



# Transitions of Care from Hospital to Home: An Overview of Systematic Reviews and Recommendations for Improving Transitional Care in the Veterans Health Administration

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## PREFACE

Quality Enhancement Research Initiative's (QUERI) Evidence-based Synthesis Program (ESP) was established to provide timely and accurate syntheses of targeted healthcare topics of particular importance to Veterans Affairs (VA) clinicians, managers and policymakers as they work to improve the health and healthcare of Veterans. The ESP disseminates these reports throughout the VA, and some evidence syntheses inform the clinical guidelines of large professional organizations.

QUERI provides funding for four ESP Centers and each Center has an active university affiliation. The ESP Centers generate evidence syntheses on important clinical practice topics, and these reports help:

- develop clinical policies informed by evidence;
- guide the implementation of effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- set the direction for future research to address gaps in clinical knowledge.

In 2009, the ESP Coordinating Center was created to expand the capacity of HSR&D Central Office and the four ESP sites by developing and maintaining program processes. In addition, the Center established a Steering Committee comprised of QUERI field-based investigators, VA Patient Care Services, Office of Quality and Performance, and Veterans Integrated Service Networks (VISN) Clinical Management Officers. The Steering Committee provides program oversight, guides strategic planning, coordinates dissemination activities, and develops collaborations with VA leadership to identify new ESP topics of importance to Veterans and the VA healthcare system.

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## EXECUTIVE SUMMARY

### INTRODUCTION

Health care systems are increasingly focused on efforts to reduce hospital readmissions; a wide variety of evidence exists on interventions to reduce readmissions, and national and local quality improvement efforts focused on transitional care have also been developed.

Transitional care interventions can be resource intensive, however, and can include many different components. For health systems that endeavor to improve the transitional care experience for their patients, it is a challenge to define the specific nature of interventions they should adopt, as well as which patient populations they should target.

This report broadly summarizes evidence examining the effects of transitional care interventions. In particular, the report identifies key themes that have emerged across the transitional care intervention literature that clarify which types of intervention are associated with reduced readmissions and/or mortality, whether intervention effects differ depending on the setting in which they are implemented, and whether effects differ across patient populations. Additionally, we outline potential policy implications based on the themes emerging from the evidence as well as our own clinical, research, and policy experience with transitional care within the Veterans Health Administration (VHA).

### METHODS

We conducted a review of published systematic reviews. We were broadly inclusive of many types of interventions, but focused on reviews that reported hospital readmissions as an outcome, regardless of whether it was the primary outcome. Within each patient population or intervention type of interest, we identified the most recent and comprehensive reviews meeting key quality criteria. We also examined the effects of transitional care activities within the context of the medical home, given its relevance to the current VA practice environment.

One investigator reviewed titles and abstracts for relevance. Two investigators independently reviewed potentially relevant full-text articles for inclusion. Any disagreements were resolved through consensus.

From each review we abstracted characteristics of the study population, outcomes, and intervention, as well as any data that would inform intervention implementation. Narrative syntheses were compiled for distinct patient populations and intervention types. These narratives were reviewed independently by each of the authors of this report, who then identified key themes in the evidence as well as recommendations for stakeholders based on their interpretation of the narratives. Policy implications were informed by interpretation of the evidence in the context of the clinical and research experience of different members of the study team.

### RESULTS

We reviewed 807 titles and abstracts from the electronic search, and identified an additional 125 from reviewing reference lists and performing manual searches for recently published and unpublished or ongoing studies. Eighty-three systematic reviews met our inclusion criteria and, of these, we selected 17 that were most recent and broadly scoped. Seven reviews focused on

specific patient populations, and another 10 reviews were organized according to intervention type.

### **Which transitional care intervention characteristics are associated with reductions in readmission rates?**

Overall, it is very difficult to identify specific intervention characteristics that are necessary for successful care transitions. There is some consistency among different patient populations and settings that successful interventions are more comprehensive, involve more aspects of the care transition, extend beyond the hospital stay, and are flexible enough to respond to individual patient needs. However, the strength of evidence supporting these overarching conclusions should be considered low because these conclusions are derived from indirect, post-hoc comparisons that include many different types of interventions implemented in a variety of ways among dissimilar populations and clinical settings. We found very little comparative effectiveness data.

### **Do the effects of transitional care interventions vary depending on the setting in which they are implemented?**

The design of an intervention and its effects may depend on factors such as the presence of a shared electronic medical record, access to community resources, integration of primary and hospital care, and the presence of a medical home. However, we found no evidence directly examining whether an intervention's effectiveness depends on the health system context within which it is implemented. Moreover, the transitional care literature generally provided only scant descriptions of the health system context of the interventions. We identified 9 studies conducted in VA settings. Overall, there is no clear pattern of effect differences between studies conducted in VA and non-VA settings.

#### *Transitions of care and the patient-centered medical home*

A 2012 review included 31 studies of PCMH interventions, which commonly included hospital-to-home transitional care coordination. The authors found moderate-strength evidence that PCMH interventions were associated with higher patient-reported levels of care coordination. They found low-strength evidence that PCMH interventions decreased emergency room use, though it is unclear which components of the PCMH mediated this effect. By contrast, they found low-strength evidence that PCMH had no effect on hospital admissions.

### **How does the choice of patient population targeted influence the effects of transitional care interventions?**

Many of the studies in these reviews identified high-risk patients for inclusion based simply on age, comorbidity, and/or prior utilization characteristics. The relative importance of careful patient selection compared to intervening in unselected populations is unclear, in part because most studies used some degree of patient selection and few reviews explicitly examined effects based on patient selection.

We found inconsistent results among reviews examining interventions in specific populations. General medical, geriatric, and congestive heart failure (CHF) patients have been the most frequently studied and there are several types of interventions that have been effective in these populations. On the other hand, there is little evidence that COPD patients benefit from

transitional care interventions, though most of the interventions took place only in the post-discharge setting. There was not enough good-quality literature in mental health or surgical populations to draw firm conclusions.

## DISCUSSION

### Summary of findings

We examined 17 systematic reviews across different patient populations and representing a variety of intervention types in order to provide a broad overview of the care transitions literature. While there have been numerous examples of interventions that reduced readmission rates, there were no patient population or intervention type categories within which transitional care interventions were uniformly successful.

It is not surprising that there are many sources of heterogeneity in a field as broadly defined as transitional care. Variation in populations studied, intervention characteristics, personnel, outcomes measured, and settings make it difficult to identify definitive recommendations for a specific intervention that should be broadly applied. Nevertheless, we were able to draw several generalizations from the literature.

- 1) Interventions that address more components of the care transition are probably better than those that address fewer.
- 2) Successful interventions tended to include the means to assess and respond to individual peri-discharge needs.
- 3) There is very little data supporting the effectiveness of interventions isolated to either the pre- or post-discharge settings. Successful interventions which were largely implemented in one setting often included components (such as home visits, a single point of contact, and/or telephone calls) that bridged settings. On the other hand, in select populations such as patients with CHF, there is some evidence supporting post-discharge interventions such as structured telephone support and multidisciplinary CHF clinics.
- 4) It is not clear to what extent and for whom post-discharge home visits are a necessary component of care transitions.
- 5) The vast majority of the care transitions literature has been hospital-focused, with very little literature examining the role of primary care teams during the transitions of care. There is a growing literature examining the effects of medical home interventions, most of which include cross-site care coordination activities; however, the characteristics of successful care transitions within the medical home context have not been well explored.
- 6) Many interventions that have demonstrated a reduction in readmission rates have included patients at high risk for readmission because of underlying comorbidities such as CHF and/or because of additional factors such as prior utilization.
- 7) Interventions designed to address the needs of patients with complex, chronic medical illness have been the best studied. It is unclear whether the success of some interventions studied in these patient populations reflects the content expertise that intervention personnel might develop in working with specific patient populations, higher baseline risk of poor outcomes among these patients, or sensitivity of chronic medical illness to transitional care improvements. However, there are many notable exceptions even among

patients with chronic medical illness – for example, we found little evidence of benefit in COPD populations, though many transitional care components were absent in these studies. There is little good-quality transitional care literature in mental health or surgical populations.

- 8) Reviews that examined effects by year of publication suggest that many of the interventions demonstrating benefit were conducted more than a decade ago.
- 9) In order to allow for better collation of results from trials, development of a standard taxonomy is needed. This taxonomy should include both population descriptors as well as intervention descriptors.

## **Policy implications**

In the main report, we present several policy implications along with a brief discussion and rationale for each. There are likely many steps of the care transition that, if missed, could hinder the quality of the care transition. We recommend each institution use a standardized approach to diagnose transitional care gaps. We have included a transitional care “map” that could be used for such assessments. We do not suggest that each step is necessary for every patient. We also suggest that the VHA could harness existing infrastructures such as PACT and home-based primary care to accomplish pieces of the care transition that had previously been accomplished in the intervention literature by additional transitional care nurses. Because some transitional care intervention activities can be resource intensive, we provide some discussion about the potential merits and pitfalls of risk assessment to identify high-risk patients for intervention. Finally, we suggest the VHA critically examine the current broad-based implementation of post-discharge telephone calls.

## **Future research**

In general, there is an overarching need for better evidence to guide selection and implementation of complex, multicomponent transitional care interventions in different settings. One of the major weaknesses of the transitional care literature is the marked variation in intervention definitions, timing of outcome follow-up, and descriptions of interventions and usual care. As VA conducts more research in this field, use of taxonomies to guide study design and description may help standardize reporting. In addition to this work, there are a number of more specific areas of investigation listed in the main report, including an urgent need for more work in mental health and surgical populations, a need for more comparative effectiveness research, and the development of continuous quality improvement mechanisms that integrate inpatient and outpatient personnel.

## **Limitations**

Our intent was to provide a broad overview of a complex literature, and to identify emerging themes that could help to define policy recommendations. However, we acknowledge that our chosen approach has a number of important limitations including its broad scope rather than in-depth analysis; the lack of formal strength of evidence ratings for our summary conclusions, though we suggest the overall strength of evidence be considered low; our use of readmissions outcomes as an inclusion criteria; and our reliance on previous systematic reviews which might not include more recently published studies. Our policy recommendations are informed by

evidence but also incorporate practical considerations and our own experience, and therefore are partly subjective in nature.

## Conclusions

The literature includes many different types of interventions, studied in varied populations and clinical settings, and implemented in different ways, but there is no commonly used taxonomy describing the various factors. Furthermore, there is very little comparative effectiveness data. It is, therefore, very difficult to identify specific intervention components and characteristics that are necessary for successful care transitions. In general, successful interventions are more comprehensive, touch on more aspects of the care transition, extend beyond the hospital stay, and are flexible enough to respond to individual patient needs. Transitional care interventions have not been well studied within integrated health systems and within the medical home context. Future work should focus on how best to incorporate outpatient teams into transitional care improvement processes.

# EVIDENCE REPORT

## BACKGROUND

The hospital-to-home transition marks an abrupt shift from intensive, provider-driven care to self-managed care, and, often, from one set of inpatient providers to an entirely different set of outpatient providers. After hospital discharge, patients in both VA and non-VA settings are uncertain how to manage their health care.<sup>1-3</sup> They are also at increased risk for adverse events,<sup>4-6</sup> and for hospital readmissions which are common and costly.<sup>5-9</sup> About one in 5 older Medicare beneficiaries is readmitted within 30 days of hospital discharge at an annual estimated cost of \$17 billion. Similarly, 15-20% of Veterans hospitalized with higher-risk conditions such as congestive heart failure (CHF), chronic obstructive pulmonary disease, or myocardial infarction are readmitted within 30 days, while nearly one-quarter of those with chronic mental illness experiences a 30 day readmission.<sup>10</sup> In 2011, the total cost of 30 day readmissions to the Veterans Health Administration (VHA) was \$1.2 billion.<sup>10</sup>

Transitional care has been defined as “a set of actions designed to ensure the coordination and continuity of healthcare as patients transfer between different locations or different levels of care within the same location.”<sup>7</sup> Early studies showed that nurse-led transitional care interventions beginning in the hospital and continuing after discharge had the potential to reduce the rate of hospital readmissions.<sup>2,11</sup> Given the promise of these early interventions and several subsequent Center for Medicaid and Medicare Service (CMS) policy initiatives designed to help promote uptake of transitional care quality improvements,<sup>12,13</sup> transitional care intervention studies have proliferated in recent years.

Currently, like many health systems, the VHA must decide how to approach care transitions. In 2010, VHA began a nationwide effort to implement a version of the medical home model of care, called Patient Aligned Care Teams (PACT), in which care coordination is a key principle.<sup>14</sup> The VHA has also instituted a goal to have PACT nurse care managers call most patients within 2 business days of hospital discharge. There is no other broadly adopted approach to transitional care in VA settings. Further transitional care efforts might require additional investment in transitional care, but the benefits of such interventions in VA settings and for Veteran populations are not well understood.

Transitional care interventions are complex and often involve multiple components. The potential success or failure of these complex health systems interventions may depend on the nature of the interventions themselves, the settings in which they were implemented, and/or the populations included. This report aims to broadly summarize the effects of transitional care interventions in different patient populations and settings, as well as the effects of particular types of transitional care interventions on readmission rates and mortality. We also identify key themes about implementing transitional care interventions that have emerged across the literature, and provide some practical recommendations to improve care transitions in VHA and guide future research.

## METHODS

We conducted a review of published systematic reviews. “Transitional care” is a loose, broadly defined term that can be applied to many different types of interventions and has been studied in many different patient populations. We use the term “intervention type” to refer to single- or multicomponent interventions that used a similar approach or bundle of care processes (*eg*, telemonitoring, hospital-at-home), or addressed a similar aspect or key process of the care transition (*eg*, medication reconciliation). Patient populations are defined according to clinical condition (*eg*, CHF) or demographic characteristics (*eg*, geriatric). There are numerous characteristics that further distinguish interventions from one another. “Intervention characteristics” refer to any of the following (derived from an existing taxonomy)<sup>15</sup>: transition type (hospital to home, hospital to nursing facility), intervention target (patient, caregiver), key processes (education, personal health record), key personnel involved (nurse, social worker), method of contact (phone, home visits), and intensity and complexity.

From an initial review of the literature, we recognized that most systematic reviews typically either examined different transitional care intervention types in a given patient population, or examined a given intervention type in a variety of patient populations. We identified categories of patient populations and intervention types to help guide our literature search, study selection, and synthesis (Appendix A, Tables 1 and 2). The intervention type and patient population categories were developed iteratively with input from a panel of content experts, a “horizon scan” of the literature, and with input from our study team. The search strategy is presented in Appendix B.

We focused on reviews that reported hospital readmissions as an outcome, regardless of whether it was the primary outcome. However, we summarized other outcomes reported by each review.

Within each patient population or intervention type of interest, we first identified reviews that fulfilled key quality criteria: 1) clearly reported their search strategy, 2) reported inclusion and exclusion criteria, and 3) conducted an appraisal of the internal validity of the included trials.<sup>16,17</sup> If there was more than one review within each category fulfilling these criteria, we prioritized the most recent review and, if there were several recent reviews meeting quality criteria, we prioritized those with the broadest scope. We discussed the ultimate choice of review as a group and resolved any disagreements through consensus.

Because of its relevance to the current VA practice environment, we also reviewed medical home literature to examine the effects of transitional care activities within the context of the medical home (see search strategy, Appendix B).

From each review we abstracted search dates, inclusion criteria, patient population characteristics, readmission and mortality outcomes, other clinical and utilization outcomes, and any data that would inform intervention implementation (*ie*, characteristics of the setting or the intervention that modified the effect of the intervention). We also developed brief narrative summaries of findings for each patient population or intervention type. These narratives were compiled into a single document and reviewed independently by each of the authors of this report, who then compiled a brief list of key themes in the evidence as well as recommendations for stakeholders based on their interpretation of the narratives.

