# How Do Care Transitions Work?

## Unraveling the Working Mechanisms of Care Transition Interventions

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**Background:** Failure of safe care transitions after hospital discharge results in unnecessary worsening of symptoms, extended period of illness or readmission to the hospital.

**Objective:** The objective of this study was to add to the understanding of the working of care transition interventions between hospital and home through unraveling the contextual elements and mechanisms that may have played a role in the success of these interventions, and by developing a conceptual model of how these components relate to each other.

**Research Design:** This was a qualitative study using in-person, semi-structured interviews, based on realist evaluation methods.

**Subjects:** A total of 26 researchers, designers, administrators, and/or practitioners of both current "leading" care transitions interventions and of less successful care transition intervention studies or practices.

**Measures:** The contextual elements and working mechanisms of the different care transition intervention studies or practices.

**Results:** Three main contextual factors (internal environment, external environment, and patient population) and 7 working mechanisms (simplifiying, verifiying, connecting, translating, coaching, monitoring, and anticipating) were found to be relevant to the outcome of care transition interventions. Context, Intervention, Mechanism, and Outcome (CIMO) configurations revealed that, in response to these contextual factors, care transition interventions triggered one or several of the mechanisms, in turn generating outcomes, including a safer care transition.

**Conclusion:** We developed a conceptual model which explains the working of care transition interventions within different contexts, and believe it can help support future successful implementation of care transition interventions.

**Key words:** care transition interventions, context, mechanisms, quality of care, conceptual model

(*Med Care* 2021;59: S387–S397)

Care transitions between health care settings are known to be hazardous. Twenty percent of patients develop an adverse event after discharge, that is, injury due to patient care, resulting in unnecessary worsening of symptoms, extended period of illness, or even readmission to the hospital.[1–3] Failure of safe care transitions between settings is associated with untimely or insufficient communication regarding the current state of the patient's health status or treatment plan with the next care clinician(s) or with the patient and any caregivers, and by insufficient follow-up and lack of communication with the patient, caregivers, and next care clinician(s) about care goals, developments to be expected and next steps in care (ie, comprehensive advance care planning).[4–6]

To target these safety problems with care transitions, many interventions have been developed in the past decade.[7] Also, health care policy measures, such as readmission penalties for hospitals in the United States and innovation programs for care transitions were created to stimulate the health care system to improve the quality and safety of care transitions.[8,9] Yet, although some trials have shown significant success of individual care transition interventions,[10–12] scaling these appears to be laborious, and outcomes remain suboptimal.[13,14] Indeed, the variability seen with implementing a care transition intervention in different environments, that is in different contexts, has consequences for its ability to improve outcomes.

Such impact of context on the working of an intervention is well known for complex interventions, which are interventions composed of interacting components.[15] They are typically delivered by individuals, aimed at patient or clinician behavior, are dependent on intervention fidelity, and lead to heterogeneity across time and place and causal complexity.[16] Care transition interventions (CTIs) between primary and secondary care represent particularly complex

interventions because they inherently overarch different care settings, often contain bundles of several intervention components[7,17] and usually include different organizational levels and several health care disciplines.

A better understanding of the contextual factors and working mechanisms of such complex CTIs may provide insight to understanding the inconsistent results of studies conducted to date, but they have not been systematically described. A realist approach for evaluating complex interventions describes how interventions might work differently in different contexts. In response to these different contexts, interventions trigger working mechanisms that generate outcomes.[18] In this approach, it is not merely the intervention itself that generates the outcome, but rather the way in which the context shapes and responds to the intervention. Pawson and Tilly describe this thinking in terms of different components: context (C) + mechanism (M) = outcome (O), or, considering the centrality of (care transition) interventions in the current study, an extended version of the CMO configuration: the CIMO (Context-Intervention-Mechanism-Outcome) configuration. Disentangling the discrete components (the C, I, M, and O) will improve understanding of the working of CTIs in different contexts as it allows researchers to understand "what works for whom in what circumstances."

This study aims to develop an understanding of the working of CTIs between hospital and home. Much has been written on specific components of CTIs (including complexity/medication management, care continuity, patient engagement, and caregiver education) and the outcomes that are used to evaluate them (including adherence and management, patient safety, clinician experience and costs) already, so the focus is on finding the (C)ontext elements and (M)echanisms that may have played a role in current CTIs.[19,20] For this, we interviewed experts on CTI research and/or implementation in the United States. We report factors on the (C)ontext and (M)echanisms predominantly, along with some illustrative CIMO configurations to understand how (I)nterventions trigger (M)echanisms in response to the (C)ontext in order to achieve (O)utcomes, and a conceptual model of how these components relate to each other generally.

