Effectiveness of Post-Discharge Contacts on Health Care Utilization and Patient Satisfaction

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PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to conduct timely, rigorous, and independent systematic reviews to support VA clinicians, program leadership, and policymakers improve the health of Veterans. ESP reviews have been used to develop evidence-informed clinical policies, practice guidelines, and performance measures; to guide implementation of programs and services that improve Veterans' health and wellbeing; and to set the direction of research to close important evidence gaps. Four ESP Centers are located across the US. Centers are led by recognized experts in evidence synthesis, often with roles as practicing VA clinicians. The Coordinating Center, located in Portland, Oregon, manages program operations, ensures methodological consistency and quality of products, engages with stakeholders, and addresses urgent evidence synthesis needs.

Nominations of review topics are solicited several times each year and submitted via the ESP website. Topics are selected based on the availability of relevant evidence and the likelihood that a review on the topic would be feasible and have broad utility across the VA system. If selected, topics are refined with input from Operational Partners (below), ESP staff, and additional subject matter experts. Draft ESP reviews undergo external peer review to ensure they are methodologically sound, unbiased, and include all important evidence on the topic. Peer reviewers must disclose any relevant financial or non-financial conflicts of interest. In seeking broad expertise and perspectives during review development, conflicting viewpoints are common and often result in productive scientific discourse that improves the relevance and rigor of the review. The ESP works to balance divergent views and to manage or mitigate potential conflicts of interest.

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Operational Partners

Operational partners are system-level stakeholders who help ensure relevance of the review topic to the VA, contribute to the development of and approve final project scope and timeframe for completion, provide feedback on the draft report, and provide consultation on strategies for dissemination of the report to the field and relevant groups.

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The findings and conclusions in this document are those of the author(s) who are responsible for its contents and do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. The final research questions, methodology, and/or conclusions may not necessarily represent the views of contributing operational and content experts. No investigators have affiliations or financial involvement (*eg*, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

Executive Summary

KEY FINDINGS

- We identified 13 studies that assessed the impact of post-discharge interventions.
  - Studies included adults with an acute medical hospitalization. None of the included studies focused on populations with an acute psychiatric hospitalization.
  - A total of 8 studies focused on patients identified as higher risk based on a variety of factors such as a combination of age (*ie,* 65 and older) and medical comorbidities (*eg*, COPD, heart failure).
  - Most studies (*N* = 11) were randomized controlled trials with only 1 rated as high risk of bias.
  - Most (*N* = 11) post-discharge approaches consisted of a single telephone contact conducted in the first 3 days after hospital discharge.
- In a meta-analysis, post-discharge interventions within 7 days after leaving the hospital were not associated with a reduction in 30-day hospital readmissions or emergency department utilization when compared with usual care. Certainty of evidence supporting this conclusion was considered moderate, based primarily on the consistency of results across randomized studies.
- This review found little evidence that such brief, often 1-call follow-ups have an impact on patient satisfaction.
- Findings should be tempered by a lack of information on intervention implementation across included studies.

The transition from hospital to home is a vulnerable period with many patients experiencing preventable and unpreventable adverse events and unplanned health care utilizations. Over the past decade, there has been an increased focus on transitional care from hospital to home. In an effort to reduce rebound hospital admissions, lower health care costs, and improve patient satisfaction, various multifaceted transitional care models have been developed. These pre-discharge models have resulted in small but meaningful reductions in hospital readmissions. Once back at home, however, patients may experience uncertainty about how to best care for themselves, in turn leading to complications. Post-discharge complications commonly stem from poor communication of unresolved medical problems, lack of patient education regarding medications and treatments, limited monitoring of medication adherence, and delayed monitoring of patient status soon after discharge. Although some transitional care models have included a post-discharge component, there is limited information available to assess the direct impact of post-discharge patient contacts on key patient and health system outcomes.

To mitigate transition-related issues, follow-up contacts to patients in the week after hospital discharge has been a widely adopted strategy over the last decade. These post-discharge contacts usually consist of a single telephone contact in the first 2 to 3 days after leaving the hospital. Prior studies have produced mixed results on the effectiveness of these transition-focused post-discharge approaches on key health system outcomes of hospital readmission, emergency department use, and patient satisfaction with care.

CURRENT REVIEW

The Veterans Health Administration (VHA) is the largest integrated health system in the nation. Veterans seeking care through the VHA experience a broad variety of medical and psychiatric illnesses that lead to hospital admissions. Currently, there is no standard post-discharge practice for Veteran patients transitioning back home from VHA hospitals. To assist the VHA in standardizing post-discharges procedures, the VA Office of Primary Care requested this review to assess the impact of post-discharge patient contacts in the first 7 days after leaving the hospital on emergency care use, hospital readmission rates, and patient satisfaction with care to ensure that effective transitional care is provided to Veterans seeking care through the VHA. In partnership with VHA operational partners, the following questions were developed for this review:

Key Question 1a	Among adults with acute medical hospital admissions, what are the effects of post-discharge contacts on hospital readmission, emergency care use, and patient satisfaction?
Key Question 1b	Do the effects of post-discharge contacts for acute medical hospital admissions vary by intervention characteristics (*ie*, mode, clinical staff initiating contact, timing, assessments used during contact, content)?
Key Question 2a	Among adults with acute psychiatric hospital admissions, what are the effects of post-discharge contacts on hospital readmission, emergency care use, and patient satisfaction?
Key Question 2b	Do the effects of post-discharge contacts for acute psychiatric hospital admissions vary by intervention characteristics (*ie*, mode, clinical staff initiating contact, timing, assessments used during contact, content)?

Data Sources and Searches

We searched MEDLINE (via Ovid), Embase (via Elsevier), and CINAHL Complete for relevant studies published from database inception to May 25, 2023. We used database-specific controlled vocabulary as well as relevant keywords to search titles and abstracts. Additional citations were identified from hand-searching reference lists and consultation with content experts. Titles, abstracts, and full-text articles were independently reviewed by 2 investigators, and disagreements were resolved by consensus.

Study Selection

In brief, the major study eligibility criteria were as follows: studies assessed the impact of bidirectional post-discharge contact (PDC) interventions from a nonspecialist clinical service provider to an adult that occurred up to 7 days from a hospital discharge; studies measured 30-day hospital readmission, 30-day ED use, or patient satisfaction; and studies were randomized trials, controlled before-after studies, or interrupted time-series or repeated-measures studies.

All citations that were classified for possible inclusion based on title and abstract by 2 investigators underwent full-text review. All articles reviewed at full-text were also evaluated independently by 2 investigators; all articles meeting eligibility criteria at full-text review were included for data abstraction. Disagreement was resolved via group consensus or by a senior investigator with content or methodological expertise.

Data Abstraction and Risk of Bias Assessment

Data elements included descriptors of the study populations, quality elements, interventions, and outcome details. To better characterize interventions, and in keeping with emerging standards in systematic reviews with intervention complexity, we mapped each included study to a common set of core functions (*ie*, purpose of the change process) of post-discharge interventions: medication review; symptom monitoring; and coordination of social or health services. Study risk of bias (ROB) was assessed by the revised Cochrane risk of bias for randomized trials and cluster-randomized trials (RoB2) and the Risk of Bias in Nonrandomized Studies of Interventions (ROBINS-I) for nonrandomized studies. Quality assessment was completed in duplicate by 2 investigators. Disagreements were resolved by consensus between those 2 investigators or, as needed, with arbitration by a third.

Synthesis

We summarized key study characteristics of the included studies. Key characteristics abstracted included participant descriptors, intervention characteristics (*eg*, timing, dose, content, interventionist), comparator, and outcomes. To better characterize interventions, and in keeping with emerging standards in systematic reviews with intervention complexity, we mapped each included study to a common set of core functional components (*ie*, purpose of the change process) of post-discharge interventions: medication review, symptom monitoring, and coordination of social or health service. We considered the feasibility of completing quantitative synthesis (*ie*, meta-analysis) to estimate summary effects given the volume of relevant literature, conceptual homogeneity of the studies, and completeness of results reporting. For outcome and intervention categories for which meta-analysis was not feasible, we synthesized data narratively by focusing on identifying patterns in efficacy across included studies.

The certainty of evidence (COE) was assessed using the approach described by the Grading of Recommendations Assessment, Development, and Evaluation working group. These domains were considered qualitatively, and a summary rating was assigned after discussion between 4 investigators with either methodologic or content expertise and rated as high, moderate, low, or very low COE.

RESULTS

Results of Literature Search

Our search identified 104 potentially relevant articles after deduplication and title-and-abstract screening. Of these, 13 primary studies (in 13 publications) met eligibility criteria. None of the identified studies were relevant to KQ2 (patients with a psychiatric hospitalization). Six studies were conducted in the USA, 5 in Europe, 1 in New Zealand, and 1 in Canada. The most common core intervention function was medication review ($N = 10$). Nine studies used coordination of care core function, and 7 included symptom monitoring. Eleven studies reported hospitalization outcomes, 7 reported ED utilization, 4 reported composite outcomes of unplanned health care use, and 4 reported on patient satisfaction. The median sample size of included studies was 311 (range: 25-3,054). Eight studies focused on patient populations at elevated medical risk. We did not identify studies that focused on patients discharged from an acute psychiatric hospitalization.

Summary of Results for Key Questions

KQ1: Effects of Post-Discharge Contacts Among Adults With Medical Hospitalizations

- We identified 13 studies that assessed the impact of PDC interventions on outcomes of interest. Most studies ($N = 11$) were randomized trials with only 1 rated as high risk of bias (ROB).
    - All but 1 intervention used telephone-delivered PDC; most ($N = 11$) PDC approaches consisted of a single contact conducted in the first 3 days after hospital discharge.
    - The most common component of PDC was medication review; only 3 studies included all 3 hypothesized core PDC functional components.
- Eleven studies measured all-cause hospital readmissions at about 30 days. Of these, 8 randomized trials were sufficiently comparable to perform meta-analysis. Pooled analysis of 7,336 patients demonstrated no impact of PDC on 30-day hospital readmissions (OR = 0.94, 95% CI [0.83,1.07]; 95% prediction interval [PI] [0.83, 1.07]).
- Seven studies measured all-cause ED use at approximately 30 days since discharge from index hospitalization. Based on the meta-analysis of the 5 RCTs encompassing 3,054 patients, there was no significant difference in the odds of 30-day ED utilization (OR = 1.03, 95% CI [0.84, 1.27]; 95% PI [0.84, 1.27]).
- Four studies measured a composite outcome of 30-day unplanned health care utilizations (*eg*, 30-day hospital readmissions plus ED use, unscheduled office visit). Individually, these studies showed no impact of PDC on a reduction in 30-day unplanned health care use relative to usual care control. Based on the meta-analysis of 3 randomized trials encompassing 1,456 patients, there was no significant difference in the odds of 30-day unplanned utilizations (OR = 1.00, [95% CI 0.76, 1.31]; 95% PI [0.76, 1.31]).
- Only 4 studies assessed the impact of PDC on patient satisfaction, and only 1 small study reported higher patient satisfaction among patients exposed to post-discharge contacts.
- Results were highly consistent across included studies for the outcomes of hospital readmission and ED use (moderate COE based on information from randomized studies only).
- Exploration of subgroup differences by intervention characteristics (*ie*, timing, interventionist, functional components of PDC) also demonstrated no differential impact on PDC effectiveness on 30-day hospital readmissions or ED use.

KQ2: Effects of Post-Discharge Contacts Among Adults With Acute Psychiatric Hospitalizations

We identified no eligible studies that addressed KQ2a or KQ2b.

Discussion and Future Directions

Based on a modest but consistent body of evidence, post-discharge follow-up contacts delivered in the first 7 days after leaving the hospital likely have no impact on 30-day hospital readmissions (moderate COE for RCTs), 30-day ED use (moderate COE for RCTs), or patient satisfaction with care. Yet our results should be contextualized. First, pre-discharge planning is now a routine procedure in most

health systems and generally includes medication review and counseling, patient and/or family caregiver education, and coordinating care with community healthcare providers. In the studies included in our review, about half described some type of pre-discharge planning protocol. It is likely that similar procedures occurred in some fashion in most studies, as this is now considered standard of care. Adding a single post-discharge contact would be a minor component with little potential for impact on outcomes like hospital readmission or ED use. Second, none of the included studies rigorously assessed intervention adherence or fidelity, which are factors that could influence intervention effectiveness. Most of the PDC interventions included in this review were delivered by telephone, which may not be the optimal modality to deliver all critical post-discharge functions. Last, most studies included in this review focused on patients identified as higher risk based on a variety of factors such as a combination of age (*ie,* 65 and older) and medical comorbidities (*eg*, COPD, heart failure). It is likely that these patients may need more intensive approaches in the transition from hospital to home that cannot be delivered in a single-contact approach.

This comprehensive review of the literature identified several gaps in the current evidence that warrant future investigation. Nearly all studies lacked important information to characterize intervention fidelity. Only 1 study reported subgroups by patient characteristics. Additional research that enrolls sufficient numbers of patients from important subgroups is needed in future studies to explore how patient characteristics—including social determinants of health (*eg*, age, race and ethnicity, sex, work environment, income)—may affect risk of readmissions and could clarify whether there are patients likely to benefit from single-contact approaches versus more intensive post-discharge approaches. We identified no studies that assessed PDC for patients with acute psychiatric hospitalization, a priority of the nominating VHA operational partners. Exploring the utility of PDC among patients with psychiatric hospitalizations is a key area for future study. We sought to explore treatment effectiveness based on key intervention characteristics identified by VHA operational partners (*eg*, content, interventionists, timing of intervention); none of these yielded any consistent pattern, but there were few studies in each subgroup to afford firm conclusions by intervention subgroups. Future studies may want to consider direct comparisons between PDC modality (*eg*, video vs phone), timing and dose of post-discharge approaches, and functional components of post-discharge interventions.

CONCLUSIONS

Post-discharge follow-up calls are widely used in the United States and elsewhere. Yet our review demonstrated little supporting evidence that such brief, often 1-call follow-ups have an impact on key health care outcomes of hospital readmissions or ED use at 30 days or patient satisfaction with care. Our findings should be contextualized further as there are (1) many unaddressed questions on the utility of post-discharge approaches and (2) some limitations of the literature and our review. While our review did not find evidence of significant impacts of brief PDC approaches, health care systems like the VHA should consider the cost effectiveness of these relatively light-touch PDC approaches on costly outcomes such as rebound hospital admissions and ED use. Such considerations of widespread, universal, brief post-discharge contacts should be balanced with the potential to target investments in more intensive post-discharge approaches focused on patients most likely to benefit from these interventions.

Main Report

Evidence Synthesis Program

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ABBREVIATIONS TABLE

AVR	Aortic valve replacement
CCI	Charlson Comorbidity Index
CI	Confidence interval
CMS	Centers for Medicare and Medicaid Services
COE	Certainty of evidence
COPD	Chronic obstructive pulmonary disorder
ED	Emergency department
EPOC	Effective Practice and Organisation of Care
GRADE	Grading of Recommendations Assessment, Development and Evaluation
KQ	Key question
NR	Not reported
OECD	Organization for Economic Cooperation and Development
OR	Odds ratio
PCM	Pharmacist case manager
PDC	Post-discharge contact
PI	Prediction interval
RCT	Randomized controlled trial
ROB	Risk of bias
TCM	Transitional care management
TEP	Technical expert panel
VHA	Veterans Health Administration

BACKGROUND

The time following hospital discharge is recognized as a vulnerable period for patients and is associated with increased morbidity, high incidence of adverse events, and unplanned health care utilizations.[1,2] Hospital readmissions in the United States remain a common occurrence in the period immediately following a hospital stay. Fingar et al[3] found that 14% of hospital discharges were readmitted within 30 days and 5% of hospital discharges were readmitted within a week. Other studies show even higher 30-day readmissions rates of 22%, with 8.5% of these readmissions identified as avoidable.[4] Overall, costs for these readmissions are substantial for health systems and payers, with more than $52.4 billion spent annually caring for patients readmitted within 30 days of discharge for a previously treated diagnosis.[5] Emergency department (ED) visits also are a common occurrence post-hospitalization, with about 1 in 5 patients using the ED in the 30 days following a hospital discharge.[6]

Over the past decade, there has been an increased focus on transitional care from hospital to home. Procedures to improve pre-discharge planning from hospitals have resulted in small but meaningful reductions in hospital readmissions.[7] Yet, once back at home, patients may experience uncertainty about how to best care for themselves despite pre-discharge efforts, leading to complications and unplanned health care use. These post-discharge complications commonly stem from poor patient and health care team communication of unresolved problems, lack of patient education regarding medications and treatments, limited monitoring of medication adherence, and delayed monitoring of patient status soon after discharge.[1] Patients who experience post-discharge complications are at high risk of hospital readmission, an undesired and costly outcome for both patients and health care systems.[8]

In 2012, the Affordable Care Act led to the establishment of the Hospital Readmissions Program from the Centers for Medicare and Medicaid Services (CMS), which created penalties for hospitals with higher 30-day readmission rates for 6 core populations: patients with acute myocardial infarction, congestive heart failure, chronic obstructive pulmonary disease, pneumonia, coronary artery bypass graft, and total hip or knee replacements.[9] In 2013, CMS subsequently expanded outpatient billing opportunities with new transitional care management (TCM) billing codes to promote timely outpatient follow-up with primary care and, subsequently, to improve outcomes.[9] Criteria for TCM billing included a face-to-face visit within 7-14 days and communication (direct contact, telephone, or electronic) with patients and/or their caregiver within 2 business days of hospital discharge.[10]

In an effort to reduce hospital readmissions, lower health care costs, and improve patient satisfaction, various multifaceted care models have been developed to improve pre- and post-discharge transitional care, and the Agency for Healthcare Research and Quality recommended implementation of a discharge process toolkit with the majority of steps focusing on pre-discharge planning based on Project RED (Re-Engineered Discharge).[8,11,12] These multistep programs are designed to optimize the transition process by standardizing core functions of pre-discharge practices such as medication review, patient and caregiver education, coordination of post-discharge care, and education about self-management.[8] Although some of these models have included a post-discharge component, there is limited information available to assess the direct impact of post-discharge patient contacts that include similar core functions of medication review, symptom monitoring, and coordination of medical or social services in the first week after leaving the hospital on key patient and health system outcomes.

The Veterans Health Administration (VHA) is the largest integrated health system in the nation, serving over 9 million Veterans at 1,321 health care facilities.[13] Veterans seeking care through the

VHA experience a broad variety of medical and psychiatric illnesses that lead to hospital admissions. Currently, there is no standard post-discharge practice for Veteran patients transitioning back home from VHA hospitals. The VHA requires that primary care Patient Aligned Care Teams (PACTs) contact patients 2 days after a hospital discharge and 7 days post-discharge for mental health teams; however, there is variability in implementation across the VHA health care system. To assist the VHA in standardizing post-discharge follow-up contacts, the VHA Office of Primary Care requested this review to assess the impact of post-discharge patient contacts on emergency care use, hospital readmission rates, and patient satisfaction to ensure that effective transitional care is provided to Veterans seeking care through the VHA.

METHODS

REGISTRATION AND REVIEW

A preregistered protocol for this review can be found on the PROSPERO international prospective register of systematic reviews (CRD42023465675). A draft version of this report was reviewed by external peer reviewers; their comments and author responses are located in the Appendix.

