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# Care Coordination Models and Tools: A Systematic Review and Key Informant Interviews

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## PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted health care topics of importance to clinicians, managers, and policymakers as they work to improve the health and health care of Veterans. These reports help:

- Develop clinical policies informed by evidence;
- Implement 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.

The program is comprised of 4 ESP Centers across the US and a Coordinating Center located in Portland, Oregon. Center Directors are VA clinicians and recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Center Program and Cochrane Collaboration. The Coordinating Center was created to manage program operations, ensure methodological consistency and quality of products, and interface with stakeholders. To ensure responsiveness to the needs of decision-makers, the program is governed by a Steering Committee comprised of health system leadership and researchers. The program solicits nominations for review topics several times a year via the [program website](#).

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In designing the study questions and methodology at the outset of this report, the ESP consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

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### Operational Partners

Operational partners are system-level stakeholders who have requested the report to inform decision-making. They recommend Technical Expert Panel (TEP) participants; assure VA relevance; help develop and approve final project scope and timeframe for completion; provide feedback on draft report; and provide consultation on strategies for dissemination of the report to field and relevant groups.

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The Coordinating Center sought input from external peer reviewers to review the draft report and provide feedback on the objectives, scope, methods used, perception of bias, and omitted evidence. Peer reviewers must disclose any relevant financial or non-financial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center and the ESP Center work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

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## ABBREVIATIONS TABLE

<b>Abbreviation</b>	<b>Definition</b>
AHRQ	Agency for Healthcare Research and Quality
CC&ICM	Coordinated Care & Integrated Care Management initiative
CFIR	Consolidated Framework for Implementation Research
CI	Confidence interval
ED	Emergency department
ESP	Evidence Synthesis Program
KQ	Key question
MeSH	Medical subject heading
OR	Odds ratio
RCT	Randomized controlled trial
RD	Risk difference
RE-AIM	Reach, Effectiveness, Adoption, Implementation, and Maintenance
SR	Systematic review(s)
TEP	Technical expert panel
US	United States of America
VA	Department of Veterans Affairs

# EVIDENCE REPORT

## INTRODUCTION

Complexity of health care services and care fragmentation contribute to adverse health outcomes and poor patient experiences of care.<sup>1-4</sup> Over the past 20 years, there has been substantial interest and investment in developing and implementing care coordination interventions, particularly for patients who have demonstrated high utilization of acute care services.<sup>5,6</sup> Although there are multiple definitions for care coordination models, such interventions usually involve systematic strategies that aim to improve continuity and bridge transitions of care.<sup>5,7,8</sup> Often, this takes the form of care or case management, in which a designated person or team helps patients manage their medical care and navigate interactions with the health care system(s). While there have been a variety of care coordination models evaluated across diverse settings, it remains unclear whether these interventions can sufficiently address gaps in care and improve patient outcomes.

The VA Care Coordination and Integrated Case Management (CC&ICM) initiative was launched in 2016, as a collaboration between the VA Offices of Care Management and Social Work, and Nursing Services.<sup>9</sup> The main goals of this initiative are to standardize and integrate care coordination services across all VA facilities and points of care for Veterans. The CC&ICM initiative has developed several tools for identifying Veterans who may benefit from various levels of care coordination services; it is currently focused on evaluation of care coordination at pilot VA sites and implementation of additional tools to assist with team integration and communication with patients. To assist the CC&ICM initiative, the VA ESP was asked to review evidence on implementation and outcomes of various care coordination models.

In this report, we summarize results from eligible systematic reviews (SR) on key characteristics and effectiveness of care coordination interventions for diverse adult populations at high risk for adverse outcomes. Additionally, we present results from primary research studies of effective interventions (*ie*, those able to reduce hospitalizations and/or emergency department [ED] visits) regarding tools and approaches used to assess patient trust and care team integration, and to improve communication between patients and providers. To better understand which results may be most applicable to VA, we also provide information about the settings in which effective care coordination models were implemented. Finally, we present results from key informant interviews to address remaining gaps in the published literature, particularly with regard to tools and approaches used by various interventions.



## METHODS

### TOPIC DEVELOPMENT

#### Conceptual Framework of Care Coordination Models

To guide scope refinement and protocol development, we reviewed several existing resources on integrated care or care coordination, including the Agency for Healthcare Research and Quality (AHRQ) Care Coordination Atlas<sup>5</sup> and a previous ESP report on care coordination frameworks.<sup>7</sup> We examined specific frameworks, such as Care Coordination in Chronic and Complex Disease Management,<sup>8</sup> the Integrated Team Effectiveness Model,<sup>10</sup> Rainbow Model for Integrated Care,<sup>11</sup> and Coordination Networks.<sup>12</sup> In collaboration with VA stakeholders from the Office of Care Management and Social Work Services and the Office of Nursing Services, and our technical expert panel, we selected the framework for Care Coordination in Chronic and Complex Disease Management as the most applicable to the goals of this current review (Table 1). This framework focuses on characteristics, processes, and interactions within and between health care teams. We considered that evidence addressing these areas would be most relevant to support the goals of the VA CC&ICM initiative. We further adapted this framework in 2 areas: 1) specification that team roles include who contacted patients (and in what manner); and 2) reorganization of outcomes by patients (*eg*, patient experience, quality of life, and survival), health care teams (*eg*, work satisfaction and burnout), and health systems (*eg*, acute care utilization and costs). While health care utilization and costs may be measured at the patient level (*eg*, number of admissions or ED visits per person), we considered such outcomes to be oriented towards the priorities of the health care system (and payers).

Applying this framework and in accordance with the priorities of our VA partners, we defined effective care coordination interventions as those that reduced hospitalizations and/or ED visits. We sought information about the key characteristics of effective interventions, particularly with regard to elements depicted in the columns on Context & Setting and Coordinating Mechanisms (Table 1). For example, key characteristics may include multidisciplinary teams (vs primarily single case manager), and home visits (vs telephone contacts and/or outpatient visits). To support ongoing implementation and evaluation of care coordination programs in the VA, we also searched for evidence on tools and approaches that were used to assess Emergent Integrating Conditions (*eg*, trust within teams) and Coordinating Actions (*eg*, within team communication); such tools may assist programs in monitoring implementation progress before final outcomes are available. To these elements from the Care Coordination Framework, we additionally considered tools to assist with evaluating patient trust or working alliance with the care coordination team, and those to improve communication between patients and providers. Finally, to support interpretation of the evidence with regard to applicability to VA health care settings, we sought information on the characteristics of health care systems and communities where effective interventions have been implemented.

**Table 1: Adapted Framework for Care Coordination in Chronic and Complex Disease Management\***

	Context & Setting	Coordination Mechanisms	Emergent Integrating Conditions	Coordinating Actions	Outcomes
<b>Within Teams</b>	<ul style="list-style-type: none"> <li>Team composition</li> <li>Experience &amp; history</li> <li>Power distribution</li> <li>Resources</li> </ul>	<ul style="list-style-type: none"> <li>Plans, rules, &amp; tools</li> <li>Objects, representations, artifacts, &amp; information systems</li> <li>Roles (eg, who contacts patients &amp; how)</li> <li>Routines</li> <li>Proximity</li> </ul>	<ul style="list-style-type: none"> <li>Accountability</li> <li>Predictability</li> <li>Common understanding</li> <li>Trust</li> </ul>	<ul style="list-style-type: none"> <li>Situation monitoring</li> <li>Communication</li> <li>Back-up behavior</li> </ul>	<ul style="list-style-type: none"> <li><u>Patients</u></li> <li>(eg, patient experience, quality of life, survival)</li> <li><u>Health care teams</u> (eg, job satisfaction)</li> </ul>
<b>Between Teams</b>	<ul style="list-style-type: none"> <li>Multiteam system composition</li> <li>Linkages between teams</li> <li>Alignment of organizational cultures/ climates</li> <li>Governance &amp; payment structure</li> </ul>			<ul style="list-style-type: none"> <li>Boundary spanning</li> <li>Information exchange</li> <li>Collective problem-solving &amp; decision-making</li> <li>Negotiation</li> <li>Mutual adjustment</li> </ul>	<ul style="list-style-type: none"> <li><u>Health systems</u> (eg, acute care utilization, costs)</li> </ul>

\*Original framework by Weaver et al (2018)<sup>8</sup>

### Key Questions (KQ)

For community-dwelling adults with a variety of ambulatory care sensitive conditions and/or at higher risk of having repeat hospitalization or ED visits:

**KQ1**—What are the key characteristics of care coordination models (of varying types) that aim to reduce hospitalization or ED visits?