Policy implications were informed by interpretation of the evidence in the context of clinical and research experience of different members of the study team, which includes: experience with implementation and evaluation of transitional care interventions (DLK, HE), readmissions policy research (DLK, SJ, HE, DK), medical home implementation and evaluation in VA (DLK), administrative leadership (DK, HE), inpatient clinical practice in VA (DLK, DK, JC, KR) and non-VA settings (HE), outpatient clinical practice in VA (DLK) and non-VA settings (HE), and policy development at federal and state levels (SJ).

## RESULTS

We reviewed 807 titles and abstracts from the electronic search, and identified an additional 94 from reviewing reference lists and performing manual searches for recently published and unpublished or ongoing studies (Appendix C, Figure 1). Eighty-one systematic reviews met our inclusion criteria and, of these, we selected 17 that were the most recent and broadly scoped.

We selected a representative review for 7 patient populations and 10 intervention types. The effects of transitional care interventions on hospital readmissions and mortality are summarized in Tables 1 and 2 (Appendix A). The effects of interventions on other clinical and utilization outcomes are summarized in Tables 3 and 4 (Appendix A), along with any information from the reviews relevant to implementation considerations (setting or intervention characteristics). All reviews used reproducible systematic searches, specified inclusion and exclusion criteria, and assessed the quality of included studies (most using established criteria – see Tables 1 and 2). Almost none of the reviews, however, rated the strength of the overall body of evidence.

### WHAT TRANSITIONAL CARE INTERVENTION CHARACTERISTICS ARE ASSOCIATED WITH REDUCTIONS IN READMISSION RATES?

Overall, it is very difficult to identify specific intervention characteristics that are necessary for successful care transitions. There is some consistency among different patient populations and different settings that successful interventions are more comprehensive, touch on more aspects of the care transition, extend beyond the hospital stay, and are flexible enough to respond to individual patient needs. However, the strength of evidence supporting these overarching conclusions should be considered low because these are indirect, post-hoc comparisons across literature that includes many different intervention types, studied in varied populations and clinical settings, and implemented in different ways. We found very little comparative effectiveness data.

#### Transitions of care taxonomies

Two reviews developed detailed taxonomies to guide their analysis of the literature.<sup>15,18</sup> One review examined transitional care interventions in patients with stroke or MI, and explicitly set out to define the key characteristics of interventions and to determine whether outcome effects were modified by intervention, patient, or system characteristics.<sup>15</sup> Their taxonomy specifies a number of intervention characteristics including: 1) transition type (hospital to home, nursing facility to home), 2) intervention target (patient, caregiver, or provider), 3) key processes (education, counseling, *etc*), 4) key personnel involved, 5) method of contact, 6) intensity and complexity, and 7) outcomes targeted.

Despite the development of a detailed taxonomy and a large number of fair- and good-quality trials, the authors were unable to draw firm conclusions about which intervention characteristics are associated with benefit, and how population and health system setting characteristics might modify effects. They cited inconsistency in intervention and usual care definitions, lack of statistical power, variation in study endpoints, methodologic shortcomings of some studies, and limited generalizability (most studies were single-site and non-US) as key limitations to the body of evidence.

A more recent review developed a similar type of taxonomy. The authors also systematically characterized intervention intensity by creating a “comprehensive support” variable which was based on number of patient interactions, number of personnel involved, number of intervention components, and the ability of the intervention to address self-management needs. A meta-regression including 42 trials, the vast majority of which included general medical patients or patients with CHF and were considered to be methodologically sound, found interventions were overall associated with reductions in readmissions (pooled RR 0.82, 95%CI 0.73-0.91). They found the observed benefits were mostly contributed by interventions with the most comprehensive support (RR readmission in the 7 studies with highest comprehensive support scores compared to 15 studies with the lowest scores, 0.63, 95% CI 0.43-0.91). They also found that the observed benefit was mainly limited to studies published before 2002 (RR readmission of studies published in 2002 or after, 1.47, 95% CI 1.10-1.96). They speculate that, over the last decade, usual care has improved, making it more difficult to demonstrate the incremental benefit of transitional care interventions.

### The effects of different intervention types

An Agency for Healthcare Research and Quality (AHRQ) review in patients with CHF categorized interventions into one of 6 types: home-visiting programs, structured telephone support, telemonitoring, outpatient clinic-based (which included multidisciplinary CHF clinics, primarily educational, and other).<sup>19</sup> This review found interventions with multidisciplinary HF clinic visits or home visits reduced both all-cause readmissions and mortality, with NNTs below 10 for readmission and 18-33 for mortality (for MDS-HF clinic and home visiting programs, respectively). Structured telephone support interventions produced a similar mortality benefit but did not reduce all-cause readmissions. The authors of this CHF review found that, across intervention types, the key processes of care that seemed to be associated with reduced readmissions included: self-management education delivered in person, early post-discharge contact, a point of post-discharge contact, and the ability to individually tailor the intervention.

One review of patients with stroke or myocardial infarction described 5 intervention types: 1) hospital-based discharge preparation, 2) hospital-based patient and family education, 3) community-based patient and family education, 4) community-based models of support interventions, and 5) chronic disease management models of care.<sup>20</sup> They found moderate-strength evidence that early supported discharge of stroke patients (short hospital stay followed by intensive home care with a multidisciplinary team) shortened length of stay without adversely impacting readmissions or mortality. Specialty care after an MI was associated with reduced mortality, but the strength of evidence was low (largely from one VA observational study).

Tables 2 and 4 summarize reviews focused on specific intervention types (Appendix A). Several show promise in reducing readmissions and/or mortality.<sup>21-23</sup> Many of the more successful interventions, in reality, touched on numerous aspects of the care transition and took place across settings. For example, according to a Cochrane review updated in 2013, there is moderate-strength evidence that structured and individually tailored discharge planning reduces readmissions within 90 days, and hospital length of stay.<sup>21</sup> However, the discharge planning interventions were likely complex and included numerous care processes, with substantial variation among studies in the exact combination of care processes used. In 9 of the interventions, a nurse “advocate” helped with discharge planning activities and care coordination. Twelve of the interventions included post-discharge follow-up.

By contrast, a review of COPD patients found 5 trials of interventions that began after hospital discharge and did not include many care processes – such as provider continuity, ensuring post-discharge follow-up, and patient-centered discharge education – that have been part of interventions that were successful in other populations. The interventions did not consistently reduce readmissions or mortality.<sup>24</sup>

Kwan et al examined peri-discharge medication reconciliation interventions.<sup>23</sup> They found one intervention that reduced clinically significant adverse drug events (ADE) and post-discharge utilization, but this intervention included additional care processes such as post-discharge follow-up.<sup>25</sup> They otherwise found that interventions focused largely on medication reconciliation found many clinically significant unintended discrepancies (median proportion of patients with at least one discrepancy, 45%), but little evidence that these focused interventions impacted utilization or reduced ADE.

## Home visits

It is unclear whether home visits are a necessary component of transitional care interventions. A meta-analysis of trials including general medicine or CHF patients did not find that the setting of care delivery influenced outcomes; however, all but one of the most comprehensive interventions included home visits in their model.<sup>18</sup> On the other hand, the CHF review discussed above found evidence in support of interventions that did and did not include a home visit component.<sup>19</sup> They found insufficient evidence directly comparing interventions with and without home visits.

Hospital-at-home interventions were associated with reductions in readmissions and mortality across 61 trials, among which medical populations were best studied.<sup>22</sup> Specific components of the included interventions were not well-described, and periods of observation for outcomes were not specified. Interventions were associated with greater patient and caregiver satisfaction in the vast majority of studies reporting such outcomes. The interventions examined in this review were largely designed to substitute home care for part or all of a hospitalization, though the degree of “admission substitution” did not appear to be associated with differences in effects. Of note, similar to the Leppin review, they found that much of the observed benefit was found in studies published before 2003.<sup>22</sup>

## Telephone-based and telemonitoring interventions

One review focused on post-discharge remote monitoring, mostly with telephone, in patients with CHF.<sup>26,27</sup> Similar to the 2014 AHRQ CHF review referenced above, there were 2 types of telephone interventions described: structured telephone support and telemonitoring. Structured telephone support (STS) interventions typically included periodic scripted telephone calls from nurses to review symptoms, interval physiologic data such as weight, and self-management skills. Telemonitoring interventions, on the other hand, focused on remote monitoring of physiologic data and, typically, further phone contact was only triggered by abnormal vital signs or weights. STS interventions reduced long-term ( $\geq 6$  month), but not short-term (2-3 month) heart failure readmissions, and were associated with reduced long-term mortality.<sup>19,27</sup> Though one review noted a trend towards reduced mortality with telemonitoring interventions, both reviews noted the substantial methodologic shortcomings of this literature and the inconsistency of results across studies. The AHRQ review found insufficient evidence (one methodologically flawed trial) of the comparative effectiveness of STS and telemonitoring interventions.

Two reviews examined the effects of post-discharge follow-up calls. An older Cochrane review from 2006 focused on calls performed by hospital-based personnel.<sup>28</sup> Though 33 studies including 5,110 patients were included in this review, there was inconclusive evidence of the effectiveness of these interventions, largely because of the low methodologic quality of most included studies. A more recent review included 3 studies of calls delivered by primary care personnel.<sup>29</sup> The authors of this review similarly concluded there was insufficient evidence of the effects of post discharge calls on utilization, though they did find that the interventions were associated with higher rates of primary care engagement.

### **Do the effects of transitional care interventions vary depending on the setting in which they are implemented?**

Theoretically, the design of an intervention and its effects might depend on factors such as the presence of a shared electronic medical record, access to community resources, integration of primary and hospital care, and the presence of a medical home. However, we found no evidence directly examining whether intervention effectiveness depends on the health system context within which they are implemented. Moreover, the transitional care literature generally has provided only scant descriptions of the health system context of the interventions.

#### **VA studies**

From the reviews included in our report, we identified 9 studies conducted in VA settings summarized in Table 5 (Appendix A). Overall, there is no clear pattern of effect differences between studies conducted in VA and non-VA settings, but there are relatively few studies. Of note, 2 studies examining the effects of increasing primary care access were conducted in VA settings – both actually found an increased risk of readmissions.<sup>30,31</sup>

#### *Transitions of care and the patient-centered medical home*

A recent review for AHRQ included 31 studies of PCMH interventions, most of which included care coordination activities – most commonly, hospital-to-home transitional care coordination.<sup>32</sup> The authors found moderate-strength evidence that PCMH interventions were associated with higher patient-reported levels of care coordination. They found low-strength evidence that PCMH interventions lowered emergency room use, though it is unclear which components of the PCMH mediated this effect. On the other hand, they found low-strength evidence that PCMH had no effect on hospital admissions (readmissions were not reported separately).

### **How does the choice of patient population targeted influence the effects of transitional care interventions?**

The relative importance of careful patient selection, as compared to intervening on an unselected group of patients, is unclear. Many studies in these reviews used inclusion criteria which selected patients who were at high risk for readmission because of older age, significant medical comorbidity, and/or a history of high utilization. However, few reviews explicitly examined variation of intervention effects based on patient criteria. One review found studies that did and did not use high-risk patient selection criteria had similar results.<sup>23</sup> A meta-regression of trials including general medical or CHF populations did not find significantly different effects between studies without age restrictions and those which included only patients over 65 years of age (interaction p = 0.24).<sup>18</sup> Similarly, a review of hospital-at-home studies did not find a clear difference in effects among studies in patients younger than 70, 70-73, and older than 74 years.<sup>22</sup>

While many studies identified high-risk populations based on simple inclusion criteria, almost no studies explicitly used multivariable readmission risk prediction tools to identify high-risk patients for inclusion. We found one review with one trial comparing the effects of risk-prioritized post-discharge telephone calls to unprioritized calls.<sup>33</sup> Groups were randomized and matched on key demographic and comorbidity characteristics. The call structure and health care team were the same in both groups, but calls in the intervention group were delivered first to the sickest patients as defined by an electronic utilization prediction tool. Calls in the intervention group were delivered sooner. There were significantly fewer readmissions in the intervention group over 30 days.

Some of the reviews also speculated that focusing on specific groups of patients allowed disease-specific customization of interventions and supported expertise development. For example, one review found that interventions in acute myocardial infarction patients which focused on effective use of disease-specific medications were associated with a mortality benefit, though this was largely driven by one study.<sup>34</sup> Another review examining comprehensive geriatric assessment interventions found that gains in the combined outcome of mortality and functional decline were only associated with interventions delivered in a geriatric ward setting.<sup>35</sup> The authors speculate that the multidisciplinary team of providers developed more expertise and facility with the patient population.

We found inconsistent results among reviews examining interventions focused on specific populations. There were several types of interventions that improved readmissions and/or mortality in CHF patients.<sup>19</sup> Multidisciplinary post-discharge heart failure clinics were associated with reduction in readmissions, while primary care based follow-up interventions did not improve outcomes. In one review of studies in COPD patients there was no consistent evidence of benefit, and one of the interventions was associated with increased mortality. However, the vast majority of intervention components in these studies took place after hospital discharge so it is unclear if the differences in results between CHF and COPD populations relate to patient population or the interventions themselves. There was not enough good-quality literature in mental health or surgical populations to draw firm conclusions.

## DISCUSSION

### SUMMARY OF FINDINGS

We examined 17 systematic reviews across different patient populations and representing a variety of intervention types in order to provide a broad overview of the care transitions literature. While there have been numerous examples of interventions that have been successful in reducing readmission rates, there were no patient population or intervention categories within which transitional care interventions were uniformly successful.

It is not surprising that there are many sources of heterogeneity in a field as broadly defined as transitional care. Variations in population studied, intervention definition, personnel, outcome definition, and setting make it difficult to identify definitive recommendations in support of a specific intervention type that should be broadly implemented. Nevertheless, there are several important generalizations we drew from the literature.

- 1) Interventions that address more components of the care transition are probably better than those that address fewer.
- 2) Successful interventions tended to include the means to assess and respond to individual peri-discharge needs.
- 3) There is very little data supporting the effectiveness of interventions isolated to either the pre- or post-discharge settings. Successful interventions which were largely implemented in one setting still often included components (such as home visits, a single point of contact, and/or telephone calls) that bridged settings. On the other hand, in select populations – such as patients with CHF – there is some evidence supporting post-discharge interventions such as structured telephone support and multidisciplinary CHF clinics.
- 4) It is not clear to what extent and for whom post-discharge home visits are a necessary component of care transitions.
- 5) The vast majority of the care transitions literature has been hospital-focused, with very little literature examining the role of primary care teams during the transitions of care. There is a growing literature examining the effects of medical home interventions, most of which include cross-site care coordination activities; however, the characteristics of successful care transitions within the medical home context have not been well explored.
- 6) Many interventions that have demonstrated a reduction in readmission rates have included patients at high risk for rehospitalization because of underlying comorbidities such as CHF and/or because of additional factors such as prior utilization.
- 7) Interventions designed to address the needs of patients with complex, chronic medical illness have been the best studied. It is unclear whether the success of some interventions studied in these patient populations reflects the content expertise intervention personnel might develop in working with specific patient populations, the higher baseline risk of poor outcomes among these patients, or sensitivity of chronic medical illness to transitional care improvements. However, there are many notable exceptions even among patients with chronic medical illness – for example, we found little evidence of benefit in COPD populations, though many transitional care components were missing from these

studies. There is little good-quality transitional care literature in mental health or surgical populations.

- 8) Reviews that assessed the association between timing of publication and outcome effects, suggest that many of the interventions demonstrating benefit were conducted more than a decade ago.
- 9) In order to allow for better collation of results from trials, development of a standard taxonomy is needed. This taxonomy should include both population descriptors as well as intervention descriptors.

## POLICY IMPLICATIONS

### **Understand the spectrum of care transitions activities and diagnose systems gaps**

There are many potential steps in the care transition that, if not sufficiently addressed, could degrade the quality of the care transition. Focusing on just one of these steps – like medication reconciliation – alone is unlikely to yield big changes for a population of patients. The pathways to readmission are likely many, as suggested both by the inability to accurately anticipate which patients will be readmitted,<sup>36</sup> and by case review studies characterizing underlying factors contributing to preventable readmissions.<sup>30</sup> As discussed above, one of the recurring themes in the literature is that interventions which account for more aspects of the care transition and bridge in- and outpatient sites of care tend to be more successful.