KEY QUESTIONS AND ELIGIBILITY CRITERIA

The following key questions were developed with key VHA operational partners:

Key Question 1a	Among adults with acute medical hospital admissions, what are the effects of post-discharge contacts on hospital readmission, emergency care use, and patient satisfaction?
Key Question 1b	Do the effects of post-discharge contacts for acute medical hospital admissions vary by intervention characteristics (*ie*, mode, clinical staff initiating contact, timing, assessments used during contact, content)?
Key Question 2a	Among adults with acute psychiatric hospital admissions, what are the effects of post-discharge contacts on hospital readmission, emergency care use, and patient satisfaction?
Key Question 2b	Do the effects of post-discharge contacts for acute psychiatric hospital admissions vary by intervention characteristics (*ie*, mode, clinical staff initiating contact, timing, assessments used during contact)?

Study eligibility criteria are shown in the table below.

	Eligibility Criteria	
	Inclusion	**Exclusion**
Population	KQ1: Adults (≥18 years of age) with an acute medical hospital admission KQ2: Adults (≥18 years of age) with acute psychiatric hospital admission If populations comprise children and adults and do not include an adult-only subgroup, studies will be included if they have 80% or more adults in the included sample.	• Elective hospitalization • Obstetric and gynecological hospitalizations • Discharge from the emergency department (ED) • Discharge from a post-hospitalization inpatient rehabilitation facility, skilled nursing facility, or long-term acute care
Intervention	Post-discharge contact (PDC) is defined as a bidirectional contact (*eg*, telephone, video, secure messaging system) from a nonspecialist clinical service provider to an adult discharged from inpatient medical or psychiatric hospital that occurs up to 7 days from discharge from a hospitalization and prior to resumption of longitudinal primary care. A PDC intervention is intended to improve the post-acute transition from hospital to home and include at least 1 of the following components: medication review; coordination of medical or	Interventions defined primarily as: • Longitudinal care management (*ie*, routine care within the 7-day window) • Interventions where the majority of the post-discharge contacts occur outside of the 7-day window • Telemonitoring • Passive monitoring • Health coaching for lifestyle modification

Eligibility Criteria		
	Inclusion	**Exclusion**
	social services; symptom monitoring; or psychoeducation.	• Programs designed to provide multidisciplinary and longitudinal transitional care that exceeds past 7 days post-discharge from hospital • Provider-to-provider communications or consultations beyond the initial transfer of information from a patient-initiated contact • Physician-led communications • General health education
Comparator	KQ1, KQ2: • Usual care/standard of care, waitlist control • Other active comparator (*eg*, in-person care)	KQ1, KQ2: • No controls
Outcomes	KQ1, KQ2: • 30-day hospital readmission • 30-day emergency care use • Patient satisfaction	Any outcomes not listed
Setting	Initiated in the inpatient or outpatient setting, if the intent is to provide a post-discharge check-in prior to resumption of longitudinal primary care and there is at least 1 contact made after the patient is discharged	• Any medical setting where the intent is to provide longitudinal management of chronic medical conditions • Primary care for regular care
Study Design	KQ1, KQ2: • Randomized trials • Nonrandomized trials • Controlled before-after studies • Interrupted time-series studies or repeated-measures studies that must have more than one measurement before and after intervention implementation	KQ1, KQ2: • Not a clinical study (*eg,* editorial, non-systematic reviews, letter to the editor) • Systematic reviews • Uncontrolled clinical study • Qualitative studies • Prospective and retrospective observational studies • Clinical guidelines • Measurement or validation studies
Countries	OECD[a]	Non-OECD
Years	Article published after 2011[b]	Article published before 2012
Publication Types	Full publication in a peer-reviewed journal	• Letters, editorials, reviews, dissertations, meeting abstracts, protocols without results • Publications in predatory journals[c]

Notes. [a] Organization for Economic Cooperation and Development countries are Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

[b] We constrained our review to studies published after 2011 to account for national policy changes that promoted post-discharge contacts as part of the Patient Protection and Affordable Care Act (ACA). Also, in 2013 Medicare approved procedure codes for transitional care management services consisting of a communication with the patient or caregiver within 2 business days of hospital discharge. We backdated our search 2 years from this date to capture any foundational literature that informed this policy change.
[c] There is no single way to identify all predatory journals as this is a rapidly evolving industry. Thus, we used the best available guidance to scrutinize potential problematic studies such as pay-to-publish models, lack of rigorous peer-review, rapid publishing timelines, lack of impact factor information, being identified as a potential problematic journal by the field, and expert librarian consultation.

SEARCHING AND SCREENING

To identify articles relevant to the key questions, a research librarian searched MEDLINE via Ovid, Embase via Elsevier, and CINAHL Complete via EBSCO from 2012 to May 25, 2023, using terms for *patient discharge, phone* or *video, follow-up, readmissions,* and *ED use* (see Appendix for complete search strategies). Editorials, case reports, letters, comments, and conference abstracts were excluded. Additional citations were identified from hand-searching reference lists and consultation with content experts. English-language titles, abstracts, and full-text articles were independently reviewed by 2 investigators, and disagreements were resolved by consensus.

DATA ABSTRACTION AND RISK OF BIAS ASSESSMENT

Data from published reports were abstracted into Covidence by 1 reviewer and over-read by a second reviewer. Disagreements were resolved by consensus or by obtaining a third reviewer's opinion when consensus could not be reached. Data elements included descriptors to assess applicability, quality elements, intervention details, and outcomes (see Appendix for risk of bias [ROB] ratings).

Key characteristics abstracted included participant descriptors (*eg*, age, sex, race, diagnosis), intervention characteristics (*eg*, timing, dose, content, interventionist), comparator, and outcomes. To better characterize interventions, and in keeping with emerging standards in systematic reviews with intervention complexity,[14,15] we mapped each included study to a common set of core functions[16] (*ie*, purpose of the change process) of post-discharge interventions: medication review, symptom monitoring, and coordination of social or health services.

We used an adapted Cochrane ROBINS-I tool[17] to assess risk of bias for nonrandomized studies that compare health effects of 2 or more interventions. The ROBINS-I includes domains for (1) confounding, (2) participant selection, (3) intervention classification, (4) deviations from intended interventions, (5) missing data, (6) outcome measurement, and (7) selective outcome reporting. Overall ROB judgments included low ROB, serious ROB, critical ROB, and no information. For randomized trials, we adapted the Cochrane ROB-2 tool.[18] This tool includes the following domains: (1) bias arising from the randomization process, (2) bias due to deviations from intended interventions, (3) bias due to missing outcome data, (4) bias in measurement of the outcome, (5) bias in selection of the reported result and has overall ROB as low, some concerns, or high ROB.

SYNTHESIS

We summarized the primary literature using relevant data abstracted from the eligible studies. Summary tables described the key study characteristics of the primary studies: study design, patient demographics, and details of the intervention and comparator. We then determined the feasibility of completing a quantitative synthesis (*ie*, meta-analysis) to estimate summary effects.

For meta-analyses, feasibility depends on the volume of relevant literature, conceptual homogeneity of the studies (*eg*, interventions used, outcomes assessed), and completeness of results reporting. We aggregated outcomes when there were at least 3 studies with the same outcome, based on the rationale that 1 or 2 studies do not provide adequate evidence for summary effects. Dichotomous outcomes were combined using odds ratio and random-effects models as appropriate. We used the Knapp-Hartung approach to adjust the standard errors of the estimated coefficients. We evaluated for statistical heterogeneity using visual inspection and used 95% prediction intervals (PIs). Meta-analyses were conducted using the *metafor*[19] package for R (R Foundation for Statistical Computing, Vienna, Austria). If meta-analyses were feasible, we considered subgroup analysis or meta-regression to explore quantitative or qualitative interactions of pre-specified potential effect modifiers deemed important by VA operational partners (*eg*, clinical staff initiating the contact, intervention content, timing of intervention). As results were consistent across studies, we do not report the findings of these subgroup analyses in keeping with current best approaches in evidence synthesis.

When quantitative synthesis was not feasible, we analyzed the data narratively. We gave more weight to the evidence from higher quality studies with more precise estimates of effect (*ie*, lower ROB). A narrative synthesis focused on documenting and identifying potential reasons for inconsistency in treatment effects across studies by evaluating differences in the study population, intervention, comparator, and outcome definitions.[2]

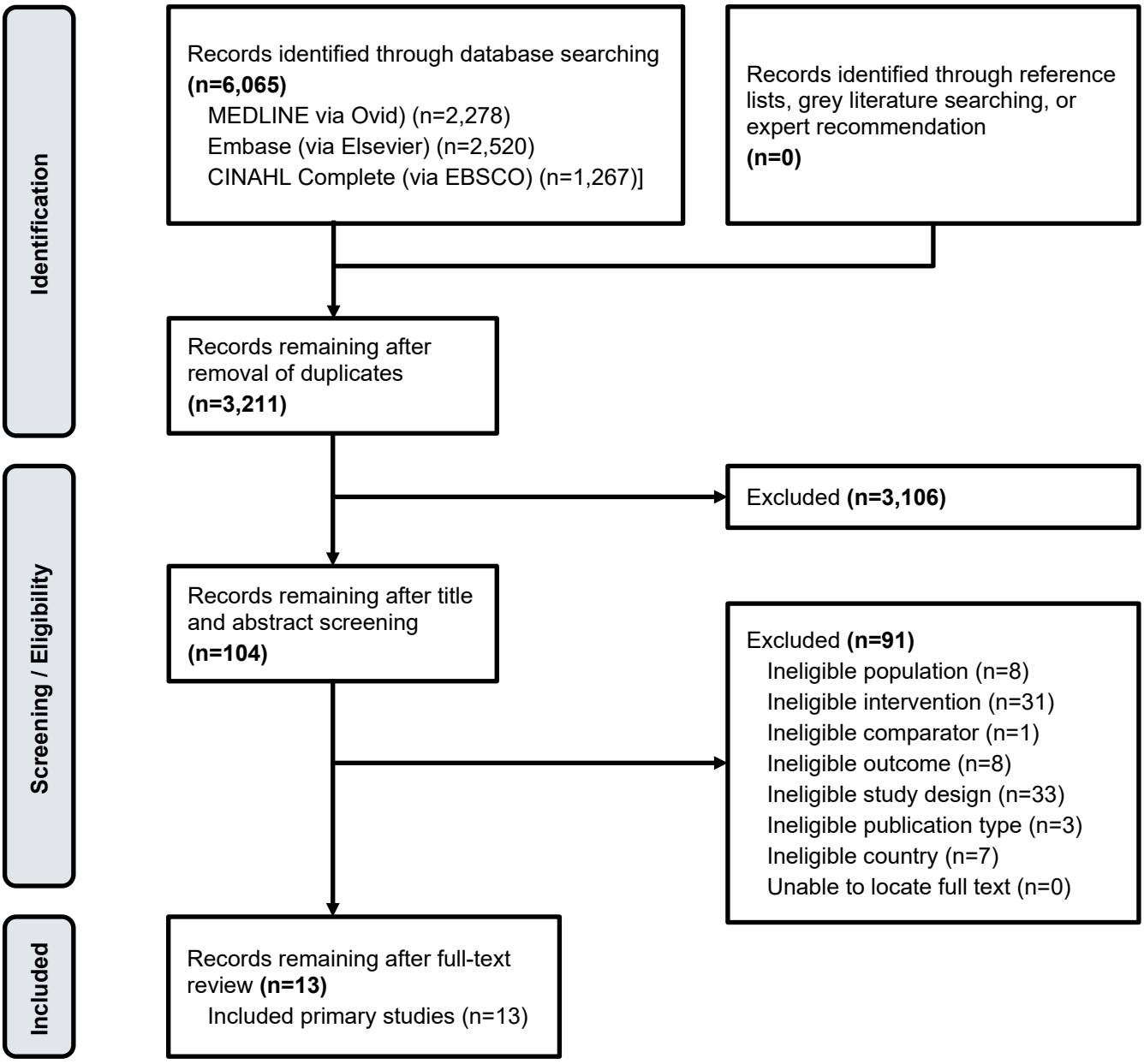
Strength of Evidence

The strength of evidence was assessed using the approach described by Grading of Recommendations Assessment, Development and Evaluation (GRADE).[20] We limited GRADE ratings to those outcomes identified by the stakeholders and TEP as critical to decision-making. In brief, the GRADE approach required assessment of four domains: risk of bias, consistency, directness, and precision. Additional domains used when appropriate were coherence, dose-response association, impact of plausible residual confounders, strength of association (magnitude of effect), and publication bias. These domains were considered qualitatively, and a summary rating was assigned after discussion by 2 investigators (JMG, AMG) as high, moderate, low, or very low strength of evidence. In some cases, high, moderate, low, or very low ratings were impossible or imprudent to make. In these situations, a grade of insufficient was assigned.

RESULTS

LITERATURE FLOW DIAGRAM

The literature flow diagram summarizes the results of the study selection process. A full list of excluded studies is provided in the Appendix.



OVERVIEW OF INCLUDED STUDIES

Our search identified 104 potentially relevant articles after deduplication and title and abstract screening. Of these, 13 primary studies (in 13 publications) met eligibility criteria.[21-33] Characteristics of included studies are shown in Table 1. None of the identified studies were relevant to KQ2. One study was a cluster-randomized trial, 10 were randomized trials, 1 was a nonrandomized trial, and 1 was an interrupted time-series. Six studies were conducted in the USA, 5 in Europe, 1 in New Zealand, and 1 in Canada. No studies were conducted among VHA populations. Ten studies employed medication review, 9 used coordination of care, and 7 included symptom monitoring. Eleven studies reported hospitalization outcomes, 7 reported ED utilization, 4 reported composite outcomes of unplanned health care use, and 4 reported on patient satisfaction. The median sample size of included studies was 311 (range: 25-3,054). Eight studies focused on patient populations at elevated medical risk.[21,23-27,29,32] We did not identify any studies that focused on patients discharged from an acute psychiatric hospitalization.

KEY QUESTION 1: EFFECTS OF POST-DISCHARGE CONTACTS AMONG ADULTS WITH ACUTE MEDICAL HOSPITALIZATIONS

Key Findings

- We identified 13 studies that assessed the impact of PDC interventions on outcomes of interest. None of the studies focused on populations with an acute psychiatric hospitalization. Most (N = 11) studies were randomized trials, with only 1 rated as high ROB.
    - All but 1 PDC intervention used telephone-delivered PDC; most (N = 11) PDC approaches consisted of a single contact conducted in the first 3 days after hospital discharge.
    - The most common component of PDC was medication review; only 3 studies included all 3 hypothesized core PDC functional components.
- In a meta-analysis, PDC interventions within the 7 days after hospitalization were not associated with a reduction in 30-day hospital readmissions or ED utilization when compared with usual care. Certainty of evidence supporting this conclusion was considered moderate, based primarily on the consistency of results across randomized studies.
- Only 4 studies assessed the impact of PDC on patient satisfaction, and only 1 small study reported higher patient satisfaction among patients exposed to post-discharge contacts.
- Exploration of subgroup differences by intervention characteristics also demonstrated no differential impact on PDC effectiveness on 30-day hospital readmissions or ED use.

General Characteristics

Of the 13 unique studies we included, 11[21,23-27,29-33] evaluated the effect of PDC interventions on 30-day hospital readmissions; 7[21,24,25,29-31,33] on 30-day ED use; 4[21,24,25,30] on a composite outcome of ED use, readmissions, or unplanned office visits; and 4[22,27,28,33] on patient satisfaction with care (Appendix). Eleven studies were randomized trials[21-28,31-33] (of which 1[31] was a cluster-randomized trial),[31] with 1[28] rated as high ROB and 3 [21,24,33] rated as low ROB. We also identified 2 eligible nonrandomized designs: 1[30] nonrandomized trial and 1[29] interrupted time-series study; both were rated as serious ROB. Common quality concerns among the RCTs included (1) bias due to deviations from

the intended PDC interventions; (2) missing outcome data; and (3) bias from potential selective reporting of results. Among the 2 nonrandomized designs, common sources of bias were (1) influence of potential unaccounted confounders; (2) deviations from intended interventions; (3) missing data; and (4) issues with outcomes measurement. (See Appendix for details on ROB rating for each included study.)

The predominant modality of delivery for these PDC interventions was telephone ($N = 10$[21,23-27,29-31,33]); 1[32] study employed videoconferencing. Studies varied in timing of PDC (range: 24 hours to 7 days post-discharge) with most ($N = 9$) initiating contact in the first 3 days post-discharge. Personnel involved in the PDC interventions included pharmacists,[24-26,28,30] nurses,[22,26,27,29,32,33] and non-clinical staff (*ie*, study coordinators,[21,23] patient navigators[31]). Four studies used more than 1 type of personnel.[21,23,24,26]

Most PDC interventions ($N = 10$[21-23,25-28,30,31,33]) consisted of a single telephone contact, with 2[23,27] studies having additional patient-driven contact with a hotline. One[29] study had 2 direct telephone contacts on the first and third day post-discharge, and 1[32] study used daily videoconference contacts for a range of 5 to 9 days. Many studies also had extensive pre-discharge components consisting of enhanced interactions with a pharmacist for medication counseling or discharge planning counseling with hospital providers. Eight interventions reported using a structured protocol with a mix of assessments conducted during the contact.[21,23,25-27,31-33] Core functional components of the contacts varied; the most common component across interventions was some type of medication review process ($N = 10$[21,22,24-30,33]). The second most common component was coordination of services ($N = 9$[24,26-33]). Only 3 interventions stated that the contacts included all 3[24,26,29] core functional components of the PDC (*ie*, medication review, coordination of services, symptom monitoring). All interventions used usual care as the comparator, with 1[26] study operationalizing usual care as an in-person appointment with a patient's usual primary care provider. Additional details of these interventions are in the Appendix.

For KQ1, we present detailed results ordered by major outcomes. Details on study characteristics are in the Appendix.

Table 1. Evidence Profile

Number of Studies	13 unique studies (13 articles)
Key Question	KQ1 (*N* = 13); KQ2 (*N* = 0)
Study Designs	Cluster-randomized trial (*N* = 1), randomized trial (*N* = 10), nonrandomized trial (*N* = 1), interrupted time-series (*N* = 1)
Countries	USA (*N* = 6), Europe (*N* = 5), New Zealand (*N* = 1), Canada (*N* = 1)
Intervention Categories	Medication review (*N* = 10), coordination of care (*N* = 9), monitoring (*N* = 7)
Outcome Categories[a]	Hospitalization (*N* = 11), ED use (*N* = 7), composite health care utilization (*N* = 4), patient satisfaction (*N* = 4)
ROBINS I Risk of Bias	Low (*N* = 0), moderate (*N* = 0), serious (*N* = 2), critical (*N* = 0)
ROB 2 Risk of Bias	Low (*N* = 3), some concerns (*N* = 7), high (*N* = 1)

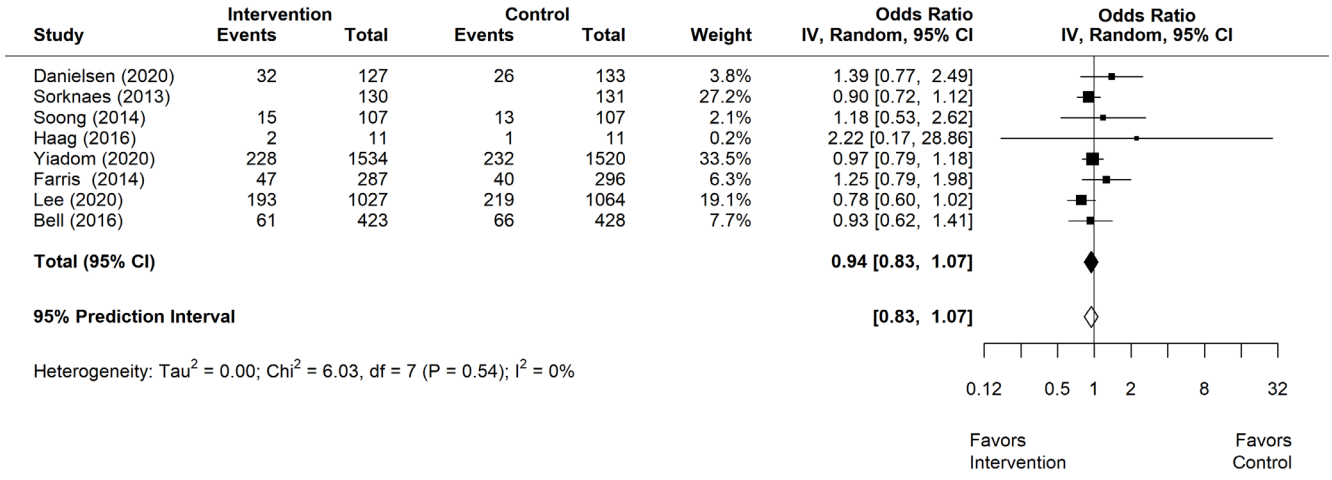
Notes. [a] Eight studies reported more than 1 outcome type.