**KQ2**—What is the effect of implementing these care coordination models on hospitalizations, ED visits, and patient experience (eg, Consumer Assessment of Healthcare Providers and Systems)?

**KQ3**—What are the characteristics of settings in which effective models have been implemented?

**KQ4**—Among effective models, which approaches/tools have been used to:

- Measure patient trust or working alliance?
- Measure team integration?
- Improve communication between patients and providers?

To address these KQ, we first focused on identifying eligible SR on care coordination models. We determined that a review of reviews would be appropriate given the broad scope and anticipated heterogeneity in types of care coordination models, as well as patient populations. In order to address likely gaps in SR results, particularly with regard to KQ 3 and 4, we also

examined primary research studies of effective interventions and conducted key informant interviews with those who implemented and evaluated interventions.

## SEARCH STRATEGY

We searched for English-language SR in the following databases, from inception until September 2019: MEDLINE, CINAHL, Embase, Cochrane Database of Systematic Reviews, AHRQ Evidence-based Practice Center reports, and VA ESP reports. The search terms included MeSH and free text for care coordination interventions (*eg*, care or case management, interdisciplinary care, and intensive primary care), and systematic reviews (Appendix 1). We anticipated that eligible SR may not provide sufficient information, particularly with regard to KQ3 and 4. Therefore, we supplemented results from eligible SR with: 1) examination of primary research studies included by SR; 2) search of MEDLINE and Embase from the year of the most recent eligible SR (2018) until February 2020 for relevant randomized controlled trials (RCT) on care coordination models (Appendix 2); and 3) interviews with investigators and/or teams who implemented interventions described in research studies thus identified (see below).

## STUDY SELECTION

Duplicates were removed from SR search results and uploaded into DistillerSR (Evidence Partners, Ottawa, Canada). Using prespecified inclusion and exclusion criteria (Appendix 3), titles and abstracts were screened for eligibility. Eligible populations of interest included community-dwelling adults with a range of ambulatory care sensitive conditions (*eg*, heart failure and chronic lung disease) and/or at higher risk for acute care episodes. If a review focused exclusively on interventions for a single health condition, it was excluded. Eligible interventions covered different care coordination models, such as care or case management and home-based primary care (Appendix 3). We required that eligible reviews reported inclusion of hospitalizations and/or ED visits as outcomes of interest in objectives or results. Articles underwent full-text review if at least 1 reviewer deemed it eligible during abstract screening. Exclusion of articles at screening required agreement of 2 reviewers. At full-text review, 2 individuals separately determined inclusion/exclusion and then resolved any conflicts through discussion. When consensus could not be reached, disagreements were discussed with a third reviewer.

From each eligible SR, we identified all included primary studies and 2 reviewers evaluated them for potential relevance to KQ3 and 4. In addition to the above criteria for SR, we applied the following: conducted in US, and RCT or quasi-experimental observational studies (*eg*, comparative control cohort or interrupted time series).<sup>13</sup> To supplement this group of relevant primary studies, we also screened search results for RCT of care coordination models from 2018 until February 2020. Two reviewers applied the same criteria used to evaluate SR, along with the additional requirement for RCT conducted in US.

## QUALITY RATING & DATA ABSTRACTION

We assessed the quality of eligible SR using criteria adapted from AMSTAR 2,<sup>14</sup> and rated overall quality as high, medium, or low (Appendix 4). In general, a high-quality SR met all applicable criteria (*ie*, at least “partial Yes” for all questions). Two reviewers independently rated each SR, and consensus was reached through discussion.

We abstracted data from all eligible SR on: target population(s); dates of search queries; and number and characteristic of included primary studies (location, setting, and study design). Additionally, from medium- and high-quality SR, we abstracted detailed results on: description of care coordination model characteristics; pooled effects (or qualitative summaries) for hospitalizations, ED visits, and/or patient experience; characteristics of settings; and tools and approaches used to measure patient trust or working alliance, assess health care team integration, and/or improve communication between patients and providers.

From relevant primary studies on care coordination models, we abstracted data on effectiveness for main outcomes; participant, intervention and setting characteristics; and tools and approaches. Because the primary studies frequently referenced other studies for information on intervention characteristics, we also reviewed these associated studies for data relevant to KQ3 and 4.

For both SR and primary studies, data abstraction was done by 1 reviewer and results overread by a second reviewer.

## **DATA SYNTHESIS FOR SYSTEMATIC REVIEWS & RELEVANT PRIMARY STUDIES**

We focused on results from SR to evaluate KQ 1 and 2, because this allowed us to address a broad scope including many types of care coordination interventions across diverse high-risk populations. Given this heterogeneity, we undertook a qualitative synthesis of these results. We summarized SR results on key characteristics of care coordination models, and effectiveness for hospitalizations, ED visits, and/or patient experience. We also included strength of evidence determinations by SR, if these were stated. Few SR provided information on KQ 3 and 4; we highlighted these results when provided.

For identified relevant primary studies, we focused on those reporting successful reductions in hospitalizations and ED visits, and summarized information from these studies that were relevant for KQ3 and 4. To address remaining gaps, we also included information from associated articles (eg, methods papers) and websites referenced by primary studies.

## **INTERVIEWS WITH KEY INFORMANTS WHO IMPLEMENTED CARE COORDINATION MODELS**

We conducted semi-structured interviews with research investigators and members of teams who implemented care coordination models, as described in relevant primary studies (identified from both eligible SR and updated search for RCT). We included individuals from relevant primary studies, regardless of effectiveness in reducing hospitalizations and/or ED visits. We initially invited 22 individuals by email, and contacted another 3 individuals per recommendations of respondents. We completed interviews with 11 participants.

The main focus of these interviews was to address gaps in the published literature regarding tools and approaches. We also addressed intervention uptake and sustainability, as this information may be particularly useful to our VA stakeholders. Interview guides included questions in each of these areas and were individually adapted using published or online information about the

interventions. A general version of the interview guide is provided in Appendix 5. Interviews lasted about 30 minutes and were audio-recorded. We reviewed contemporaneous notes and audio-recordings to first develop summaries for each care coordination intervention. We then examined summaries for all interviews to provide overall themes.