The problems with recommending that a specific intervention be broadly implemented across VA sites include both the lack of evidence supporting such a recommendation and the likelihood that the transitional care gaps are not the same in all VAs, nor for all populations of patients treated at VAs. Moreover, we found at least 2 large reviews which showed that more recently published studies were less likely to have shown an improvement in outcomes, suggesting a need to think critically about broadly implementing resource-intensive interventions in the current health system context.<sup>18,22</sup>

Rather, we propose institutions use a standardized process for assessing the current state of transitional care. As part of this review, we developed a transitional care map (Appendix C, Figure 2), which diagrams the basic steps that should be considered when targeting areas for improvement. The elements on this map were identified through several means: 1) activities that have consistently been part of successful transitional care interventions, 2) elements that have been part of prior consensus statements, and 3) consensus among our own research team. Ideally, the map should be part of collaborative discussions between hospital and outpatient administrators and clinicians.

It is important to adapt the map to different patient populations. For instance, existing transitional care processes and gaps are likely to be quite different for patients who are established in a VA PACT team and those who do not regularly receive primary care at a VA. It is likely not feasible for each institution to examine its transitional care processes for all patient populations served. Rather, institutions may choose to focus on particular patient populations experiencing poor outcomes (such as high readmission rates), or for whom providers perceive substantial gaps in transitional care.

The map is a menu of many elements that have been part of successful interventions and some (such as outpatient to inpatient communication at the transition into the hospital) that have not been adequately studied but in the group's opinion represent an important opportunity for quality improvement investigation. The map has not been tested empirically and its steps are not necessarily meant to apply to all patients. Rather, it is meant to be used to assess systemic gaps and opportunities for improvement. For instance, we do not know whether and when in-person post-discharge follow-up is needed for all patients, but the means to systematically and easily secure follow-up proactively for subsets of patients who do require follow-up should be in place.

The map is only meant to serve as a guide for discussing current processes of care and gaps in care. It is important that stakeholders include representatives from across the care continuum and perhaps patient representatives as well. One of the purposes of such discussions is to define a shared understanding of accountability for various aspects of the transitional care map. For example, inpatient and outpatient providers need to understand who is responsible for following tests that are outstanding at the time of discharge. A review of quality improvement methodology is beyond the scope of this review, but there are activities such as process mapping that could be used to operationalize use of this map.<sup>37</sup>

We anticipate this process would be useful for all institutions regardless of current performance on measures such as readmission rates both because such outcomes may be an imperfect measure of transitional care quality,<sup>38,39</sup> and because an institution may still identify significant residual gaps for particular patient populations even if it has not been identified globally as a poor performer.

## Care transitions and PACT

The value of investing in new transitional care personnel relative to harnessing the potential value of existing infrastructure and personnel is unclear. The pioneering care transitions interventions which had demonstrated reductions in readmissions had largely been patient-level interventions that predated widespread adoption of the medical home model of care, and were not extensively tested in integrated health systems.<sup>2,11</sup> These interventions were largely constructed around a nurse (the "transitional care nurse") or nurse practitioner dedicated to key activities to support better transitional care, such as self-management education, communication, information transfer, and follow-up care.

The literature to date has not fully explored care transitions implementation within the context of integrated systems and the medical home model. It is not clear that introducing new roles – such as the transitional care nurse – within VA is a requisite step to improving care transitions. It is important to acknowledge existing systems innovations which may already be accomplishing some of the work done in earlier transitional care interventions. For instance, with some re-engineering of the process, the PACT nurse care manager could serve as a point of contact during the peri-discharge period. Home-based primary care (HBPC), which is already widely used throughout VHA and is associated with a lower risk of hospitalization among higher-risk Veterans, could expand its role and serve as a point of continuity during the hospital-to-home transition.<sup>40</sup> Finally, many larger VAs have structures in place, such as heart failure specialty clinics, that could identify patients during an admission and arrange close follow-up.

### *Reach-in, reach-out*

The vast majority of the transitional care literature to date is hospital-centered. This is likely, at least in part, because the overwhelming focus of national policy efforts has been on reducing readmissions, and hospitals have been the entities at risk in financial penalization and public reporting initiatives. Consequently, most of the intervention literature examines models of care that essentially extend hospital services beyond hospital walls. However, it is possible that a “reach-in” model of transitions in which PACT personnel engage with patients and inpatient providers and take the “hand-off” prior to discharge would work in the VA PACT setting. Additionally, the PACT model may represent an opportunity to explore improvements in processes of care as patients transition *into* the hospital.

On the other hand, the more traditional transitional care models in which hospital-based personnel connect with inpatients and then follow through with them after discharge may be the right approach for hospitalized Veterans who are either not part of a PACT team, or who typically receive care at a different VA institution.

### **Consider targeting high-risk populations**

Given resource considerations and the lack of strong evidence suggesting benefit of transitional care programs across broad populations, it may make most sense to target more resource-intensive aspects of transitional care to higher-risk populations. There are several ways to do this. One would be to focus on specific patient populations who are generally at higher risk of poor outcomes, such as older patients and CHF patients. Another would be a referral-based system in which the clinical team uses its assessment of patient need to determine which patients to refer on to more intensive transitional care management. Finally, risk assessment using a formal risk scoring tool is yet another approach to identifying high-risk patients.

It is important to distinguish risk assessment from needs assessment. Risk assessment, as we are defining it, simply means assessing the probability that a patient with a given set of characteristics will experience a given outcome (often readmissions in this context). Needs assessment, on the other hand, refers to a patient’s specific needs and can help inform the tailoring of interventions. We consider needs assessment to be an important step for all patients and one that necessarily precedes anticipatory discharge planning. Indeed, as discussed in the results section, there is good evidence that individually tailored discharge planning can help improve outcomes, especially in medical inpatients.<sup>21</sup>

The role of risk assessment tools is less clear. Many readmission risk prediction models have been tested and they have been, at best, only moderately accurate.<sup>36</sup> Nevertheless, even models with only modest accuracy may be helpful. We are aware of at least one recent study not included in the reviews that successfully used an EMR-based risk prediction tool to identify CHF patients for inclusion in an intensive transitional care intervention.<sup>41</sup> In addition, there may be some utility in using models to identify low-risk patients for whom intervention would not be necessary.<sup>42,43</sup>

The incremental benefits of using a formal risk prediction tool compared to clinician gestalt are unclear. The choice may depend on the intended use. Risk prediction models may be useful triage tools when trying to apply scarce resources to a large population of patients. For example, some health systems have used risk prediction scores as a way to prioritize patients for post-

discharge telephone calls. Clinician referral may make more sense when considering patients for interventions – such as hospital-at-home programs or HBPC – that reach a smaller segment of the population and may need to be more nuanced in understanding patient needs and appropriateness of referral.

If a risk assessment tool is implemented in VA, it is important to consider factors such as model complexity, impact on workflow, and application to the population under consideration before broad adoption. Very simple models may perform similarly to more complex models and may be readily implemented – for example, one health system is using a single risk factor (2 or more unplanned admissions in the last year) to identify patients.<sup>44</sup> Finally, there is no compelling reason that VA needs to consider only readmission risk prediction models. The CAN score was developed and validated in VA populations and has good ability to predict future hospital admissions or mortality.<sup>45</sup> The incorporation of such a model into the transitional care context is another approach that could be considered, but should be studied further.

### **Measure outcomes beyond 30 day readmissions**

Although poor-quality care transitions can negatively impact patients' experience of care and patient safety,<sup>1-6</sup> hospital readmissions have been the major focus of transitional care literature and policy discussions. While reduction in preventable readmissions is a laudable goal, there are many uncertainties with this outcome metric including its reliability, its relationship to care quality and mortality, and the proportion of readmissions that are ultimately preventable.<sup>38,46-48</sup>

There are other utilization measures which are often measured, but receive less attention. Emergency room utilization (especially visits that do not lead to a hospitalization) would be useful to examine in the immediate post-discharge period, especially within the context of the medical home, since theoretically some of these may be sensitive to improvements in peri-discharge care coordination. The timing of the readmissions metric likely should differ according to the group seeking to use the information to guide quality improvement. For instance, 7 day readmissions, which may be more reflective of hospital care and discharge planning, might be more relevant to VA hospitals while longer-term readmissions (and total admission rates) might be of more relevance to PACT teams.

Care transitions interventions may improve patient-perceived transitional care quality while having little impact on high-cost utilization.<sup>49</sup> Nevertheless, improving patient experience of care may be, in and of itself, a substantive rationale for transitional care improvements. Transitions measures such as the Care Transitions Measure (CTM) which examine patient experience and their preparedness should be examined.<sup>4</sup>

Finally, care transitions also have the potential to impact patient safety. The small portion of the transitions literature that has examined patient safety outcomes has mainly focused on medication reconciliation interventions and adverse drug event outcomes. Other outcomes such as falls, iatrogenic complications, delayed test follow-up, and missed diagnoses have not been adequately examined. While such outcomes are difficult to assess on a large scale, systematic chart review approaches such as the Global Trigger Tool could be adapted for use in the care transitions context.<sup>50</sup>

## Implementation considerations

It is probably important to think of transitional care improvements at both the patient and system level. Implementing a transitional care program – for example, the Care Transitions Intervention or Project RED – without an explicit systems-learning component could be a missed opportunity to improve sustainability, breadth, and efficiency of systematic transitional care improvements. In many VAs, there may already be personnel and structure poised to identify transitional care gaps and to work on systems improvements to address those gaps. For instance, multidisciplinary inpatient rounds involving medical providers, nursing staff, social workers, physical therapists, and nutritionists could be used as a means for anticipatory discharge planning. It is likely that such multidisciplinary discussion of patient needs will reveal larger systems gaps. Each VA needs the means to not only identify these gaps, but also to feed back the information to local and regional leaders who may be able to effect change. It might be useful to designate an individual or individuals at each institution who could be empowered to gather data about gaps from multidisciplinary team meetings and then report the information to the appropriate leadership.

Quality improvement efforts to improve cross-site communication should explicitly incorporate input from in- and outpatient providers and staff. As an example, a group of hospitalists at our own hospital has taken the initiative to visit area community-based outpatient clinics (CBOCs) and conduct semi-structured interviews to better understand primary care provider views about improving the structure, content, and timing of discharge summaries. They've found differing views among primary care providers about means and timing of admission notification, and the logistics of orchestrating "warm hand-offs".

Dissemination of needs assessment tools could be used to guide multidisciplinary discharge planning meetings and craft individually-tailored discharge plans. VA should consider piloting the incorporation of these brief assessments and plans into cross-site communication tools such as the post-discharge telephone call template and/or the discharge summary.

Of note, it is important to anticipate some of the potential limitations of using non-VA services, such as community home nursing agencies, to accomplish care transitions since their means of communication with inpatient and outpatient VA providers (given their lack of access to the EMR) is limited and may introduce further discontinuities in care.

## Critically assess the current system of post-discharge telephone calls

There is little evidence to support the current VA practice of conducting one-time post-discharge telephone calls in broad, unselected groups of recently discharged patients. We found little evidence from published systematic reviews that simple post-discharge telephone calls improve outcomes. However, for high-risk patients with complex chronic illness and high self-management burden, periodic post-discharge contact with trained nurses may be useful. Structured telephone support interventions conducted by trained nurses have been associated with lower rates of readmissions over the long-term in CHF patients. In these populations such interventions may be a useful adjunct, and may be a more practical means of reaching larger numbers of VA patients who may be more geographically dispersed than home visit-based interventions.

Of note, the C-Trac intervention study, which was conducted in VA, was more recently published and suggested a telephone-based intervention with components bridging in- and outpatient care can improve outcomes.<sup>51</sup> However, there are important differences between this study and the current post-discharge call system. In the C-Trac study, calls were delivered by a nurse care manager who visited with patients in the hospital, rounded with the inpatient teams, provided patients with call times and a list of red flags, and communicated findings to the primary care team. The intervention was perceived as useful by patients, and was associated with an 11% absolute reduction in readmission rates after the intervention was introduced. The intervention included only high-risk patients as defined by the presence of cognitive impairment and/or older age with other comorbidities and prior utilization. Indeed, the baseline readmission rate of this population was quite high at 34%, which is substantially higher than 30 day readmission rates in older VA and non-VA populations with serious chronic illness.<sup>9,52</sup>

Broad application of post-discharge calls may still prove useful even absent clear evidence that they reduce utilization. It is possible that such calls are viewed favorably by patients and are a useful mechanism for PACT teams to prioritize follow-up care. It is also possible that the resource use issues are relatively small since the calls are made by PACT nurses who, at any one time, may have relatively few post-discharge calls for a panel of patients. These issues need to be explored further in future work.

Finally, because post-discharge calls have become a major vehicle for transitional care in VA, it is important to consider telephone access issues. A sizable minority of patients are unreachable after discharge by phone (unpublished data from our own VISN). A given institution should look at its own post-discharge call data, assess what proportion of patients are reached, and identify reasons why some patients are unreachable. It is likely that, due to socioeconomic circumstances, some patients simply do not have access to reliable phone service. It would be important to have a system in place, then, to identify these patients prior to discharge and to have all necessary follow-up appointments secured and communicated to these patients prior to discharge.

## FUTURE RESEARCH AND QUALITY IMPROVEMENT WORK

In general, there is an overarching need for better evidence to guide selection and implementation of complex, multicomponent transitional care interventions in different settings. One of the major weaknesses of the transitional care literature is the marked variation in intervention definitions, timing of outcome follow-up, and descriptions of interventions and usual care. As the VHA conducts more research in this field, use of taxonomies (such as the ones described above) to guide study design and description may help standardize reporting. Recently, a large Patient Centered Outcomes Research Institute (PCORI) grant was awarded to better clarify which transitional care intervention components work, for whom, and in which settings based on current experience with care transitions implementation across the country. This should help fill in many of the literature gaps we've identified. In addition to this work, there are a number of more specific areas of investigation that would be relevant to the VHA:

- Readmissions in mental health care populations are very high in the VHA. There is an urgent need to better understand mental health patients' experience as they transition across setting, and to identify the facilitators and barriers to care transitions in this population. Similar work should be done in surgical populations.

- The VHA has an opportunity to think more broadly about the effects of care transitions beyond hospital readmissions. Patient surveys and qualitative work would be helpful in better understanding the types of outcomes that matter to patients.
- Adapt transitional care continuous quality improvement methods used by other initiatives for the VHA setting and populations, incorporating input from personnel across care settings and integrated with local and regional leadership.
- Even within integrated health systems like VHA, there has been relatively little examination of the communication between outpatient and inpatient care teams. There is a need to better understand communication preferences, opportunities, and priorities from both perspectives. Additionally, more work needs to be done to examine ways in which communication from the outpatient care teams to the inpatient care teams early on during a hospital admission could ease subsequent discharge planning (*ie*, through communication of care plans, end-of-life discussions, understanding of preference sensitive decisions).
- There are a number of comparative studies which would be helpful:
  - contrasting approaches to transitional care in VA patients with and without a primary VA-based medical home;
  - comparison of home visit-based and telephone-based interventions;
  - comparison of unselected and risk-prioritized approaches to post-discharge calls;
  - comparison of the use of electronic risk-scoring tools, disease- or age-based criteria, and clinician gestalt to identify high-risk patients for intensive transitional care management interventions; and
  - evaluation of changes in usual care before and after 2002 to help interpret effectiveness of studies when compared to usual care

## LIMITATIONS

Our review has a number of important limitations. Our approach to reviewing and summarizing the literature was necessarily broad rather than deep. There are many nuances in the results, internal validity, and generalizability of studies included within these reviews that are not represented in our overview. It was difficult to use established criteria to formally rate the strength of evidence for each of our conclusions, and few of the included reviews reported strength of evidence ratings. As we note in the results, our assessment of the common themes across the different reviews is likely best viewed as being based on low-strength evidence, given the indirect comparisons and the many different factors that varied among the included studies. There was heterogeneity in the outcome timings, making direct comparisons difficult.