KQ1a: Effects of PDC on Hospital Readmission, Emergency Care Use, and Patient Satisfaction

Hospital Readmission

Eleven studies measured all-cause hospital readmissions at about 30 days (range: 28-30 days).[21,23-27,29-33] Individually, none of the 11 PDC interventions led to significant reductions in 30-day readmission rates relative to usual care. Although PDC interventions and personnel involved varied, 8[21,23-26,31-33] of the 9 randomized trials were deemed to have sufficient conceptual homogeneity and provided enough information to perform meta-analysis. Pooled analysis of 7,336 patients demonstrated no significant impact of PDC on 30-day hospital readmissions (OR = 0.94, 95% CI [0.83,1.07]). As shown in Figure 1, effect estimates were generally consistent across studies (95% prediction interval [PI] [0.83, 1.07]).

Figure 1. Effects of PDC Interventions in First 7 Days on 30-Day Hospital Readmission (RCTs Only)

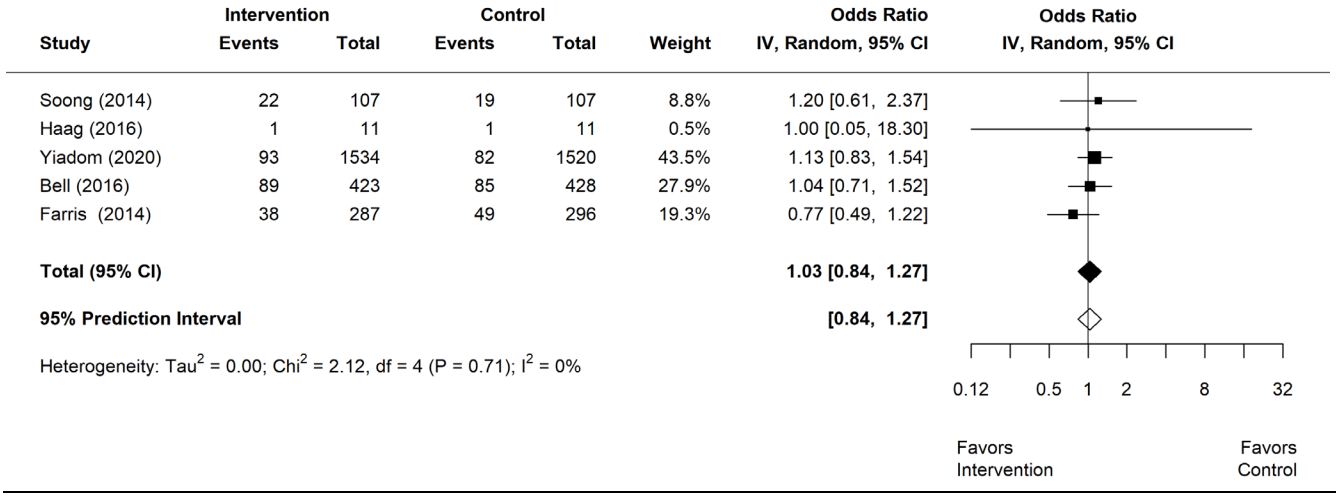


These results are corroborated by the results of the nonrandomized trial and interrupted time-series studies that were not included in the meta-analysis.[29,30] These studies also found no significant impact of PDC on 30-day readmissions. Similarly, 2 studies that also looked at disease-specific readmissions did not identify a reduction in readmissions for the studied conditions.[26,32] The small randomized trial ($N = 57$[27]) excluded from the pooled analysis reported greater 30-day hospitalizations in the PDC group compared to usual care ($p = 0.026$), though a point estimate and number of readmissions in each group were not provided. Only 1 study performed sub-analyses and found no significant associations for sex or age.[26] Detailed results of all studies are in the Appendix.

Emergency Care Use

Seven studies measured all-cause ED use at approximately 30 days since discharge from index hospitalization.[21,24,25,29-31,33] Five[21,24,25,31,33] studies were randomized trials (1[33] of which was a cluster-randomized trial), 1[29] was an interrupted time-series, and 1[30] was a nonrandomized trial. Individually, no included study showed a significant reduction in 30-day ED use relative to usual care control. Based on the meta-analysis of the 5 RCTs encompassing 3,054 patients, there was no difference in the odds of 30-day ED utilization (OR = 1.03, 95% CI [0.84, 1.27]; 95% PI [0.84, 1.27]) (Figure 2). There was no evidence of statistical heterogeneity across these studies.

Figure 2. Effects of PDC Interventions in First 7 Days on 30-Day ED Use (RCTs Only)



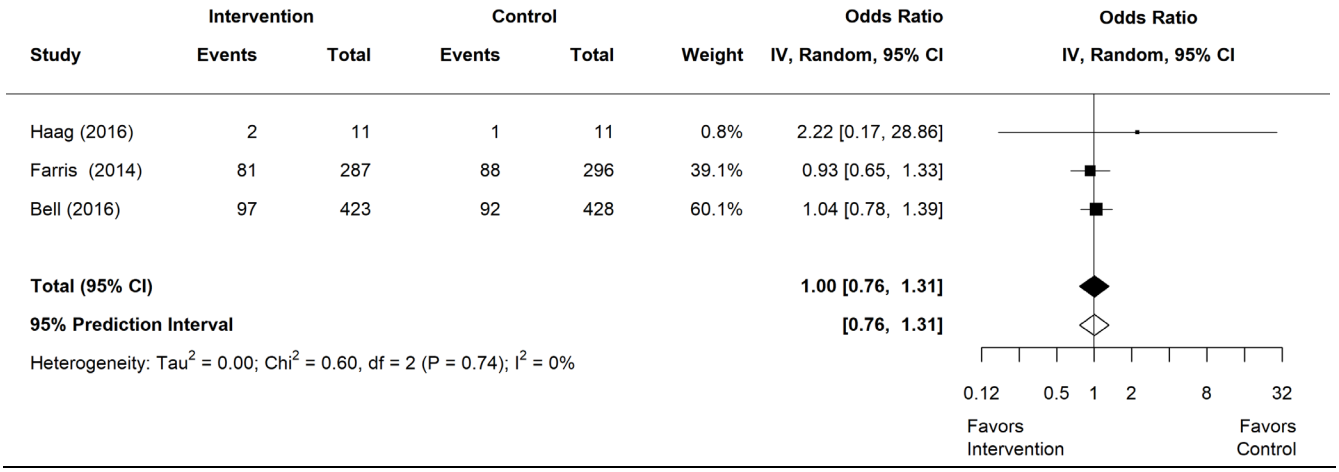
The interrupted time-series trial and the nonrandomized trial also do not show a significant difference in 30-day ED utilization with PDC interventions when compared to usual care. One[24] study also assessed ED utilization at 90 days with no significant difference in ED utilization with PDC interventions compared to usual care. None of the studies included subgroup analysis on any variable. Details of results by each included study are in the Appendix.

Composite Measures of Health Care Utilization

Four studies measured a composite outcome of 30-day unplanned health care utilizations (*eg*, 30-day hospital readmissions plus ED use or unscheduled office visit). Three[21,24,25] were randomized trials and 1[30] was a nonrandomized trial.

Results were consistent with the other 30-day utilization outcomes; individually, these studies showed no impact of PDC on a reduction in 30-day unplanned health care use relative to usual care control. Based on the meta-analysis of the 3 randomized trials encompassing 1,456 patients, there was no significant difference in the odds of 30-day unplanned utilizations (OR = 1.00, 95% CI [0.76, 1.31]; 95% PI [0.76, 1.31]) (Figure 3). Details of these results per study are in the Appendix.

Figure 3. Effects of PDC Interventions in First 7 Days on 30-Day Composite Measures of Health Care Utilization (RCTs Only)



Patient Satisfaction

Four RCTs[22,27,28,33] encompassing 3,397 patients measured some aspects of patient's satisfaction (*eg*, clarity of information, overall satisfaction with post-discharge, patient experience with hospital). Overall patient satisfaction with the discharge process was high across control and PDC groups, with only 1 small study ($N = 60$)[27] reporting a significantly higher patient satisfaction in the PDC group. Details of these results per study are in the Appendix.

KQ1b: Impacts by PDC Intervention Characteristics

We explored PDC intervention factors that may have an impact on the outcomes of interest. We found no statistical evidence that the following factors affected the outcomes:

- Mode of PDC (*ie*, phone vs video)
- Clinical staff initiating the contact (*ie*, pharmacist vs nurse vs non-clinical staff)
- Timing of the contact (*ie*, within 3 days vs within 7 days of hospital discharge)
- Use of structured assessments during contact (*ie*, yes vs no protocolized assessments)
- Content of the contact (*ie*, containing 1 or more of these core PDC functions: medication review, symptom monitoring, coordination of medical or social services during contact).

Both visual inspection and statistical subgroup testing demonstrated no impact of these characteristics. Forest plots of these subgroup analyses are in the Appendix.

Certainty of Evidence

The certainty of evidence (COE) was moderate for randomized studies and very low for nonrandomized studies (Table 2). Nine RCTs were graded as moderate COE for no effect of post-discharge contacts on 30-day hospital readmission. This category was downgraded only for imprecision. The 2 observational studies that reported impacts on hospitalization were downgraded to very low certainty for very serious ROB, given serious indirectness as well as imprecision. The evidence for post-discharge contacts on 30-day ED use was rated as moderate COE for no effect and

downgraded for imprecision. The 2 observational studies reporting ED use were rated as very low certainty. We did not conduct a GRADE evaluation for the composite outcomes of unplanned health care utilization, though the overall patterns of outcomes were similar to those for hospitalization and ED use.

Table 2. Certainty of Evidence

Outcome	Number of Studies	Findings	Certainty of Evidence (Rationale)
Hospitalization	9 RCT (7,402 patients)	OR = 0.94 (95% CI [0.83, 1.07])	**Moderate** (Downgraded for imprecision)
	2 Observational (20,924)	Non-significant results	**Very low** (Downgraded for very serious risk of bias, serious indirectness, and imprecision)
Emergency Department Use	5 RCT (4,724 patients)	OR = 1.03 (95% CI [0.84, 1.27])	**Moderate** (Downgraded for imprecision)
	2 Observational (20,924)	Non-significant results	**Very low** (Downgraded for very serious risk of bias, serious indirectness, and imprecision)

Abbreviations. RCT=randomized controlled trial; OR=odds ratio.

KEY QUESTION 2: EFFECTS OF POST-DISCHARGE CONTACTS AMONG ADULTS WITH ACUTE PSYCHIATRIC HOSPITALIZATIONS

We identified no eligible studies that addressed KQ2a or KQ2b.

DISCUSSION

The transition from hospital to home is a vulnerable period for patients, with many experiencing a variety of health-related problems in the period directly following a hospital discharge. Follow-up contacts to patients in the week after hospital discharge has been widely used as a strategy to mitigate transition-related issues. Our systematic review identified 13 relevant studies that assessed the impact of post-discharge contacts (PDCs) with adult patients after an acute hospitalization. Most included studies were randomized trials ($N = 11$), with only 1 rated as high risk of bias. More than half of studies ($N = 8$) focused on populations at elevated medical risk (*eg*, 65 years of age and older, chronic obstructive pulmonary disease [COPD], heart failure). None of the included studies focused on populations with an acute psychiatric hospitalization. All but 1 study used telephone to deliver the PDC intervention, and most ($N = 11$) interventions consisted of a single contact conducted in the first 3 days after hospital discharge. Based on a modest but consistent body of evidence, post-discharge follow-up contacts delivered in the first 7 days after leaving the hospital likely have no impact on 30-day hospital readmissions (moderate COE; randomized trials), 30-day ED use (moderate COE; randomized trials), or patient satisfaction with care.

There are several considerations for interpreting our findings on the lack of impact of PDC interventions, which may also guide future research on the topic. First, discharge planning that occurs during inpatient care is a routine procedure in most health systems.[34,35] These discharge planning procedures vary but generally include medication review and counseling, patient and/or family caregiver education, and coordinating care with community healthcare providers.[35] In the studies included in our review, about half describe some type of pre-discharge planning protocol. It is likely that similar pre-discharge procedures occurred in some fashion in most studies, as this has grown to be the standard of care and is highlighted in the AHRQ Project RED toolkit.[11,36] In fact, the vast majority of discharge planning steps in the Project RED toolkit are designated as pre-discharge tasks. Thus, the addition of a single post-discharge contact would be a minor component of a broader discharge planning intervention with little potential to have an isolated impact on hospital readmission or ED use.

Second, while most studies reported having a standard protocol for PDC interventions, virtually none of the included studies rigorously assessed whether patients actually received a post-discharge contact (*ie*, intervention adherence) or whether the post-discharge contact delivered the call according to the protocol (*ie*, intervention fidelity). Factors related to intervention implementation like adherence and fidelity can impact intervention effectiveness. One large, low risk of bias randomized study included in this review did report implementation information and also conducted a post hoc analysis of patients who were reached versus not reached for their telephone-delivered post-discharge contact.[33] Higher rates of hospital readmissions were observed among the patients who were not reached for their post-discharge call.

Next, most of the PDC interventions included in this review were delivered by telephone. Telephone may be an effective modality for some important post-discharge functions (*eg*, patient education, verification of follow-up appointments), but may be less effective for other critical PDC functions like medication review (*eg*, unable to see medication labels) or symptom monitoring (*eg*, visual exam not possible). In the 1 study included in this review that compared telephone to in-person PDC, there was no difference in 30-day hospital readmissions.[26] Yet, adherence to an office visit in the first 7 days after discharge was significantly lower than adherence to telephone-delivered PDC (79% vs 92% respectively). Additionally, while many patients may be likely to engage over telephone, other patients might respond better to alternative modalities like text messaging, email, or electronic health record

smartphone applications. Some patients, such as those experiencing homelessness or severe mental health issues, may not have reliable access to a telephone or have contact information that changes frequently. Last, most studies included in this review focused on patients identified as higher risk based on a variety of factors such as age and medical comorbidities (*eg*, COPD, heart failure). It is likely that these patients may need more intensive approaches in the transition from hospital to home that cannot be delivered in a single-contact approach. In fact, there is evidence from earlier studies published prior to 2011 that more intensive transition care interventions that include multiple contact before and after hospital discharge are effective in reducing 30-day rehospitalization.[37,38]

Limitations

It is important to note limitations of both the identified literature and our approach to conducting this review. In addition to the study limitations described in the previous section, many studies were small (median sample size of 311) and only 1 study reported subgroups by patient characteristics. Additional research that enrolls sufficient numbers of patients from important subgroups (*eg*, by age, race, social support status, health literacy, insurance status) could clarify whether there are patients that are likely to benefit from single-contact approaches versus more intensive post-discharge approaches. We identified no studies that assessed PDC for patients with acute psychiatric hospitalizations, a priority of the nominating operational partners. Also, we identified no studies conducted within the VHA health care system. Findings may be less applicable to the VHA population, where historical care, hospital course, and follow-up plans may be available to the PDC interventionist via the Veteran's comprehensive electronic health record. Last, our definition of PDC did not include interventions that were centered on electronic symptom monitoring only; we required bidirectional communications. Thus, we may have missed some interventions that were focused on remote symptom monitoring.

We constrained our review to studies published after 2011 to align with national policy shifts in the use of PDC in the United States. In date-limiting our search, we likely missed some prior relevant studies. We also limited our eligibility criteria to randomized and EPOC nonrandomized design standards (*ie*, nonrandomized trials, controlled before-after studies, interrupted time-series, or repeated-measures studies), missing observational studies which may contribute useful information. Yet our findings are consistent with prior reviews that included earlier studies and observational and qualitative designs. These reviews generally found no consistent impact of post-discharge follow-up contacts, though these reviews noted the generally weak methodological quality and high statistical heterogeneity of previous studies.[2,39] Our systematic review extends these findings by including higher quality study designs (*ie*, EPOC design standards) and by including an exploration of treatment effectiveness based on key intervention characteristics (*eg*, content, interventionists, timing of intervention) identified by VHA operational partners. Although there were too few studies in each subgroup to allow for firm conclusions, the consistency of effects across groups suggests that these study characteristics have little influence on the effects of PDC.

FUTURE RESEARCH

This comprehensive review of the literature identified several gaps in the current evidence that warrant future investigation, which are described below using the population, intervention, comparator, and outcome (PICO) framework (Table 3).

Table 3. Evidence Gaps

Population	• Patients with psychiatric hospitalizations
	• Sufficiently powered subgroup analyses by key patient populations related to the following:
	  ○ Age
	  ○ Comorbidity (*ie*, older adult patients with multiple chronic conditions)
	  ○ Hospital length of stay
	  ○ Race and ethnicity
	  ○ Family social support
	  ○ Medical and health literacy
	  ○ Higher vs lower risk of readmission based on a combination of factors

Intervention	• Multi-contact approaches • Multimodal approaches (*eg*, digital vs non-digital approaches; automated vs in-person) • Video- and other modality-delivered (*eg*, text) interventions • Integration of family caregiver as needed co-recipient of PDC intervention
Comparator	• Head-to-head comparisons of video vs in-person vs phone modalities • Variable doses of post-discharge contacts (*eg*, 1 contact vs daily contacts; received vs did not receive post-discharge contacts) • Direct comparison of optimal timing of post-discharge interventions • Direct comparison of the additive effects of post-discharge functions (*ie*, medication review, symptom monitoring, coordination of social and health services) • Adjustment for intensity and type of pre-discharge contacts
Outcomes	• Well-specified measures of patient experience with the PDC intervention only • Patient comprehension of discharge plan and adherence to that plan • Intervention fidelity to intended content • Intervention adherence (*ie*, PDC completed) • Process outcomes of what problems were detected and addressed during PDC approaches that may inform future utility of these brief interventions

CONCLUSIONS

Brief post-discharge follow-up calls are widely used in the United States and elsewhere. In the United States, this push toward follow-up contacts after a hospitalization likely is due to national policy changes that promoted post-discharge contacts as part of the Patient Protection and Affordable Care Act (ACA).[40] In 2013, Medicare approved procedure codes for transitional care management services consisting of communication with the patient or caregiver within 2 business days of hospital discharge. Yet our review demonstrated little supporting evidence that such brief, often 1-call follow-ups impacted key health care outcomes of hospital readmissions and ED use at 30 days, or patient satisfaction with care. Our findings should be contextualized further, as there are many unaddressed questions on the utility of post-discharge approaches and limitations of the existing literature included in this systematic review. While our review did not find evidence of significant impacts of brief PDC approaches, health care systems like the VHA should consider the cost effectiveness of these relatively light-touch approaches on costly outcomes such as rebound hospital admissions and ED use. Such considerations of widespread universal brief post-discharge contacts should be balanced with the potential to target investments in more intensive post-discharge approaches focused on patients most likely to benefit from these interventions.

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Appendix

SEARCH STRATEGIES

Librarian searcher: Sarah Cantrell, MLIS; Duke University Medical Center Library & Archives; Duke University School of Medicine.