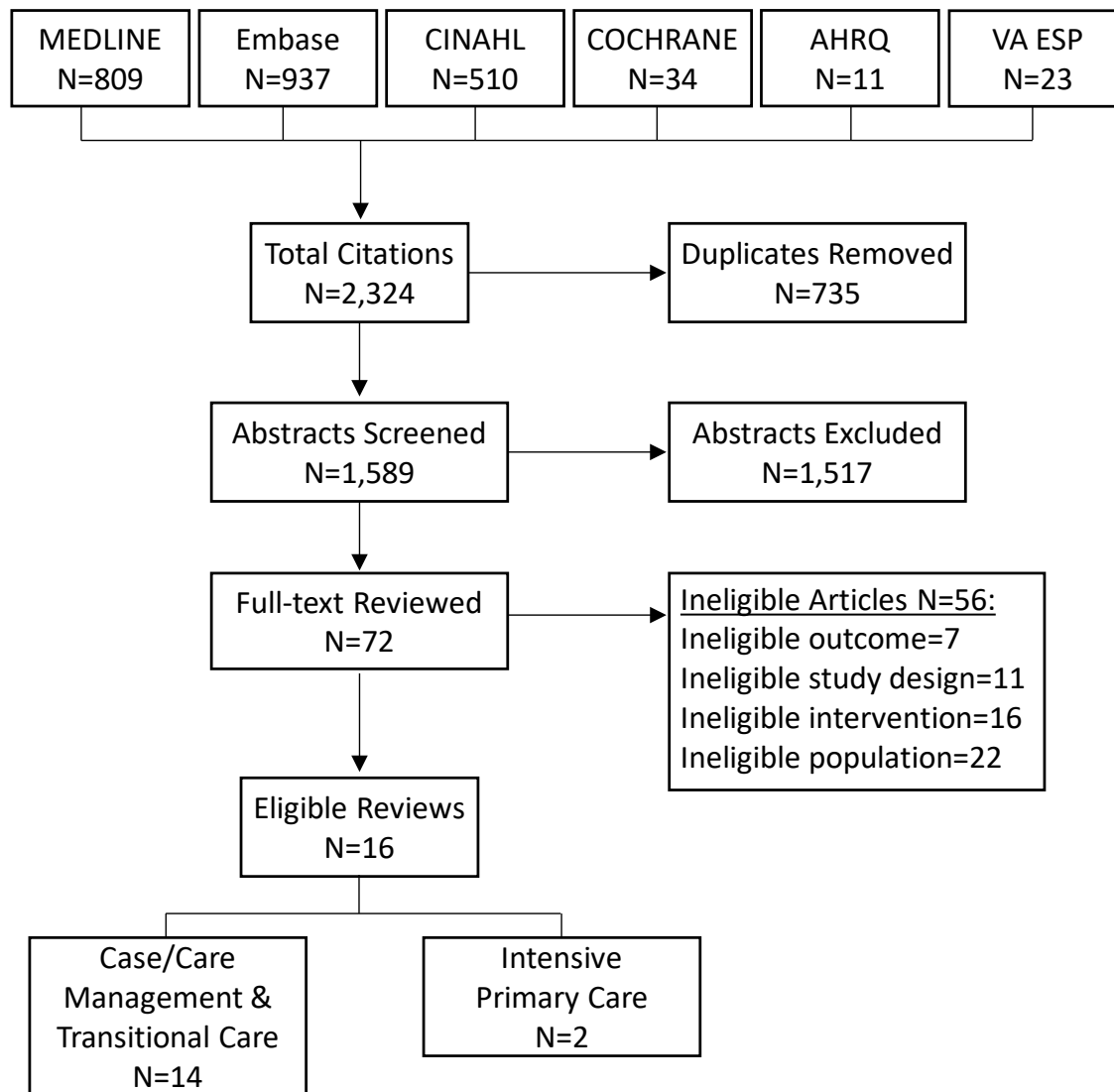
## PEER REVIEW

A draft version of this report was reviewed by 6 technical experts, as well as VA operational partners. Their comments and our responses are presented in Appendix 6.

## RESULTS

### OVERVIEW OF ELIGIBLE SYSTEMATIC REVIEWS

Of 2324 unique citations, 72 underwent full-text review (Figure 1). We identified 16 eligible SR, 14 of which examined case management or transitional care interventions,<sup>15-28</sup> and 2 of which evaluated intensive primary care models (eg, home-based primary care).<sup>29,30</sup> All SR included a wide range of interventions, using broad definitions for case coordination or intensive primary care models. Four SR included only RCT,<sup>15,21,22,27</sup> while the others allowed both RCT and observational studies. Three SR included only US studies,<sup>16,20,24</sup> and the remaining SR included studies conducted in several different countries. Seven SR focused specifically on patients at higher risk for acute care utilization (ie, high-utilizers),<sup>15,18-20,23,24,26</sup> and 1 SR examined interventions for individuals with frailty.<sup>27</sup> Six SR were high quality,<sup>19,22,23,25,26,30</sup> 6 were medium quality,<sup>15,18,20,21,27,29</sup> and 4 were low quality.<sup>16,17,24,28</sup> We focused on the 12 medium- and high-quality SR for detailed results addressing KQ. Key characteristics and summary of results from high- and medium-quality SR are shown in Table 2. We also provide descriptions of results for KQ1 and 2 in the following text and in Appendix 7 (along with detailed SR characteristics). SR reported very limited information regarding KQ 3 and 4.

**Figure 1: Search & Selection of Eligible Systematic Reviews**

## KQ1—WHAT ARE THE KEY CHARACTERISTICS OF CARE COORDINATION MODELS?

All SR provided general descriptions of different components included by interventions, with many providing some information on team composition and frequency of use of certain components (eg, multidisciplinary care plan). Outside of in-person contacts (whether in a clinical setting or at home), the other main form of communication with patients was via telephone. Four SR<sup>19,25,27,30</sup> specifically addressed whether there are key characteristics for care coordination interventions (Table 2). Hudon et al<sup>19</sup> used qualitative comparative analysis to examine intervention characteristics of effective case management models, reporting “*case-finding...and complexity of health care needs are necessary to produce a positive outcome.*” Additionally, selection of cases needed to be combined with either a high-intensity model (defined by authors

using caseload and frequency and types of contact with patients) or a multidisciplinary care plan. Smith et al<sup>25</sup> reported that interventions “*targeted at specific risk factor management or focused areas...are more likely to be effective... [while] interventions that have a broader focus...seem less effective.*” Van der Elst et al<sup>27</sup> conducted subgroup analyses by intervention duration and different approaches to address frailty, finding no significant differences. Totten et al<sup>30</sup> examined home-based primary care and stated “*there is not an apparent pattern or cluster of services associated with differences in outcomes.*” Additionally, 2 SR<sup>15,29</sup> sought to determine the key components for care coordination models but were unable to draw conclusions; authors reported challenges due to lack of published information on components and fidelity of intervention implementation.

## **KQ2—WHAT IS THE EFFECT OF IMPLEMENTING CARE COORDINATION MODELS?**

Of 10 SR examining case or care management and/or transitional care interventions, 2 conducted quantitative meta-analyses,<sup>22,27</sup> while the remaining SR used qualitative syntheses to describe results<sup>15,18-21,23,25,26</sup> (Table 2). Six SR evaluated effects on hospitalization, with 5 reporting mixed or unclear results<sup>15,19,21,22,25</sup> and 1 finding lack of effectiveness.<sup>27</sup> Among these, Le Berre et al<sup>22</sup> pooled results for transitional care interventions (most involved nurses who called patients and/or made home visits) for diverse patient populations. Pooled results from 11-35 RCT found no effect at 1 month (risk difference [RD] -0.03, 95% CI -0.05, 0) and some effects at 3-18 months (RD range -0.05 to -0.11). Van der Elst et al<sup>27</sup> conducted meta-analyses to evaluate effects on hospitalization but examined a diverse set of case management interventions for frail community-dwelling older adults; pooled results from 5 RCT showed that case management did not reduce hospitalizations (odds ratio [OR] 1.13, 95% confidence interval [CI] 0.95, 1.35).