Interventions that improved short-term readmission may not have had lasting effects, whereas interventions that seemed ineffective in the short term may have longer term benefit. We only included reviews that included readmissions as an outcome as a way to feasibly scope the review and because we suspected that most interventions focused on the hospital to home transition would report this as an outcome. It is certainly possible that there are interventions that span care settings and effect care transitions that focus exclusively on other outcomes (*eg*, there is a body of literature focused on smoking cessation around the time of discharge).<sup>53</sup> Furthermore, there are many outpatient-based interventions which are designed to affect emergency room and

hospital utilization that are not captured in our review, but may nevertheless be important to understanding the role of care coordination in the context of the medical home.

We did not systematically update the included reviews' searches and, therefore, there are undoubtedly more recent studies that have been published that are not represented here, though we are not aware of newer studies that would substantively change our summary of findings and policy recommendations. Our recommendations are, in part, based on the evidence but also incorporate our own subjective assessment of the practical implications of the evidence (or lack thereof) and undoubtedly reflect our own clinical, research, and policy experience.

## CONCLUSIONS

The literature includes many different types of interventions, studied in varied populations and clinical settings, and implemented in different ways, but there is no commonly used taxonomy describing the various factors. Furthermore, there is very little comparative effectiveness data. It is, therefore, very difficult to identify specific intervention components and characteristics that are necessary for successful care transitions. In general, successful interventions are more comprehensive, touch on more aspects of the care transition, extend beyond the hospital stay, and are flexible enough to respond to individual patient needs. Transitional care interventions have not been well studied within integrated health systems and within the medical home context. Future work should focus on how best to incorporate outpatient teams into transitional care improvement processes.

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## APPENDIX A. TABLES

**Table 1. Characteristics and Key Findings of Systematic Reviews of Care Transitions, by Patient Population**

Patient condition; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
Acute MI/ Acute Coronary Syndrome Auer, 2008 <sup>34</sup> 1966-2007	16 controlled trials, including 14 RCTs (26 studies total)	Hospitalized for ACS including unstable angina, NSTEMI, STEMI N=2467 from trials, including N=1910 from RCTs	6-12 months: 0.96 (0.79-1.17)	All causes: 0.94 (0.63-1.40) All causes at 1 year: 0.94 (0.63-1.44)	Study quality for RCT assessed using modified Jadad score 3 (lowest ROB category): n=8 2: n=5 1 (highest ROB category): n=3 Before-after designs: n=12 (no formal ROB assessment)
Cancer Smeenk, 1998 <sup>54</sup> 1985-1997	5 RCTs (9 studies total)	Cancer N=4249	Range of ratios for readmission (%) in intervention group/control group: 0.62 to 1.12 Combined estimate NR. Timing of readmission assessment NR.	NR	Weighted methodological quality score (0-100 max): 48: n=1 50: n=1 56: n=1 61: n=1 63: n=1 64: n=2 68: n=1 All considered moderate quality
CHF Feltner, 2014 <sup>19</sup> 1990-2013	47 RCTs (47 studies total)	Moderate-to-severe HF; mean age of 70 N=8693	Combined RR (95% CI) by intervention type; results from single studies per intervention type not included below: Home-visiting program, 3-6 months: 0.75 (0.66-0.86) Structured telephone support, 3-6 months: 0.92 (0.77-1.10) Telemonitoring, 3-6 months: 1.11 (0.87-1.42) Clinic-based (MDS-HF), 6 months: 0.70 (0.55-0.89)	Combined RR (95% CI) by intervention type; results from single studies per intervention type not included below: Home-visiting program, 3-6 months: 0.77 (0.60-0.996) Structured telephone support, 3.6 months: 0.69 (0.51-0.92) Clinic-based (MDS-HF) 6 months: 0.56 (0.34-0.92)	AHRQ ROB for trials (high, medium, low, unclear) Low ROB: n=6 Medium ROB: n=27 High ROB: n=9 Unclear ROB: n=5

Patient condition; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
COPD Prieto-Centurion, 2014 <sup>24</sup> 1966-2013	5 RCTs (5 studies total)	Patients hospitalized for COPD within the previous 12 month. N=1393	2 studies found reduced 12-month readmissions (mean number of hospitalizations per patient, 1.0 vs 1.8; P = 0.01; percent hospitalized, 45 vs 67%; P= 0.028) 3 studies found no significant change in 6 or 12-month readmissions.	4 of 5 studies: no difference 1 study: increased 12-month mortality (17 vs 7%, p=0.003)	EPOC criteria (# domains with low ROB: 1-7 max) 6: n=4 5: n=1
General/ unselected Leppin, 2014 <sup>18</sup> 1990-2013	42 RCTs (42 studies total)	N=17273	30 days: 0.82 (0.73-0.91)	NR	EPOC ROB (high, low, unclear) "Most studies were at overall low risk of bias. The most common methodological limitation of these trials was the lack of a reliable method for dealing with missing data." 8/42 studies were rated as low ROB in all categories; all others were rated as high or unclear ROB in one or more categories.
Mental Health Vigod, 2013 <sup>55</sup> Database inception through 2012	13 controlled trials, including 8 RCTs (15 studies total)	Admitted to the hospital for mental health inpatient care N=2880 (Controlled trials) N=1007 (RCTs)	Range among studies in % of patients readmitted, intervention group vs control: 3 month: 7-23 vs 13-36 6-24 month: 0-63% vs 4-69%	NR	EPOC criteria (# domains with low ROB: 1-9 max) 8: n=1 7: n=1 6: n=1 5: n=4 4: n=3 3: n=3 Most included studies had small sample sizes, high dropout rates, and/or did not account for baseline differences between groups on key prognostic factors.

Patient condition; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
Stroke Prvu-Bettger, 2012 <sup>20</sup> 2000-2012	24 RCTs stroke 8 RCTs MI (44 studies total: 27 stroke, 17 MI)	hospitalized for stroke or acute coronary syndromes N=4307 stroke N=1062 MI	Insufficient evidence for most intervention subtypes in both stroke and MI. Moderate strength evidence that hospital-initiated support did not reduce readmissions in stroke patients. Timing of readmission assessment NR.	Low strength evidence in MI patients: reduced 3 month mortality (1 study), reduced 12 month mortality (2 studies)	AHRQ (Good, Fair, Poor Quality) Good: n=10 Fair: n= 42 Poor: n=10 Strength of evidence insufficient for all intervention/population subgroups except as noted.

Abbreviations: ACS = acute coronary syndrome; AHRQ = Agency for Healthcare Research & Quality; CHF = congestive heart failure; CI = confidence interval; COPD = chronic obstructive pulmonary disease; EPOC = Cochrane Effective Practice and Organisation of Care Group; HF = heart failure; MDS-HF = multidisciplinary heart failure; MI = myocardial infarction; N = population/study sample size; NR = not reported; NSTEMI = non-ST-segment elevation myocardial infarction; RCTs = randomized controlled trials; ROB = risk of bias; STEMI = ST-segment elevation myocardial infarction; Tx = treatment; vs = versus

**Table 2. Characteristics and Key Findings of Systematic Reviews of Care Transitions, by Intervention Type**

Key process; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
<i>Geriatric Case Management</i> Huntley, 2013 <sup>56</sup> 1950-2010	11 RCTs (11 studies total)	Patients aged 65+ who were discharged from acute care hospitals (ED included) or were community dwelling N=4318	0.71 (0.49-1.03)	Combined estimate NR. Mortality (5 studies) was not significantly different based on case management.	Cochrane ROB "Risk of bias was generally low". Most studies had low or unclear ROB in all categories except one study which had high ROB in 3 categories.
<i>Geriatric Case Assessment</i> Ellis, 2011 <sup>35</sup> 1966-2010	22 RCTs (22 studies total)	Adults aged 65 years or older who were admitted to the hospital. N=10,315	No difference between groups, N=3822. OR 1.03 (0.89-1.18)	Death or functional decline, combined outcome: 0.76 (0.64 to 0.90, P=0.001) based on data from 5 RCTs, N= 2622	Cochrane ROB "The studies identified were heterogeneous in quality. All used some method of individual patient randomization, though reporting of key issues such as allocation concealment varied. Outcome assessment was seldom blinded [though] this is less of an issue for hard outcomes such as death or institutionalization". Some trials noted attrition for functional or cognitive outcomes."
<i>Discharge planning</i> Shepperd, 2013 <sup>21</sup> 1946-2012	24 RCTs (24 studies total)	Mostly older medical patients, but some trials included a mix of medical and surgical conditions. Psychiatric patients were included as well. N=8,098	Within 3 months of discharge: 0.82 (0.73-0.92) for older patients with a medical condition. No difference was found when mixed medical and surgical populations were included.	At 6-9 months: 0.99 (0.78-1.25)	Cochrane ROB, Low ROB: n=9 Medium ROB: n=9 High ROB: n=5 Unclear ROB: n=1
<i>ERAS/Fast Track</i> Kagedan, 2014 <sup>57</sup> 2000-2013	0 trials or RCTs (10 studies total)	After pancreatic surgery N=0 (no RCTs)	Range among studies in % of patients readmitted, ERAS vs UC: (3.5-15) vs (0-25)	Range (% of patients), ERAS vs UC: (0-4) vs (0-3)	GRADE (Low; Moderate; High) "No high-quality studies were identified. Cohort studies comparing multiple groups were labelled as being of moderate quality. Single-group prospective studies were graded as low quality." Moderate quality: n=7 Low quality: n=3

Key process; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
<i>Hospital at home</i> Caplan, 2012 <sup>22</sup> Database inception through 2012	61 RCTs (61 studies total)	N=6992	0.75 (0.59-0.95)	0.81 (0.69-0.95)	EPOC criteria Quality ratings not reported; "Almost all studies were not blinded. However, many studies used blinded initial assessments before randomisation. Some outcome assessment was blinded."
<i>Medication reconciliation</i> Kwan, 2013 <sup>23</sup> 1980-2012	5 RCTs (18 studies total)	N=1075	ER visits and hospitalizations within 30 days of discharge in 3 RCTs, HR 0.77 (95% CI, 0.63-0.95)	NR	Cochrane ROB Low ROB: n=5 RCTs
<i>PCMH</i> Jackson, 2013 <sup>58</sup> Database inception through June 2012	9 RCTs (19 studies total)	Unselected population N=54465	0.96 (0.84-1.10)	NR	AHRQ (Good, Fair, Poor Quality). All but one study were rated as being good or fair quality.
<i>Telemonitoring and structured telephone support</i> Pandor, 2013 <sup>26</sup> 1999-2011	21 RCTs (21 studies total)	Heart failure N=6317	Median HR (credible interval, 2.5%-97.5%) vs UC. All-cause: STS HH: 0.97 (0.70-1.31) TM office hours (transmitted data reviewed by medical staff during office hours): 0.75 (0.49-1.10) HF-related: STS HH: 0.77 (0.62-0.96) TM office hours: 0.95 (0.70-1.34)	Median HR (credible interval, 2.5%-97.5%) vs UC: STS HH vs UC: 0.77 (0.55-1.08) TM office hours vs UC: 0.76 (0.49-1.18)	Study quality not reported individually; "The methodological quality of the 21 included studies varied widely and reporting was generally poor on random sequence generation, allocation concealment, blinding of outcome assessment, definition and confirmation of HF diagnosis, and intention-to-treat analysis."

Key process; Systematic review; Search dates	N controlled trials (total N studies)	Sample characteristics; N total from RCTs (Tx + control)	Summary estimate for readmission risk (95% CI)	Summary estimate for mortality (95% CI)	Quality measures
<i>Telephone follow-up, primary-care based</i> Crocker 2012 <sup>29</sup> 1948-2011	3 RCTs (3 studies total)	Unselected population N=1765	Combined estimate NR. None of the 3 RCTs reported a statistically significant impact of telephone follow-up on readmission or ER visits.	NR	Study quality not reported individually: assessed sequence generation, allocation concealment, blinding, follow-up and intent to treat analysis, and publication bias. Most studies were high or unclear ROB based on poor reporting of sequence generation, allocation concealment; lack of blinding; and lack of information about attrition.
<i>Telephone follow-up, hospital-based</i> Mistiaen, 2006 <sup>28</sup> Database inception through July 2003	13 RCTs (33 studies total)	Unselected population with cardiac and surgical subgroup analyses N=5110	Cardiac (3 RCTs, N=616): 0.75 (0.41-1.36) Surgical (4 RCTs, N=460): 0.65 (0.28-1.55)	NR	Cochrane ROB Medium ROB: n=7 High ROB: n=26

Abbreviations: AHRQ = Agency for Healthcare Research & Quality; CI = confidence interval; ED = emergency department; EPOC = Cochrane Effective Practice and Organisation of Care Group; ER = emergency room; ERAS = enhanced recovery after surgery; GRADE = grading of recommendations assessment, development and evaluation; HR = hazard ratio; N = population/study sample size; NR = not reported; OR = odds ratio; RCTs = randomized controlled trials; ROB = risk of bias; STS HH = structured telephone support delivered by human-to-human contact; TM = telemonitoring; Tx = treatment; UC = usual care; vs = versus

**Table 3. Clinical Outcomes, Utilization Outcomes, and Implementation Considerations in Systematic Reviews of Care Transitions, by Patient Population**

Patient population Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
Acute MI/Acute Coronary Syndrome Auer, 2008 <sup>34</sup> 1966-2007	Re-infarction rates RR 0.51, 95% CI 0.23 – 1.13 among trials)  Smoking cessation RR 1.29 (1.02-1.63, I <sup>2</sup> = 66%)	NR	Interventions that included provider- or systems-level components reduced mortality (RR 0.77, 95% CI 0.65-0.92) whereas patient-level interventions did not (RR 0.93, 95% CI 0.63-1.36). However, many of the studies of provider- or systems-level interventions were before-after studies.  Interventions targeting an increase in the use of effective medications were associated with mortality benefit (RR 0.80, 95% CI 0.68-0.93) whereas those not targeting medication use were not (RR 0.75, 95% CI 0.39-1.46).	Substantial statistical and clinical heterogeneity among studies.  Nearly half the included studies were before-after studies and these accounted for most of the benefit seen [mortality clinical trials only RR was 0.96 (0.64-1.44) vs 0.77 (0.66-0.9) for before-after designs]  All studies were published 2005 and earlier; applicability to current practice is uncertain.
Cancer Smeenk, 1998 <sup>54</sup> 1985-1997	Quality of life outcomes were positively associated with home care programs in 3 of 7 studies.	NR	Programs that included multidisciplinary team meetings and involvement of team members during patient home visits was associated with favorable outcomes in 3 studies.	Author notes: The methodological quality of the studies was moderate (median score of 62/100). The main shortcomings were in the areas of population homogeneity, study design, comparability of groups, handling of drop outs, and blinding procedures. Furthermore, the findings of failed to show a consistent pattern across studies
CHF Feltner, 2014 <sup>19</sup> 1990-2013	NR	NR	The following types of interventions had no effect on mortality: telemonitoring, nurse-led clinics, and primarily educational intervention. (low SOE)  Evidence was insufficient for primary care interventions and cognitive training programs.	Minimal 30 day data. UC not well defined and quite variable. Conclusions of this study and the NHS one focusing on TM/STS reach different conclusions with slightly different study inclusion.