Peer review of search conducted by: Samantha Kaplan, PhD, MLIS; Duke University Medical Center Library & Archives; Duke University School of Medicine.

Database: MEDLINE (via Ovid)
Search date: 5/26/2023
Note: Ovid MEDLINE ALL 1946 to May 25, 2023

	Search Set	Search Statement	Results
1	*Patient discharge*	exp patient discharge/ or (postdischarg* or post-discharg*).ti,ab. or ((patient or patients or inpatient or inpatients or in-patient or in-patients or hospital*) adj3 discharg*).ti,ab. or ((post or after) adj2 hospital*).ti,ab.	161588
2	*Phone or video*	telephone/ or cell phone/ or smartphone/ or videoconferencing/ or remote consultation/ or exp text message/ or (phone or phones or phoned or phoning or telephon* or tele-phon* or cellphon* or cell-phon* or smartphon* or smart-phon* or videoconferenc* or video-conferenc* or webconferenc* or web-conferenc* or webex or zoom or skype or FaceTime or GoToMeeting or web-delivered or "web delivered" or internet-delivered or "internet delivered" or computer-delivered or "computer delivered" or teleconsult* or tele-consult* or "remote consult" or "remote consults" or "remote consultation" or "remote consultations" or "remote consulting" or "electronic consult" or "electronic consults" or "electronic consultation" or "electronic consultations" or "electronic consulting" or tele-consult* or teleconsult* or teleconferenc* or tele-conferenc* or "text message" or "text messages" or "text messaging").ti,ab. or ((followup or follow-up) adj3 (call or calls or called or calling or text or texts or texting or message or messages or messaging)).ti,ab. or ((remote* or video* or internet or internet-based or web or web-based or online or online-based or computer or computer-based or asynchronous*) adj3 (meet* or call* or chat* or conferenc* or consult* or counsel* or visit* or message or messages or messaging or messaged or text or texts or texting or texted)).ti,ab. or ((video* or remote* or web-based or internet-based or tele*) adj2 care).ti,ab. or ((secure or secured or EHR or EMR or "electronic health record" or "electronic health records" or "electronic medical record" or "electronic medical records") adj3 (text or texts or texting or message or messages or messaging)).ti,ab. or ((asynchronous* or synchronous*) adj3 communicat*).ti,ab.	168793
3	*Combining*	1 and 2	5577
4	*Follow-Up*	(follow-up OR followup OR "follows up" OR "followed up" OR "following up" or "after care" or aftercare).ti,ab.	1289628
5	*Readmissions*	exp Patient Readmission/ OR (readmission* OR re-admission* OR readmit* OR re-admit*).ti,ab.	53636
6	*ED use*	Emergency Service, Hospital/ OR ("emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms").ti,ab.	173870
7	combining	4 or 5 or 6	1487227

	Search Set	Search Statement	Results
8	Combining	3 and 7	3504
9	*Study Design: EPOC filter or RCTs*	exp "Cohort Studies"/ or exp "Longitudinal Studies"/ or exp "Follow-Up Studies"/ or exp "Evaluation Studies as Topic"/ or exp "Controlled Before-After Studies"/ or exp "Interrupted Time Series Analysis"/ or "Randomized Controlled Trial".pt. or "Controlled Clinical Trial".pt. or "Clinical Trial".pt. or "Evaluation Studies".pt. or "Comparative Study".pt. or (randomized or randomised or randomization or randomisation or placebo or randomly or trial or trials or groups or "evaluation study" or "evaluation studies" or "intervention study" or "intervention studies" or cohort or cohorts or longitudinal or longitudinally or prospective or prospectively or "follow up" or follow-up or followup or "comparative study" or "comparative studies" or nonrandom or "non-random" or nonrandomized or "non-randomized" or nonrandomised or "non-randomised" or quasi-experiment* or quazi-experiment* or quasiexperiment* or quaziexperiment* or quasirandom* or quazirandom* or quasi-random* or quazi-random* or quasi-control* or quazi-control* or quasicontrol* or quazicontrol*).ti,ab. or (controlled AND study).ti,ab. or ("pre-post" or "pre post" or "posttest" or "post-test" or "post test" or pretest or "pre-test" or "pre test" or "repeated measure" or "repeated measures").ti,ab. or (before AND after).ti,ab. or (before AND during).ti,ab. or ("time series" AND interrupt*).ti,ab. or ("time points" AND (multiple or one or two or three or four or five or six or seven or eight or nine or ten or month or monthly or day or daily or week or weekly or hour or hourly)).ti,ab.	9516428
10	*study design exclusion*	9 not (case reports or editorial or letter or comment or congress).pt.	3,363
11	*Remove animal-only*	10 not (exp animals/ not exp humans/)	3233
12	*Remove case reports, editorials, conference abstracts*	11 not (case reports OR editorial OR letter OR comment OR congress).pt.	3185
13	*Date Limit 2012-present*	Limit 12 to da=20120101-20231231	2278

Database: Embase (via Elsevier)
Search date: 5/26/2023
Note: Search from the Results page

	Search Set	Search Statement	Results
1	*Patient discharge*	'hospital discharge'/exp OR (postdischarg* OR 'post discharg*'):ti,ab OR ((patient OR patients OR inpatient OR inpatients OR 'in patient' OR 'in patients' OR hospital*) NEAR/3 discharg*):ti,ab OR ((post OR after) NEAR/2 hospital*):ti,ab	347638
2	*Phone OR video*	'telephone'/exp OR 'mobile phone'/exp OR 'smartphone'/exp OR 'videoconferencing'/exp OR 'teleconsultation'/exp OR 'text message'/exp OR (phone OR phones OR phoned OR phoning OR telephon* OR 'tele phon*' OR cellphon* OR 'cell phon*' OR smartphon* OR 'smart phon*' OR videoconferenc* OR 'video conferenc*' OR webconferenc* OR 'web conferenc*' OR webex OR zoom OR skype	255771

	Search Set	Search Statement	Results
		OR FaceTime OR GoToMeeting OR 'web delivered' OR 'internet delivered' OR 'computer delivered' OR teleconsult* OR 'tele consult*' OR 'remote consult' OR 'remote consults' OR 'remote consultation' OR 'remote consultations' OR 'remote consulting' OR 'electronic consult' OR 'electronic consults' OR 'electronic consultation' OR 'electronic consultations' OR 'electronic consulting' OR teleconferenc* OR 'tele conferenc*' OR 'text message' OR 'text messages' OR 'text messaging'):ti,ab OR ((followup OR 'follow up') NEAR/3 (call OR calls OR called OR calling OR text OR texts OR texting OR message OR messages OR messaging)):ti,ab OR ((remote* OR video* OR internet OR web OR online OR computer OR asynchronous*) NEAR/3 (meet* OR call* OR chat* OR conferenc* OR consult* OR counsel* OR visit* OR message OR messages OR messaging OR messaged OR text OR texts OR texting OR texted)):ti,ab OR ((video* OR remote* OR 'web based' OR 'internet based' OR tele*) NEAR/2 care):ti,ab OR ((secure OR secured OR EHR OR EMR OR 'electronic health record' OR 'electronic health records' OR 'electronic medical record' OR 'electronic medical records') NEAR/3 (text OR texts OR texting OR message OR messages OR messaging)):ti,ab OR ((asynchronous* OR synchronous*) NEAR/3 communicat*):ti,ab	
3	combining	#1 AND #2	11472
4	*Follow-Up*	'follow up'/exp OR ('follow up' OR followup OR 'follows up' OR 'followed up' OR 'following up' OR aftercare OR "after care"):ti,ab	2638498
5	*Readmissions*	'hospital readmission'/exp OR (readmission* OR 're admission*' OR readmit* OR 're admit*'):ti,ab	119876
6	*ED use*	'hospital emergency service'/exp OR ('emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms'):ti,ab	229882
7	combining	#4 OR #5 OR #6	2915778
8	combining	#3 AND #7	7679
9	*Study Design: EPOC filter OR RCTs*	'cohort analysis'/exp OR 'longitudinal study'/de OR 'randomized controlled trial'/exp OR 'controlled clinical trial'/exp OR 'single blind procedure'/exp OR 'double blind procedure'/exp OR 'crossover procedure'/exp OR 'crossover procedure':de OR 'double-blind procedure':de OR 'randomized controlled trial':de OR 'single-blind procedure':de OR (random* OR factorial* OR crossover* OR cross NEXT/1 over* OR placebo* OR doubl* NEAR/1 blind* OR singl* NEAR/1 blind* OR assign* OR allocat* OR volunteer*):ti,ab OR ('evaluation study' OR 'evaluation studies' OR 'intervention study' OR 'intervention studies' OR cohort OR cohorts OR longitudinal OR longitudinally OR prospective OR prospectively OR 'follow up' OR follow-up OR followup OR 'comparative study' OR 'comparative studies' OR nonrandom OR 'non-random' OR nonrandomized OR 'non-randomized' OR nonrandomised OR 'non-randomised' OR quasi-experiment* OR quazi-experiment* OR quasiexperiment* OR quaziexperiment* OR quasirandom* OR quazirandom* OR quasi-random* OR quazi-random* OR quasi-control* OR quazi-control* OR quasicontrol* OR quazicontrol*):ti,ab OR (controlled AND study):ti,ab OR ('pre-post' OR 'pre post' OR 'posttest' OR 'post-test' OR 'post test' OR pretest OR 'pre-test' OR 'pre test' OR 'repeated measure' OR 'repeated measures'):ti,ab OR (before AND after):ti,ab OR (before AND during):ti,ab OR ('time series' AND interrupt*):ti,ab OR ('time points' AND (multiple OR one OR two OR three OR four OR five OR	8130677

	Search Set	Search Statement	Results
		six OR seven OR eight OR nine OR ten OR month OR monthly OR day OR daily OR week OR weekly OR hour OR hourly)):ti,ab	
10	combining	#8 AND #9	6748
11	Remove animal-only	#10 AND [humans]/lim	6451
12	Remove case reports, editorials, conference abstracts	#11 NOT ('case report'/exp OR 'case study'/exp OR 'editorial'/exp OR [editorial]/lim OR 'letter'/exp OR [letter]/lim OR 'note'/exp OR [note]/lim OR [conference abstract]/lim OR 'conference abstract'/exp OR 'conference abstract'/it)	3512
13	Date Limit 2012-present	#12 AND [01-01-2012]/sd	2520
14	Exemplar check	#13 AND 31451065:ui	1/1

Database: CINAHL Complete (via EBSCO)
Search date: 5/26/2023

	Search Set	Search Statement	Results
1	*Patient discharge*	(MH "Patient Discharge") OR (MH "Early Patient Discharge") OR ((TI postdischarg* OR AB postdischarg*) OR (TI post-discharg* OR AB post-discharg*)) OR (((TI patient OR AB patient) OR (TI patients OR AB patients) OR (TI inpatient OR AB inpatient) OR (TI inpatients OR AB inpatients) OR (TI in-patient OR AB in-patient) OR (TI in-patients OR AB in-patients) OR (TI hospital* OR AB hospital*)) N3 (TI discharg* OR AB discharg*)) OR (((TI post OR AB post) OR (TI after OR AB after)) N2 (TI hospital* OR AB hospital*))	74682
2	*Phone or video*	(MH "Telephone") OR (MH "Cellular Phone") OR (MH "Text Messaging") OR (MH "Smartphone") OR (MH "Videoconferencing") OR (MH "Teleconferencing") OR (MH "Remote Consultation") OR ((TI phone OR AB phone) OR (TI phones OR AB phones) OR (TI phoned OR AB phoned) OR (TI phoning OR AB phoning) OR (TI telephon* OR AB telephon*) OR (TI tele-phon* OR AB tele-phon*) OR (TI cellphon* OR AB cellphon*) OR (TI cell-phon* OR AB cell-phon*) OR (TI smartphon* OR AB smartphon*) OR (TI smart-phon* OR AB smart-phon*) OR (TI videoconferenc* OR AB videoconferenc*) OR (TI video-conferenc* OR AB video-conferenc*) OR (TI webconferenc* OR AB webconferenc*) OR (TI web-conferenc* OR AB web-conferenc*) OR (TI webex OR AB webex) OR (TI zoom OR AB zoom) OR (TI skype OR AB skype) OR (TI FaceTime OR AB FaceTime) OR (TI GoToMeeting OR AB GoToMeeting) OR (TI web-delivered OR AB web-delivered) OR (TI "web delivered" OR AB "web delivered") OR (TI internet-delivered OR AB internet-delivered) OR (TI "internet delivered" OR AB "internet delivered") OR (TI computer-delivered OR AB computer-delivered) OR (TI "computer delivered" OR AB "computer delivered") OR (TI teleconsult* OR AB teleconsult*) OR (TI tele-consult* OR AB tele-consult*) OR (TI "remote consult" OR AB "remote consult") OR (TI "remote consults" OR AB "remote consults") OR (TI "remote consultation" OR AB "remote consultation") OR (TI "remote consultations" OR AB "remote consultations") OR (TI "remote consulting" OR AB "remote consulting") OR (TI "electronic consult" OR AB "electronic consult") OR (TI "electronic consults" OR AB "electronic	97395

Search Set		Search Statement	Results
		consults") OR (TI "electronic consultation" OR AB "electronic consultation") OR (TI "electronic consultations" OR AB "electronic consultations") OR (TI "electronic consulting" OR AB "electronic consulting") OR (TI tele-consult* OR AB tele-consult*) OR (TI teleconsult* OR AB teleconsult*) OR (TI teleconferenc* OR AB teleconferenc*) OR (TI tele-conferenc* OR AB tele-conferenc*) OR (TI "text message" OR AB "text message") OR (TI "text messages" OR AB "text messages") OR (TI "text messaging" OR AB "text messaging")) OR (((TI followup OR AB followup) OR (TI follow-up OR AB follow-up)) N3 ((TI call OR AB call) OR (TI calls OR AB calls) OR (TI called OR AB called) OR (TI calling OR AB calling) OR (TI text OR AB text) OR (TI texts OR AB texts) OR (TI texting OR AB texting) OR (TI message OR AB message) OR (TI messages OR AB messages) OR (TI messaging OR AB messaging))) OR (((TI remote* OR AB remote*) OR (TI video* OR AB video*) OR (TI internet OR AB internet) OR (TI internet-based OR AB internet-based) OR (TI web OR AB web) OR (TI web-based OR AB web-based) OR (TI online OR AB online) OR (TI online-based OR AB online-based) OR (TI computer OR AB computer) OR (TI computer-based OR AB computer-based) OR (TI asynchronous* OR AB asynchronous*)) N3 ((TI meet* OR AB meet*) OR (TI call* OR AB call*) OR (TI chat* OR AB chat*) OR (TI conferenc* OR AB conferenc*) OR (TI consult* OR AB consult*) OR (TI counsel* OR AB counsel*) OR (TI visit* OR AB visit*) OR (TI message OR AB message) OR (TI messages OR AB messages) OR (TI messaging OR AB messaging) OR (TI messaged OR AB messaged) OR (TI text OR AB text) OR (TI texts OR AB texts) OR (TI texting OR AB texting) OR (TI texted OR AB texted))) OR (((TI video* OR AB video*) OR (TI remote* OR AB remote*) OR (TI web-based OR AB web-based) OR (TI internet-based OR AB internet-based) OR (TI tele* OR AB tele*)) N2 (TI care OR AB care)) OR (((TI secure OR AB secure) OR (TI secured OR AB secured) OR (TI EHR OR AB EHR) OR (TI EMR OR AB EMR) OR (TI "electronic health record" OR AB "electronic health record") OR (TI "electronic health records" OR AB "electronic health records") OR (TI "electronic medical record" OR AB "electronic medical record") OR (TI "electronic medical records" OR AB "electronic medical records")) N3 ((TI text OR AB text) OR (TI texts OR AB texts) OR (TI texting OR AB texting) OR (TI message OR AB message) OR (TI messages OR AB messages) OR (TI messaging OR AB messaging))) OR (((TI asynchronous* OR AB asynchronous*) OR (TI synchronous* OR AB synchronous*)) N3 (TI communicat* OR AB communicat*))	
3	*Combining*	S1 AND S2	3701
4	*Follow-Up*	(MH "After Care") OR ((TI follow-up OR AB follow-up) OR (TI followup OR AB followup) OR (TI "follows up" OR AB "follows up") OR (TI "followed up" OR AB "followed up") OR (TI "following up" OR AB "following up") OR (TI "after care" OR AB "after care") OR (TI aftercare OR AB aftercare))	348945
5	*Readmissions*	(MH "Readmission") OR ((TI readmission* OR AB readmission*) OR (TI re-admission* OR AB re-admission*) OR (TI readmit* OR AB readmit*) OR (TI re-admit* OR AB re-admit*))	27971
6	*ED use*	(MH "Emergency Service") OR ((TI "emergency department" OR AB "emergency department") OR (TI "emergency departments" OR AB "emergency departments") OR (TI "emergency room" OR AB	103921

	Search Set	Search Statement	Results
		"emergency room") OR (TI "emergency rooms" OR AB "emergency rooms"))	
7	combining	S4 OR S5 OR S6	466385
8	combining	S3 AND S7	2322
9	*Study Design: EPOC filter or RCTs*	(ZT "randomized controlled trial") OR (MH "Randomized Controlled Trials") OR (MH "Double-Blind Studies") OR (MH "Prospective Studies+") OR (MH "Single-Blind Studies") OR (MH "Triple-Blind Studies") OR (MH "Crossover Design") OR (MH "Experimental Studies") OR (MH "Clinical Trials") OR (MH "Intervention Trials") OR (MH "Preventive Trials") OR (MH "Therapeutic Trials+") OR (MH "Controlled Before-After Studies") OR (MH "Interrupted Time Series Analysis") OR (MH "Nonrandomized Trials") OR (MH "Quasi-Experimental Studies+") OR (MH "Multiple Time Series") OR (MH "Time Series") OR (MH "Repeated Measures") OR ((TI randomized OR AB randomized) OR (TI randomised OR AB randomised) OR (TI randomization OR AB randomization) OR (TI randomisation OR AB randomisation) OR (TI placebo OR AB placebo) OR (TI randomly OR AB randomly) OR (TI trial OR AB trial) OR (TI trials OR AB trials) OR (TI groups OR AB groups) OR (TI "evaluation study" OR AB "evaluation study") OR (TI "evaluation studies" OR AB "evaluation studies") OR (TI "intervention study" OR AB "intervention study") OR (TI "intervention studies" OR AB "intervention studies") OR (TI cohort OR AB cohort) OR (TI cohorts OR AB cohorts) OR (TI longitudinal OR AB longitudinal) OR (TI longitudinally OR AB longitudinally) OR (TI prospective OR AB prospective) OR (TI prospectively OR AB prospectively) OR (TI "follow up" OR AB "follow up") OR (TI follow-up OR AB follow-up) OR (TI followup OR AB followup) OR (TI "comparative study" OR AB "comparative study") OR (TI "comparative studies" OR AB "comparative studies") OR (TI nonrandom OR AB nonrandom) OR (TI non-random OR AB non-random) OR (TI nonrandomized OR AB nonrandomized) OR (TI non-randomized OR AB non-randomized) OR (TI nonrandomised OR AB nonrandomised) OR (TI non-randomised OR AB non-randomised) OR (TI quasi-experiment* OR AB quasi-experiment*) OR (TI quazi-experiment* OR AB quazi-experiment*) OR (TI quasiexperiment* OR AB quasiexperiment*) OR (TI quaziexperiment* OR AB quaziexperiment*) OR (TI quasirandom* OR AB quasirandom*) OR (TI quazirandom* OR AB quazirandom*) OR (TI quasi-random* OR AB quasi-random*) OR (TI quazi-random* OR AB quazi-random*) OR (TI quasi-control* OR AB quasi-control*) OR (TI quazi-control* OR AB quazi-control*) OR (TI quasicontrol* OR AB quasicontrol*) OR (TI quazicontrol* OR AB quazicontrol*)) OR ((TI controlled OR AB controlled) AND (TI study OR AB study)) OR ((TI pre-post OR AB pre-post) OR (TI "pre post" OR AB "pre post") OR (TI posttest OR AB posttest) OR (TI post-test OR AB post-test) OR (TI "post test" OR AB "post test") OR (TI pretest OR AB pretest) OR (TI pre-test OR AB pre-test) OR (TI "pre test" OR AB "pre test") OR (TI "repeated measure" OR AB "repeated measure") OR (TI "repeated measures" OR AB "repeated measures")) OR ((TI before OR AB before) AND (TI after OR AB after)) OR ((TI before OR AB before) AND (TI during OR AB during)) OR ((TI "time series" OR AB "time series") AND (TI interrupt* OR AB interrupt*)) OR ((TI "time points" OR AB "time points") AND ((TI multiple OR AB multiple) OR (TI one OR AB one) OR (TI two OR AB two) OR (TI three OR AB three) OR (TI four OR AB four) OR (TI five OR AB five) OR (TI six OR AB six)	2152369

	Search Set	Search Statement	Results
		OR (TI seven OR AB seven) OR (TI eight OR AB eight) OR (TI nine OR AB nine) OR (TI ten OR AB ten) OR (TI month OR AB month) OR (TI monthly OR AB monthly) OR (TI day OR AB day) OR (TI daily OR AB daily) OR (TI week OR AB week) OR (TI weekly OR AB weekly) OR (TI hour OR AB hour) OR (TI hourly OR AB hourly)))	
10	Combining	S8 AND S9	2047
11	*Remove animal-only*	S10 NOT (((MH "Animals+") OR (MH "Animal Studies") OR (TI "animal model*")) NOT (MH "human"))	2046
12	*Remove case reports, editorials, conference abstracts*	S11 NOT PT (Abstract OR Algorithm OR Anecdote OR Bibliography OR Biography OR Book OR Book Chapter OR Book Review OR Cartoon OR Case Study OR Commentary OR Editorial OR Letter OR Masters Thesis OR Doctoral Dissertation OR Forms OR Games OR Pamphlet OR Pamphlet Chapter OR Poetry)	1800
13	*Date Limit 2012-present*	Published Date: 20120101-20231231	1267

STUDY CHARACTERISTICS

For full study citations, refer to the main report's reference list.