Seven SR examined effects of case or care management and/or transitional care interventions on ED visits (Table 2). Two SR<sup>21,23</sup> indicated that care coordination interventions reduced ED visits, and both provided descriptive information about included studies. One SR stated that 6 included studies reported reductions in ED visits,<sup>21</sup> and the other found that the median rate ratio (of care coordination vs control) was 0.63, with interquartile range of 0.41-0.71.<sup>23</sup> All 5 remaining SR<sup>18-20,22,26</sup> reported unclear or mixed effects on ED visits, including 1 that conducted pooled meta-analyses over various timeframes (1-12 months).<sup>22</sup>

Only 1 SR on case management evaluated effects on patient experience and, using qualitative synthesis, found inconsistent results.<sup>19</sup>

Two SR evaluated intensive primary care interventions, with the 1 focused on home-based primary care reporting reduced hospitalizations,<sup>30</sup> and the other describing inconsistent results across studies<sup>29</sup>; both used qualitative syntheses (Table 2). The SR on home-based primary care also found that there was improved patient and caregiver satisfaction (low strength of evidence).<sup>30</sup>



## **KQ3—WHAT ARE THE CHARACTERISTICS OF SETTINGS IN WHICH EFFECTIVE MODELS HAVE BEEN IMPLEMENTED?**

Only 2 SR addressed characteristics of settings for interventions. 1 SR on case management stated that all but 1 of 16 included studies were single-site, usually in an urban setting.<sup>26</sup> The other SR sought to address organizational settings for home-based primary care models but was unable to find published information.<sup>30</sup>

To further address KQ 3 (and KQ 4), we identified 272 unique primary studies included by eligible SR, and found 18 RCT<sup>31-48</sup> and 9 observational studies<sup>49-57</sup> that were relevant. While 78% of relevant observational studies (n=7)<sup>49-53,55,56</sup> reported reductions in hospitalizations and/or ED visits, only 22% of RCT (n=4)<sup>34,39,42,44</sup> demonstrated effectiveness. Additionally, we searched for RCT that were published after the most recent eligible SR. This search resulted in 1048 unique citations, of which 21 underwent full-text review. We identified 2 relevant RCT<sup>47,48</sup> but both studies reported that interventions were not effective for reducing hospitalizations and/or ED visits.

Characteristics of effective care coordination models described in these studies, their effects and the settings in which they were implemented are summarized in Table 3. We categorized the effective interventions into transitional care, outpatient care or case management (led by nurse or social worker), or other intensive primary care models. These interventions were implemented in a variety of settings, including rural community hospitals and health systems, academic medical centers (in urban settings), and public hospitals serving largely poor and uninsured populations. There was no clear connection between differences in settings, types of intervention and various patient populations.

## **KQ4—WHAT ARE THE TOOLS AND APPROACHES USED BY EFFECTIVE MODELS?**

No SR commented on tools and approaches used to measure patient trust or care team integration, or to improve communication between patients and providers. Primary research studies described several approaches to improve patient-provider communications, such as coaching patients on how to ask questions, making lists of key concerns, and role-playing visits with providers.<sup>34,42,51,55,58</sup> In 2 studies, care coordinators supported communication by attending outpatient visits with patients and their providers.<sup>42,55</sup> No primary research study described specific tools or measures to assess patient working alliance with care coordination staff, care team integration, or patient-provider communications. For 1 intervention, qualitative methods were used to evaluate patient experiences and relationship with care coordinators.<sup>34,59</sup>

## **KEY INFORMANT INTERVIEWS**

We conducted 11 interviews with investigators and other team members who implemented care models described by relevant primary research studies. Several interviewees described using approaches akin to health coaching (although not called that in the published studies) to improve patient communications with providers. None of the interviews provided additional information on specific tools or approaches used to assess patient working alliance with care coordination staff, care team integration, or patient-provider communications. Review of additional



intervention materials provided by some interviewees indicated that assessments of patient experience sometimes included factors conceptually related to patient trust (eg, perception that care coordinator was knowledgeable and understood patients' needs).

Regarding the sustainability of care coordination interventions, we found great variation in long-term effects. In some cases, interventions were not continued after completion of the research studies. Lack of financial viability was often a key factor in discontinuation of these interventions. Others were substantially modified and adapted to meet changing health system priorities (eg, in targeted patient populations). There was variable success in engaging stakeholders such as hospital leadership and front-line providers. Health care utilization and costs were priorities for those in leadership, and improved patient experiences were not usually sufficient for continuing interventions. One interviewee indicated “*a tension between reducing costs/hospitalizations and adding value to the patient.*”

In terms of key issues to for future care coordination interventions, some key informants questioned whether acute care utilization by high-risk populations was truly preventable, as these patients often had multiple challenges and health needs that required hospitalization. For example, 1 interviewee stated, “*Everything that could be possibly going wrong is going wrong...A lot of these people are going to get readmitted no matter what you do.*” There was also concern with current readmission metrics and the ability to make substantial changes within a short timeframe: “*30 days doesn't give you sufficient time...especially in elderly patients with many issues.*” Some also suggested that care coordination interventions may work better in those with less severe conditions and/or modifiable factors; an important challenge with such an approach is that the intervention may need to serve a large number of patients before there are appreciable differences in acute care utilization. One individual described it thus: “*You can allocate a lot of resources to extremely high need patients...or you can allocate resources to a larger population and ... have a smaller impact on individual level, but on population level have greater impact...*”

**Table 2: Summary of Results for Key Questions 1 and 2 from High- and Medium-Quality Systematic Reviews**

Author, Year (Quality, Year of Search)	Included Populations; Study Designs; # Relevant Primary Studies	Synthesis Method	KQ1—What are the key characteristics of care coordination models?	KQ2—What is the effect of implementing care coordination models?		
				↓ Hospitalization? (Y/N)	↓ ED Visits? (Y/N)	↑ Patient Experience? (Y/N)
<b>Case Management and Transitional Care Interventions</b>						
Di Mauro, 2019 <sup>18</sup> (Medium, 2018)	High-utilizers; RCT, cohort; 3	Qualitative synthesis	NR	NR	Unclear (inconsistent across studies)	NR
Hudon, 2019 <sup>19</sup> (High, 2017)	High-utilizers with chronic conditions; RCT, cohort, cross-sectional; 4	Qualitative comparative analysis	Necessary characteristics: “ <i>case-finding</i> ” (high utilization and/or complexity of needs) AND High-intensity or multidisciplinary care plan	Unclear (inconsistent across studies)	Unclear (inconsistent across studies)	Unclear (inconsistent across studies)
Iovan, 2019 <sup>20</sup> (Medium, 2017)	High-utilizers; RCT, cohort; 6	Qualitative synthesis	NR	NR	Unclear (inconsistent across studies)	NR
Van der Elst, 2018 <sup>27</sup> (Medium, 2016)	Frail older adults; RCT; 0	Quantitative meta-analysis	No significant results in subgroup analyses by: intervention duration; recruitment method; “ <i>multi- versus unidimensional approach to frailty</i> ”	N	NR	NR
Joo, 2017 <sup>21</sup> (Medium, 2016)	Chronic conditions; RCT; 1	Qualitative synthesis	NR	Unclear (inconsistent across studies)	Y	NR
Baker, 2018 <sup>15</sup> (Medium, 2015)	Multimorbidity, high-utilizers; RCT; 4	Qualitative synthesis	“[C]ommon methodologic issues limited our ability to draw conclusions regarding the effectiveness of specific intervention components...”	Unclear (inconsistent across studies)	NR	NR
Le Berre, 2017 <sup>22</sup> (High, 2015)	Older adults with chronic conditions; RCT; 3	Quantitative meta-analysis	NR	Unclear (inconsistent across studies)	Unclear (inconsistent across studies)	NR