Patient population Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
COPD Prieto-Centurion, 2014 <sup>24</sup> 1966-2013	NR	NR	Author states: No specific intervention or bundle of interventions could be identified as effective in reducing the rate of rehospitalizations.	Well done systematic review with a focus on readmission. Studies that did not have readmission as the primary outcome were excluded. No studies were found that examined 30-day readmission as a primary outcome, all used either 6 or 12 months. Some studies initiated interventions >28 days after the patient was discharged. Extensive heterogeneity in both the content and context of the intervention.
General/unselected Leppin, 2014 <sup>18</sup> 1990-2013	NR	NR	Characteristics of the intervention such as impact on patient workload and the site of delivery had no significant effect.	Adjusted for year of publication
Mental Health Vigod, 2013 <sup>55</sup> Database inception through 2012	NR	NR	Study author identified the following as effective components within the context of multicomponent interventions: pre-discharge medication education/reconciliation; post-discharge telephone follow-up, efforts to ensure timely follow-up appointments, home visits and peer support, bridging components of transition manager; and timely communication by in-patient staff with an outpatient care or community service provider during transition.	These results are consistent with the 2 other MH reviews.
Stroke Prvu-Bettger, 2012 <sup>20</sup> 2000-2012	No significant differences in ADLs (7 studies using the Barthel index).  Insufficient evidence on caregiver outcomes (inconsistent effects on caregiver strain, quality of life in 5 studies measuring caregiver outcomes)	NR	Insufficient evidence of benefit of patient and family educational interventions (5 studies), community based support (10 studies), and chronic disease management (2 studies).	Limitations of the studies include sample size, heterogeneity of outcome measures, lack of definition for the UC group, and fair or poor study quality. Authors cite the need for definitive taxonomy for the components of transitional care services and the evaluation of outcome measures.

Abbreviations: ADLs = activities of daily living; CHF = congestive heart failure; CI = confidence interval; COPD = chronic obstructive pulmonary disease; MH = mental health; MI = myocardial infarction; NR = not reported; RR = relative risk; SOE = strength of evidence; UC = usual care

**Table 4. Clinical Outcomes, Utilization Outcomes, and Implementation Considerations in Systematic Reviews of Care Transitions, by Intervention Type**

Key process; Systematic review; Search dates	Clinical outcomes	Other utilization outcomes	Implementation considerations	Limitations/comments
<i>Geriatric Case Management</i> Huntley, 2013 <sup>56</sup> 1950-2010	NR	ED visits, GP visits, specialist clinic/outpatient visits and length of stay were not improved by case management in all but one study.	Case management initiated in hospital (2 RCTs) was associated with decreased readmissions; 3 out of 4 RCTs showed no difference for case management initiated upon discharge; 5 RCTs on case management initiated in the community showed no significant differences in readmissions.	4 other case management systematic reviews report similar findings: some limited examples of positive results, but overall non-significant effects. <sup>59-62</sup>
<i>Geriatric Case Assessment</i> Ellis, 2011 <sup>35</sup> 1966-2010	There was a significant reduction in cognitive function (5 trials, 3317 participants, standardized mean difference 0.08, 0.01 to 0.15, P=0.02) associated with CGA. There were non-significant differences for dependence.	The hospital costs of CGA intervention were mixed – some trials reported decreased cost while others reported increased cost. Few trials accounted for nursing home costs; those that did suggested that CGA might be associated with overall reduced cost.	The positive impact on living at home was seen only in studies of CGA wards and not among studies of mobile CGA consultative teams (interaction $\chi^2 = 9.06$ , p = 0.003). There is only evidence supporting CGA assessment in setting of geriatric wards, and not for consultative teams. The authors speculate that specialized wards allow nursing and other key personnel to develop skills and expertise and foster multi-disciplinary team-building, while consulting teams might have difficulty in influencing health provider behavior.	Author notes: Trials evaluating direct admission from ED all have admission criteria related to age, whereas trials evaluating post-acute care all have criteria related to needs (with one trial as an exception). Author suggests that the optimal model of comprehensive geriatric assessment for hospitals includes both acute and post-acute models.

<b>Key process; Systematic review; Search dates</b>	<b>Clinical outcomes</b>	<b>Other utilization outcomes</b>	<b>Implementation considerations</b>	<b>Limitations/comments</b>
<i>Discharge Planning</i> Shepperd, 2013 <sup>21</sup> 1946-2012	<p>CHF patients improved on total CHFQ score in one trial: mean difference 22.1 (20.8), p&lt;0.01; whereas, control patients in a trial of stroke patients had more functional improvement on the Barthel score (2 points change in tx vs 6 points change in controls, p&lt;0.01).</p> <p>QOL outcomes were mixed among studies.</p> <p>No difference between groups in 5 trials that reported functional status, mental well-being, perception of health, self-esteem, and affect.</p>	<p>LOS after medical admission was lower with discharge planning vs UC: mean difference in 10 trials -0.91 days (95%CI -1.55 to -0.27) in 10 trials.</p> <p>LOS after surgery did not differ: mean difference in 2 trials -0.06 days (95%CI -1.23 to 1.11).</p>	<p>The point during admission when discharge planning may have bearing on timely follow-up. Discharge planning was implemented varied across studies: commencing from time admission in 2 trials, 3 days prior to discharge in one study.</p>	<p>Very good review that looked at a wide range of trials including a diverse group of patients.</p>
<i>ERAS/Fast Track</i> Kagedan, 2014 <sup>57</sup> 2000-2013	NR.	<p>Four studies examined costs associated with postoperative care following pancreatic surgery. Two of these studies found a decrease in cost following the implementation of an ERAS protocol and 2 studies found no significant change.</p>	NR	<p>This review focused on pancreatic surgery, and notes that, "Although randomized trials and meta-analyses have consistently reported an advantage to ERAS over conventional care, these studies have been performed predominantly in colorectal surgery patients."</p>

<b>Key process; Systematic review; Search dates</b>	<b>Clinical outcomes</b>	<b>Other utilization outcomes</b>	<b>Implementation considerations</b>	<b>Limitations/comments</b>
<i>Hospital at home Caplan, 2012<sup>22</sup> Database inception through 2012</i>	<p>No meta-analysis was performed for patient or caregiver satisfaction because varied instruments were used, but studies consistently found higher satisfaction in HAH groups (21/22 studies reporting patient satisfaction, 6/8 studies reporting CG satisfaction).</p> <p>No difference in caregiver burden (7 studies, mean difference 0.00, 95% CI -0.19 to 0.19).</p>	<p>Mean cost difference HAH vs UC (11 RCTS): -1567.11 (-2069.53 to -1064.69, p&lt;0.001)</p> <p>Average cost savings 26.5%. 32 of 34 studies reporting any cost data concluded HAH was less expensive.</p>	<p>Mortality, readmission, and cost findings were consistent across all subgroups (type of hospitalization, degree of admission substitutions, average age of patient, and year of publication).</p> <p>Components of HAH programs are not described at all; the only criterion seems to have been home-based care substitution.</p>	<p>Specific components of any of the HAH intervention are not well-described.</p> <p>Periods of observation for mortality and readmissions were not defined and likely varied significantly.</p> <p>"Next best" review has differing conclusions: Cochrane review from 2009 of HAH to facilitate early discharge (as opposed to HAH to replace admission) found no clear difference in mortality in stroke (HR 0.79 [0.32—1.91]) or mixed elderly (HR 10.6 [0.69—1.61]), and they found higher readmissions among the elderly (HR 1.57 [1.10—2.24]). They did find lower rates of residential care and greater satisfaction, with cost data mixed.</p>
<i>Medication Reconciliation Kwan, 2013<sup>23</sup> 1980-2012</i>	<p>Fewer adverse drug events occurred in 2 studies, respectively:</p> <p>Tx vs control: 1% vs 11% (p=0.01)</p> <p>RR 0.72 (95% CI 0.52 to 0.99)</p>	NR	NR	

<b>Key process; Systematic review; Search dates</b>	<b>Clinical outcomes</b>	<b>Other utilization outcomes</b>	<b>Implementation considerations</b>	<b>Limitations/comments</b>
<i>PCMH</i> Jackson, 2013 <sup>58</sup> Database inception through June 2012	<p>One observational study reported a higher rate of improved HbA1c and LDL cholesterol in tx patients.</p> <p>Another obs. study found no difference in composite diabetes and CAD outcomes.</p> <p>None of the 3 RCTs found differences in self-reported health status. One observational study found less functional decline with PCMH at 1-year follow-up (31% vs 49% of patients).</p>	<p>Three RCTs reporting ED utilization found no effect: combined RR 0.93 (95% CI 0.72 to 1.20).</p>	NR	<p>The components, models, and operationalization of PCMH varied widely among studies.</p>

<b>Key process; Systematic review; Search dates</b>	<b>Clinical outcomes</b>	<b>Other utilization outcomes</b>	<b>Implementation considerations</b>	<b>Limitations/comments</b>
<i>Telemonitoring</i> Pandor, 2013 <sup>26</sup> 1999-2011	Quality of life was significantly improved in 3 of 4 studies of STS interventions, and 2 of 4 studies of TM interventions that measured and reported it.	HF-related hospitalizations: STS HM vs UC: 1.02 (0.70-1.49) STS HH vs UC: 0.76 (0.61-0.94) TM office hours vs UC: 0.86 (0.61-1.21).	In the 5 studies that reported it, adherence to RM was good (STS 55-84%, TM 81-98%). Likewise, reported acceptance and/or satisfaction rates were high in 5 of 6 studies. In the sixth, however (Scherr, 2009), 16/66 patients in the intervention group either did not transmit any data or requested early termination.	This is limited to HF patients and cannot be extrapolated to other patient populations.
		LOS was reported in 6 studies but unaffected in 5 of them (shorter in Tsuyuki et al, 2004).	Since RM cannot affect outcomes unless actions are taken based on results of monitoring, any successful intervention also requires patient education/empowerment and advice/timely access to care.  Studied interventions were heterogeneous in terms of monitored parameters and HF selection criteria, and results were not reported in such a way as to permit assessment of intervention effect modifiers. Thus, uncertainties remain around best "active ingredients" of RM interventions, suitability of different systems, and determinants of patient responsiveness.  Finally, RM is likely to have greater impact in systems where UC is suboptimal and HF readmission rates are high.	The authors intended to use meta-regression to explain heterogeneity in effects between studies but could not because of limited data on study-level covariates.

<b>Key process; Systematic review; Search dates</b>	<b>Clinical outcomes</b>	<b>Other utilization outcomes</b>	<b>Implementation considerations</b>	<b>Limitations/comments</b>
<i>Telephone follow-up, Hospital-based Database inception through July 2003</i> <i>Mistiaen, 2006<sup>28</sup></i>	Anxiety in cardiac surgery patients 1 month post-discharge was not significantly different. Tx vs UC, pooled effect from 3 studies: standardized mean difference -0.47 (95% CI -1.28 to 0.34) Depression was not significantly different between tx and control in 2 studies.	ED visits in surgery patients was not significant. Pooled from 2 studies, tx vs control: RR 1.47 (95% CI 0.85 to 2.53)	NR	Most of the included studies were poor quality (high ROB) and small sample size. The authors cite clinical diversity and statistical heterogeneity among studies as further limitations. They note, however, that patients valued the TFU calls despite no detectable benefits in the measured empirical outcomes.

Abbreviations: CAD = coronary artery disease; CGA = comprehensive geriatric assessment; CHF = congestive heart failure; CHFQ = chronic heart failure questionnaire; CI = confidence interval; ED = emergency department; ERAS = enhanced recovery after surgery; GP = general practice; HAH = hospital at home; HbA1c = glycated hemoglobin A1c; HF = heart failure; HR = hazard ratio; LDL = low density lipoprotein; LOS = length of stay; NR = not reported; PCMH = patient-centered medical home; QOL = quality of life; RCT = randomized controlled trial; RM = remote monitoring; ROB = risk of bias; RR = relative risk; STS = structured telephone support; STS HM = structured telephone support human to machine interface; TFU = telephone follow-up; TM = telemonitoring; Tx = treatment; UC = usual care; vs = versus

**Table 5. Studies of Care Transition Interventions Conducted in VA Settings**

<b>Study</b> <b>Design and setting (N)</b> <b>Years of observation</b>	<b>Patient population</b>	<b>Intervention</b>	<b>Summary of findings</b>
Ho, 2007 <sup>63</sup> Retrospective cohort study using data from all VAMCs (N=4933) 2003-2004	Acute coronary syndromes including acute MI and unstable angina	Inpatient and follow-up cardiology care	Compared with other levels of cardiology care (inpatient only, outpatient only, and neither inpatient nor outpatient), unadjusted all-cause mortality was lower for patients with inpatient and follow-up cardiology care (18.8% vs 22.1%, p = 0.009). In multivariable analysis adjusting for age, race, site, comorbidities, hospital presentation factors (TIMI risk score for STEMI or NSTEMI, left ventricular systolic dysfunction, abnormal serum creatinine level), receipt of PCI and/or CABG surgery, discharge medications, and follow-up visit with a primary care provider within 60 days after discharge, patients with inpatient and follow-up cardiology care remained at lower risk for mortality (HR 0.73, 95% CI 0.62-0.87).
Oddone, 1999 <sup>64</sup> Multi-site RCT 9 VAMCs (N=443) Observation period NR	CHF	Enhanced access to primary care	Enhanced access to primary care did not improve quality of life and increased hospital readmissions, with an average of $1.5 \pm 2.0$ readmissions per 6 months of follow-up for patients who had enhanced access compared with $1.1 \pm 1.8$ for those who received UC ( $P= 0.02$ ).
Wakefield, 2008 <sup>65</sup> Single site RCT (N=148) 2002-2006	CHF	Home telehealth	Readmission at 12 months comparing telephone and videophone groups combined vs control: 59% vs 41%; unadjusted OR 0.49 (95% CI 0.24-0.98; $p = 0.04$ ) Risk of all-cause admission was significantly lower in the intervention group, adjusted for age, mean LVEF, NYHA classification, and MLHF instrument proportional hazards model: HR 0.54 (95% CI 0.33-0.90; $p = 0.02$ ) Mortality did not differ between intervention and control at 3 or 12 months. A Cox proportional hazards model adjusting for age, mean LVEF, NYHA classification, and MLHF found no difference in mortality at 12 months (HR = 1.04; 95% CI: 0.49, 2.24; $p = 0.91$ ).
Fan, 2012 <sup>66</sup> Multisite RCT 20 VA hospital-based outpatient clinics (N=426) 2007-2009	COPD	Comprehensive care management	Trial was stopped early due to excess risk of death in the intervention group (compared with UC; 17 vs 7%, $p = 0.003$ ) At that time, the 1-year cumulative incidence of COPD related hospitalization was 27% in the intervention group and 24% in the UC group (HR, 1.13 [95% CI, 0.70 to 1.80]; $P = 0.62$ ). An extensive evaluation by the study authors failed to identify a reason that mortality was higher in the intervention group. <sup>24</sup>
Fitzgerald, 1994 <sup>67</sup> Single-site RCT (N=668) 1988-1990	General medicine/ unselected	Telephone-based follow-up by nurse case managers	No significant differences between intervention and control groups in non-elective readmissions, readmission days, or total readmissions. No significant difference in mortality, Tx vs comparator (%): 10.5 vs 10.4, ( $p=0.90$ ) Average follow-up, Tx vs comparator (months): 12.14 vs 12.23

<b>Study Design and setting (N) Years of observation</b>	<b>Patient population</b>	<b>Intervention</b>	<b>Summary of findings</b>
Evans, 1993 <sup>68</sup> Single-site RCT (N=835) Observation dates NR	High-risk patients (risk-screening index score* >=3)	Discharge planning	<p>Patients receiving early discharge planning were more likely to return home after hospitalization and less likely to be readmitted within 9 months. Tx vs control, % of patients:</p> <ul style="list-style-type: none"> <li>30-day readmission: 24 vs 35 (p=0.001)</li> <li>9-month readmission: 55 vs 61 (p=0.08)</li> <li>Discharged to home: 79 vs 73</li> <li>Discharged to nursing home: 15 vs 22 (p=0.05 for discharge location)</li> <li>Deceased at discharge: 2 vs 2 (p=NS)</li> <li>Deceased at 9 months: 16 vs 16 (p=NS)</li> <li>At home at 9 months: 62 vs 54</li> <li>In nursing home at 9 months: 19 vs 26 (p=0.05 for location at 9 months)</li> </ul>
Kasprow, 2007 <sup>69</sup> Multi-site implementation study with historical controls 8 VAMCs (N=484) 2001-2004	Homeless Veterans hospitalized for mental illness	Critical time intervention community case management with structured needs assessment	<p>Compared with historical controls, the intervention cohort:</p> <ul style="list-style-type: none"> <li>Had significantly fewer psychiatric problems at 3-, 6-, and 9-month follow-up (p&lt;.001, p&lt;.001, and p=.005, respectively).</li> <li>Spent significantly fewer days in institutional settings at the 6-, 9-, and 12-month follow-up intervals (p=.01, p=.001, and p=.001, respectively) compared with historical controls.</li> <li>Had significantly more days housed at 6-, 9-, and 12-month follow-up (p=.02, p=.001, and p=.001, respectively).</li> <li>Had significantly lower alcohol use than historical controls at 3-, 6-, and 9 month follow-up (p&lt;.001, p&lt;.001, and p=.001, respectively).</li> <li>Had significantly lower drug use at 3-, 6-, and 6-month follow-up (p&lt;.001, p&lt;.001, and p=.04, respectively).</li> </ul>
Weinberger, 1996 <sup>31</sup> Multi-site RCT 9 VAMCs (N=1396) 1992-1994	Inpatients with DM, COPD, or CHF	Discharge planning	<p>In an intensive primary care intervention involving close follow-up by a nurse and PCP from pre-discharge to 6 months post-discharge, the proportion of patients readmitted within 6 months did not significantly differ between intervention and control patients: 49% vs 44% (p=0.06)</p>

<b>Study Design and setting (N) Years of observation</b>	<b>Patient population</b>	<b>Intervention</b>	<b>Summary of findings</b>
Cummings, 1990 <sup>70</sup> Single-site RCT (N=419) 1984-1987	Severely disabled or terminally ill patients	HBHC	Total VA hospital days did not significantly differ between HBHC and control groups. HBHC patients spent a greater proportion of their hospital stay on the intermediate care ward (3.0 days vs 1.5 days) p<.03) and less time on general care wards (8.5 days vs 12.2 days, p<.04) than control group patients. Total per-patient hospital costs were lower in the HBHC group vs controls (\$3000.24 vs \$4245.84, p=0.03). HBHC patients had greater satisfaction with care (0.1 on a 3-point scale, p<.001) than controls, at 1 month. No significant group differences in satisfaction at 6 months. No significant differences in patient morale at either 1 or 6 months.