## THEORETICAL CONSIDERATIONS

In safe care transitions patient involvement, continuity of care and patient safety management are main guiding principles.[21–23] No single CTI will reach its full potential when continuity of care is not appreciated.[22] Indeed, providing an environment in which the patient's disease trajectory is entirely covered and smoothly organized within and across clinicians can be considered as the "basic infrastructure" from which patient safety management in the care continuum should be organized. The patient often being the only continuously present individual in the journey from hospital to home may play an additional and distinct role in the care continuity CTIs aim to ensure.[23]

Patient safety management has particularly gained priority over the last decades, which is reflected by the development of numerous models and frameworks to promote and evaluate patient safety.[24,25] All these models and frameworks have in common that they consider the greater context in which patient safety interventions are embedded or implemented. Both Brown et al's[24] framework and Carayon et al's[25] model on patient safety research rely on the structure-process-outcome framework by Donabedian[26] and the work system model by Reason.[27] Combining both creates a chain of structures and processes—or groupings of inter-related mechanisms that act together in a particular context—along which safety interventions should be evaluated. The CIMO configurations of the CTIs included in this study— particularly their contextual factors and mechanisms—are expected to reflect aspects of patient involvement, continuity of care and patient safety management as the 3 guiding principles of safe CTIs.

## METHODS

### Study Design and Setting

An exploratory research design, conducting interviews, and focus groups with key informants, was chosen to unravel the contextual factors and working mechanisms that underpin CTIs without closing off any avenue of inquiry. Interviews were conducted with researchers, designers, administrators, and/or practitioners of both current "leading" evidence-based CTIs and of practice-based CTIs because of their first-hand perceptions, experiences and knowledge on choices, challenges, surprises, and results while implementing the CTI they worked with, from which emerged the mechanisms and context factors that may have impacted the working of current CTIs in the United States.

### Sampling Strategy and Participants

Participants were recruited through purposeful and snowball sampling: selection was based on several variables ensuring balanced representation of different CTIs, such as the effectiviness and content of the intervention. For this, we started with approaching authors of leading studies of CTIs and other experts in the authors' network and also we consulted members of the Patient-Centered Outcomes Research Institute (PCORI) transitional care expert group [Transtional Care Evidence to Action Network (TC-E2AN)]. Of the initial 30 potential interview candidates approached by e-mail, 1 candidate did not respond, 1 did not want to be interviewed because of time constraints, and 2 referred to candidates in their health care delivery system whom they thought were more appropriate (knowledgeable) for an interview on this subject. Data were gathered conducting individual interviews and one 3-person group.

### Data Collection and Analysis

Information on the context, design, and outcomes of the interventions were extracted from the original manuscripts in preparation for the interviews. Next, data were obtained by semi-structured interviews with experts in their own workplace on their experiences, perceptions, and thoughts about the design, implementation, and outcomes of the CTIs they worked with. To minimize the influence of the background of the interviewer [Researcher 1 (R1), general practitioner] on

the responses of the experts, R1 explicitly stated the reasons for doing the research and her personal interest in the topic. Key questions provided a lead for discussion (see Box 1, Supplemental Digital Content 1, http://links.lww.com/MLR/C272, which demonstrates the topic list), but topics could be tailored to the participant's needs and input based on the flow of the dialogue.[28]

Participants' consent with audio taping, the confidentiality of data collection and analysis, as well as anonymizing the data for publication, were explicitly discussed and confirmed before starting the interviews. The study was reviewed by the IRB at Brigham and Women's Hospital and Massachusetts General Hospital (Partners Human Research Committee), and was designated as exempt from further review.

A total of 23 individual interviews and one 3-person group interview were conducted, each lasting between 35 and 65 minutes. The majority of the interviews were conducted by telephone. Thematic saturation was presumably reached, although saturation is a contested concept in qualitative research.[29] All but 1 interview were audio-recorded and transcribed verbatim. Anonymized transcripts were analyzed using an integrated approach. Using the qualitative data analysis software NVivo, codes were developed both deductively as well as inductively.[30]

The pre-set coding scheme included 5 different code types that are helpful in generating themes (ie, conceptual codes, relationship codes, participant perspective codes, participant characteristic codes, and setting codes).[31] In addition, the coding scheme included codes for different factors influencing clinical practice as proposed in the framework by Vincent et al[32] on risk and safety in clinical medicine, such as institutional context and patient factors. Deductive coding was complemented by inductive coding, focusing on the different themes discussed by respondents in the interviews on context, mechanisms and outcomes of their interventions, as well as the design and components of their interventions.

The coding scheme was developed by the main researcher (R1). Codes were allowed that emerged from a first set of transcripts and were added and refined over the course of analyzing further transcripts. A second researcher (R2) reviewed the first set of transcripts, and the coding scheme was discussed. To improve the coding scheme's discriminant capability (ie, reduce coding errors), codes were discussed where there were discrepancies or confusion.[33] Unreliable codes were modified, merged or dropped and code definitions were clarified. R1 coded the full set of transcripts.

A third researcher (R3) then coded 2 transcripts against the coding scheme and codes were compared. To solve the "unitization" problem, needed for determining reliability of coding, it was decided to standardize the units of analysis of the first 2 transcripts.[33] The units of analysis were identified by R1: discrete parts of the transcripts were demarcated with a bracket and the appropriate code or codes were placed alongside the bracket. Once the transcripts had been fully coded, all the codes were removed but not the brackets. The bracketed, but no longer coded, versions were given to R3 who then coded the already bracketed sections. In this way, both researchers coded exactly the same units of text and their coding could be compared with evaluate intercoder reliability

and agreement.[34] Subsequently, R3 continued double-coding until acceptable levels of intercoder reliability and agreement were achieved.[33]

After the coding process, a thematic analysis with integrated approach was conducted to validate the naive understanding of the transcripts.[31] Scrutiny techniques (searching for repetition, linguistic connectors, and similarities/differences) were followed by processing techniques (eg, cutting and sorting) to find themes. This resulted in themes describing relevant contextual elements and mechanisms. In addition, we described examples of CIMO configurations that emerged from the interviews. Lastly, we created a conceptual model based on the study's findings.