Author, Year (Quality, Year of Search)	Included Populations; Study Designs; # Relevant Primary Studies	Synthesis Method	KQ1—What are the key characteristics of care coordination models?	KQ2—What is the effect of implementing care coordination models?		
				↓ Hospitalization? (Y/N)	↓ ED Visits? (Y/N)	↑ Patient Experience? (Y/N)
Soril, 2015 <sup>26</sup> (High, 2015)	High-utilizer; RCT, cohort; 3	Qualitative synthesis	NR	NR	Unclear (inconsistent across studies)	NR
Moe, 2017 <sup>23</sup> (High, 2014)	High-utilizer; RCT, cohort; 3	Median, IQR for RR	NR	NR	Y	NR
Smith, 2016 <sup>25</sup> (High, 2011)	Multimorbidity; RCT, cohort; 2	Qualitative synthesis	<i>"[I]nterventions that are targeted at specific risk factor management or focused areas where patients have difficulties, such as with functional ability or medicines management, are more likely to be effective... [while] interventions that have a broader focus...seem less effective."</i>	N	NR	NR
<b>Intensive Primary Care Interventions</b>						
Totten, 2016 <sup>30</sup> (High, 2015)	Chronic conditions and/or disabilities; RCT, cohort; 1	Qualitative synthesis	<i>"There is wide variation in the services provided as part of [home-based primary care]. [T]here is not an apparent pattern or cluster of services associated with differences in outcomes..."</i>	Y	Y	Y
Edwards, 2017 <sup>29</sup> (Medium, 2017)	High risk for hospitalization or death; RCT, cohort; 7	Qualitative synthesis	<i>"We had hoped to identify key program features... that may have contributed to the success or failure of these programs. Unfortunately, reporting of key intervention characteristics was inconsistent..."</i>	Unclear (inconsistent across studies)	N	NR

CI=confidence interval; ED=emergency department; IQR=interquartile range; NR=not reported; OR=odds ratio; RCT=randomized controlled trials; RD=risk difference; RR=risk (or rate) ratio



**Table 3: Primary Studies—Characteristics and Results of Effective Care Coordination Models**

Author, Year; Study Design*; N	Intervention Name; Eligibility Criteria	Description of Patient Contacts	Effects of care coordination interventions		KQ3—Characteristics of settings in which effective models have been implemented?
			Hospitalizations	ED Visits	
<b>Transitional Care Interventions</b>					
Capp, 2017 <sup>49</sup> ; Cohort; I=406 C=3396	Bridges to Care; adults with ≥ 2 ED visits and/or hospitalizations in past 180 days	First home visit by community health worker within 24-72 hours, second visit by PCP within 1 week of ED or hospital discharge; 8 visits over 60 days (community health worker, nurse, primary care provider, and/or behavioral health provider) depending on patient needs.	Average # admissions per person, 180 days before enrollment: I=1.04, C=1.15  180 days after 60-day intervention: I=0.75, C=1.02  Difference of differences= -0.16, P<0.1	Average # visits per person, 180 days before enrollment: I=5.12, C=4.93  180 days after 60-day intervention: I=2.79, C=3.60,  Difference of differences=-1.01, P=<0.01	Large urban academic medical center, Colorado
Hamar, 2016 <sup>52</sup> ; Cohort; I=560 C=3340	Care Transition Solution; adults admitted with ≥ 1 condition (COPD, heart failure, myocardial infarction, pneumonia)	Initial visit in hospital with nurse before discharge, then 4 calls over 4 weeks	Proportion with ≥ 1 readmission at 30 days: AOR=0.56 (0.41-0.77)  At 6 months: AOR=0.47 (0.35-0.65)	NR	14 community hospitals in north Texas
Gardner, 2014 <sup>51</sup> ; Cohort; I=21 C=21	Care Transitions Intervention; adults participating in Medicare fee-for-service, admitted to hospital	Initial visit in hospital by nurse, home visit "shortly after discharge," 2-3 phone calls during 30-day post-discharge period	Propensity score matched # readmissions at 6 months: I=0.65, C=0.93 P=0.01	Propensity score matched # visits at 6 months: I=0.44, C=0.50 P=0.55	6 community hospitals, Rhode Island
Coleman, 2006 <sup>34</sup> ; RCT; I=379 C=371	Care Transitions Intervention; older adults (≥65) admitted with ≥ 1 condition (stroke, heart failure, diabetes mellitus, etc)	Nurse met patients in hospital before discharge, home visit within 48-72 hours of discharge, then 3 more times during 28-day post-discharge period.	Proportion with ≥ 1 readmission at 30 days: I=0.08, C=0.12 AOR=0.59 (0.35, 1.00), P=0.048  At 90 days: I=0.17, C=0.23	NR	Community health system, Colorado



Author, Year; Study Design*; N	Intervention Name; Eligibility Criteria	Description of Patient Contacts	Effects of care coordination interventions		KQ3—Characteristics of settings in which effective models have been implemented?
			Hospitalizations	ED Visits	
			AOR=0.64 (0.42, 0.99), P=0.04  At 180 days: I=0.26, C=0.31 AOR=0.80 (0.54, 1.19), P=0.28		
Naylor, 1999 <sup>39</sup> ; RCT; I=177 C=186	Transitional Care Model; older adults (≥65) admitted with ≥ 1 condition (heart failure, respiratory infection, orthopedic procedure, etc.)	Initial nurse visit within 48 hours of admission, visits at least every 48 hours during admission, home visits after discharge (first within 48 hours, second 7-10 days post-discharge, additional visits based on patients' needs), weekly nurse-initiated phone contact	Proportion with ≥ 1 readmission at 24 weeks: I=0.20, C=0.37 P=<0.01	NR	2 urban hospitals affiliated with University of Pennsylvania
<b>Outpatient Care or Case Management</b>					
Shah, 2011 <sup>55</sup> ; Cohort; I=98 C=160	Care Management Program; adults aged 18-64, <200% federal poverty level, uninsured, " <i>met frequent user criteria</i> "	Care managers (social worker or medical office assistant) met with patients at least monthly in the home and/or clinic, for variable lengths of time (care manager decided when patient graduated program)	Adjusted ratio of # of admissions per year (I:C) was 0.81, P=0.38	Adjusted ratio of # of visits per year (I:C) was 0.67, P<0.001	Public safety-net hospital and clinics in Kern County, California
Peikes, 2009 <sup>42</sup> ; RCT; Mercy Medical Center (1 of 15 sites)—I=669, C=467	Medicare Coordinated Care Demonstration; adults participating in Medicare fee-for-service and with ≥ 1 condition (heart failure, COPD, etc.)	Nurse completed in-person evaluation within 2 weeks of enrollment, contacted patient at least monthly, 69% were in-person (either at home or during clinic visit)	Average # admissions per person per year: I= 1.15, C=0.98 P=0.02	NR	Mercy Medical Center—rural community hospital, Iowa
Shumway, 2008 <sup>19</sup> ; RCT; I=167, C=85	Comprehensive case management; adults with ≥ 5 ED visits in past 12 months and had " <i>psychosocial problems that could be addressed with case management</i> "	Social workers completed assessments, individual and group supportive therapy, assistance to a variety of community resources, and "assertive community outreach" (frequency and schedule of patient contacts NR)	Effect size NR, P=0.08 for treatment effect in adjusted model for visits over 2 years	Effect size NR, P<0.01 for treatment effect in adjusted model for visits over 2 years	Urban public hospital in San Francisco, California