\* Evans RL, Hendricks RD, Lawrence KV, Bishop DS. Factors influencing use of health care resources: A hospital-based risk screening index. *Soc Sci Med* 1988; 27(9):947.

Abbreviations: CABG = coronary artery bypass graft; CHF = congestive heart failure; CI = confidence interval; COPD = chronic obstructive pulmonary disease; DM = diabetes mellitus; HR = hazard ratio; HBHC = hospital-based home care; LVEF = left ventricular ejection fraction; MI = myocardial infarction; MLHF = Minnesota Living with Heart Failure; N = population/sample size; NR = not reported; NSTEMI = non-ST-segment elevation myocardial infarction; NYHA = New York Heart Association; OR = odds ratio; PCI = percutaneous coronary intervention; PCP = primary care provider; RCT = randomized controlled trial; STEMI = ST-segment elevation myocardial infarction; TIMI = Thrombolysis in Myocardial Infarction; UC = usual care; VA = Veterans Affairs; VAMCs = Veterans Affairs Medical Centers

## APPENDIX B. SEARCH STRATEGY

Concept	Search string
recurrence	"recurrence"[MeSH Terms] OR "recurrence"[All Fields]
recurrences	"recurrence"[MeSH Terms] OR "recurrence"[All Fields] OR "recurrences"[All Fields]
hospital-based home care	"home care services, hospital-based"[MeSH Terms] OR ("home"[All Fields] AND "care"[All Fields] AND "services"[All Fields] AND "hospital-based"[All Fields]) OR "hospital-based home care services"[All Fields] OR ("hospital"[All Fields] AND "based"[All Fields] AND "home"[All Fields] AND "cares"[All Fields])
eHealth	"telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "ehealth"[All Fields]
telehealth	"telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "telehealth"[All Fields]
telemedicine	"telemedicine"[MeSH Terms] OR "telemedicine"[All Fields]
continuity	"Continuity"[Journal] OR "continuity"[All Fields]
referral	"referral and consultation"[MeSH Terms] OR ("referral"[All Fields] AND "consultation"[All Fields]) OR "referral and consultation"[All Fields] OR "referral"[All Fields]
discharge	"patient discharge"[MeSH Terms] OR ("patient"[All Fields] AND "discharge"[All Fields]) OR "patient discharge"[All Fields] OR "discharge"[All Fields]
sub-acute care	"subacute care"[MeSH Terms] OR ("subacute"[All Fields] AND "care"[All Fields]) OR "subacute care"[All Fields] OR ("sub"[All Fields] AND "acute"[All Fields] AND "care"[All Fields]) OR "sub acute care"[All Fields]
subacute care	"subacute care"[MeSH Terms] OR ("subacute"[All Fields] AND "care"[All Fields]) OR "subacute care"[All Fields]
cochrane database syst rev[ta]	"Cochrane Database Syst Rev"[Journal]
acp journal club[ta]	"ACP J Club"[Journal]
health technol assess[ta]	"Health Technol Assess"[Journal]
evid rep technol assess summ[ta]	"Evid Rep Technol Assess (Summ)"[Journal]
evidence-based medicine[mh]	"evidence-based medicine"[MeSH Terms]
behavior and behavior mechanisms[mh]	"behavior and behavior mechanisms"[MeSH Terms]
therapeutics[mh]	"therapeutics"[MeSH Terms]
risk[mh]	"risk"[MeSH Terms]
death	"death"[MeSH Terms] OR "death"[All Fields]
treatment outcome[mh]	"treatment outcome"[MeSH Terms]
Humans[Mesh]	"humans"[MeSH Terms]
adult[MeSH]	"adult"[MeSH Terms]

**Database: PubMed****Date of search: 5/02/2014**

*Filters activated:* Humans, English, Adult: 19+ years

*User query:* (((((((("Recurrence"[Mesh]) OR "Patient Readmission"[Mesh])) OR (((readmission) OR readmissions) OR recurrence) OR recurrences))) AND (((((((((((((((((("exercise therapy") OR "physical therapies") OR "physical therapy") OR "non-professional home care") OR "nonprofessional home care") OR "home nursing") OR "hospital-based home cares") OR "hospital-based home care") OR "hospital home care services") OR "hospital based home cares") OR "mobile health") OR eHealth) OR telehealth) OR telemedicine) OR "clinical pathways") OR "clinical pathway") OR "clinical paths") OR "clinical path") OR "critical paths") OR "critical path") OR "critical pathway") OR "critical pathways") OR continuity) OR referral) OR discharge) OR sub-acute care) OR subacute care) OR posthospital\*) OR post-hospital\*) OR postacute care) OR post-acute care) OR coordinate) OR coordination) OR post-discharge) OR postdischarge) OR transition\*)) OR (((((((("Case Management"[Mesh]) OR "Rehabilitation"[Mesh]) OR "Continuity of Patient Care"[Mesh]) OR "Patient Discharge"[Mesh]) OR "Patient Transfer"[Mesh]) OR "Telemedicine"[Mesh]) OR "Critical Pathways"[Mesh]) OR "Home Care Services, Hospital-Based"[Mesh]) OR "Home Nursing"[Mesh]) OR "Physical Therapy Modalities"[Mesh]) OR "Exercise Therapy"[Mesh]))) AND (((systematic review[ti] OR meta-analysis[pt] OR meta-analysis[ti] OR systematic literature review[ti] OR (systematic review[tiab] AND review[pt]) OR consensus development conference[pt] OR practice guideline[pt] OR cochrane database syst rev[ta] OR acp journal club[ta] OR health technol assess[ta] OR evid rep technol assess summ[ta] OR drug class reviews[ti]) OR (clinical guideline[tw] AND management[tw]) OR ((evidence based[ti] OR evidence-based medicine[mh] OR best practice\*[ti] OR evidence synthesis[tiab]) AND (review[pt] OR diseases category[mh] OR behavior and behavior mechanisms[mh] OR therapeutics[mh] OR evaluation studies[pt] OR validation studies[pt] OR guideline[pt] OR pmcbook)) OR ((systematic[tw] OR systematically[tw] OR critical[tiab] OR (study selection[tw]) OR (predetermined[tw] OR inclusion[tw] AND criteri\*[tw]) OR exclusion criteri\*[tw] OR main outcome measures[tw] OR standard of care[tw] OR standards of care[tw]) AND (survey[tiab] OR surveys[tiab] OR overview\*[tw] OR review[tiab] OR reviews[tiab] OR search\*[tw] OR handsearch[tw] OR analysis[ti] OR critique[tiab] OR appraisal[tw] OR (reduction[tw] AND (risk[mh] OR risk[tw])) AND (death OR recurrence))) AND (literature[tiab] OR articles[tiab] OR publications[tiab] OR publication[tiab] OR bibliography[tiab] OR bibliographies[tiab] OR published[tiab] OR unpublished[tw] OR citation[tw] OR citations[tw] OR database[tiab] OR internet[tiab] OR textbooks[tiab] OR references[tw] OR scales[tw] OR papers[tw] OR datasets[tw] OR trials[tiab] OR meta-analy\*[tw] OR (clinical[tiab] AND studies[tiab]) OR treatment outcome[mh] OR treatment outcome[tw] OR pmcbook)) NOT (letter[pt] OR newspaper article[pt] OR comment[pt]))) AND (Humans[Mesh] AND English[lang] AND adult[MeSH])

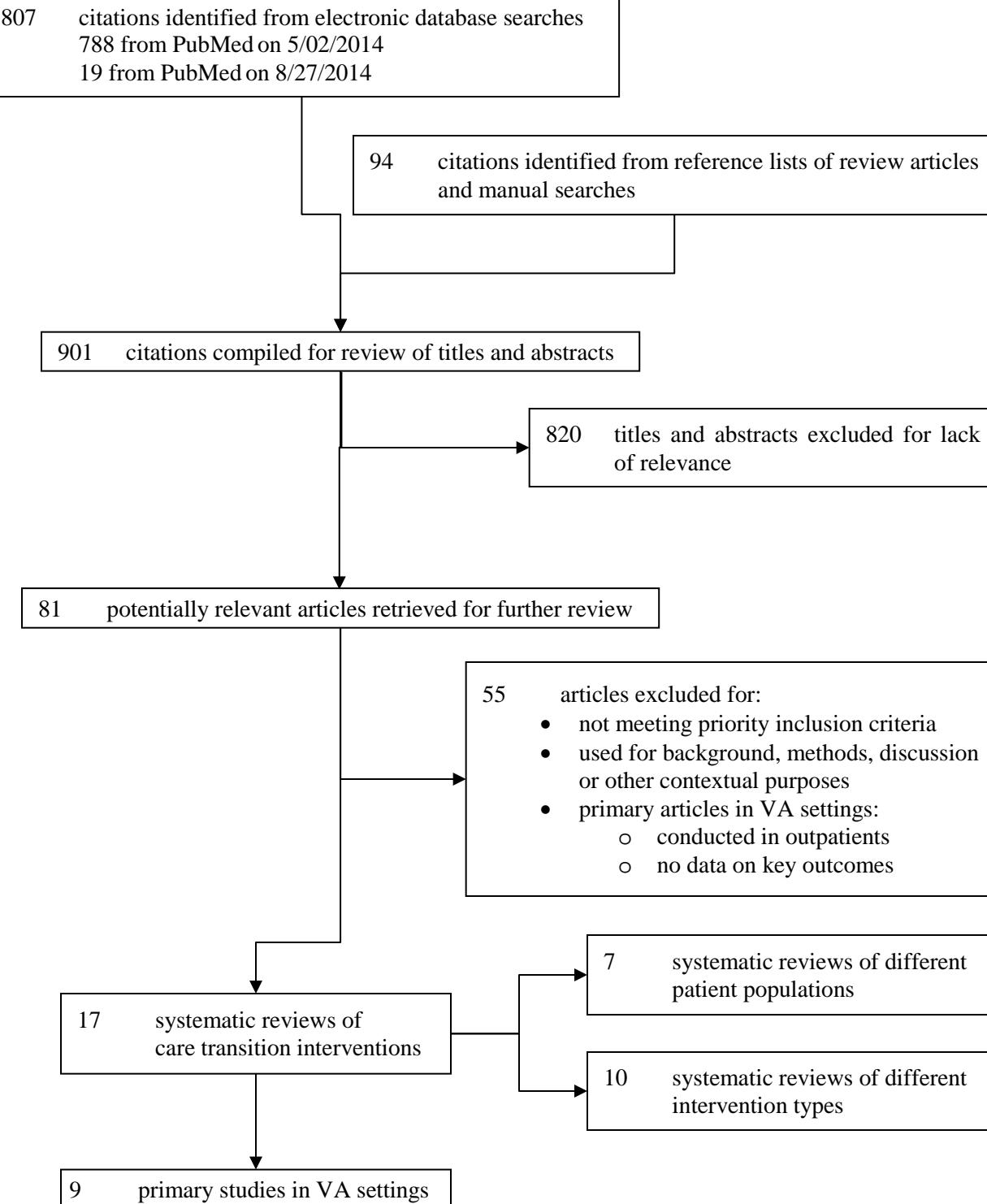
## ADDITIONAL SEARCH FOR PATIENT CENTERED MEDICAL HOME

**Database: PubMed****Date of search: 8/27/2014**

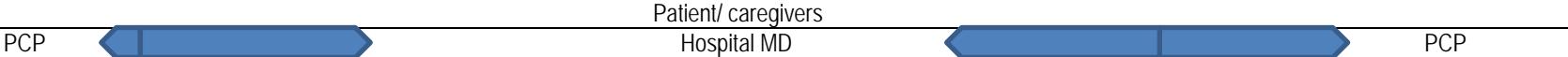
*User query:* (((medical home[Title]) OR medical homes[Title]) OR pcmh[Title])) AND "Patient-Centered Care"[MeSH] AND (systematic[sb])

## APPENDIX C. FIGURES

**FIGURE 1. LITERATURE FLOW DIAGRAM**



**FIGURE 2. TRANSITIONAL CARE MAP**

Setting						
Core Processes	Advanced care planning	<b>Anticipatory discharge planning and care coordination</b> <ul style="list-style-type: none"> <li>- Post-DC services (<i>i.e.</i>, DME, SNF, home health, transportation) arranged</li> <li>- Patient has a clear point of contact across settings</li> </ul>			Reassessment of signs/ symptoms <ul style="list-style-type: none"> <li>- Follow up call</li> <li>- Home Visit for high risk patients</li> </ul> Ongoing telephone follow-up ( <i>e.g.</i> , structured telephone support) for select patients	Timely ambulatory follow up
		<b>Readmission risk assessment</b>				
	<b>Proactive communication</b> <ul style="list-style-type: none"> <li>- PACT team alerted on admission</li> <li>- Means of communication between primary care team and hospital team</li> </ul>	<b>Continued communication with hospital and ambulatory providers</b> at key junctures ( <i>i.e.</i> , end of life decisions, opioid pain management, other key medical decisions)		<b>DC summary completed and transmitted</b> <b>Patient-level transition record (PHR, AVS)</b>		<b>Outstanding test follow through</b>
		<b>Psychosocial Needs assessment</b>	<b>Patient/ Caregiver engagement and education</b> with focus on: <ul style="list-style-type: none"> <li>- Self-management including red flags/ warning signs</li> <li>- Medication changes</li> <li>- Follow up</li> </ul>			
Key team members	Admission med rec		DC med rec			PCP med list updated
						
				home health, PT/OT	Outpatient pharmacists	Ambulatory RNs
						

**Figure 2.** This transitional care map can guide transitional care improvements, and represents the core components of an ideal transition. We suggest that many of these elements be incorporated into best practice for all care transitions. For example, practices of proactive communication, anticipatory discharge planning, patient/ caregiver communication, and timely completion of a discharge summary ought to be standard work for all patients and in any system. However, other elements, such as use of a formal readmission risk tool, detailed pharmacist-guided medication reconciliation, or reassessment of signs and symptoms after discharge via a home visit may be more important in some settings and populations. The arrows at the points of transition indicate that, in some cases, the primary care team may be able to “reach-in” to the hospital as a means of care coordination.