## RESULTS

### Description of the Interviewees and Their Interventions

Baseline information describing the participants and their interventions is provided in Table 1. A total of 26 experts were interviewed, varying by clinical background (9 PCPs, 10 hospitalists, 2 general internists, 2 medical specialists, 3 nurses, 1 social worker), roles (researchers, administrators, clinician-project leaders, transition team members), and type of health care delivery system (eg, rural hospitals, large integrated delivery systems).

The interventions on which the experts were interviewed were widespread across the United States (Massachusetts, Colorado, Kentucky, Illinois, Montana, Tennessee, Washington, Oregon, Iowa, Maryland, Atlanta, New York, North Carolina, Pennsylvania, Virginia). CTIs ranged from facilitating patient navigation through the health care system to building "transition clinics."

### (C)ontextual Factors

We found 10 contextual factors, divided over 3 larger categories, relevant for the outcome of CTIs, that is through triggering mechanisms (Table 2). These factors included organizational infrastructure, individual clinician characteristics, relationship/communication between professionals, relationship between professional and patient, payment model, national expectations/culture, fragmentation of health care delivery system, patient characteristics, patient expectations, and patient role.

### (M)echanisms

We found 7 underlying mechanisms that were presumed to induce the outcomes of the CTIs (Table 3): simplifying, verifying, connecting, translating, coaching, monitoring, and anticipating. All 7 mechanisms are focused on creating a seamless follow-up of patient's medical conditions until recovery.

The first 3 mechanisms refer to improving the discharge process through managing errors as well as managing the human factors causing these errors.[35] Simplifying is about reducing the complexity of the care transition to prevent error and to expedite essential process steps. Modifications to patient instruction templates are an example of that. Verifying is about proactively confirming the essential steps in the care transition process or searching for potential errors in the care

**TABLE 1.** Baseline Characteristics

| Interviewee | Clinician | Role | State | Name of Intervention | Description of Project |
|---|---|---|---|---|---|
| 1. | FP | Res | MA | RED—Re-engineered discharge | Evaluates a 12-step standardized approach to discharge planning and discharge education in a way to promote patient safety and reduce re-hospitalization rates |
| 2. | FP | Res | CO | CTI—Care Transition Intervention | Evaluates a 4-wk program in which patients with complex care needs and family caregivers receive specific tools and work with a transition coach to learn self-management skills that will ensure their needs are met during the transition from hospital to home |
| 3. | Hosp | Res | KE | BOOST—Better Outcomes for Older adults through Safe Transitions | Identifies which transitional care services and outcomes matter most to patients and caregivers and evaluates the comparative effectiveness of ongoing multi-component efforts at improving care transitions |
| 4. | Hosp | Res/impl | IL | BOOST—Better Outcomes for Older adults through Safe Transitions | Identifies which transitional care services and outcomes matter most to patients and caregivers and evaluates the comparative effectiveness of ongoing multi-component efforts at improving care transitions |
| 5. | Psych | Res | MT | ROADMAP—Rural Options at Discharge Model of Active Planning | Tests whether a "rural options at discharge model of active planning" improves patient outcomes and reduces disparities in a frontier/rural setting |
| 6. | Hosp | Res | TN | PILL-CVD—Pharmacist Intervention for Low Literacy in Cardiovascular Disease | Determines the effect of a tailored intervention on the occurrence of clinically important medication errors after hospital discharge |
| 7. | PCP | Adm/Res | WA | Composite* | NA |
| 8. | PCP | Adm/PCP | MA | Composite | NA |
| 9. | Gen Int | Res | OR | C-TraIn—The Care Transitions Innovation | Evaluates the impact of a multicomponent transitional care improvement program (such as transitional nurse coaching and posthospital primary care linkage) on 30-d readmissions, emergency department use, transitional care quality, and mortality |
| 10. | Card | Impl | MA | Composite | NA |
| 11. | Hosp | Res/impl | IA | Care transition nurse | Tests the care coordination for hospitalized Veterans returning to VA primary care through a care transition nurse |
| 12. | PCP | Adm | TN | Composite | NA |
| 13. | Nurse | Adm/impl | | | |
| 14. | Soc work | Admimpl | | | |
| 15. | PCP | Res/cons | MD | Composite | NA |
| 16. | Nurse | Adm | AT | Composite | NA |
| 17. | Hosp | Res | NY | CCTP—Community-based care transition program | Serves as a platform to encourage new partnerships to reduce re-hospitalizations at the community level |
| 18. | PCP | Res/impl | MA | Patient Navigator | Determines if an intervention by patient navigators (PNs), hospital-based Community Health Workers, reduces readmissions among high risk, low socioeconomic status patients |
| 19. | Hosp | Res | NC | AIRTIGHT—Aiming to Improve Readmissions Through InteGrated Hospital Transitions | Evaluates the effect of referral to a provider-led integrated practice unit, inclusive of comprehensive multidisciplinary care and virtual visits, on 30-d readmission rates for high-risk hospitalized patients |
| 20. | Nurse | Res | PE | Transitional Care Model | Evaluates the evidence for a nurse-led intervention targeting older adults at risk for poor outcomes as they move across health care settings and between clinicians |
| 21. | Hosp | Impl/res | IA | Composite | NA |
| 22. | FP | Adm/res | VA | Composite | NA |
| 23. | Hosp | Res | IL | Discharge summary training curriculum | Evaluates the training of medical students on how to write effective discharge summaries |
| 24. | Hosp | Res | IL | CCP—Comprehensive Care Physian program | Tests a model in which the same physician provides care for patients in the clinic as well as in the hospital |
| 25. | Hosp | Impl/adm | NC | Transition Clinic | Develops a robust follow-up solution for patients who may be able to avoid a hospital admission with the assurance of having short term outpatient follow-up |
| 26. | FP | Res | MD | BREATHE | Examines whether patient/family engagement in a hospital-initiated 3-mo transitional care program that addresses the patient's biopsychosocial needs and advances the patient/family caregiver ability to manage the disease will (a) improve the patient's health-related quality of life and (b) reduce number of hospitalizations and ED visits |

