability planning when integrating the COACH intervention into routine care. In particular, processes to adapt workflow to integrate responsibilities with both implementation of the COACH intervention and corresponding implementation strategies are necessary to ensure sustainability. In addition, sites should aim to invest time to ensure buy-in from leadership before embarking on a full-scale implementation, as this buy-in and alignment in priorities may further facilitate implementation success.

Sites interested in implementing COACH may also benefit from a rapid assessment of individual and contextual barriers to their site. Tools such as the Practical Knowledge Translation workbook (a workbook that guides novice implementers to use knowledge translation methods to implement an evidence-based intervention) or the pCAT (an abbreviated survey version of the CFIR) may facilitate these rapid assessments and provide sites with guidance on which implementation strategies may best be used and adapted to their site to improve chances of implementation success.[20,24]

Limitations

This study has limitations. First, the COACH study used a stepped-wedge implementation design.[6] Although this design allowed us to incorporate lessons learned into each round of implementation, the adaptive nature of implementation affected our ability to evaluate COACH implementation in a standardised manner (owing to adaptive modifications to the strategies with each step). Given the significant amount of time required to address barriers, particularly cultural or resource barriers, sites that were randomised to implement COACH at a later date were disadvantaged regarding implementation, because they had less time to prepare for or iteratively adapt their strategies. As a result, we were able to conduct interviews at only a single time point for those sites. In addition, our study findings are limited to the perceptions of the staff who agreed to participate in our process evaluation interviews. For example, we were unable to interview site leads, emergency department staff, or clinic staff at all 10 sites, which further indicates the variable levels of interest toward COACH and its evaluation at study sites. This process evaluation is also subject to desirability bias, given the relationships developed between the site navigators and study team.[25] In addition, although we were able to collect data on the dosage or frequency of implementation strategy use, in an effort to reduce burden on study sites, we did not

collect data on adherence or fidelity to the strategies. Finally, although we probed in our interviews to identify perceptions of factors affecting sustainability, our study period did not allow us to assess whether the intervention or strategies were in fact sustained over time. Follow-up to assess maintenance of the COACH clinical intervention, whether barriers were resolved over time, whether new barriers arose, and whether sites continued to deliver implementation strategies beyond our study period would be an opportunity for future research and would contribute to the implementation science literature.

Conclusion

We supported the implementation of the COACH intervention at 10 hospital sites in Ontario and conducted a process evaluation to assess barriers and facilitators to implementation and to design and implement strategies to address these barriers. We measured implementation efforts over a 6-month period. We identified a number of individual and contextual barriers related to COACH implementation, many of which persisted over time. Successful implementation of implementation strategies varied by site. Sites with ample time to prepare for and iteratively implement the intervention, site-specific personnel support, physical and technologic resources, leadership buy-in, strong social networks between staff, and experienced navigators more frequently reported successful implementation of the implementation strategies. We recommend a rapid assessment of barriers and facilitators to sites wishing to implement COACH, to facilitate identification of the relevant strategies that can be tailored to site needs and the context to improve success of COACH implementation.

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Data Availability

The data generated and analysed for this study are included in this published article and its supplementary information files.

Ethics Statement

This study was approved by the Unity Health Toronto Research Ethics Board (no. 16-091).

Patient Consent

The authors confirm that study participants provided verbal consent to participate.

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Disclosures

The authors have no conflicts of interest to disclose.

References

1. Lee DS, Schull MJ, Alter DA, et al. Early deaths in patients with heart failure discharged from the emergency department. Circ Heart Fail 2010;3:228-35.
2. Lee DS, Stitt A, Austin PC, et al. Prediction of heart failure mortality in emergent care. Ann Intern Med 2012;156:767-75.
3. Lee DS, Lee JS, Schull MJ, et al. Design and rationale for the Acute Congestive Heart Failure Urgent Care Evaluation: the ACUTE study. Am Heart J 2016;181:60-5.
4. Lee DS, Armstrong R, Mohamed S. Patient engagement in a trial testing a new strategy of care for acute heart failure. CMAJ 2018;190(suppl):S34-6.
5. Dunbar-Yaffe R, Stitt A, Lee JJ, Mohamed S, Lee DS. Assessing risk and preventing 30-day readmissions in decompensated heart failure: opportunity to intervene? Curr Heart Fail Rep 2015;12:309-17.
6. Lee DS, Straus SE, Farkouh ME, et al. Trial of an intervention to improve acute heart failure outcomes. N Engl J Med 2023;388:22-32.
7. Graham ID, Logan J, Harrison MB, et al. Lost in knowledge translation: time for a map? J Contin Educ Health Prof 2006;26:13-24.
8. Moore GF, Audrey S, Barker M, et al. Process evaluation of complex interventions: Medical Research Council guidance. BMJ 2015;350:h1258.
9. Durlak JA, DuPre EP. Implementation matters: a review of research on the influence of implementation on program outcomes and the factors affecting implementation. Am J Community Psychol 2008;41:327-50.
10. Lee DS, Straus SE, Austin PC, et al. Rationale and design of the comparison of outcomes and access to care for heart failure (COACH) trial: a stepped wedge cluster randomized trial. Am Heart J 2021;240:1-10.
11. Statistics Canada. Population estimates, quarterly: Q1 2017 to Q4 2018. Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901&cubeTimeFrame.startMonth=01&cubeTimeFrame.startYear=2017&cubeTimeFrame.endMonth=10&cubeTimeFrame.endYear=2018&referencePeriods=20170101%2C20181001. Accessed November 29, 2023.
12. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. Implementation Science 2012;7:37.
13. Damschroder LJ, Aron DC, Keith RE, et al. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. Implement Sci 2009;4:50.
14. Lumivero. NVivo 14—leading qualitative data analysis software with AI solution. Available at: https://lumivero.com/products/nvivo/. Accessed May 23, 2023.
15. Gagliardi AR, Berta W, Kothari A, Boyko J, Urquhart R. Integrated knowledge translation (IKT) in health care: a scoping review. Implement Sci 2016;11:38.
16. Nguyen T, Graham ID, Mrklas KJ, et al. How does integrated knowledge translation (IKT) compare to other collaborative research approaches to generating and translating knowledge? Learning from experts in the field. Health Res Policy Syst 2020;18:35.
17. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC Med Res Methodol 2013;13:117.

18. Cochrane Effective Practice and Organisation of Care (EPOC). EPOC taxonomy. Available at: https://epoc.cochrane.org/epoc-taxonomy. Accessed November 29, 2023.

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. Fahim C, Courvoisier M, Somani N, de Matas F, Straus SE. Creation of a theoretically rooted workbook to support implementers in the practice of knowledge translation. Implement Sci Commun 2023;4:99.

21. Michie S, Richardson M, Johnston M, et al. The Behavior Change Technique Taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Ann Behav Med 2013;46:81-95.

22. Michie S, Prestwich A. Are interventions theory-based? Development of a theory coding scheme. Health Psychol 2010;29:1-8.

23. Denzin Norman K. The Research Act: A Theoretical Introduction to Sociological Methods. New York: McGraw-Hill, 1978.

24. Robinson CH, Damschroder LJ. A pragmatic context assessment tool (pCAT): using a think aloud method to develop an assessment of contextual barriers to change. Implement Sci Commun 2023;4:3.

25. Bergen N, Labonté R. "Everything is perfect, and we have no problems": detecting and limiting social desirability bias in qualitative research. Qual Health Res 2020;30:783-92.

Supplementary Material

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