Author, Year; Study Design*; N	Intervention Name; Eligibility Criteria	Description of Patient Contacts	Effects of care coordination interventions		KQ3—Characteristics of settings in which effective models have been implemented?
			Hospitalizations	ED Visits	
Sommers, 2000 <sup>56</sup> ; Cohort I=280 C=263	Senior Care Connections; adults ≥65 with difficulty in ≥1 instrumental activity of daily living and 2 ≥ chronic conditions	Initial home visit with case manager (nurse or social worker), treatment plan drafted by care team (nurse, social worker, primary care provider), patients contacts via phone, home visits, small group sessions, or office/hospital visits at least once every 6 weeks	# of admissions per person per year at baseline: I=0.35, C=0.06  during year 1: I=0.38, C= 0.34  during year 2: I=0.36, C=0.52  P=0.03	Proportion with ≥1 visit at baseline: I=0.09, C=0.06  during year 1: I=0.20, C=0.17  during year 2: I=0.21, C=0.17  P=0.77	Primary care clinics in San Francisco Bay area, California
<b>Other Intensive Primary Care Models</b>					
Crane, 2012 <sup>50</sup> ; Cohort; I=34 C=36	Drop-in group medical appointments; uninsured, family income ≤ 200% federal poverty level, ≥ 6 ED visits in past year	Twice-weekly groups sessions, short individual visit right after; direct phone access to nurse care manager; team included nurse, primary care and behavioral health providers	NR	Median # visits per month during 1 year before: I=0.58, C=0.58  during 1 year after: I=0.23, C=0.42  Difference in differences: 0.23, P=0.005	Rural community hospital, North Carolina
Meret-Hanke, 2011 <sup>53</sup> ; Cohort; I=3889 C=3103	Program for All-Inclusive Care for the Elderly; adults >65, with functional limitations or dementia, income <300% Supplemental Security Income	Interdisciplinary care teams provided care management, clinical monitoring, and updated care plan in response to changes in enrollee's health and functional status	Propensity score matched any hospitalization at 6 months: AOR 0.35, P<0.01  At 2 years: AOR 0.16, P<0.01	NR	National US program

AOR=adjusted odds ratio; C=control group; COPD=chronic obstructive pulmonary disease; ED=emergency department; I=intervention group; RCT=randomized controlled trial

\*Study designs were either RCT or observational cohorts with comparative controls



## SUMMARY AND DISCUSSION

### SUMMARY OF KEY FINDINGS

To inform the VA CC&ICM initiative, we conducted a multi-stage review of evidence for care coordination models. We identified 16 eligible SR addressing care coordination interventions, and further examined 29 relevant primary research studies. We also conducted 11 key informant interviews with those who have implemented care coordination models. Key findings include:

- One SR reported that high-intensity models and/or multidisciplinary plans were required for effectiveness (in combination with selection criteria noted above).
- Most SR reported unclear or inconsistent effects of care coordination models in reducing hospitalizations or ED visits.
- Primary studies reporting effective interventions were conducted in a variety of settings, including rural community hospitals, academic medical centers in urban settings, and public hospitals serving largely poor and uninsured populations.
- Approaches to improve patient-provider communication included coaching patients, role-playing, and attending appointments with patients.
- SR, primary studies, and interviews provided little information on specific tools or approaches used to assess patient trust or working alliance or health care team integration.
- Key informant interviews suggested variation in sustainability of care coordination interventions, with substantial adaptation occurring among many of those that have continued.

Care coordination models were complex and differed along multiple dimensions, thus presenting substantial challenges for SR authors in summarizing and comparing results across studies. Four SR drew conclusions with regard to key intervention characteristics, with 2 highlighting selection criteria, 1 indicating importance of high-intensity model (defined by lower caseload and more patient contacts) and multidisciplinary plans, and 2 finding no key characteristics. Several SR seeking to examine key characteristics and/or organizational settings of care coordination models reported difficulty finding sufficient published evidence to address these questions.

Among 11 primary studies demonstrating effective care coordination models, none reported specific tools or approaches for measuring patient trust or health care team integration. Key informant interviews did not provide additional information on these areas. Interventions used a variety of approaches to improve communication between patients and providers, including coaching and role-playing. In some interventions, care coordinators also directly communicated with providers on patients' behalf, including participation at outpatient appointments.

Some interviewees described adaptation of the intervention over time to address evolving priorities for health care organizations. Some also highlighted the difficulty of modifying health

and social factors contributing to need for acute care utilization among many patients in the highest risk category. There were suggestions that there may be more benefit in focusing on patients at somewhat lower risk and improving health care processes for larger groups of patients.

## IMPLICATIONS FOR POLICY

It remains unclear whether care coordination interventions should be implemented in particular health care settings and how they may be adapted to improve effectiveness and sustainability. Two SR highlighted the importance of carefully selecting patients for care coordination interventions. The VA CC&ICM initiative has implemented several tools for evaluating Veteran needs and matching the level of care coordination services to those needs. The CC&ICM team has conducted site visits to assess the use of these tools and implementation of care coordination models at pilot VA facilities. It will be important for VA to evaluate the feasibility of applying these tools more widely, and the effects of implementing such tools on delivery of services and patient outcomes. Additionally, because VA medical centers and clinics are located in a variety of settings, it will be important to understand differences in utility of these tools across large and small sites, and those serving urban and more rural communities.

VA facilities differ in the number and types of care coordination services and programs that are offered. Understanding what is available at a particular facility may be challenging for Veterans, their caregivers, and VA clinical staff. A key goal of the CC&ICM initiative is to standardize care coordination across VA sites, and this may improve access and use of appropriate services for Veterans. However, the CC&ICM initiative also acknowledges the importance of flexibility to adapt care coordination models to accommodate local circumstances. Our interview results also support the importance of local adaptations for uptake and sustainability of care coordination interventions. A potential avenue to achieving more consistency of services while allowing flexibility may be to align services and programs based on program goals and Veteran needs; this information could then be collected in a central hub that Veterans and/or VA staff can use to find appropriate services. It may also be valuable to provide educational materials as part of the CC&ICM initiative to guide adaptations (*eg*, highlighting the key program goals or outcomes, and distinguishing between core components and more flexible options). Additionally, evaluation of implementation should consider which adaptations were made and the rationale to support these.

One SR indicated that a high-intensity (defined using case load and patient contacts) or multidisciplinary care coordination model was more likely to be successful. Our examination of effective primary research studies also found a high number and frequency of patient contacts, often involving home visits. Therefore, it may also be valuable to understand which VA programs or models are most similar to these high-intensity interventions, and consider whether it would be cost-effective to implement more broadly. Currently, such high-intensity care coordination programs serve a limited number of Veterans with specific diagnoses (*eg*, VA Mental Health Intensive Case Management for those with bipolar disorder or schizophrenia).<sup>60</sup>

Finally, there may be specific patient groups that would benefit more from models that go beyond additional care coordination services (*eg*, by a nurse and/or social worker). For example, VA Primary Care Mental Health Integration (PCMHI)<sup>61</sup> is a collocated, collaborative model where mental health staff have frequent structured and informal communications with primary



care staff. The national implementation of VA PCMHI sought to improve access to mental health services for Veterans and improve integration of mental health concerns with other aspects of care. The VA has also been interested in potentially implementing different models of integrating oncology and palliative care for cancer patients.<sup>62</sup>

## EVIDENCE GAPS AND FUTURE RESEARCH NEEDS

Our examination of primary research studies suggested that those with observational quasi-experimental designs were more likely to report reductions in hospitalizations and/or ED visits. Observational studies may have residual confounding and are more likely to be affected by publication bias, as there are no requirements for a priori registration (with explicit description of primary outcomes and analysis strategy).

Studies of effective care coordination models did not report standardized tools used to assess patient trust or care team integration. It may be that these interventions relied on informal assessment by study staff or that there was an assumption that these domains would all improve. However, descriptions of these tools and strategies for assessment will support health systems in evaluating their existing services and implementing new care coordination models.