Study Country Sample Size Design	Population % Female % White	Pre- and Post-Discharge Intervention Description Comparator	Outcome (Time Point) Risk of Bias Rating
Bell, 2016[21] United States 851 Randomized trial	Patients aged 18 that were hospitalized for acute coronary syndromes (ACS) and/or acute decompensated heart failure (ADHF), as determined by medical record review conducted by a physician using standard criteria -Percentage not reported -Percentage not reported	Pharmacists reconciled preadmission medications and discharge medications with the patient and reported any inconsistencies to the medical team, prior to hospital discharge. The pharmacist then provided tailored counseling, including assessing patient understanding of the medication regimen, barriers to medication adherence, and troubleshooting barriers while the patient was in the hospital. At discharge, the pharmacist provided additional counseling, an illustrated medication schedule showing the discharge regimen, and a pillbox, which the patient practiced filling. The pharmacist employed a teach-back technique to ensure patient understanding. Within 4 days after hospital discharge, study coordinators contacted the patients and inquired about general health, symptoms, and any medication related problems such as regimen confusion, non-adherence, or side effects. If issues were detected, the study coordinator contacted the pharmacist to provide those patients reinforcement education and to resolve problems. -Usual care/routine discharge	Emergency Department visit (30 days) Hospital readmission (30 days) ROB rating: Low
Clari, 2015[22] Italy 219 Randomized trial	Patients between 18 and 80 years old hospitalized for elective "low- or medium-intensity orthopaedic surgery" (ASA score < 3) -46% female -Percentage not reported	Patients assigned to the intervention group received routine care and instruction for discharge. A follow-up telephone call carried out by a nurse who specialised in orthopaedics 24 – 96 hours after discharge that was designed to give the nurse the opportunity to assess the overall health of the patient. During this phone call, the nurse followed a standardized sequence of questions and was also able to record whether or not an educational intervention or reinforcement technique was carried out. -Usual care/routine discharge	Patient satisfaction ROB rating: Some concerns

Study Country Sample Size Design	Population % Female % White	Pre- and Post-Discharge Intervention Description Comparator	Outcome (Time Point) Risk of Bias Rating
Danielsen, 2020[23] Norway 282 Randomized trial	Patients aged 18 and older assigned to the following aortic valve replacement (AVR) treatments: First-time isolated AVR, AVR with concomitant coronary artery bypass grafting (CABG), or AVR with concomitant supra-coronary tube graft (SCG). -Percentage not reported -Percentage not reported	Prior to discharge, the intervention group received standard discharge care, which included a scheduled consultation with the treating surgenon before discharge from the tertiary hospital. Project coordinator called intervention patients on day 2 and day 9 after hospital discharge to home (telephone follow-up). These were structured telephone calls comprising of advice on the importance of physical activity in the early rehabilitation phase after AVR, and remindning participant about the availability of 24/7-telephone support to answer questions they might have about their present health condition (patient-centered instructions and/or reassurance). The patients could also call a 24/7-phone hotline that was staffed by a group of dedicated and experienced advanced nurse practitioners to receive information whenever they wanted during the first 30 days after discharge. -Usual discharge care	Hospital readmissions (30 days) ROB rating: Some concerns
Farris,2014[24] United States 630 Randomized trial	Patients 18 years or older admitted with diagnosis of hypertension, hyperlipidemia, heart failure, coronary artery disease, myocardial infarction, stroke, transient ischemic attack, asthma, chronic obstructive pulmonary disease or receiving oral anticoagulation. -Percentage not reported -91.4% White	Minimal Intervention Group: - Pharmacist case manager (PCM) verifies admission medications with community pharmacy, in addition to medication review by unit pharmacist. - PCM makes recommendations to inpatient medical team. PCM educates patient during hospitalization, provides discharge medication counseling and wallet card medication list. Strategies are reviewed to enhance self-management. - No call. Enhanced Intervention Group: In addition to PCM activities described for Minimal Intervention Group, the Enhanced group also receives the following after unblinding to PCM at discharge. 1) PCM creates discharge care plan and faxes to community physician and pharmacy. 2) PCM phones patient 3-5 days post-discharge to evaluate adherence and new side effects and answer questions. Report is faxed to community physician and pharmacist if problem noted. Control/Usual Care Group: - Unit pharmacist performs medication review. - Unit nurse provides discharge summary and medication list.	Hospital readmission (30 days and 90 days) Emergency Department visit (30 days and 90 days) ROB rating: Low

Study Country Sample Size Design	Population % Female % White	Pre- and Post-Discharge Intervention Description Comparator	Outcome (Time Point) Risk of Bias Rating
Haag,2016[25] United States 25 RCT	Independent living elderly adults, age 60 or older, enrolled in care transitions program (CTP) who were at high risk for an emergency department visit or hospital readmission. -Percentage not reported -Percentage not reported	A medication therapy management consultation by pharmacist between 3 days and up to 7 business days after hospital discharge. Pharmacist reviewed EMR to complete a comprehensive review of all prescriptions, nonprescriptions, and herbal meds. This review included the identification, resolution, and prevention of drug related problems including adverse events or the use of inappropriate medication. -Usual care group: a nurse practioner home visit within 3 days after discharge to review medication.	Emergency Department visits (30 days) Hospital readmissions (30 days) Composite of both Emergency Department visits and hospital readmissions (30 days) ROB rating: Some concerns
Lee,2020[26] United States 2372 RCT	All patients aged ≥ 21 years who were hospitalized in 16 hospitals between January 15, 2017, and March 31, 2018, within Kaiser Permanente Northern California with heart failure (HF); identified by diagnosis codes for HF as the primary hospital problem, or diagnosis code for a HF-related sign or symptom as the primary hospital problem in combination with a HF-specific diagnosis code as a secondary problem -44% female -60.4% White	Telephone appointment - patients were called by a nurse or pharmacist who were previously trained and experienced using a structure HF protocol, including directions for titrating diuretics and other HF-related medications and ordering lab tests based on reported symptoms and vitals. Nurse/pharmacist also had immediate access to supervising physician and could arrange for expedited appointments as necessary. -In-person clinic appointment (usual care) - scheduled primarily with their primary care physician who provided usual care	Hospital readmission for heart failure (30 days) Hospital readmission for ay cause (30 days) ROB rating: Some concerns
Lindpaintner, 2013[27] Switzerland 60 RCT	Patients were “high risk” for adverse events after discharge and had either: oral anticoagulation, newly ordered insulin, polypharmacy (defined as more than eight regularly used medicines at the time of admission), or new diagnosis requiring four or more long-term medicines. Patients also either lived alone, received home nursing care prior to admission, or required complex wound care. -50% female	For patients in the intervention group, prior to discharge the nurse care manager (NCM) conducted a comprehensive structured assessment of symptom burden, prior adherence to prescribed therapies, family caregiving, functional status using the Barthel Index, cognition using a German adaptation of the Mini Mental Test and the Clock-drawing Test, and comorbidity, using the Charlson Comorbidity Index (CCI). The NCM then conferred with the ward team about discharge planning and joined the team for rounds on intervention patients. Contacting patients by structured telephone contact within 24 hours of discharge, evaluating self-efficacy and giving reminders about self-management strategies and follow-up appointments; Availability of the NCM by pager 24/7 for 5 days following discharge; Ending the intervention with a home visit and a letter to the primary care physician; Using	Hospital readmission (30 days) ROB rating: Some concerns

Study Country Sample Size Design	Population % Female % White	Pre- and Post-Discharge Intervention Description Comparator	Outcome (Time Point) Risk of Bias Rating
	-Percentage not reported	proprietary case management software (e-case) adapted for the project to collect data and generate correspondence. The individualized interventions emphasized adherence, self-management skills, and extending the network of support available to patient and family caregivers. -Usual care/routine discharge	
Lundby,2020[28] Denmark 64 RCT	Patients 18 years or older discharged from the gastrointestinal unit with gastrointestinal diseases (inflammatory bowel disease, cancer within the gastrointestinal system, or complex fistulas) -48% female -Percentage not reported	Intervention included preparing patient information for the discharge counseling, medication review, discussion with physician, patient counseling at discharge, medication report to primary care physician, and phone follow-up to the patient 3 days after discharge. The discharge counseling included an updated medication list and a written summary of the counseling for the patient to take home, including a direct phone number to the pharmaconomist performing the counseling.	Patient satisfaction ROB rating: High
Robinson,2015[29] New Zealand 20682 Interrupted time-series	Age 65 years with an acute medical admission that were identified as being "high risk" patients -Percentage not reported -Percentage not reported	Pre-discharge component: nutrition screening, and if necessary referral to a dietitian; allied health review; and discharge medicines reconciliation and patient education by a pharmacist. Post-discharge component: a telephone assessment, education, and support by a team of experienced community nurses on the first and third days post-discharge. No comparator	Hospital readmission (28 days) Emergency Department visit (28 days) ROB rating: Serious
Sarangarm,2013[30] United States 279 Nonrandomized trial	All English- or Spanish-speaking patients who were discharged from all internal medicine teams between 8 am and 5 pm Monday through Friday were included in the study based on pharmacist availability to perform discharge counseling -44% female	Intervention patients received discharge counseling from a pharmacist that included information about proper medication administration, side effects, and disease state education. Pharmacists also reviewed patients' medications and prescriptions by completing medication review; identifying duplicative, unnecessary, or incomplete therapy; checking for drug interactions; verifying patients' formulary drug coverage and availability of medications; and ensuring prescription	Composite hospital readmissions and Emergency Department visits (30 days) ROB rating: Serious

Study Country Sample Size Design	Population % Female % White	Pre- and Post-Discharge Intervention Description Comparator	Outcome (Time Point) Risk of Bias Rating
	-89% White	completeness. To minimize interpharmacist variability during the discharge process, a standardized checklist was developed outlining the topics to be covered during a counseling session, and standardized patient education leaflets were used. Usual discharge care	
Soong,2014[31] Canada 334 Cluster RCT	General medical patients age 18 and older discharged home after hospitalization -Percentage not reported -Percentage not reported	The discharge process involves each patient receiving a copy of the electronic discharge summary and patient-specific instructions. In addition, the provider must review written discharge instructions with the patient and/or caregiver. The non-clinicical pateint navigator called a patient or caregiver within 3 days following discharge from hospital with a minimum of 5 attempts conducted. A standardized intervention phone script that solicited information on general health status post discharge, comprehension of discharge instructions, and reinforced instructions was read to the patient. The caller utilized a modified teach-back method to educate the patient on discharge instructions, medications, and follow up recommendations. Usual care	Emergency Department visit (30 days) Hospital readmission (30 days) ROB Rating: Some concerns
Sorknaes,2013[32] Denmark 266 RCT	Patients who were at least 40 years old and 1) diagnosed with COPD verified by spirometry 2) admitted with acute exacerbation of COPD (AECOPD) "defined by increased need or medicine and increased dyspnoea, increased expectorate volume or increased coughing" -Percentage not reported -Percentage not reported	All COPD patients admitted with exacerbation received conventional treatment according to GOLD guidelines, ie, inhaler with bronchodilator medication, systemic glucocorticoid treatment, and if needed, antibiotics, noninvasive ventilation or respirator treatment. Prior to discharge, control of inhalation techniques was performed and a decision was made concerning the treatment with which the patient should continue.Intervention consisted of daily teleconsultations (initiated within 24 hours of discharge) conducted by a nurse via videom everyday for an average of 7 days post-dsicharge. Telemedicine equipment loaned to patient at discharge allowed patient to measure pulse, oxygen saturation, and spirometry and transmit the information to the nursing providing the intervention. The week after the teleconsultations were finished, a telephone follow-up call was made. Conventional treatment	Hospital readmissions (within 26 weeks) ROB rating: Some concerns

Study Country Sample Size Design	Population % Female % White	Pre- and Post-Discharge Intervention Description Comparator	Outcome (Time Point) Risk of Bias Rating
Yiadom,2020[33] United States 3054 RCT	All inpatients discharged home from a general medicine service -Percentage not reported -Percentage not reported	A semi structured script was used to guide the conversation to assess their knowledge of discharge diagnosis and plan, with attention to medication changes, follow-up appointments, and anticipated discharge support services (medication procurement, visiting health assistance, and needed equipment). Patients were asked to “teach back” their discharge plan. Gaps in knowledge or planned care transition supports were identified and addressed as needed.	Hospital readmission (30 days) ROB rating: Low

INTERVENTION CHARACTERISTICS

For full study citations, refer to the main report's reference list.

Study	Mode Timing Dose	Staff Access to EHR Assessments Conducted	Post-Discharge Intervention Description	Core Components Outcomes Assessed
Bell, 2016[21]	Phone Within 4 days 1 call	Study coordinator; pharmacist (if needed) Yes Medication related problems; general health assessment; symptom screener	Within 4 days after hospital discharge, study coordinators contacted the patients and inquired about general health, symptoms, and any medication related problems such as regimen confusion, non-adherence, or side effects. If issues were detected, the study coordinator contacted the pharmacist to provide those patients reinforcement education and to resolve problems.	Medication review, monitoring Emergency department visits, hospitalizations/readmissions, patient satisfaction/composite outcomes
Clari, 2015[22]	Phone Within 4 days 1 call, 4.89 minutes on average	Nurses Do not know Overall health screener; explore experienced and potentail problems via standarized sequence of questions	A follow-up telephone call carried out by a nurse who specialised in orthopaedics 24 – 96 hours after discharge designed to give the nurse the opportunity to assess the overall health of the patient	Medication review, monitoring Patient satisfaction/composite outcomes
Danielsen,2020[23]	Phone Day 2 Number and duration of calls not specified	Study coordinator; pharmacist (if needed) Yes None	Project coordinator called intervention patients on day 2 and day 9 after hospital discharge to home (telephone follow-up). These were structured telephone calls comprising of advice on the importance of physical activity in the early rehabilitation phase after AVR, and remindning participant about the availability of 24/7 telephone support to answer questions they might have about their present health condition (patient-centered instructions and/or reassurance). The patients could also call a 24/7 phone hotline that was staffed by a group of dedicated and experienced advanced nurse practitioners to receive information whenever they wanted during the first 30 days after discharge.	Coordination of services Hospitalizations/readmissions

Study	Mode Timing Dose	Staff Access to EHR Assessments Conducted	Post-Discharge Intervention Description	Core Components Outcomes Assessed
Farris, 2014[24]	Phone 3–5 days post-discharge 1 call; duration not reported	Pharmacist Do not know None	Pharmacist case manager (PCM) creates discharge care plan and faxes to community physician and pharmacy. PCM phones patient 3-5 days post-discharge to evaluate adherence and new side effects and answer questions. Report is faxed to community physician and pharmacist if problem noted.	Medication review, coordination of services, monitoring Emergency department visits, hospitalizations/readmissions, patient satisfaction/composite outcomes
Haag, 2016[25]	Phone 3 days Number and duration of calls not specified	Pharmacist; study coordinator Yes None	A medication therapy management consultation by pharmacist between 3 days and up to 7 business days after hospital discharge. Pharmacist reviewed EMR to complete a comprehensive review of all prescriptions, nonprescriptions, and herbal meds. This review included the identification, resolution, and prevention of drug related problems including adverse events or the use of inappropriate medication. Additionally, the electronic medical record was investigated for potential prescribing omissions. This review was the foundation for the phone consultation with the patient to ensure medication optimization.	Medication review Emergency department visits, hospitalizations/readmissions, patient satisfaction/composite outcomes
Lee, 2020[26]	Phone Within 7 days 1 call, duration not reported	Pharmacist or nurse Yes Symptom management protocol; self-report weight; self-report blood pressure; medication review	Within 7 days post-discharge patients were called by a nurse or pharmacist who were previously trained and experienced using a structured HF protocol, including directions for titrating diuretics and other HF-related medications and ordering lab tests based on reported symptoms and vitals. Nurse/pharmacist also had immediate access to supervising physician and could arrange for expedited appointments as necessary.	Medication review; coordination of services; monitoring Hospitalizations/readmissions
Lindpaintner, 2013[27]	Phone Day 1 1 call, duration not reported	Nurse (registered nurse with Masters degree) Yes Medication review	Structured telephone contact within 24 hours of discharge, evaluating self-efficacy and giving reminders about self-management strategies and follow-up appointments and making the Nurse Care manager available to the patient by pager 24/7 for 5 days following discharge. Ending the intervention with a home visit and a	Medication review; coordination of services Hospitalizations/readmissions

Study	Mode Timing Dose	Staff Access to EHR Assessments Conducted	Post-Discharge Intervention Description	Core Components Outcomes Assessed
			letter to the primary care physician. Using proprietary case management software (e-case) adapted for the project to collect data and generate correspondence.	
Lundby, 2020[28]	Phone Within 3 days 1 call, mean time intervention + call 32 min (range 25-35)	Pharmaconomist Do not know None	Phone follow-up to the patient 3 days after discharge. The discharge counseling included an updated medication list and a written summary of the counseling for the patient to take home, including a direct phone number to the pharmaconomist performing the counseling.	Medication review Patient satisfaction/composite outcomes
Robinson, 2015[29]	Phone Day 1 and 3 2 calls; duration not reported	Nurse (supported by a geriatrician, a pharmacist, and cultural support workers) Yes None	A telephone assessment, education, and support by a team of experienced community nurses on the first and third days post-discharge.	Medication review, coordination of services, monitoring Emergency department visits, hospitalizations/readmissions
Sarangarm, 2013[30]	Phone 2-3 days 1 call; duration not reported	Pharmacist Yes None	Intervention patients received a phone call 36 to 72 hours post-discharge to assess patient clinical status and to identify and resolve further medication-related issues.	Medication review; coordination of services Emergency department visits, hospitalizations/readmissions, patient satisfaction/composite outcomes
Soong, 2014[31]	Phone Within 3 days 1 call	Patient navigator Yes General health screener; structured assessment of discharge instructions	Within 3 days following discharge from hospital the PN called a patient or caregiver and a standardized intervention phone script that solicited information on general health status post discharge, comprehension of discharge instructions, and reinforced instructions was read to the patient. The caller utilized a modified teach-back method to educate the patient on discharge instructions, medications and follow up recommendations.	Coordination of services; monitoring Emergency department visits, hospitalizations/readmissions

Study	Mode Timing Dose	Staff Access to EHR Assessments Conducted	Post-Discharge Intervention Description	Core Components Outcomes Assessed
Sorknaes, 2013[32]	Video Day 1-9 Daily for 5 to 9 days, duration not reported	Nurse N/A Pulse, oxygen saturation, and spirometry	Daily teleconsultations post-discharge conducted by a nurse via video. Telemedicine equipment loaned to patient at discharge allowed patient to measure pulse, oxygen saturation, and spirometry and transmit the information to the nursing providing the intervention.	Coordination of services; monitoring Hospitalizations/readmissions
Yiadom, 2020[33]	Phone Within 3 days Not reported	Not reported Yes Structured assessment of understanding of discharge reccommendations	A first call attempt was made within 72 hours of discharge with at least 3 call attempts made until successful contact for up to 7 days after discharge. A semistructured script was used to guide a conversation with the patient to assess their knowledge of their discharge diagnosis and plan with attention to medication changes, follow-up appointments, and actualization of anticipated discharge supports, including acquisition of durable medical equipment, visiting health assistance visits, and medication procurement. Patients were asked to “teach back” their discharge plan.	Medication review; coordination of services Emergency department visits, patient satisfaction/composite outcomes

RESULTS: HOSPITAL READMISSIONS

For full study citations, refer to the main report's reference list.