*Composite = undefined, comprehensive approach toward improving care transitions, generally composed from other interventions' components, adapted to their own context—for example, the CMS readmission reduction program, which among others penalizes hospitals with high readmission rates.

Adm indicates Administrator; AT, Atlanta; Card, Cardiologist; CO, Colorado; Cons, consultant; FP, Family physician; Gen Int, General internist; Hosp, hospitalist; IA, Iowa; IL, Illinois; impl, implementer; KE, Kentucky; MA, Massachusetts; MD, Maryland; MT, Montana; NA, not available; NC, North Carolina; NY, New York; OR, Oregon; PCP, Primary Care Physician; Psych, psychologist; PE, Pennsylvania; Res, researcher; Soc work, Social worker; TN, Tennessee; VA, Virginia; WA, Washington.

**TABLE 2.** Contextual Factors

| Category | Factor | Example Quote |
|---|---|---|
| Internal environment (health care delivery system) | Organizational (infra)structure (*governance, culture, priority*) | *"The other thing that I will say is I think we've done very similar things for a very long time and why it is that when things don't work very well we just keep doing them. Probably deserves some thought."* [Researcher-gen. internist] |
| | Individual clinician characteristics (*individual stage of change, individual identification with the organization, role of PCP, role of hospitalist*) | *"And I think part of why I'm hesitant is because I do not want to diminish primary care's role in health care. And I you know I don't want to make it seem like I don't respect what they're doing because I absolutely do. I'm trying to portray myself as an asset to them because I think we are."* [Researcher-hospitalist] |
| | Relationship/communication between professionals (*levels of continuity of care—within the same setting, across settings*) | *"I always say it is relationship, process and outcomes, and so we are developing those relationships between us and the next provider of care…"* [Administrator] |
| | Relationship between professional and patient (*trust, respect, honesty*) | *"You know we had another lady who she ended up actually being a failure of transition and when I say failure you know a readmission. But it was re-admission because she had an acute stroke. And I believe that we were able to find it because we had the relationship that she felt comfortable calling us when she was having those symptoms and we got her in and she got taken care of you know before something worse could have happened."* [Researcher-hospitalist] |
| External environment (health care delivery market) | External policies and incentives (*governmental policies, external mandates, payment model*) | *"Nobody really is incented, other than to avoid penalties, to do the right thing. And so you rely on professionals being professionals."* [Administrator] |
| | National expectations/culture (*American culture, consequence of current American health care structure*) | *"When you would experience the system you would be unpleasantly surprised how badly some things function; how difficult it is to get things done around transitions."* [Researcher-gen. internist] |
| | Fragmentation of health care delivery system (*appropriate care setting, geography challenges*) | *"Whereas what usually happens is: Here's the prescription-follow up with your primary care provider. Good luck. 'Hail Mary pass', as we say in the States as using a football analogy. So and that's been the issue."* [Researcher-hospitalist] |
| Patient population | Patient's characteristics (*disease and disease severity, functional status, language and literacy—including health literacy, access to health care services and community-based resources, social supports*) | *"So it's quite complicated even for the physicians and nurses to kind of keep track of how to use each of these devices. And then let alone the patients, especially with low literacy patients."* [Researcher-PCP] |
| | Patient's expectations (*consistency of care, confidence, affordability*) | *"Also, patients understand that when they are discharged that 'they are better'. That follow up visits are not necessary. Also, additional payments prevent them from going. And when they go, often they don't think it was useful because the PCP fills the time with asking what happened to them in hospital because he does not have any info!"* [Researcher-gen. internist] |
| | Patient's role (*responsibility, self-efficacy, activation*) | *"Like we might say, make sure the patient knows. But that's a whole, that's like a whole module of training itself. So you can't just say it's like apply this to that, you know? Because there's new actors coming in, you know?"* [Researcher-hospitalist] |

PCP indicates primary care physician.

transition—such as ensuring patient's understanding of care plans. The third mechanism, connecting, links the diverse stakeholders (patients/caregivers and health care providers) involved in the care-chain to ensure both situational awareness in the health care chain and continuity of care, for example, between inpatient and outpatient providers.[36]

The mechanisms called "translating" and "coaching" refers to patient empowerment. Translating is about making sure that the provider's goals are translated into the patient's goals; it is also about translating medical jargon into terms understood by patients and translating care provided in the hospital to activities to be conducted in the home. Coaching is about transferring sustainable knowledge and skills to patients that help them to navigate the health care system.