Finally, multiple SR raised concerns about lack of information on intervention implementation, including fidelity and frequency of various components. To improve evaluation and interpretation of the effectiveness of care coordination interventions, future studies should consider application of frameworks and designs with explicit consideration of implementation outcomes (eg, hybrid effectiveness-implementation designs, Consolidated Framework for Implementation Research [CFIR], and Reach, Effectiveness, Adoption, Implementation, and Maintenance [RE-AIM]).<sup>63-66</sup> Studies using such frameworks should clearly define the “core” set of key components and describe the “adaptable periphery” of elements that can be adjusted to accommodate the local context.

Therefore, we recommend the following for future research:

- Evaluate future care coordination interventions using randomized designs.
- Consider application of standardized tools to assess patient trust or working alliance, health care team integration, and communication between patients and providers.
- Consider study designs that explicitly consider implementation outcomes in future studies of care coordination models.
- Define “core” intervention components and describe local adaptations, particularly in multi-site studies.

## LIMITATIONS

To address the priorities of our VA partners, this work focused on care coordination models that were effective in reducing hospitalizations and/or ED visits; SR and studies that did not address these outcomes were excluded. While we acknowledge the importance of patient experience outcomes, our discussions with stakeholders and key informant interviews all supported the high priority of acute care utilization for health care system leadership, particularly with regard to

sustainability of interventions. We prioritized high- and medium-quality reviews for abstracting detailed results addressing KQ. However, we identified relevant primary studies from all eligible SR. We relied on SR authors' determination of overall effectiveness and strength of evidence for care coordination models. Because interventions in countries other than the US may be less relevant for the VA, we limited primary studies to those conducted in the US. It is possible that studies conducted in other countries may have been informative for VA policy, despite very substantial differences in health care financing and delivery. We were able to complete interviews with less than half of those whom we invited to participate; it is possible that there was unpublished information on tools and approaches that we were unable to identify.

## CONCLUSIONS

Existing evidence on care coordination models indicate that they have inconsistent effects on reducing hospitalizations and/or ED visits for high-risk community-dwelling adults. It remains unclear whether such interventions should be implemented and how they may be adapted to different health care settings. Implementation of new care coordination services should be carefully evaluated, preferably using randomized designs. Policymakers should also consider whether for certain patient populations, a larger-scale redesign of care models may be necessary to improve continuity and collaboration.

## REFERENCES

1. Coleman EA, Berenson RA. Lost in transition: challenges and opportunities for improving the quality of transitional care. *Ann Intern Med.* 2004;141(7):533-536.
2. Gadbois EA, Tyler DA, Shield R, et al. Lost in Transition: a Qualitative Study of Patients Discharged from Hospital to Skilled Nursing Facility. *J Gen Intern Med.* 2019;34(1):102-109.
3. Harrison A, Verhoef M. Understanding coordination of care from the consumer's perspective in a regional health system. *Health Serv Res.* 2002;37(4):1031-1054.
4. Montgomery JE, Irish JT, Wilson IB, et al. Primary care experiences of medicare beneficiaries, 1998 to 2000. *J Gen Intern Med.* 2004;19(10):991-998.
5. McDonald K, Schultz E, Albin L, et al. *Care Coordination Atlas Version 4 (AHRQ Publication No. 14-0037-EF).* Rockville, MD: Agency for Healthcare Research and Quality;2014.
6. Shojania KG, Wachter RM, Owens DK, et al. Closing the quality gap: a critical analysis of quality improvement strategies. *Care Coordination.* 2007;7.
7. Peterson K, Anderson J, Bourne D, Boundy E. *Scoping Brief: Care Coordination Theoretical Models and Frameworks.* VA ESP Project #09-199;2018.
8. Weaver SJ, Che XX, Petersen LA, Hysong SJ. Unpacking Care Coordination Through a Multiteam System Lens. *Med Care.* 2018;56(3):247-259.
9. Greenstone CL, Peppiatt J, Cunningham K, et al. Standardizing Care Coordination Within the Department of Veterans Affairs. *J Gen Intern Med.* 2019;34(Suppl 1):4-6.
10. Lemieux-Charles L, McGuire WL. What do we know about health care team effectiveness? A review of the literature. *Med Care Res Rev.* 2006;63(3):263-300.
11. Valentijn PP, Schepman SM, Opheij W, Bruijnzeels MA. Understanding integrated care: a comprehensive conceptual framework based on the integrative functions of primary care. *Int J Integr Care.* 2013;13:e010.
12. Gittell JH, Weiss L. Coordination networks within and across organizations: A multi-level Framework. *J Manag Stud.* 2004;41(1):127-153.
13. Rockers PC, Rottingen JA, Shemilt I, Tugwell P, Barnighausen T. Inclusion of quasi-experimental studies in systematic reviews of health systems research. *Health Policy.* 2015;119(4):511-521.
14. Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ.* 2017;358:j4008.
15. Baker JM, Grant RW, Gopalan A. A systematic review of care management interventions targeting multimorbidity and high care utilization. *BMC Health Serv Res.* 2018;18(1):65.
16. Bleich SN, Sherrod C, Chiang A, et al. Systematic Review of Programs Treating High-Need and High-Cost People With Multiple Chronic Diseases or Disabilities in the United States, 2008-2014. *Prev Chronic Dis.* 2015;12:E197.
17. De Pourcq K, Meijboom B, Trybou J, Mortier E, Eeckloo K. The role of hospitals in bridging the care continuum: a systematic review of coordination of care and follow-up for adults with chronic conditions. *BMC Health Serv Res.* 2017;17(1):550.
18. Di Mauro R, Di Silvio V, Bosco P, Laquintana D, Galazzi A. Case management programs in emergency department to reduce frequent user visits: a systematic review. *Acta Biomed.* 2019;90(6-S):34-40.

19. Hudon C, Chouinard MC, Pluye P, et al. Characteristics of Case Management in Primary Care Associated With Positive Outcomes for Frequent Users of Health Care: A Systematic Review. *Ann Fam Med*. 2019;17(5):448-458.
20. Iovan S, Lantz PM, Allan K, Abir M. Interventions to Decrease Use in Prehospital and Emergency Care Settings Among Super-Utilizers in the United States: A Systematic Review. *Med Care Res Rev*. 2020;77(2):99-111.
21. Joo JY, Liu MF. Case management effectiveness in reducing hospital use: a systematic review. *Int Nurs Rev*. 2017;64(2):296-308.
22. Le Berre M, Maimon G, Sourial N, Gueriton M, Vedel I. Impact of Transitional Care Services for Chronically Ill Older Patients: A Systematic Evidence Review. *J Am Geriatr Soc*. 2017;65(7):1597-1608.
23. Moe J, Kirkland SW, Rawe E, et al. Effectiveness of Interventions to Decrease Emergency Department Visits by Adult Frequent Users: A Systematic Review. *Acad Emerg Med*. 2017;24(1):40-52.
24. Raven MC, Kushel M, Ko MJ, Penko J, Bindman AB. The Effectiveness of Emergency Department Visit Reduction Programs: A Systematic Review. *Ann Emerg Med*. 2016;68(4):467-483 e415.
25. Smith SM, Wallace E, O'Dowd T, Fortin M. Interventions for improving outcomes in patients with multimorbidity in primary care and community settings. *Cochrane Database Syst Rev*. 2016;3:CD006560.
26. Soril LJ, Leggett LE, Lorenzetti DL, Noseworthy TW, Clement FM. Reducing frequent visits to the emergency department: a systematic review of interventions. *PLoS ONE*. 2015;10(4):e0123660.
27. Van der Elst M, Schoenmakers B, Duppen D, et al. Interventions for frail community-dwelling older adults have no significant effect on adverse outcomes: a systematic review and meta-analysis. *BMC Geriatr*. 2018;18(1):249.
28. Weeks LE, Macdonald M, Martin-Misener R, et al. The impact of transitional care programs on health services utilization in community-dwelling older adults: a systematic review. *JBIC Database System Rev Implement Rep*. 2018;16(2):345-384.
29. Edwards ST, Peterson K, Chan B, Anderson J, Helfand M. Effectiveness of Intensive Primary Care Interventions: A Systematic Review. *J Gen Intern Med*. 2017;32(12):1377-1386.
30. Totten AM, White-Chu EF, Wasson N, et al. *Home-based primary care interventions*. Rockville, MD: Agency for Healthcare Research and Quality; 02 2016.
31. Balaban RB, Galbraith AA, Burns ME, Vialle-Valentin CE, Laroche MR, Ross-Degnan D. A patient navigator intervention to reduce hospital readmissions among high-risk safety-net patients: a randomized controlled trial. *J Gen Intern Med*. 2015;30(7):907-915.
32. Boulton C, Reider L, Leff B, et al. The effect of guided care teams on the use of health services: results from a cluster-randomized controlled trial. *Arch Intern Med*. 2011;171(5):460-466.
33. Coleman EA, Grothaus LC, Sandhu N, Wagner EH. Chronic care clinics: a randomized controlled trial of a new model of primary care for frail older adults. *J Am Geriatr Soc*. 1999;47(7):775-783.
34. Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med*. 2006;166(17):1822-1828.