Study Design	Outcome (Time Point)	Results
Bell, 2016[21] RCT	Unplanned hospitalizations assessed via follow-up call (30 days)	PILL-CVD Events: 61 Total: 423 Usual care Events: 66 Total: 428 Adjusted hazard ratios: 0.94 (95% CI [0.63, 1.28]) *P* value = NR
Danielsen, 2020[23] RCT	All-cause hospital readmission (30 days)	Telepone follow-up/hotline Events: 32 Total: 127 Post-discharge usual care Events: 26 Total: 133 Chi-squared: 1.196 *P* value = 0.274
Farris, 2014[24] RCT	Hospital readmission (30 days)	Enhanced intervention Events: 47 Total: 287 Minimal intervention Events: 40 Total: 296 Effect estimate: NR *P* value: NR
	Hospital readmission (90 days)	Enhanced intervention Events: 49 Total: 287 Minimal intervention Events: 51 Total: 296 Effect estimate: NR *P* value = NR
Haag, 2016[25] RCT	Hospital readmission (30 days)	Pharmacist intervention Events: 2 Total: 11 Usual care

Study Design	Outcome (Time Point)	Results
		Events: 1 Total: 11 Effect estimate: NR *P* value = 0.53
Lee, 2020[26] RCT	Heart failure hospitalizations obtained from EHR (30 days)	Telephone follow-up Events: NR Total: 1027 Usual care (in-person visit in the first 7 days) Events: Total: 1064 HR = 0.81 (95% CI [0.59, 1.11]) *P* value = NR
	All-cause hospitalizations obtained from EHR (30 days)	Telephone follow-up Events: NR Total: 1027 Usual care (in-person visit in the first 7 days) Events: Total: 1064 HR = 0.82 (95% CI [0.66, 1.02]) *P* value = NR
Lindpaintner, 2013[27] RCT	Readmission reported by patient, visiting nurse, or primary care provider (5 days)	Discharge management Events: 1 Total: 28 Usual care Events: 2 Total: 29 Effect estimate: NR *P* value = NR
	Readmission reported by patient, visiting nurse, or primary care provider (30 days)	Discharge management Events: NR Total: 29 Usual care Events: NR Total: 30 Effect estimate: NR *P* value = 0.026
Robinson, 2015[29] Interrupted time-series	Pre-intervention period trend (% change per month) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention

Study Design	Outcome (Time Point)	Results
		Events: NR Total: NR Percent change per month: 0 *P* value = 0.334
	Development period trend (% change per month) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change per month: 0.4 *P* value = 0.683
	Intervention period trend (% change per month) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change per month: -0.6 *P* value = 0.604
	Shift (pre-intervention/development) (%) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change between pre-intervention and development: -1.6 *P* value = 0.614
	Shift (development/intervention) (%) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change between development and intervention: 1.7 *P* value = 0.502
Sarangarm, 2013[30] Nonrandomized trial	Total number of post-discharge hospital admissions	Pharmacist counseling Events: 20 Total: 140

Study Design	Outcome (Time Point)	Results
	(30 days)	Usual care Events: 16 Total: 139 Effect estimate: NR *P* value = 0.49
Soong, 2014[31] Cluster RCT	Unplanned hospitalizations (readmission to any hospital in the local health region as verified per patient self-report and/or available electronic medical records) (30 days)	Patient navigator call group Events: 15 Total: 107 No call group Events: 13 Total: 107 OR = 1.18 (95% CI [0.53, 2.61]) *P* value = 0.68
Sorknaes, 2013[32] RCT	Total readmission after discharge (182 days)	Teleconsultations Events: NR Total: 121 Conventional treatment Events: NR Total: 121 Mean difference: 0.14 (95% CI [-0.4, 0.68]) *P* value = 0.62
	Total readmission after discharge (84 days)	Teleconsultations Events: NR Total: 127 Conventional treatment Events: NR Total: 126 Mean difference: -0.03 (95% CI [-0.38, 0.32]) *P* value = 0.87
	Total readmission after discharge (56 days)	Teleconsultations Events: NR Total: 127 Conventional treatment Events: NR Total: 130 Mean difference: -0.16 (95% CI [-0.44, 0.12]) *P* value = 0.26
	Total readmission after discharge (28 days)	Teleconsultations Events: NR Total: 130

Study Design	Outcome (Time Point)	Results
		Conventional treatment Events: NR Total: 131 Mean difference: -0.08 (95% CI [-0.25, 0.09]) *P* value = 0.35
	AECOPD readmission (182 days)	Teleconsultations Events: NR Total: 121 Conventional treatment Events: NR Total: 121 Mean difference: 0.06 (95% CI [-0.43, 0.54]) *P* value = 0.82
	AECOPD readmission (84 days)	Teleconsultations Events: NR Total: 127 Conventional treatment Events: NR Total: 126 Mean difference: -0.05 (95% CI [-0.35, 0.25]) *P* value = 0.75
	AECOPD readmission (56 days)	Teleconsultations Events: NR Total: 127 Conventional treatment Events: NR Total: 130 Mean difference: -0.16 (95% CI [-0.4, 0.09]) *P* value = 0.2
	AECOPD readmission (28 days)	Teleconsultations Events: NR Total: 130 Conventional treatment Events: NR Total: 131 Mean difference: -0.09 (95% CI [-0.25, 0.07]) *P* value = 0.28
Yiadom, 2020[33] RCT	Inpatient readmission (30 days)	Telephone call program Events: 228 Total: 1534

Study Design	Outcome (Time Point)	Results
		Usual care Events: 232 Total: 1520 Absolute difference: -0.4 (95% CI [-2.9, 2.1]) *P* value = 0.76
	Observation readmission (30 days)	Telephone call program Events: 59 Total: 1534 Usual care Events: 55 Total: 1520 Absolute difference: 0.2 (95% CI [-1.1, 1.6]) *P* value = 0.74
	Any revisit (30 days)	Telephone call program Events: 318 Total: 1534 Usual care Events: 322 Total: 1520 Absolute difference: -0.5 (95% CI [-3.3, 2.4]) *P* value = 0.76

RESULTS: EMERGENCY CARE USE

For full study citations, refer to the main report's reference list.

Study Design	Outcome (Time Point)	Results
Bell, 2016[21] RCT	Unplanned ED visits assessed via follow-up call (30 days)	PILL-CVD Events: 89 Total: 423 Usual care Events: 85 Total: 428 Adjusted hazard ratios: 1.03 (95% CI [0.76, 1.39]) *P* value = NR
Haag, 2016[25] RCT	Emergency department visits (30 days)	Pharmacist intervention Events: 1 Total: 11 Usual care Events: 1 Total: 11 Effect estimate: NR *P* value = >0.99
Robinson, 2015[29] Interrupted time-series	Pre-intervention period trend (% change per month) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change per month: 0.1 *P* value = 0.1
	Development period trend (% change per month) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change per month: -0.7 *P* value = 0.445
	Intervention period trent (% change per month) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention

Study Design	Outcome (Time Point)	Results
		Events: NR Total: NR Percent change per month: 0.7 *P* value = 0.478
	Shift (pre-intervention/development) (%) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change between pre-intervention and development: 1.5 *P* value = 0.547
	Shift (development/intervention) (%) (28 days)	Transition of care calls Events: NR Total: NR Pre-intervention Events: NR Total: NR Percent change between development and intervention: 3.1 *P* value = 0.174
Sarangarm, 2013[30] Nonrandomized	Total number of post-discharge ED visits (30 days)	Pharmacist counseling Events: 17 Total: 140 Usual care Events: 11 Total: 139 Effect estimate: NR *P* value = 0.24
Soong, 2014[31] Cluster RCT	Unplanned ED visits to any hospital in the local health region as verified per patient self-report and/or available electronic medical records (30 days)	Patient navigator call group Events: 22 Total: 107 No call group Events: 19 Total: 107 OR = 1.2 (95% CI [0.61, 2.37]) *P* value = 0.6
Yiadom, 2020[33] RCT	Emergency department revisits (30 days)	Telephone call program Events: 93 Total: 1534

Study Design	Outcome (Time Point)	Results
		Usual care Events: 82 Total: 1520 Absolute difference: 0.7 (95% CI [-1, 2.3]) *P* value = 0.43
Farris, 2014[24] RCT	ED visits (30 days)	Rnhanced intervention Events: 38 Total: 287 Minimal intervention Events: 49 Total: 296 Effect estimate: NR *P* value = NR
	ED visits (90 days)	Enhanced intervention Events: 41 Total: 287 Minimal intervention Events: 40 Total: 296 Effect estimate: NR *P* value = NR

RESULTS: COMPOSITE MEASURES OF UTILIZATION

For full study citations, refer to the main report's reference list.

Study Design	Outcome (Time Point)	Results
Haag, 2016[25] RCT	Composite 30-day emergency department visit or hospital readmission (30 days)	Pharmacist intervention Events: 2 Total: 11 Usual care Events: 1 Total: 11 Effect estimate: NR *P* value = 0.53
Sarangarm, 2013[30] Nonrandomized trial	Combined total number of 30-day post-discharge hospitalizations and ED visits (30 days)	Pharmacist counseling Events: 30 Total: 140 Usual care Events: 24 Total: 139 Effect estimate: NR *P* value = 0.34
Farris, 2014[24] RCT	Composite healthcare utilization: composite variable of combined hospital readmission, emergency department visit or unscheduled office visit (30 days)	Enhanced intervention Events: 81 Total: 287 Minimal intervention Events: 88 Total: 296 Effect estimate: NR *P* value = NR
	Composite healthcare utilization: composite variable of combined hospital readmission, emergency department visit or unscheduled office visit (90 days)	Enhanced intervention Events: 97 Total: 287 Minimal intervention Events: 90 Total: 296 Effect estimate: NR *P* value = NR

Study Design	Outcome (Time Point)	Results
Bell, 2016[21] RCT	First unplanned health care utilization; was defined as a composite of first unplanned hospital readmission or ER visit within 30 days after discharge (30 days)	PILL-CVD Events: 97 Total: 423 Usual care Events: 92 Total: 428 Adjusted hazard ratios: 1.04 (95% CI [0.78, 1.39]) *P* value = NR

RESULTS: PATIENT SATISFACTION

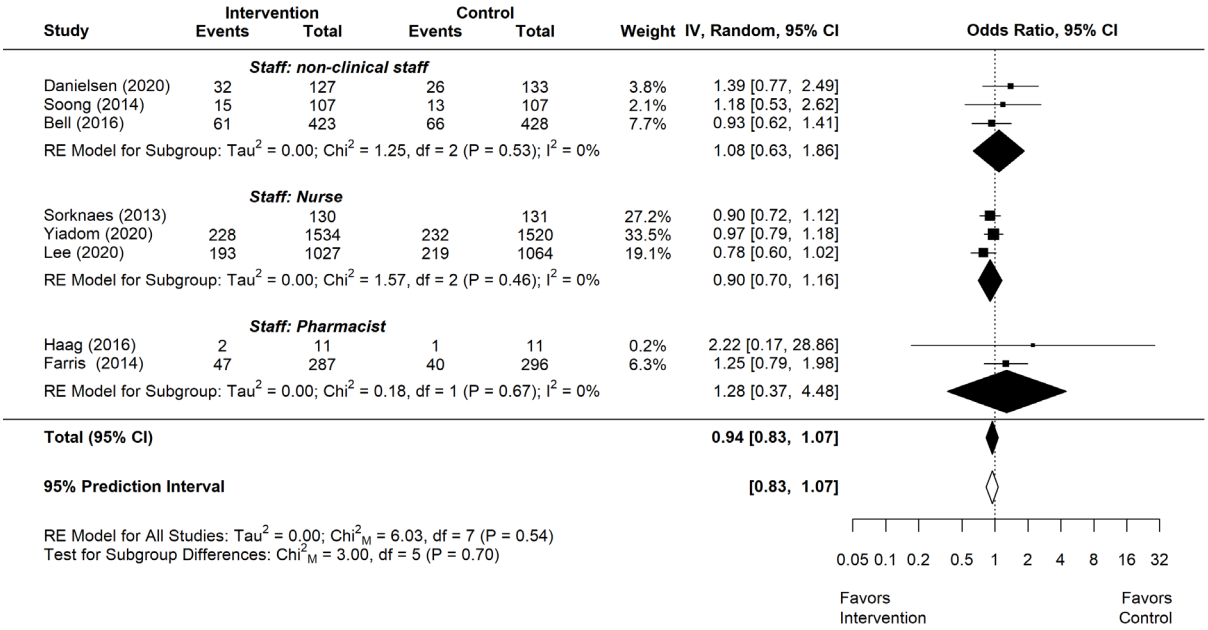
For full study citations, refer to the main report's reference list.

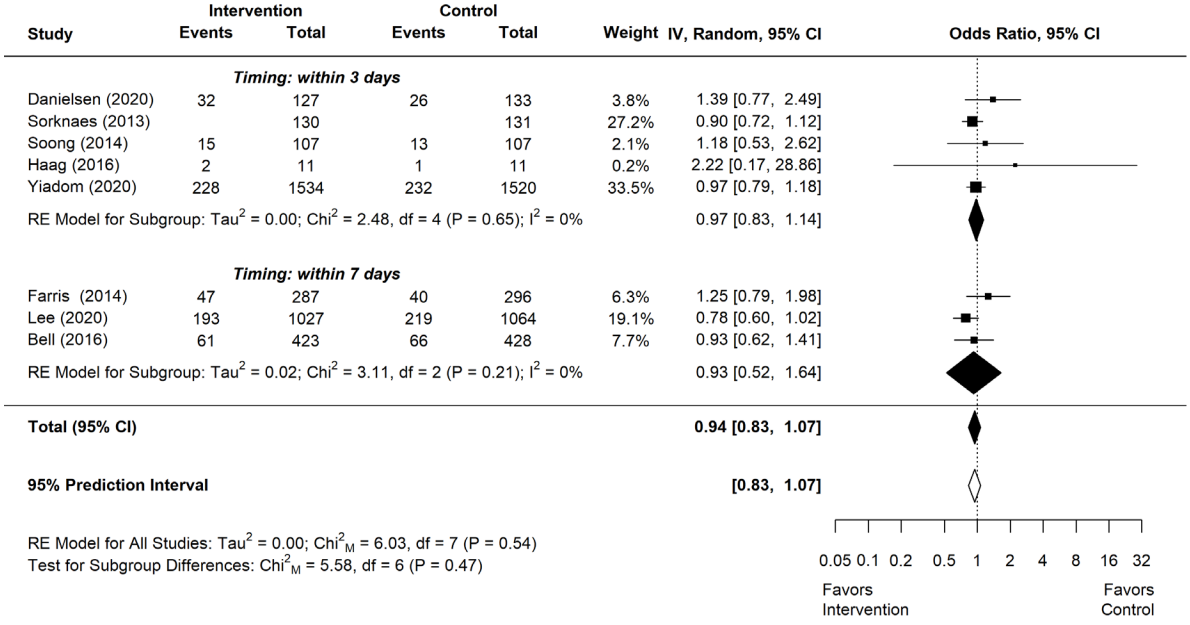
Study Design	Outcome (Time Point)	Results
Clari, 2015[22] RCT	Patients who said the information was useful (15 days)	Telephone follow-up Events: NR Total: NR Routine care Events: NR Total: NR Effect estimate: NR *P* value = 0.004
	Overall experience (15 days)	Telephone follow-up Events: NR Total: NR Routine care Events: NR Total: NR Effect estimate: NR *P* value = 0.07
	Patients experience with clarity of information (15 days)	Telephone follow-up Events: NR Total: NR Routine care Events: NR Total: NR Effect estimate: NR *P* value = 0.08
Lindpaintner, 2013[27] RCT	Overall satisfaction with discharge process, 4-point Likert scale (5 days)	Discharge Management Events: NA Total: NA Usual care Events: NA Total: NA Effect estimate: NR *P* value = 0.027
	Overall satisfaction with discharge process, 4-point Likert scale (30 days)	Discharge management Events: NA Total: NA Usual care