The last 2 mechanisms "monitoring" and "anticipating" are about managing future health events that patients may experience after being discharged. Monitoring refers to the measures taken to ensure that changes in the patient's clinical status will be noted in a timely manner. Anticipating is about creating contingency plans or "what-if" scenarios.

The different mechanisms capture the 3 guiding principles of CTIs (patient safety management, continuity of care, and patient involvement). Depending on the aim of interventions, the different interventions from Table 1 triggered different mechanisms. Project

**TABLE 3.** Mechanisms

| Mechanism | Definition | Examples of Intervention Elements Mapping to Mechanism | Example Quote |
|---|---|---|---|
| Simplifying | Reducing the complexity of the care transition in order to prevent error and to expedite essential process steps | Modifications to Patient Instructions templates so that they are better organized<br>Having one individual in charge of the discharge process | "so they [the patients] are not on the top of the cognitive game … But the After Discharge Care Plan is key because it is like large font and colors and photographs, and the medicines are very clear." [Researcher-hospitalist] |
| Verifying | Proactively confirming the essential steps in the care transition process or searching for potential error in the care transition, such as ensuring patient's understanding of care plans, follow-up scheduling and medications | Pharmacist-led medication reconciliation at discharge<br>Using read-back techniques to ensure patient understanding | "I also learned the importance of checking and making sure that the patient and caregivers knew what they were supposed to do…" [Researcher-hospitalist] |
| Connecting | Linking the stakeholders (patient/caregivers and health care providers) involved in the care-chain. It happens on different levels: organizationally, eg, making preferred provider contracts; technically, eg, providing communication technology or simply providing telephone numbers; and emotionally, by building trust and relationships | Creating a "microblog" for all the patient's providers to easily communicate with each other<br>Providing a hotline for patients to call if they have questions or concerns after discharge | "And so for example we had to have the nurses credentialed within the primary care setting so that they could access the electronic health record for Mr. Smith regardless of where they were. And so they were seen as partners." [Researcher-hospitalist]<br>"It is about having a point of contact after discharge. The patients feeling like they had a bit of a safety net so that they weren't being discharged into a black hole." [Researcher-gen. internist] |
| Translating | Making sure that the provider's goals (preferences) are met, or that the provider's goals are translated into the patient's goals, that the recovery plan is doable in the patient's home, that patients will be able to incorporate the medical plan into their daily life | Use of motivational interviewing techniques to show how patient's priorities match to the post-discharge care plan<br>Moving more of the patient/family counselling to the post-discharge period, once the patient is home (in the environment where they will be doing their activities) | "He [the patient] said: Well you know you see. That I have this, that I have to be catheterized. That my wife has to do it. And I know that if I take up medicine that she'll have to do it more. And that, there is a sense of dignity that I feel that has been lost […] And, so we really learned a lot from that [development of CTI]. Because, we are so tempted to say that, you know, that our outcomes are what's important. That readmission rates are like the most important thing. Patients don't care a bit about that. That's not important at all. But dignity is important. Being a burden to the family is important. And this far outweighs some abstract rate that the hospital has to deal with." [Researcher-hospitalist]<br>"A patient who was advised by the hospital physiotherapist to exercise, who ended up having this very very cluttered house, so that the plan couldn't work because he couldn't get the walker through. And we didn't know!" [Researcher-PCP] |
| Coaching | Transferring sustainable knowledge and skills to patients (and any caregivers) that help them independently navigate the health care system and care for themselves | Role-playing with patients: how to handle various situations<br>Encouraging patients to do for themselves rather than doings tasks for them | "I guess empowering the patient to really being their own point of continuity, so that they can be agents in their own healthcare across sites is the key aspect" [Researcher-hospitalist]<br>"We then give them some more intensive services, better monitoring, better prepare them and their family caregivers with the skills that they need to better monitor or earlier identify symptoms that they're running into trouble. So you know it's really a philosophy of thinking about moving risk populations to a lower risk and positioning them with the knowledge and the skills and the motivation and resources to be able to do the things that they need to be doing 24/7 where you can't rely on health professionals alone to do that." [Researcher-nurse] |