**Advanced care planning** around goals of care at the end of life can be an important part of transitional care from primary care to the hospital, and in particular among patients with terminal illness or geriatric patients, can be initiated in the primary care setting and help guide inpatient care decisions, or potentially avoid unwanted admission altogether. Similarly, if a change in functional status is anticipated after a planned hospitalization – for example, after planned hip replacement – decisions around choice of skilled nursing facilities and other post-discharge needs might be best coordinated prior to hospitalization.

**Proactive Communication** in which the hospital team alerts primary care that a patient is hospitalized, and in which, key history from the primary care setting is communicated forward to the hospital team. A well-integrated and complete medical record may be sufficient in most circumstances. However, where systems are less integrated or where more complex medical or social factors are at play, a warm handoff from primary care to hospital providers can be beneficial.

**Anticipatory discharge planning** is a key element of all hospital-to-home transitions. We suggest that all team members – including physicians, inpatient nurses, social workers, physical and occupational therapists, as well as family and caregivers – are supported to anticipate and prepare for post-discharge needs such as durable medical equipment, home health, and transportation. Multidisciplinary meetings conducted during inpatient rounds may be an efficient way to accomplish much of this discussion.

**Readmission risk assessment** for the purposes of identifying patients for transitional care interventions can be performed at admission, discharge, or even in the post-discharge period depending on the nature of the intervention. For example, some interventions incorporate length of stay as a variable, and thus would be performed on discharge and are best used to guide post-discharge interventions. Other interventions are intended to begin during hospitalization, and thus are best performed early on hospitalization. See Policy Implications section for more discussion of risk assessment.

**Psychosocial needs assessment** should assess factors such as access to outpatient care, ability to afford needed medications, health literacy and numeracy, housing, transportation, and social/caregiver support. These factors inform a more accurate understanding of a patient's ability to self-manage care after hospitalization, whether caregivers should be involved in self-management education, and should guide decisions around role for home health or skilled nursing placement, complexity of medication regimens, and any additional transitional care needs that patient's might need to be successful after hospitalization.

**Communication with hospital and ambulatory providers** during hospitalization may be important at key junctures, for example, around end of life decision-making or around prescribing opioids in high-risk situations, where the success of the plan hinges on the patient's outpatient providers and care environment.

**Patient/ Caregiver engagement and education** should occur throughout hospitalization and utilize teach-back to assess patient understanding. Education can be tailored to focus on transitional care pillars which include: patient understanding of self-management including red flags and warning signs that should prompt further medical attention, medication changes, and a clear follow-up plan. These activities are an opportunity to improve patients' self-efficacy and confidence in self-management, as well as empowering them to serve as their own advocates while transitioning across care settings.

**DC summaries** should be completed within a reasonable time frame of discharge (some suggest within 24 hours of discharge), should be complete, and transmitted effectively to appropriate outpatient providers. Some key elements of discharge summaries include hospital course and discharge diagnoses, an accurate medication list with rationale for new or discontinued medications, results of key procedures, pending studies and any suggested next steps in evaluation, follow up appointments, discharge location (*ie*, home, name of SNF), suggested next steps in evaluation, and a physical examination that includes cognitive and functional status.

**Patient-level transition record** might vary depending on the system and patient. All patients should receive basic written instructions that include an accurate medication list and clear instructions to stop or start any medications and self-care instructions that avoid overly complex language. Some patients may benefit from additional written materials such as a pictorial medication calendar or a more detailed personal health record. For some high-risk populations (*eg*, CHF patients), there may be some utility in creating (or vetting existing) educational tools/instructions, many elements of which may be applicable to most patients, and which can have sections that are individually adaptable as well.

**Medication reconciliation**, while not supported by literature to reduce readmission rates, is an expected part of any hospital admission and discharge. Depending on patient risks and medication complexity and existing resources this may best be performed by a pharmacist versus an inpatient provider.

**Reassessment of signs and symptoms:** optimal approaches to reassessing signs and symptoms after discharge may depend on system and patient characteristics. For example, there is some evidence that a home visit after discharge can improve care and reduce readmissions among high-risk patients, however it is neither feasible nor cost effective for all patients to receive a home visit after discharge. Similarly, systems best consider who performs a phone call after hospitalization (perhaps primary care teams, to assure a close connection back to primary care, or perhaps the health plan to assure that all medications and equipment have been supplied, and to expedite approval and scheduling of any needed appointments).

**Ambulatory follow up:** the optimal timing for post-discharge follow-up is unclear and likely differs based on patient need and medical acuity.

**Outstanding test follow through:** errors due to lack of follow through on tests (lab, imaging, pathology) pending at the time of discharge are common. It is important that there is a shared understanding of accountability for test follow-through among outpatient and inpatient care teams, and a seamless process for communicating outstanding tests and responsibility for follow through across care settings.

## APPENDIX D. INCLUSION/EXCLUSION CRITERIA

Key Questions	<p><b>KQ1. What are the overlapping elements identified in existing systematic reviews that promote successful hospital-to-home transitions?</b></p> <p>We propose a review of systematic reviews to identify the common themes that have emerged from reviews that have focused on specific patient populations (eg, MI, pneumonia, COPD, and CHF). We will then identify randomized controlled trials that include diverse patient populations and test the effects of transitional care interventions on readmission rates (KQ2).</p>	<p><b>KQ2. How do intervention, population, and health care setting characteristics modify the effectiveness of transitional care interventions in lowering readmissions and/or reducing mortality?</b></p> <p>a. What are the key intervention subcomponents that are common to successful interventions?  b. How do implementation characteristics such as the facilitator, intensity, and method of contact modify intervention effects?  c. Are there different characteristics of successful interventions in integrated and non-integrated health systems?  d. How do the characteristics of successful interventions vary among different patient populations?</p>
Population	<p>Include: Adults discharged from the hospital</p> <ul style="list-style-type: none"> <li>- any disease specific medical population (cardiovascular, respiratory illness, etc), or general medical population</li> <li>- any surgical population (inclusion in KQ2 contingent on yield)</li> </ul> <p>Exclude: pediatric; O/B</p>	
Intervention	<p>We will define interventions as those that include “a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations or different levels of care” (Coleman 2004) and/or help prepare patients/caregivers to self-manage their care after discharge from a hospital.</p> <p>Interventions can take place before or after discharge, or include components that span settings (aka bridging interventions).</p> <p>Key processes of interventions may include patient education, motivational interviewing, medication reconciliation, risk-based dosing, monitoring/remote data collection, personal health record, single point of contact, outpatient/provider follow-up, advanced care planning, and care coordination.</p> <p>Characteristics of the intervention, such as facilitator, recipient, intensity (frequency and duration), method of contact, and other aspects, may vary, and will be abstracted and analyzed as covariates.</p>	
Comparator	Usual care, or other included intervention ( <i>i.e.</i> , head-to-head trial)	
Outcomes of interest	<p>Primary outcomes of interest: readmission rate, mortality</p> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>• Quality of life</li> <li>• Functional status</li> <li>• ER utilization</li> <li>• Long-term care placement</li> </ul>	<p>Readmission rate Mortality</p>
Timing	Any timeframe	
Included study designs	Systematic reviews, meta-analyses, meta-regression studies	Controlled clinical trials
Excluded study designs	Observational studies, case series, case reports	

Setting	<ul style="list-style-type: none"> <li>• Any setting within US; integrated and non-integrated</li> <li>• We will include studies in other countries that have health systems, or parts of their health system, that resemble the VA</li> </ul> <p>There are essentially three schemes for universal health care:</p> <ol style="list-style-type: none"> <li>1. <b>The UK National Health Service Model</b> is publicly financed through taxation and is characterized by state ownership of most hospitals and clinics. Many physicians are employed by the state.</li> <li>2. <b>The Bismarck Model</b> uses highly regulated non-profit health insurance funds that are financed through joint employer/employee contributions. Most hospitals are privately owned and most physicians are privately employed.</li> <li>3. <b>The National Health Insurance Model</b> is a hybrid of the first two. A publicly financed, governmentally run single payer purchases care from private providers.</li> </ol> <table border="1"> <tbody> <tr> <td>UK NHS Model</td><td>UK, Spain, Italy, Norway, Finland, Sweden,</td><td>Hong Kong, New Zealand,</td></tr> <tr> <td>Bismarck Model</td><td>Germany, France, Belgium, the Netherlands, Switzerland</td><td>Japan</td></tr> <tr> <td>National Health Insurance Model</td><td>Canada</td><td>Taiwan, South Korea, Australia</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>• Discharged from hospital to home</li> <li>• Discharged from hospital to skilled nursing facilities</li> </ul> <p>Exclude: studies of patients transitioning from outpatient setting or from skilled care facility</p>	UK NHS Model	UK, Spain, Italy, Norway, Finland, Sweden,	Hong Kong, New Zealand,	Bismarck Model	Germany, France, Belgium, the Netherlands, Switzerland	Japan	National Health Insurance Model	Canada	Taiwan, South Korea, Australia
UK NHS Model	UK, Spain, Italy, Norway, Finland, Sweden,	Hong Kong, New Zealand,								
Bismarck Model	Germany, France, Belgium, the Netherlands, Switzerland	Japan								
National Health Insurance Model	Canada	Taiwan, South Korea, Australia								

## APPENDIX E. REVIEWER COMMENTS AND RESPONSES

PR #	Comment	Response
Are the objectives, scope, and methods for this review clearly described?		
1-8	All reviewers entered "Yes"	Noted.
Is there any indication of bias in our synthesis of the evidence?		
1-8	All reviewers entered "No"	Noted.
Are there any published or unpublished studies that we may have overlooked?		
1-3 5-7	No	Noted.
4	Yes - I have heard that a study was published on the IPEC Readmissions tool, and so it seems odd its not even mentioned in your compilation of studies.	Thank you for the suggestion. The IPEC tool would not be eligible for our review because it does not meet inclusion criteria for intervention type.
8	Yes - CMAJ 2004;170(3):345-9 Adverse events among medical patients after discharge from hospital NTOCC September 2008 Update, Transitions of Care Measures, Paper by the NTOCC Measures Work Group, 2008	Thank you for the suggestion. We examined the suggested study and determined that it does not meet inclusion criteria for intervention type.
Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.		
1	Congratulations to the authors on a very ambitious undertaking. This is an impressive review of the literature, and a respectable attempt at deriving standardized, quantifiable and generalizable knowledge around best practices in transitional care improvement.	Noted, thank you.
1	I agree with the author's conclusions, and believe it is supported by the reviewed material and the tables. However the clarity and potential impact of this paper is reduced by a lack of definitions or consistency for many of the terms used throughout, such as 'intervention,' 'intervention component,' 'intervention characteristic,' 'elements,' and 'population.' I suspect that elements, components and characteristics often mean the same thing, and/or characteristics include all of the above, but there are examples where the authors seem to indicate that these terms mean something more specific, but then seem to not use them consistently for those specific meanings. 'Characteristics' is carefully defined as facilitator, recipient, intensity, etc in the inclusion/exclusion criteria, but there are instances in the paper that seem to imply that 'characteristics' is used more generally as a way of describing variation in interventions, patients and setting generally. The title to Table 2 is one example.  There were many instances where I was unsure whether or not the term 'intervention' meant 'intervention components,' also called 'key processes' in the tables, or was referring to a named	We agree that the terminology used is inconsistent and confusing. We have added definitions of intervention type, patient population, and intervention characteristics to the first paragraph of the Methods section. We have revised the rest of the report to be more consistent in the use of these terms.

PR #	Comment	Response
	<p>evidence-based intervention model, which is usually comprised of many components. ‘Specific populations’ sometimes seemed to mean clinical condition, sometimes demographic features, sometimes treatment setting and sometimes risk status. If all of those ways of slicing populations are what is meant by ‘specific’ it would be helpful for the authors to have said this plainly somewhere early in the paper. This is in my view exactly what much of the research in transitional care suffers from, and which is holding us back from comparative effectiveness studies, and is in fact mentioned many times in this paper, and that is a standard taxonomy.</p> <p>Table 2 categorizes interventions by main activities, but some are multi-component categories (eg Hospital at Home) and some are single components (f/u phone calls). This led me to be confused for the rest of the paper about what is meant by ‘intervention type.’</p> <p>p 13 lns 43-45 Again interventions that are single component and some that are multi-component</p> <p>p 13 lns 22-25 Intervention types here is equated with processes of care, but again includes interventions that are single component or single processes, and interventions that are complex multi-component, leaving confusion about what you mean by ‘intervention’ and ‘intervention type.’</p> <p>pp 13 - 15 This examines several individual components, but includes components likely included in other ‘intervention types.’ It is hard to draw conclusions from this. Although the authors do explain this, and note the difficulty deriving conclusions because of it, it leaves the reader not knowing what the authors in this paper consider to be an ‘intervention.’</p> <p>p 18 first paragraph - what do the authors mean at this point by ‘intervention type’? Single component vs multi-component? The presence of the specific components showing promising results?</p>	
1	<p>It would help me follow this complex paper better if the introduction included a description of the usual transitional care given in the VA, and how it is evolving - ie new activities that have been introduced for the purposes of improving care transitions and/or reducing readmissions; and the methods section began with an overview of the taxonomy problem (which is included in the results section, and is well done) with a summary of how the authors intend to define their own taxonomy for the rest of this paper. It would help ground the reader in the elements/components/characteristics that are the highest priority to examine closely, and the yardstick by which the paper intends to examine them.</p>	<p>We have added some VA specific information to the background, and added some definitions to the first paragraph of the methods section.</p>

PR #	Comment	Response
1	<p>METHODS - The introduction describes the method for establishing patient populations and intervention categories and references Tables 1 and 2. Table 1 makes it clear that population categories are clinical; if this is what is meant by ‘population’ throughout the rest of the paper, it would be helpful to just state that - that populations refer to patients grouped according to condition.</p> <p>p 17 ln 17 This refers to ‘specific populations’ and seems to mean clinical condition only.</p>	We agree – we have revised accordingly.
1	P 11 - I found this discussion of taxonomies very helpful, and would have found it more helpful if it had been introduced in the Methods section with a definition of terms for this paper.	Agree – included the taxonomy in first paragraph of methods.
1	P 12 line 41 - needs closing parens	Done
1	P 13 ln 24 ‘several show promise’ needs refs	Added
1	p 18 ln 29 Does ‘specific intervention’ here mean components or larger multi-component models?	Revised to refer to intervention types
1	p 18 lns25-26 ‘Variation of population’ seems awkward. Maybe ‘Variations in’ or ‘Variability of’?	Corrected
1	P 19 - might consider adding to this list ‘Development of a standard taxonomy is desperately needed’!	Done
1	P20 ln 30 I am assuming that the research team developed the map as a result of this review? Would be good to state that plainly. Is this based on the review alone or the combination of the review and the experience within the VA? I like the map - could be a great way to categorize components in the future.	We were more explicit in describing this as part of the review. We left in the description of specific elements used to develop the map.
1	p 21 ln 24-25 ‘Transitional care nurse’ refers to a named comprehensive intervention model. It would be more accurate to describe this as ‘a nurse dedicated to key activities to support better transitional care.’	We edited the “care transitions and PACT” section on page 18 (where the term is first used). We used the suggested wording after referencing the Care Transitions Intervention and we applied quotations to the term.
1	p 25 ln 8 I am not familiar with “CBOC”	Clarified
1	p 26 ln 41 ‘post discharge calls have become a major vehicle for transitional care aty the VA’ - it seems that this should have been introduced earlier, as one of the stated goals of this review is to determine what the VA should invest in for transitional care improvement. See my earlier comments.	As above, we added more VA-specific detail to the background including mention of current use of these calls.
1	p 27 ln 45+ There are many current initiatives doing exactly this. It might be more accurate to say ‘adapt the continuous quality imrpvement methods used by other initiatives for the VA setting and population.’	Thank you for the suggestion – we have revised accordingly
1	p15 ln13 ‘older Cochrane review’ - it would be helpful to put in the year this was published	Done