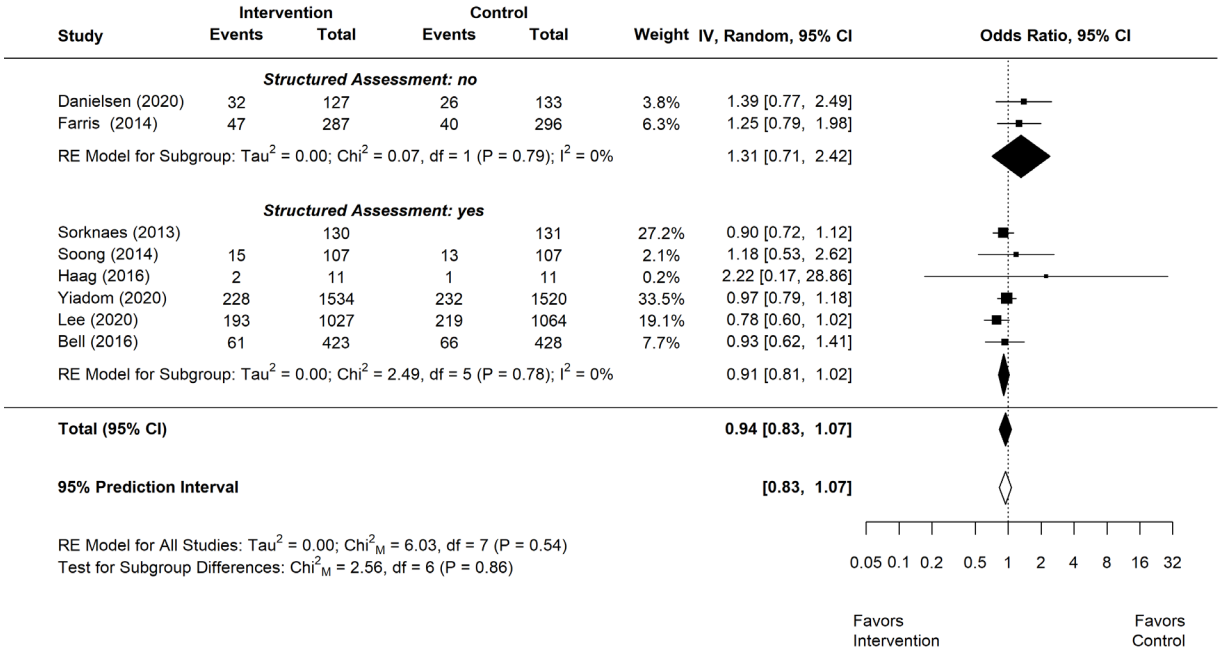
Study Design	Outcome (Time Point)	Results
		Events: NA Total: NA Effect estimate: NR *P* value = 0.008
Lundby, 2020[28] RCT	Overall satisfaction (7 days)	Medication counseling Events: 24 Total: 32 Usual care Events: 29 Total: 32 Effect estimate: NR *P* value = 0.1
	Overall satisfaction (7 days)	Medication counseling Events: 8 Total: 32 Usual care Events: 0.09 Total: 32 Effect estimate: NR *P* value = NR
Yiadom, 2020[33] RCT	Patient expereince assessed using 2 items of the Hospital Consumer Assessment of Healthcare Providers and Systems score data from Press Ganey (*ie*, ovearall satifiacation; likelihood of recommending hosptial (30 days)	Telephone call program Events: NA Total: NA Usual care Events: NA Total: NA Absolute difference: 16% response rate was too low for analysis *P* value = NA

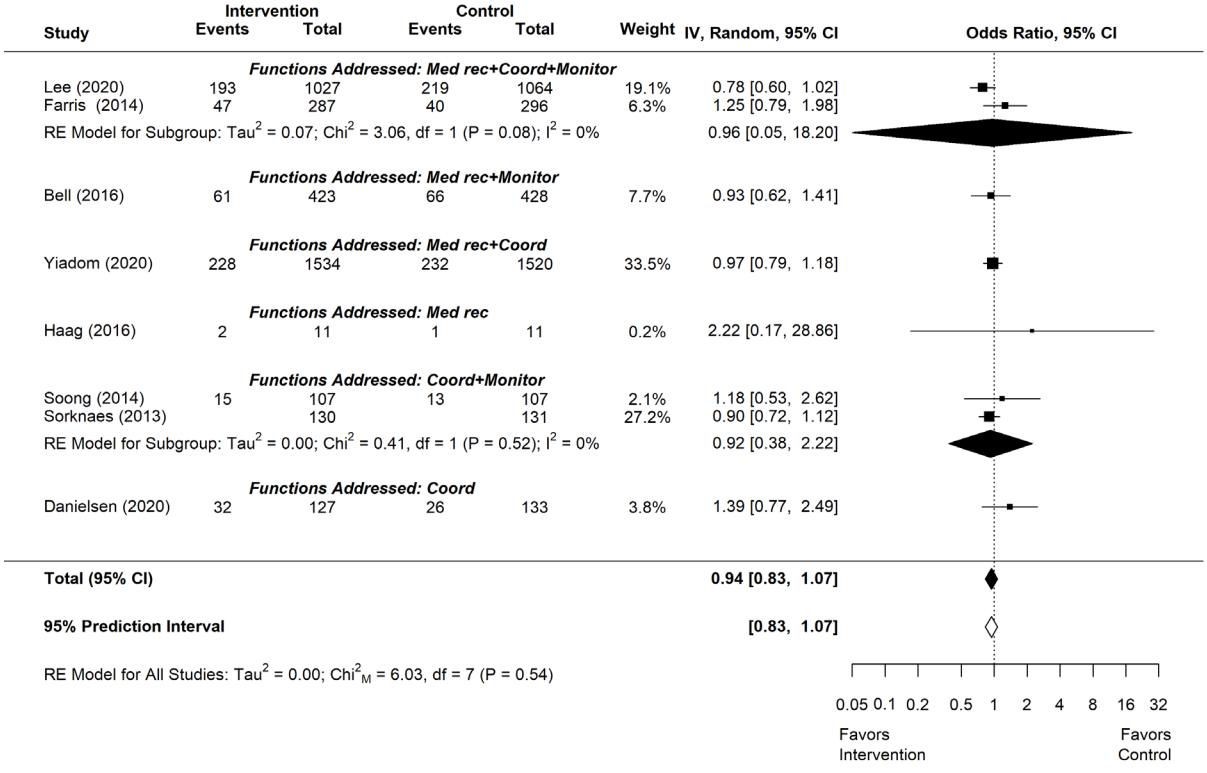
SUBGROUP ANALYSES

30-DAY HOSPITAL READMISSION

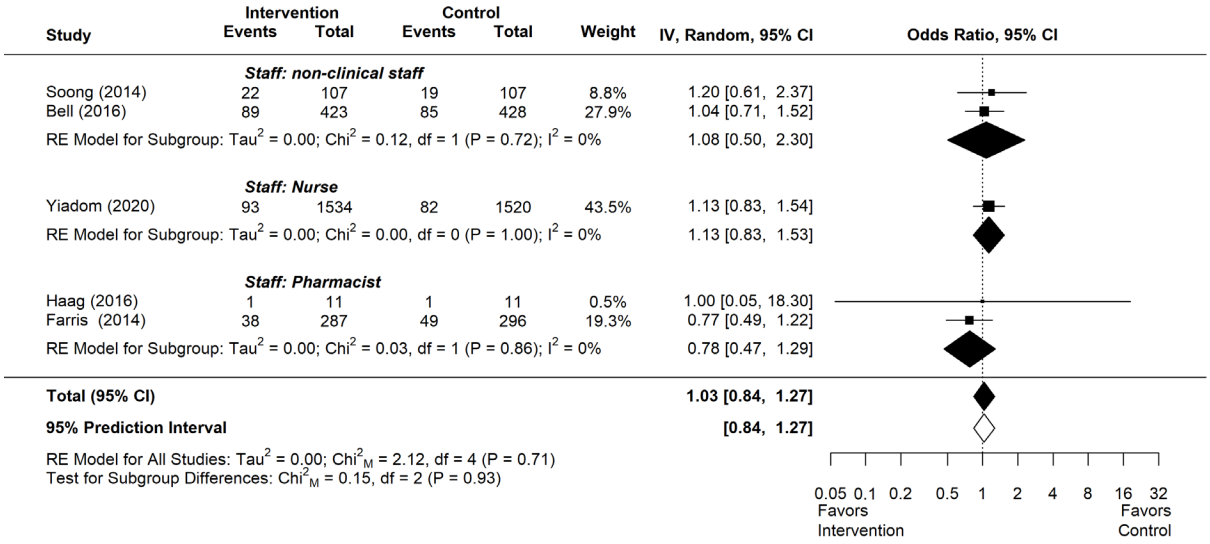


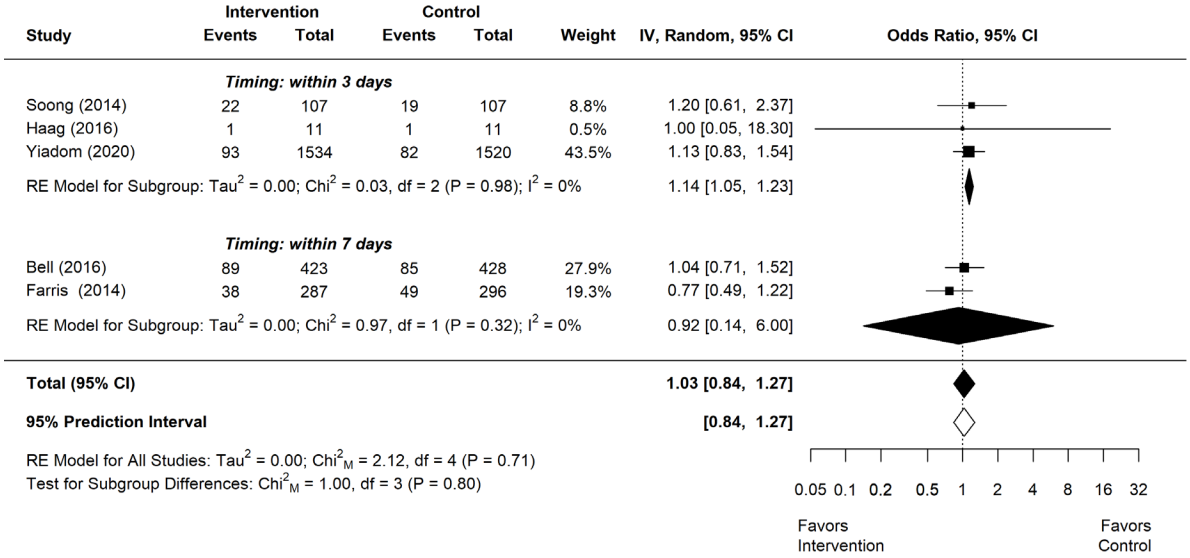


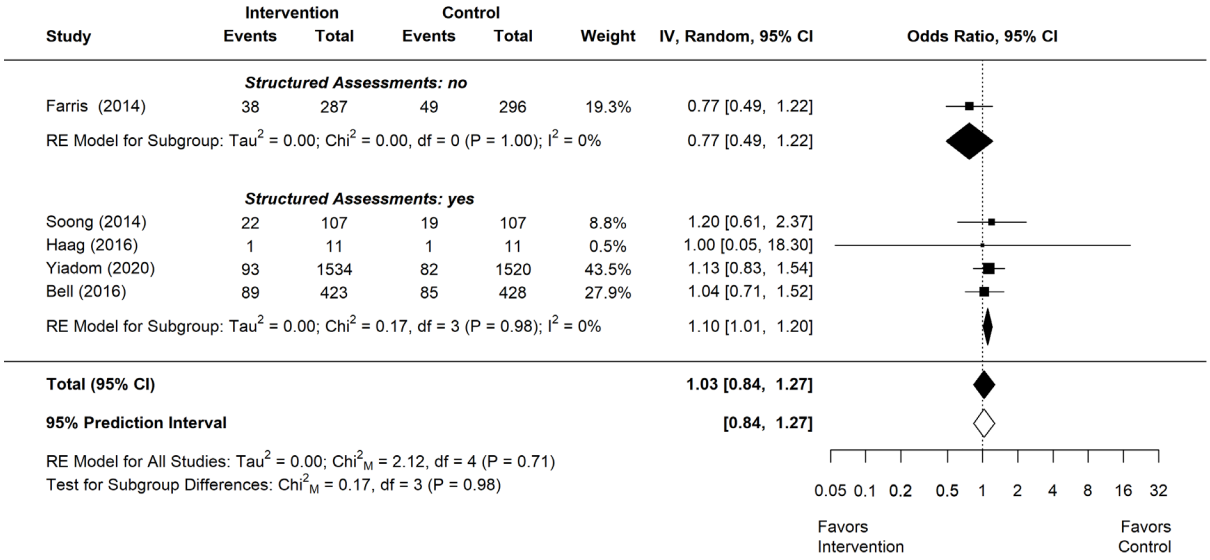

Intervention
Control
Study
Events
Total
Events
Total
Weight
IV, Random, 95% CI
Odds Ratio, 95% CI
Structured Assessment: no
Danielsen (2020) 32 127 26 133 3.8% 1.39 [0.77, 2.49]
Farris (2014) 47 287 40 296 6.3% 1.25 [0.79, 1.98]
RE Model for Subgroup: Tau² = 0.00; Chi² = 0.07, df = 1 (P = 0.79); I² = 0% 1.31 [0.71, 2.42]
Structured Assessment: yes
Sorknaes (2013) 130 131 27.2% 0.90 [0.72, 1.12]
Soong (2014) 15 107 13 107 2.1% 1.18 [0.53, 2.62]
Haag (2016) 2 11 1 11 0.2% 2.22 [0.17, 28.86]
Yiadom (2020) 228 1534 232 1520 33.5% 0.97 [0.79, 1.18]
Lee (2020) 193 1027 219 1064 19.1% 0.78 [0.60, 1.02]
Bell (2016) 61 423 66 428 7.7% 0.93 [0.62, 1.41]
RE Model for Subgroup: Tau² = 0.00; Chi² = 2.49, df = 5 (P = 0.78); I² = 0% 0.91 [0.81, 1.02]
Total (95% CI) 0.94 [0.83, 1.07]
95% Prediction Interval [0.83, 1.07]
RE Model for All Studies: Tau² = 0.00; Chi²M = 6.03, df = 7 (P = 0.54)
Test for Subgroup Differences: Chi²M = 2.56, df = 6 (P = 0.86)
0.05 0.1 0.2 0.5 1 2 4 8 16 32
Favors Intervention
Favors Control

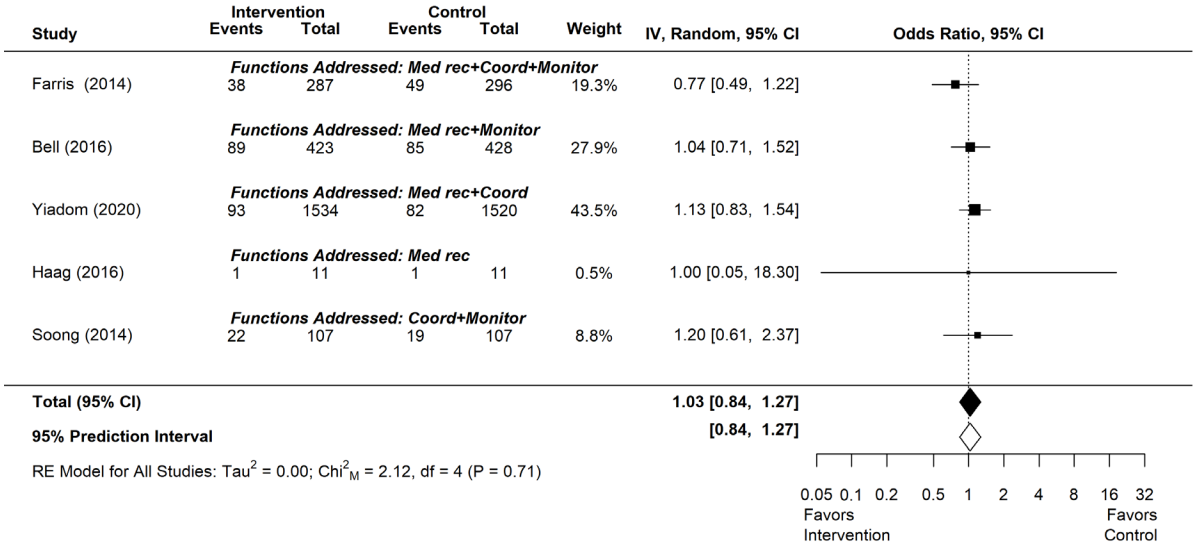

Intervention
Control
Study
Events
Total
Events
Total
Weight
IV, Random, 95% CI
Odds Ratio, 95% CI
Functions Addressed: Med rec+Coord+Monitor
Lee (2020) 193 1027 219 1064 19.1% 0.78 [0.60, 1.02]
Farris (2014) 47 287 40 296 6.3% 1.25 [0.79, 1.98]
RE Model for Subgroup: Tau² = 0.07; Chi² = 3.06, df = 1 (P = 0.08); I² = 0% 0.96 [0.05, 18.20]
Functions Addressed: Med rec+Monitor
Bell (2016) 61 423 66 428 7.7% 0.93 [0.62, 1.41]
Functions Addressed: Med rec+Coord
Yiadom (2020) 228 1534 232 1520 33.5% 0.97 [0.79, 1.18]
Functions Addressed: Med rec
Haag (2016) 2 11 1 11 0.2% 2.22 [0.17, 28.86]
Functions Addressed: Coord+Monitor
Soong (2014) 15 107 13 107 2.1% 1.18 [0.53, 2.62]
Sorknaes (2013) 130 131 27.2% 0.90 [0.72, 1.12]
RE Model for Subgroup: Tau² = 0.00; Chi² = 0.41, df = 1 (P = 0.52); I² = 0% 0.92 [0.38, 2.22]
Functions Addressed: Coord
Danielsen (2020) 32 127 26 133 3.8% 1.39 [0.77, 2.49]
Total (95% CI) 0.94 [0.83, 1.07]
95% Prediction Interval [0.83, 1.07]
RE Model for All Studies: Tau² = 0.00; Chi²M = 6.03, df = 7 (P = 0.54)
0.05 0.1 0.2 0.5 1 2 4 8 16 32
Favors Intervention
Favors Control