*(Continued)*

**TABLE 3.** Mechanisms (*continued*)

| Mechanism | Definition | Examples of Intervention Elements Mapping to Mechanism | Example Quote |
|---|---|---|---|
| Monitoring | Ensuring that changes in the patient's clinical status will be noted in a timely manner | Scheduling tests in advance<br>Providing home monitoring equipment (eg, scales, pulse oximeter, glucose meter), ideally connected to the provider's information systems | *"So, we have shown and others have shown, that, part of project RED too is to call them two days later to reinforce the plan. And that, we know that from that data, that half the people, when they go home are doing something wrong with their medications. Half of them!. And we do get them back on track."* [Researcher-hospitalist]<br>*"…one thing that I found with these patients is they think things aren't important enough to ask. And so, and so then they wait until it's too much of a problem and it's out of control and so she [home visiting nurse] will say you know what's concerning you today? Is there something bothering you today? Something along those lines. And we are able to pull things out of people and I think they appreciate that."* [Researcher-hospitalist] |
| Anticipating | Creating contingency plans or "what-if" scenarios | Teaching patients what red flags to watch for and what to do if they occur<br>Having goals of care conversations where appropriate | *"Having said that one of the key areas that I feel people from, is gaining a little bit more understanding of how to manage that health condition in terms of what kind of symptoms to watch out for, what to do, and then also learning techniques to help them manage when they feel like out of stress in their daily living, so that they don't, that their symptoms don't end up escalating to a time when they need to call 911 and come to the hospital."* [Researcher-PCP]<br>*"Because, you know, care planning in nursing is a big deal, but, so for doctors we don't do care planning. We should, but we don't … So, it [the intervention] will deliver the components of a Hospital based discharge program, this is what the project is."* [Researcher-hospitalist] |

PCP indicates primary care physician.

CTI on introducing a transition coach to address complex care needs (row 2) triggered the Coaching mechanism predominantly, where project BOOST on multi-component transitional care services for older adults (rows 3–4) triggered all mechanisms. As another example, project CCP tests a model in which the same physician provides care for patients in the clinic as well as in the hospital (row 24) and predominantly triggered the mechanism referred to as Connecting, and project BREATHE on patient and family engagement in a transitional care program (row 26) triggered Translating and Coaching mechanisms.

## CIMO Configurations: Example

The process of formulating CIMO configurations based on the transcripts and the contextual elements and mechanisms depicted above is illustrated in Table 4. This table illustrates the predominant mechanisms underlying one of the included CTIs (project RED). This intervention is posited to work by "simplifying," "verifying," and "connecting" across the care transition process. Less emphasis was on "translating," "monitoring," "coaching," or "anticipating."

## DISCUSSION

In this study, we aimed to develop an understanding of the working of CTIs between hospital and home in the US setting. We found using interview data covering 15 different CTIs, that 3 main contextual factors and 7 working mechanisms are relevant to the outcome of CTIs. In reponse to the internal environment (health care delivery system), external environment (health care delivery market), and the patient population, CTIs trigger different mechanisms: simplifying, verifiying, connecting, translating, coaching, monitoring, and anticipating. In turn, these mechanisms are hypothesized to generate outcomes, including a safer care transition.

Examples of CIMO configurations that emerged from the interviews were provided. Rather than assembling these CIMO configurations from separately coded context, intervention, mechanism and outcome elements, these configurations were coded and extracted as linked quadrads directly from the interviews, strengthening the relationship between the 4 elements. CIMO configurations highlight the complexity (ie, breadth and variety) of how CTIs are understood to contribute to a chain of results and produce impact, thereby

**TABLE 4.** Project RED (Re-Engineered Discharge): A Standardized Hospital-based Program Designed to Provide Patients and Caregivers Information to Continue Care at Home

| Context | Mechanism | CIMO (Context—Intervention—Mechanism—Outcome) |
|---|---|---|
| Patient's characteristics | Simplifying | *These are patients who have been in a hospital and been sleep deprived. They have had maybe hypoxia, an operation, a fever, narcotic medications; so they're not on the top of the cognitive game …* But the after discharge care plan is key *because it is like large font and colors and photographs, and the medicines are very clear … so that people can actually do what it takes to care for themselves* |
| Organizational structure (*culture*) & patient's characteristics | Verifying | *Because, you know, care planning in nursing is a big deal … And that discharge summaries were being treated as care plans. And that we would sometimes, not always, give the discharge summary to the patients, as if they understood any of it. Right?* One of the tenants of project RED is that all patients have an appointment when they leave the hospital. *It says, when patient is being discharged, the nurse goes into the room with a postcard that has the next 14 d on it and says cross off the days that you are unable to keep an appointment and circle the days that you would be able to make an appointment and write in who is going to take you on those days.* So, the chances of them actually keeping the appointment are much greater if the appointment is made in that manner |
| Relationship/communication between professionals (*across settings*) | Connecting | *So, so one thing we noted, was that communication between the hospital doctors and the community doctor hardly ever happened. Directly, hardly … So I've been to hospitals, many of them, that say: Well, we can't do our discharge summaries at the time of discharge …* So, in project RED it is. That's it. Within 24 hours the information has to be sent from the hospital to the source of ongoing care … *And then, but what discharge summary is, is doctor to doctor communication … So it would be more clearly: here is the medicines, here is the diagnosis, here's the follow up plan, and here is the pending tests.* Well, and that is kind of what you need to know. Well, when we sent people to nursing homes with it, we got a lot of feedback from the nursing homes that the nurses really liked it … So then the principal would be having communication with your post discharge source of ongoing care is important |

PCP indicates primary care physician.

providing stakeholders with guidance as to what to consider when implementing these complex interventions. Indeed, current evidence suggests that CTIs are only effective within certain contexts, so there is a need to understand the mechanisms within which contexts CTIs are effective.[7,37] Ultimately, this understanding may guide the future of CTIs and implementation strategies.