PR #	Comment	Response
	because the divide in effectiveness at 2002 has already been referenced.	
1	p16 ln 28 In this section 'population' is defined a number of ways other than clinical condition - demographic factors, risk status	See comments above – we clarified that population could refer to clinical condition or demographic characteristics in Methods section
1	Future research - Might add the need to better understand the changes in usual care before and after 2002 to help interpret effectiveness studies in the future.	Agree, added.
1	Conclusions - I think the lack of a common taxonomy cannot be overstated, as it is on this that comparisons could be made and therefore comparative effectiveness studies be performed.	We added this to the conclusion
1	Table 1 - The authors are clear that they did not set a timeline for readmissions as an inclusion criteria, but it would be helpful to include a column or otherwise note what the time to readmissions was for each set of reviews if possible.	We added timing information where available.
1	Table 2 - Would help scan this table to put in bold those processes with statistically significant results.	Agree; done.
1	Figure 2. Transitional care map - Consider adding 'activation' to "Patient/Caregiver education" as it is much discussed in the transitional care literature.	Added this to the description of this item, and added the term "engagement"
3	General comments: This is a challenging literature base to synthesize; the authors appear to have captured recent systematic reviews focused on transitional care. I marked "no: for studies that were overlooked. However, I suggest that the authors make sure they are citing the most recent Cochrane review on structured telephone support/ telemonitoring interventions: Reference # 24 ("older Cochrane review" cited on page 15, line 15. I believe this was updated by the Cochrane collaboration (in 2008): <a href="http://www.thecochranelibrary.com/userfiles/ccoch/file/Telemedicine/CD007228.pdf">http://www.thecochranelibrary.com/userfiles/ccoch/file/Telemedicine/CD007228.pdf</a>	The study at the suggested link (Inglis 2010) was not included because it looks broadly at CHF populations, not recently discharged patients.
3	In the background section of the main report (and ES) I could not get a sense of the scope of the readmission problem as it relates to the VA. For example, are overall readmission rates similar to rates in Medicare populations? And do the same conditions (HF, acute MI, etc...) account for similar % of total readmissions?	See earlier comment – we added VA specific readmissions information to the background section.
3	Throughout the report, there is inconsistent use of abbreviations (particularly for CHF); for example page 14 (line 520 "congestive heart failure" is spelled out int the first sentence but no in the second. I noted a few of these cases below, but suggest word searching or having the editor check the final copy. Page 3, line 58: Consider abbreviating congestive heart failure here or adding acronym if it has not been called out previously. "CHF" is used on page 4, line 55. line 21: CHF could be used instead of spelling this out.	Done
3	Specific comments: Preface (ii): Person listed as the PI on page i (Devan Kansagara) does not	Noted and corrected, thanks

PR #	Comment	Response
	appear to be listed as an author in the "recommended citation" on page ii. I am not sure if this is an oversight?	
3	Executive Summary: page 1, first paragraph: -In line 11, I recommend that "admissions" be changed to readmission or readmission rates.	Done
3	-The first sentence of the executive summary is not clear and maybe a little redundant. I'm not sure we can say that there has been an "exponential" increase in the implementation of transitional care programs- certainly hospitals are increasingly focused on reducing readmission rates and improving care transitions. One suggestion: "Health care systems are increasingly focused on efforts to reduce hospital readmissions; a wide variety of evidence exists on interventions to reduce readmissions, and national and local quality improvement efforts focused on transitional care have also been developed."	This was referring to a citation showing the breadth and rapidity of program interest over a brief period of time. Nevertheless, we have reworded and appreciate the suggested language.
3	page 2, line 14: Sentence starting with "Policy implications...." would be helpful to briefly note the variety of clinical and research experience.	The clinical and research experience of the investigators is detailed in the corresponding section of the main report – we left the details out of the executive summary in an effort to keep it relatively brief.
3	page 3, line 40: PCMH had no effect on admissions or should this be readmissions?	Changed to readmissions
3	page 5, line 20: Consider using readmissions (instead of rehospitalizations) for consistency.	Changed
3	Background: page 8, line 25-26. Are there other financial penalties besides CMS's HRRP? If not, I would specifically list this program and maybe what patient populations are covered (...unless this is not relevant to the VA).	This is less relevant to VA, but we did edit this section to note several CMS initiatives.
3	page 8, line 32-33. See comment from ES. I'm not sure that we know enough about implementation efforts around transitional care components/programs in order to justify using "exponential." It seems there is more of a concern about low rates of implementation, or implementation of some components (but not others) of the multicomponent interventions that are supported by the evidence.	As noted above, we changed the language accordingly.
3	page 10, line 38. I suggest adding the specific populations (X on HF, X on acute MI...etc).	We only selected one review for each patient population or intervention type category.
3	page 12, line 43. Parentheses is missing here. I think the sentence "They found interventions "which" should be changed to "with"?	Changed.
3	page 13, line 15/16. Without adversely impacting which outcomes? Suggest editing this to say "...shortened length of stay without increasing readmission rates" (or whatever the outcomes were).	Specified readmissions and mortality

PR #	Comment	Response
3	page 13, line 16-19. Suggest not starting this sentence with the strength of evidence grade (but rather the conclusion of the study). As written, it is unclear.	Agree, changed.
3	<p>page 14, line 48. The sub-header here is "telephone based interventions"; I think this should be edited. The paragraph also seems to include telemonitoring interventions; maybe change to "technology based" or "Telephone-based and telemonitoring interventions."</p> <p>Also, I'm not sure that this paragraph captures the uncertainty in benefit of structured telephone support vs. telemonitoring for HF in reducing early readmissions. One review cited appear to have lumped these together. Others (like ours) split them apart and found no benefit for telemonitoring (for reducing early readmissions or mortality). I believe the Cochrane review focused on outcome timings &gt; 6 months after an index admission; if so, this should be noted. Some would say that "re"admissions &gt; than 6 months after an index hospitalization don't have much to do with the quality of care transitions. Is there a reason why the more recent Cochrane review is not cited here? See comment above.</p>	Agree. We have substantially revised this section and changed the subheading according. We distinguished the two interventions and noted the uncertainties in the evidence. We looked at the 2008 Cochrane review, but it did not focus on TM interventions after discharge and therefore seemed less directly applicable to our review than the reviews chosen.
3	page 14. line 23-26: I think it may be misleading to call out this one head to head trial of telemonitoring vs. a home visit. I don't have the full review in front of me, but I think this trial may have been rated high risk of bias (and the results here are not consistent with other telemonitoring trials...). Consider editing to state that there was insufficient evidence to make a conclusion on the comparative efficacy of intervention types (or something along these lines).	Agree, changed accordingly.
3	page 14, line 30: I was surprised to suddenly see "hospital at home" interventions. The background/methods did not make it clear that these types of interventions would be included (although I could have missed this). I think this is a different strategy than transitional care interventions; both aim to reduce utilization rates, but I think some would say that the applicability (and perhaps patient populations) are quite different and that these intervention types should not be lumped together. One focuses on an alternative to acute care, while transitional care interventions focus on a different set of processes.	We note that the purpose of these interventions was often to substitute home care for part of a hospitalization, but also note that results did not vary according to the degree of "admission substitution". While we agree hospital-at-home interventions are probably different from other types of transitions interventions, there is substantial overlap (post-d/c home visits, pt education, bridging element) and we would argue the patient populations targeted (older patients with chronic illness) are often the same populations targeted in other TC interventions. Furthermore, these interventions are often, at least in VA, brought up in the TC discussions and are relevant to TC related policy discussions.

PR #	Comment	Response
3	Page 15, line 60. I'm not sure the authors of this review need to add a disclaimer about the VA trials finding an increased risk of readmissions (the sentence starting with "However...."). We don't know if these system-wide changes would have necessarily affected the results of those trials. If I remember correctly, the intervention in the trial by Oddone et. al. had some of the features of a medical home. I would just leave the sentence out, or instead add some of the reasons the authors of those trials cite as explanations for the increased rate of readmissions.	Agreed, we don't know how this would impact readmissions and there have been a number of system wide changes to all the systems studied.
3	Page 16, line 55. Selection of higher risk populations would only increase statistical power in trials if we could correctly identify patients at higher risk. This sentence seems out of place. My sense is that trials have focused on specific populations (such as HF) because this condition itself is associated with a high proportion of Medicare hospitalizations and 30-day readmissions. And because there is some data to indicate that these readmissions are potentially preventable. The use of risk-prediction tools seems like a separate issue.	We deleted the sentence about statistical power. We clarified some of the other language in order to better distinguish the use of simple inclusion criteria from risk prediction in identifying the study population. We believe the issue is relevant to TC discussions as one of the main purported uses of risk prediction tools has been to identify patients for intervention. There has been at least one quasi-experimental study in CHF patients using a risk prediction tool to identify intervention patients. The issue comes up frequently and we believe the relative lack of empiric data examining this approach in an intervention context is worth noting.
3	Page 19, line 55. The term "sabotage" sounds very colloquial within this report. Consider revising and focusing on quality of patient hand-off from hospital to home, or ensuring close follow-up. The terms "sabotage" and "missed" sound like there is some well defined formula that needs to be followed.	Agree, changed.
3	Policy Implications: How would a VA hospital know that they needed to address transitional care? Is this map intended as a checklist for all hospitals to sort of inventory overall quality in transition processes. Or is intended for hospitals that have a higher than expected readmission rate for certain conditions (e.g., HRRP covered conditions)?	We anticipated it being used by all institutions regardless of current performance. We have added clarification and an explanation here.
3	Page 21, line 45.I would be careful about using "high-risk" here. Seems like the previous section concluded that there was no evidence to support a risk-based approach to targeting patients who receive transitional care interventions. HBPC programs would certainly be able to provide in-person care following an admission for patients already enrolled. I wonder if one of the VA home-based care trials have reported data on readmission rates? If so, I would mention that here. Many VAs (or larger VAs) also have a heart failure specialty clinic that can identify patients during an inpatient admission and arrange close follow-up.	Agree – we have taken out that term and we've added a recent reference to the impact of HBPC on hospitalization rates. We appreciate the suggestion re: CHF clinics and have added this.

PR #	Comment	Response
3	Page 22-23; The section on risk-prediction is long (compared to other sections) given that the authors note the incremental benefits are unclear and the problems noted with implementation. Seems like this is more of a "research gap"- testing the external validity/ feasibility and effectiveness of various tools in VA settings.	While the point is well taken, we have decided to keep the section in as the question of risk assessment comes up very frequently in policy discussions and we felt it important to clarify the different approaches to risk assessment, acknowledging the gaps in evidence.
3	Page 25, starting at page 46. I may be biased or missing some other review that found benefit, but I would disagree that using telemonitoring/transfer of physiologic data is a useful adjunct to preventing early readmissions for people with HF (without other intervention components). This paragraph seems to paint these interventions in too positive a light.	This was meant to refer to the STS interventions which were associated with long-term readmissions risk reduction. We changed the wording to emphasize the periodic contact by trained nurses (rather than the physiologic data) and we have clarified that the impact was on long-term readmissions. We have tried to be circumspect in the language, but there is at least some promising data in support of the STS interventions in CHF patients and the VA especially has reasons to value telephone-based interventions.
3	Page 27, line 19-20. I don't think PCORI was spelled out previously in this report.	Thanks - changed
3	Page 27, line 41-42. I'm not sure what "transition into the hospital" means. Is this about understanding the reasons for admissions? This is more challenging in some ways then looking at readmissions, and likely varies more by condition (compared with transition to home).	We edited to clarify that this is about communication between outpatient and inpatient teams at the proximal end of hospital stay – clarified that this is simply a poorly understood, but potentially important, area for further investigation. Agree it may be a challenging area to investigate, but in our opinion was still important to acknowledge.
3	Limitations section: I would note that reviews focused on different outcome timings (and trials mentioned had different readmission outcome timings). Interventions showing efficacy at 6 months may not prevent early readmissions.	Agree, changed accordingly
4	In general, I love your writing. I was however waiting for the big bang of what I would walk away with... everything seemed to not demonstrate a whole lot, weak evidence, so whats a	We acknowledge the need to provide some practical recommendations. We

PR #	Comment	Response
	<p>reader to do? You make recommendations about a model that touches many points of care "peri discharge", but what models do that? I know RED does, but will all your readers know that? Overall, impressive! Just know that your readers are likely well informed on transitions and will be looking for the magic pill, we don't have that, but we could offer some guidance or just make it more clear. Very proud of your work!</p>	<p>have strived to do this within the constraints of the available evidence. We have edited the discussion to provide some more guidance on use of the map and we have included references to documents such as the NTOCC report that detail QI strategies institutions might use. While we would have loved to be able to identify an easy answer to fixing transitional care, we simply could not find one. But we would argue a shared understanding of the current evidence base is useful in guiding future discussions, even if there are many evidence gaps.</p>
5	<p>I agree that the current post-discharge calls should be critically evaluated but their purpose is not necessarily to reduce utilization or improve outcomes. This is partially addressed on p. 26, lines 28-37, but in a speculative way. Perhaps it could be clearer that this review was confined to reviews using readmissions as outcomes (in the title?) and that the conclusions reflect that focus.</p>	<p>We have specified our inclusion criteria in the methods. We added that our review focuses on readmissions and mortality outcomes in the objectives paragraph in both ES and main report. We also acknowledge this issue in the Limitations section.</p>
6	<p>I didn't understand the attachment describing the Map you developed that facilities could use for doing a gap analysis. A little more instruction on the form would be helpful</p>	<p>We've added some more explanation to the corresponding section of the discussion, as well as a reference to the NTOCC report which provides greater detail about specific QI methodology.</p>
7	<p>This ESP review speaks to the complexity of evaluating much of the transition literature. The lack of effectiveness of most of the interventions evaluated speaks to this complexity. This review clearly speaks to this issue.</p>	<p>Noted</p>
8	<p>There is a noticeable paucity of discussion of metrics for transitional care. While the report calls into question the use of readmissions alone as a metric (appropriately so) it alludes to other utilization measures but not enough attention is paid to other outcome and process measures (page 23-24). Most dramatically absent is the need to assess adverse events associated with inadequate transitions. Falls with injuries, delayed or missed diagnosis due to diagnostic study results not</p>	<p>We agree and appreciate these suggestions. We have added a discussion of patient safety to the outcomes section and added a reference to the global trigger tool.</p>

PR #	Comment	Response
	<p>being followed up or recommended testing not being completed, nosocomial infections, morbidity from inadequate home health arrangements, etc. do not register on the 30d readmission metric but are poor outcomes with high impact to patients and resources.</p> <p>There are published process measures and outcome measures in addition to utilization measures. The NTOCC (National Transitions of Care Coalition) defines various measures categories (structure, process, outcomes). This is a start but probably not the best paradigm for measuring transitional care.</p> <p>Additionally, the global trigger tool as a mechanism for capturing adverse events was not examined. Utilization measures (readmissions, ED visits, etc.) are based on financial outcomes for CMS first, and patient outcomes second. They are not adequate for addressing the enormity of health outcomes that suffer from inadequate transitions. Mortality is a balancing measure for readmissions. In the case of heart failure, if an institution has a high readmission rate but a lower than average mortality rate, the case can be made for enhanced access as a contributing factor.</p>	
8	<p>Was the SHM BOOST data included in the studies that were reviewed? BOOST data was published in 2013 and I wasn't sure if it was included in the analysis. Their emphasis on QI methodology as a way to improve transitional care is an important consideration.</p>	<p>We are aware of this observational study, but since this was a review of reviews we did not formally include individual studies that were not included in reviews (and this study would not have been included in recent systematic reviews most of which examined only trials). We agree that a complete discussion of TC improvement needs to acknowledge QI methods that can be used to affect change. Such a discussion is beyond the scope of this review, but we have added a sentence to the discussion about the TC map that acknowledges this gap and references the NTOCC report.</p>