35. Hughes SL, Cummings J, Weaver F, Manheim LM, Conrad KJ, Nash K. A randomized trial of Veterans Administration home care for severely disabled veterans. *Med Care*. 1990;28(2):135-145.
36. Hughes SL, Weaver FM, Giobbie-Hurder A, et al. Effectiveness of team-managed home-based primary care: a randomized multicenter trial. *JAMA*. 2000;284(22):2877-2885.
37. Lin MP, Blanchfield BB, Kakoza RM, et al. ED-based care coordination reduces costs for frequent ED users. *Am J Manag Care*. 2017;23(12):762-766.
38. Linden A, Butterworth S. A comprehensive hospital-based intervention to reduce readmissions for chronically ill patients: a randomized controlled trial. *Am J Manag Care*. 2014;20(10):783-792.
39. Naylor MD, Brooten D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA*. 1999;281(7):613-620.
40. Newcomer R, Maravilla V, Faculjak P, Graves MT. Outcomes of preventive case management among high-risk elderly in three medical groups: a randomized clinical trial. *Eval Health Prof*. 2004;27(4):323-348.
41. Parry C, Min S-J, Chugh A, Chalmers S, Coleman EA. Further application of the care transitions intervention: results of a randomized controlled trial conducted in a fee-for-service setting. *Home Health Care Serv Q*. 2009;28(2-3):84-99.
42. Peikes D, Chen A, Schore J, Brown R. Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. *JAMA*. 2009;301(6):603-618.
43. Shannon GR, Wilber KH, Allen D. Reductions in costly healthcare service utilization: findings from the Care Advocate Program. *J Am Geriatr Soc*. 2006;54(7):1102-1107.
44. Shumway M, Boccellari A, O'Brien K, Okin RL. Cost-effectiveness of clinical case management for ED frequent users: results of a randomized trial. *Am J Emerg Med*. 2008;26(2):155-164.
45. Sledge WH, Brown KE, Levine JM, et al. A randomized trial of primary intensive care to reduce hospital admissions in patients with high utilization of inpatient services. *Dis Manag*. 2006;9(6):328-338.
46. Zulman DM, Pal Chee C, Ezeji-Okoye SC, et al. Effect of an Intensive Outpatient Program to Augment Primary Care for High-Need Veterans Affairs Patients: A Randomized Clinical Trial. *JAMA Intern Med*. 2017;177(2):166-175.
47. Finkelstein A, Zhou A, Taubman S, Doyle J. Health Care Hotspotting - A Randomized, Controlled Trial. *N Engl J Med*. 2020;382(2):152-162.
48. Yoon J, Chang E, Rubenstein LV, et al. Impact of Primary Care Intensive Management on High-Risk Veterans' Costs and Utilization: A Randomized Quality Improvement Trial. *Ann Intern Med*. 2018;168(12):846-854.
49. Capp R, Misky GJ, Lindrooth RC, et al. Coordination program reduced acute care use and increased primary care visits among frequent emergency care users. *Health Affairs*. 2017;36(10):1705-1711.
50. Crane S, Collins L, Hall J, Rochester D, Patch S. Reducing utilization by uninsured frequent users of the emergency department: combining case management and drop-in group medical appointments. *J Am Board Fam Med*. 2012;25(2):184-191.
51. Gardner R, Li Q, Baier RR, Butterfield K, Coleman EA, Gravenstein S. Is implementation of the care transitions intervention associated with cost avoidance after hospital discharge? *J Gen Intern Med*. 2014;29(6):878-884.

52. Hamar B, Rula EY, Wells AR, Coberley C, Pope JE, Varga D. Impact of a scalable care transitions program for readmission avoidance. *Am J Manag Care*. 2016;22(1):28-34.
53. Meret-Hanke LA. Effects of the program of all-inclusive care for the elderly on hospital use. *The Gerontologist*. 2011;51(6):774-785.
54. Schubert CC, Myers LJ, Allen K, Counsell SR. Implementing Geriatric Resources for Assessment and Care of Elders Team Care in a Veterans Affairs Medical Center: Lessons Learned and Effects Observed. *J Am Geriatr Soc*. 2016;64(7):1503-1509.
55. Shah R, Chen C, O'Rourke S, Lee M, Mohanty SA, Abraham J. Evaluation of care management for the uninsured. *Med Care*. 2011;49(2):166-171.
56. Sommers LS, Marton KI, Barbaccia JC, Randolph J. Physician, nurse, and social worker collaboration in primary care for chronically ill seniors. *Arch Intern Med*. 2000;160(12):1825-1833.
57. Weerahandi H, Basso Lipani M, Kalman J, et al. Effects of a Psychosocial Transitional Care Model on Hospitalizations and Cost of Care for High Utilizers. *Soc Work Health Care*. 2015;54(6):485-498.
58. Brown R, Peikes D, Chen A, Ng J, Schore J, Soh C. The evaluation of the Medicare coordinated care demonstration: Findings for the first two years. Paper presented at: Second Report to Congress. Mathematica Policy Research, Inc. Princeton, NJ2007.
59. Parry C, Kramer HM, Coleman EA. A qualitative exploration of a patient-centered coaching intervention to improve care transitions in chronically ill older adults. *Home Health Care Serv Q*. 2006;25(3-4):39-53.
60. Watkins K, Smith B, Paddock S, et al. Veterans Health Administration Mental Health Program Evaluation Capstone Report. In: RAND Corporation; 2011.
61. Wray LO, Szymanski BR, Kearney LK, McCarthy JF. Implementation of primary care-mental health integration services in the Veterans Health Administration: program activity and associations with engagement in specialty mental health services. *J Clin Psychol Med Settings*. 2012;19(1):105-116.
62. Fulton J, Williams J, LeBlanc T, et al. *Integrated Outpatient Palliative Care in Oncology*. VA ESP;2017.
63. Curran GM, Bauer M, Mittman B, Pyne JM, Stetler C. Effectiveness-implementation hybrid designs: combining elements of clinical effectiveness and implementation research to enhance public health impact. *Med Care*. 2012;50(3):217-226.
64. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci*. 2009;4(1):50.
65. Rabin BA, McCreight M, Battaglia C, et al. Systematic, Multimethod Assessment of Adaptations Across Four Diverse Health Systems Interventions. *Front Public Health*. 2018;6:102.
66. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health*. 1999;89(9):1322-1327.