The realist approach considers how interventions respond to context factors and trigger mechanisms accordingly. Taking the realist approach within the present study implied that, even though an intervention seemed successfully implemented, intervention efficacy could never be assumed (as it is not only about complying with the necessary intervention constructs for successful implementation, but also about the way these constructs respond to the context and trigger mechanisms). This is in contrast with the field of implementation science, which focuses on the constructs necessary for succesful implementation, inherently assuming intervention efficacy under conditions of perfect implementation.

Many CTIs or frameworks for CTIs build on ideas or concepts from implementation science. They focus in particular on implementing the intervention constructs as designed, or on describing which constructs should be covered in the first place.[17] The Care Transitions Framework by Rojas Smith and colleagues, building on the Consolidated Framework for Implementation Research (CFIR), addresses the influence of context by saying that "details of development and implementation vary from one context to another" and that the framework as such "provides an extensive, though not exhaustive, set of potential items that teams working on care transitions interventions research can choose."[38,39]

However, the realist approach takes the influence of context a step further, and rather than leaving out items because of the context, actively explores the response of items toward the context and how they trigger the mechanisms that actually lead to improved outcomes. On the other hand, one strength of the implementation science approach is the thoroughness with which it explores contextual issues such as Outer Setting, Inner Setting, and Characteristics of Individuals, which closely match the 3 contextual constructs identified in our study. The extensiveness of the implementation science approach, and the context sensitivity of the realist approach might well complement each other.

Combining the contextual elements and mechanisms found in this study with elements from implementation science, we propose a new model for the implementation of CTIs: the Care Transition Intervention Evaluation (Care TIE) model. The CareTIE model—inspired by Donobedian's structure-process-outcome model and Carayon's SEIPS model 2.0—roughly describes (i) the contextual factors that impact the care transition process, (ii) the components of CTIs, (iii) the (intended) mechanisms of CTIs, and (iv) the interaction between these elements (eg, context can influence how the intervention is designed, how successfully it is implemented, and how well mechanisms are triggered in response to changes in care). A visualization of the model is provided in Figure 1.

The proposed model can support stakeholders in understanding why and how CTIs work (or do not work) through disentangling the context, mechanisms, and outcomes simultaneously with their intervention constructs. Especially for the complex nature of CTIs, requiring
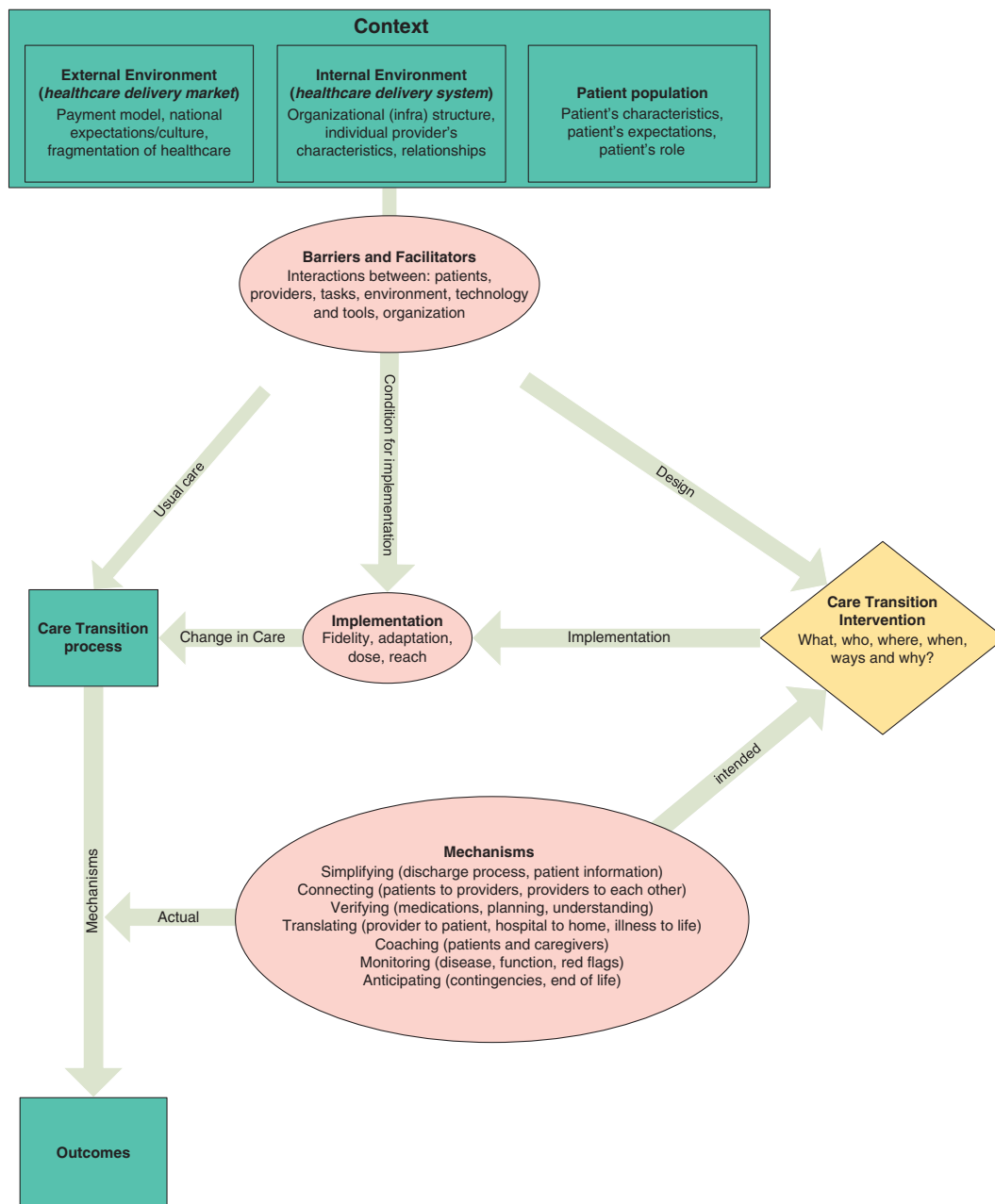
**FIGURE 1.** The Care Transition Intervention Evaluation (Care TIE) model is developed to disentangle the context, mechanisms and outcomes of care transition interventions, and to show the interaction between them. It can support stakeholders in understanding why and how care transition interventions work (or do not work).

interventions to change over time and to allow for site-specific adaptations in the form (but not the function), the model supports researchers, designers, administrators, and/or practitioners of CTIs in understanding the (changing) contextual factors and mechanisms that may influence the impact of their intervention. These contextual factors and mechanisms need to be identified in each transitional care effort. Only then can stakeholders make the interactions between the (C)ontext, (I)ntervention constructs, (M)echanisms, and (O)utcomes—for different scenarios—explicit and therefore understand why

some interventions are succesfull and others are not. For example, interventions may trigger a combination of Simplifying, Verifying, Connecting, Translating and Coaching mechanisms to address a patient population (eg, patient's characteristics) that is high risk. Approaches may include working with community-based organizations, focusing on social determinants of health, using health coaches, etc.

In our interviews, we found that the mechanisms triggered by different interventions were closely in line with the focus of these interventions. The focus of the CTI, for

example, was on patient empowerment.[10] Indeed, the mechanism we found to be triggered most often was "coaching." As a second example, the Transitional Care Model was based on continuity of care principles, and predominantly triggered "connecting," "anticipating," and "monitoring" mechanisms.[40]

Based on our findings, it seems that the mechanisms employed by the different CTIs not only correspond to the intervention goals but also to the phase(s) of the care transition process that they address. Indeed, in their systematic review on interventions to prevent rehospitalization, Hansen et al[7] introduced a subdivision in predischarge interventions, postdischarge interventions, and interventions bridging the transition. Simplifying, verifying, and connecting are mechanisms that are trigged especially during the hospitalization and discharge (bridging the transition). Translating and coaching are triggered in the same period, but have a longer time course: these mechanisms also seem to play an important role in the period after discharge. For example, project BREATHE (encouraging patient and family engagement in a 3-mo transitional care program) from Table 1 illustrates how translating and coaching are important mechanisms throughout a longer period of time. The mechanism "monitoring" seems especially and exclusively important in the period after discharge, and finally, the mechanism described here as "anticipating" seems to be triggered throughout the entire period from predischarge to postdischarge.

However, while some of the interventions are largely covered by 1 of the 3 intervention types introduced by Hansen and colleagues, many interventions included in the present study had some aspects of all 3 types, trying to achieve many or all working mechanisms. Project BOOST (evaluating ongoing multi-component efforts to improve care transitions) from Table 1 is an example of such an intervention that addresses all phases of the care transition process and accordingly attempts to trigger all mechanisms. Such "kitchen sink models" may be necessary to achieve impact, since poor postdischarge outcomes may be due to a wide variety of causes, along several phases of the care transition process. Indeed, one review found that the more domains a transitional care intervention included, the more successful it was likely to be.[41]

Ideally, future studies of CTIs explicitly identify the mechanisms by which their intervention is supposed to influence outcomes, optimize the intervention, and its implementation, given the environmental context, such that achievement of these mechanisms is maximized. For transparency, future studies should report on each CIMO domain (Context, Intervention, Mechanisms, and Outcomes) so that stakeholders can understand why the intervention was or was not successful.

The present study has strengths and limitations. The main strength of the present study is that contextual elements and mechanisms were disentangled from empirical data of 24 different interventions. These CTIs ranged from facilitating patient navigation through the health care system to building transition clinics. Moreover, the study was conducted and reported according to the consolidated criteria for reporting qualitative studies (COREQ) checklist.[29] The study, however, contains data from the United States only. Nevertheless, the interventions on which the experts were interviewed were

widespread across the United States, so we believe that most of the context and element mechanisms that we found are relevant to other healthcare systems as well.[42]

In summary, we attempted to understand the contextual elements and mechanisms of complex interventions by interviewing experts. The formal realist methodology "prescribes" the development of potential C-I-M-O configurations (eg, based on interviews) as a first step toward understanding how interventions might work differently in different contexts.[43] We performed this step in the current research. The next step in realist evaluation is to challenge the findings with (other) empirical data, including more recently conducted studies (eg, those recently funded by the Patient-Centered Outcomes Research Institute); this should be undertaken in the future. Another step will be to determine how best to measure these different constructs in real time to allow for a more thorough understanding of which interventions are most effective in different contexts.

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