30-DAY EMERGENCY DEPARTMENT USE

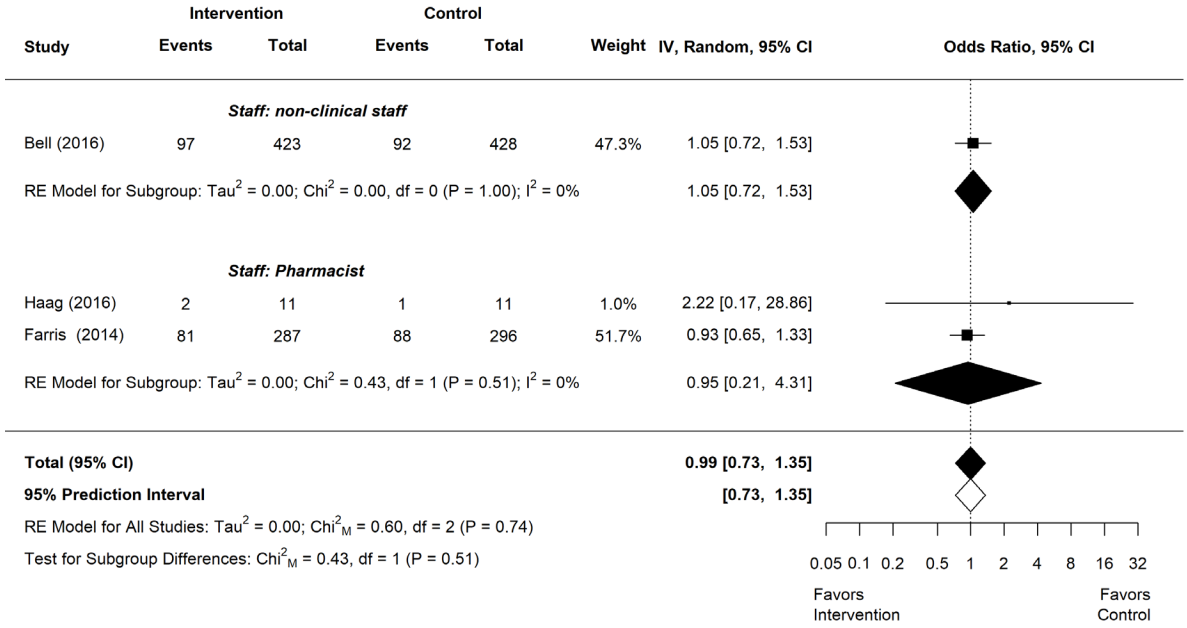


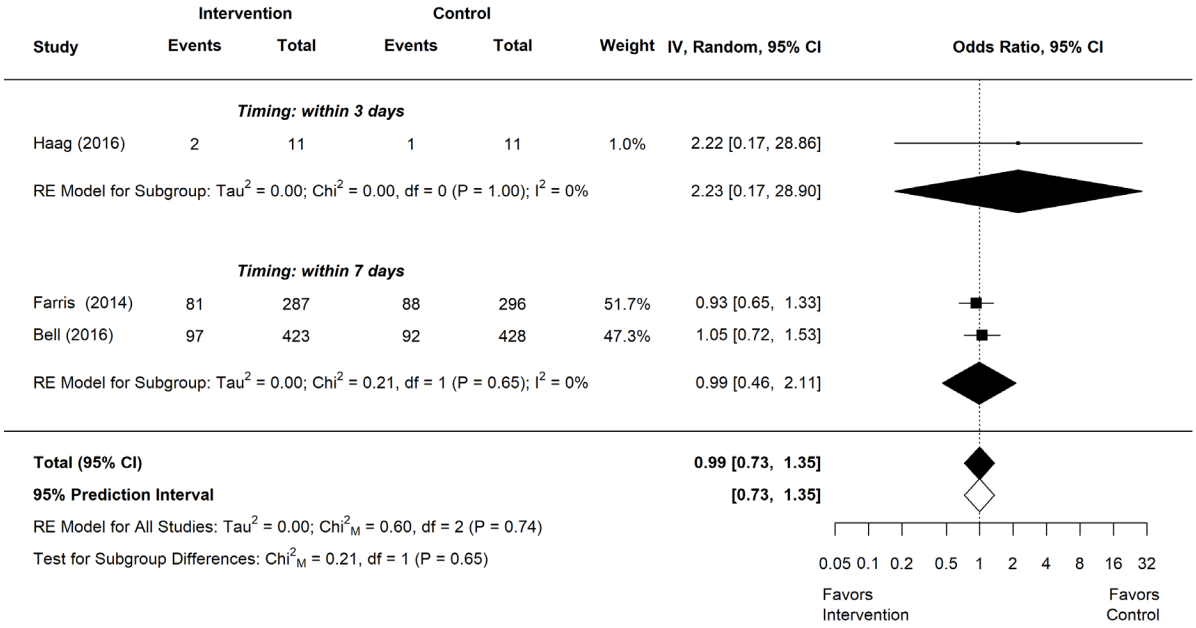


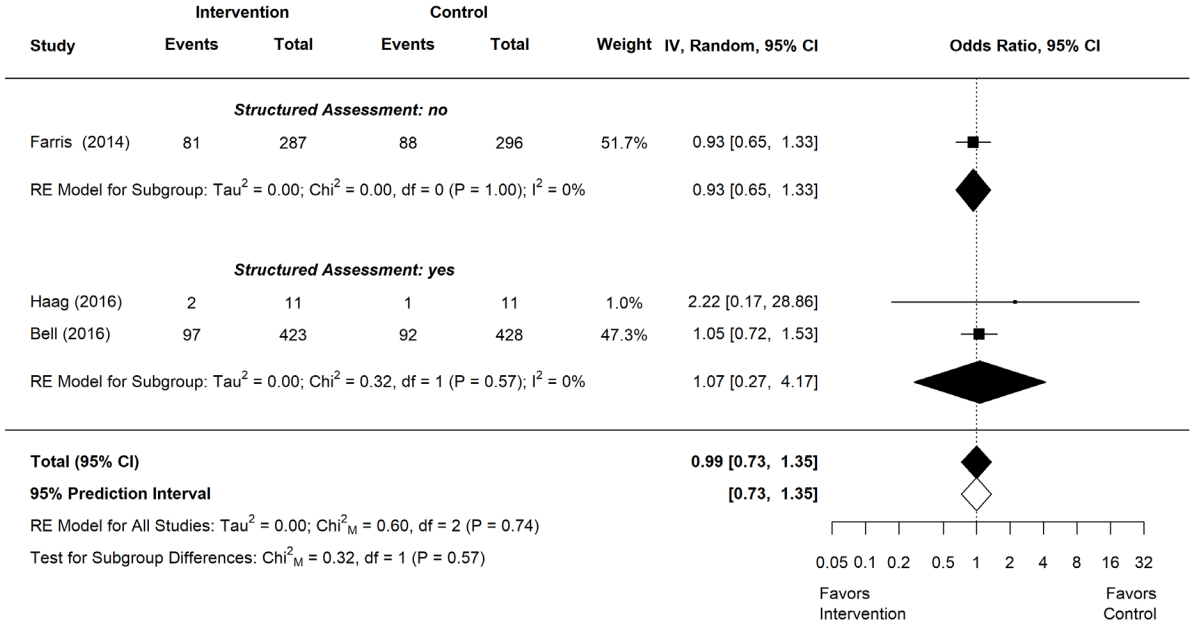

Intervention
Control
Study
Events
Total
Events
Total
Weight
IV, Random, 95% CI
Odds Ratio, 95% CI
Structured Assessments: no
Farris (2014) 38 287 49 296 19.3% 0.77 [0.49, 1.22]
RE Model for Subgroup: Tau² = 0.00; Chi² = 0.00, df = 0 (P = 1.00); I² = 0% 0.77 [0.49, 1.22]
Structured Assessments: yes
Soong (2014) 22 107 19 107 8.8% 1.20 [0.61, 2.37]
Haag (2016) 1 11 1 11 0.5% 1.00 [0.05, 18.30]
Yiadom (2020) 93 1534 82 1520 43.5% 1.13 [0.83, 1.54]
Bell (2016) 89 423 85 428 27.9% 1.04 [0.71, 1.52]
RE Model for Subgroup: Tau² = 0.00; Chi² = 0.17, df = 3 (P = 0.98); I² = 0% 1.10 [1.01, 1.20]
Total (95% CI) 1.03 [0.84, 1.27]
95% Prediction Interval [0.84, 1.27]
RE Model for All Studies: Tau² = 0.00; Chi²M = 2.12, df = 4 (P = 0.71)
Test for Subgroup Differences: Chi²M = 0.17, df = 3 (P = 0.98)
0.05 0.1 0.2 0.5 1 2 4 8 16 32
Favors Intervention
Favors Control

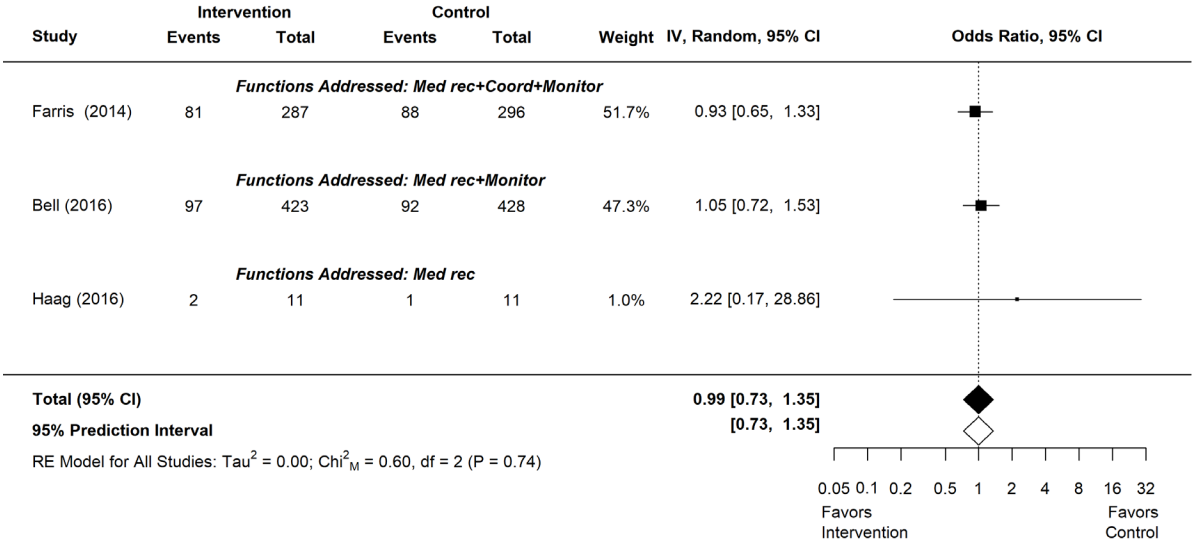

Intervention
Control
Study
Events
Total
Events
Total
Weight
IV, Random, 95% CI
Odds Ratio, 95% CI
Functions Addressed: Med rec+Coord+Monitor
Farris (2014) 38 287 49 296 19.3% 0.77 [0.49, 1.22]
Functions Addressed: Med rec+Monitor
Bell (2016) 89 423 85 428 27.9% 1.04 [0.71, 1.52]
Functions Addressed: Med rec+Coord
Yiadom (2020) 93 1534 82 1520 43.5% 1.13 [0.83, 1.54]
Functions Addressed: Med rec
Haag (2016) 1 11 1 11 0.5% 1.00 [0.05, 18.30]
Functions Addressed: Coord+Monitor
Soong (2014) 22 107 19 107 8.8% 1.20 [0.61, 2.37]
Total (95% CI) 1.03 [0.84, 1.27]
95% Prediction Interval [0.84, 1.27]
RE Model for All Studies: Tau² = 0.00; Chi²M = 2.12, df = 4 (P = 0.71)
0.05 0.1 0.2 0.5 1 2 4 8 16 32
Favors Intervention
Favors Control

30-DAY COMPOSITE ED AND HOSPITAL UTILIZATION






Intervention
Control
Study
Events
Total
Events
Total
Weight
IV, Random, 95% CI
Odds Ratio, 95% CI
Structured Assessment: no
Farris (2014) 81 287 88 296 51.7% 0.93 [0.65, 1.33]
RE Model for Subgroup: Tau² = 0.00; Chi² = 0.00, df = 0 (P = 1.00); I² = 0% 0.93 [0.65, 1.33]
Structured Assessment: yes
Haag (2016) 2 11 1 11 1.0% 2.22 [0.17, 28.86]
Bell (2016) 97 423 92 428 47.3% 1.05 [0.72, 1.53]
RE Model for Subgroup: Tau² = 0.00; Chi² = 0.32, df = 1 (P = 0.57); I² = 0% 1.07 [0.27, 4.17]
Total (95% CI) 0.99 [0.73, 1.35]
95% Prediction Interval [0.73, 1.35]
RE Model for All Studies: Tau² = 0.00; Chi²M = 0.60, df = 2 (P = 0.74)
Test for Subgroup Differences: Chi²M = 0.32, df = 1 (P = 0.57)
0.05 0.1 0.2 0.5 1 2 4 8 16 32
Favors Intervention
Favors Control


Intervention
Control
Study
Events
Total
Events
Total
Weight
IV, Random, 95% CI
Odds Ratio, 95% CI
Functions Addressed: Med rec+Coord+Monitor
Farris (2014) 81 287 88 296 51.7% 0.93 [0.65, 1.33]
Functions Addressed: Med rec+Monitor
Bell (2016) 97 423 92 428 47.3% 1.05 [0.72, 1.53]
Functions Addressed: Med rec
Haag (2016) 2 11 1 11 1.0% 2.22 [0.17, 28.86]
Total (95% CI) 0.99 [0.73, 1.35]
95% Prediction Interval [0.73, 1.35]
RE Model for All Studies: Tau² = 0.00; Chi²M = 0.60, df = 2 (P = 0.74)
0.05 0.1 0.2 0.5 1 2 4 8 16 32
Favors Intervention
Favors Control

STUDIES EXCLUDED DURING FULL-TEXT SCREENING

Abu-Sheasha, 2020[1]	Ineligible country
Adams, 2020[2]	Ineligible study design
Ahc, 2018[3]	Ineligible comparator
Bashir, 2016[4]	Ineligible study design
Botha, 2018[5]	Ineligible country
Brearly, 2020[6]	Ineligible study design
Cawthon, 2012[7]	Ineligible intervention
Chan, 2015[8]	Ineligible intervention
Charles, 2020[9]	Ineligible intervention
Chen, 2019[10]	Ineligible country
Choudhury, 2022[11]	Ineligible study design
Christy, 2016[12]	Ineligible intervention
Costantino, 2013[13]	Ineligible intervention
Crannage, 2020[14]	Ineligible study design
Dichmann Sorknaes, 2016[15]	Ineligible intervention
Donze, 2023[16]	Ineligible population
Elmose Mols, 2019[17]	Ineligible outcomes
Fera, 2014[18]	Ineligible study design
Freburger, 2022[19]	Ineligible intervention
Gaines-Dillard, 2015[20]	Ineligible study design
Gamez-Lopez, 2012[21]	Ineligible intervention
Gesell, 2019[22]	Ineligible outcomes
Goldman, 2014[23]	Ineligible intervention
Hamar, 2016[24]	Ineligible intervention
Hamar, 2018[25]	Ineligible study design
Hani, 2021[26]	Ineligible country
Hervieu-Begue, 2013[27]	Ineligible study design
Hodalova, 2020[28]	Ineligible intervention
Hoyer, 2018[29]	Ineligible study design
Iacoviello, 2017[30]	Ineligible intervention
Irewall, 2019[31]	Ineligible outcomes
Jahn, 2014[32]	Ineligible outcomes
Jalal, 2016[33]	Ineligible population
Jennings, 2015[34]	Ineligible intervention
Jenq, 2016[35]	Ineligible intervention
Jones, 2018[36]	Ineligible study design
Kansagara, 2012[37]	Ineligible study design
Kassymova, 2021[38]	Ineligible population

Citation	
Kassymova, 2023[39]	Ineligible population
Kilcup, 2013[40]	Ineligible study design
Kirkham, 2014[41]	Ineligible study design
Kripalani, 2019[42]	Ineligible study design
Lavesen, 2016[43]	Ineligible intervention
Lee, 2022[44]	Ineligible population
Lindegaard Pedersen, 2017[45]	Ineligible intervention
Lisby, 2019[46]	Ineligible population
Liu, 2013[47]	Ineligible country
Löser, 2022[48]	Ineligible population
March, 2022[49]	Ineligible study design
Marcus, 2018[50]	Ineligible study design
Matarazzo, 2019[51]	Ineligible outcomes
Miller, 2015[52]	Ineligible study design
Miller, 2016[53]	Ineligible study design
Monkong, 2020[54]	Ineligible country
Montero, 2016[55]	Ineligible study design
Nguyen, 2023[56]	Ineligible study design
Nguyen, 2018[57]	Ineligible intervention
Noel, 2020[58]	Ineligible intervention
O'Reilly, 2020[59]	Ineligible study design
Odeh, 2019[60]	Ineligible study design
Ota, 2013[61]	Ineligible study design
Parodi, 2022[62]	Ineligible study design
Phatak, 2016[63]	Ineligible intervention
Phillip, 2022[64]	Ineligible publication type
Rasmussen, 2023[65]	Ineligible study design
Rice, 2016[66]	Ineligible study design
Rinfret, 2013[67]	Ineligible outcomes
Ritchie, 2016[68]	Ineligible intervention
Ross, 2017[69]	Ineligible intervention
Salmany, 2018[70]	Ineligible country
Seto, 2020[71]	Ineligible publication type
Shah, 2021[72]	Ineligible population
Shalaby, 2022[73]	Ineligible intervention
Shaver, 2019[74]	Ineligible study design
Shepherd, 2015[75]	Ineligible intervention
Sides, 2012[76]	Ineligible intervention
Simpson, 2014[77]	Ineligible intervention
Smith, 2021[78]	Ineligible intervention

Citation	
Sutton, 2021[79]	Ineligible outcomes
Szöts, 2016[80]	Ineligible intervention
Tedesco, 2016[81]	Ineligible study design
Trang, 2015[82]	Ineligible study design
Turan Kavradim, 2020[83]	Ineligible outcomes
Tuso, 2013[84]	Ineligible intervention
Tuso, 2014[85]	Ineligible study design
Van Spall, 2016[86]	Ineligible publication type
Vieira, 2022[87]	Ineligible study design
Weisman, 2012[88]	Ineligible intervention
Wingard, 2017[89]	Ineligible intervention
Xiao, 2019[90]	Ineligible study design
Youens, 2019[91]	Ineligible intervention

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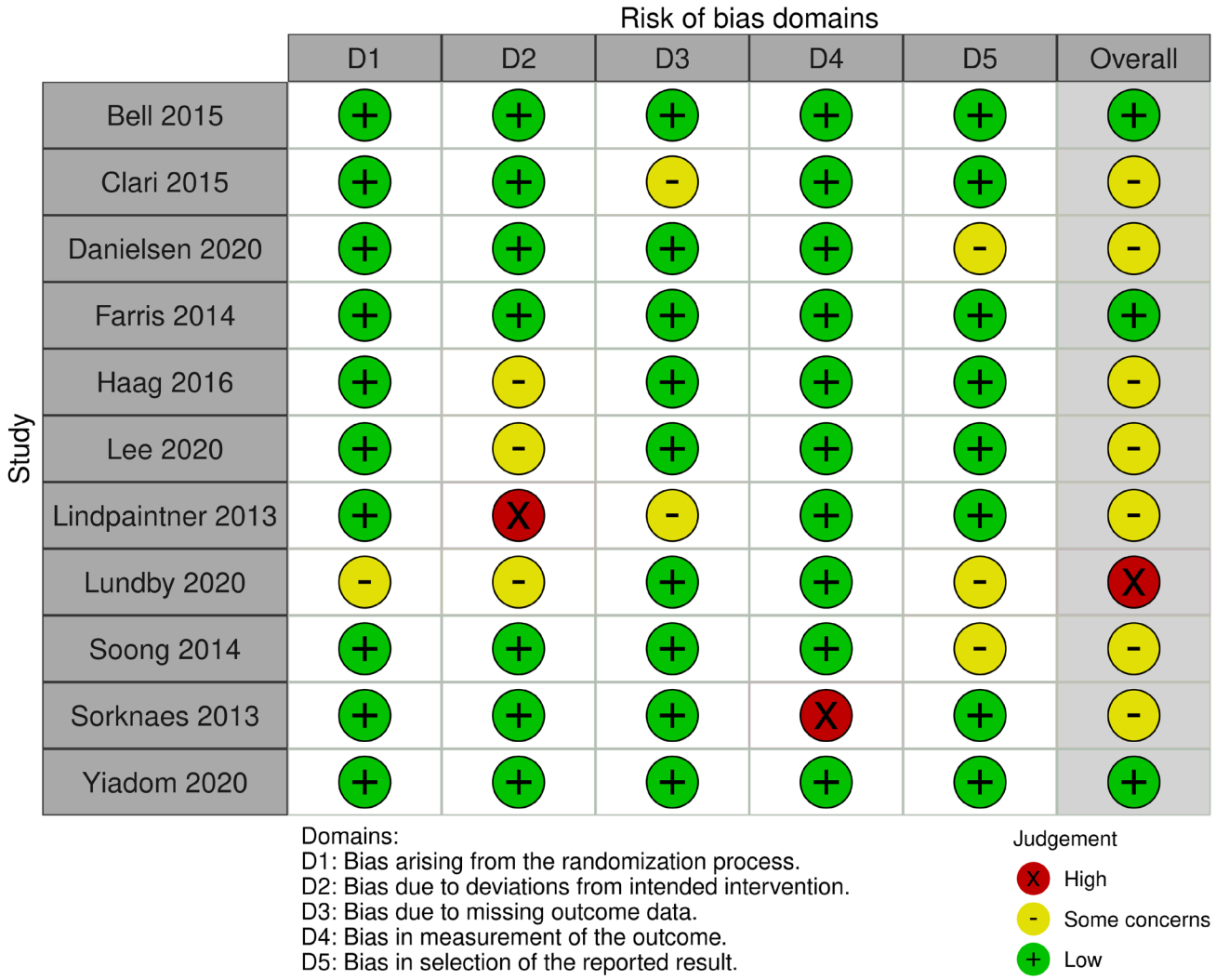
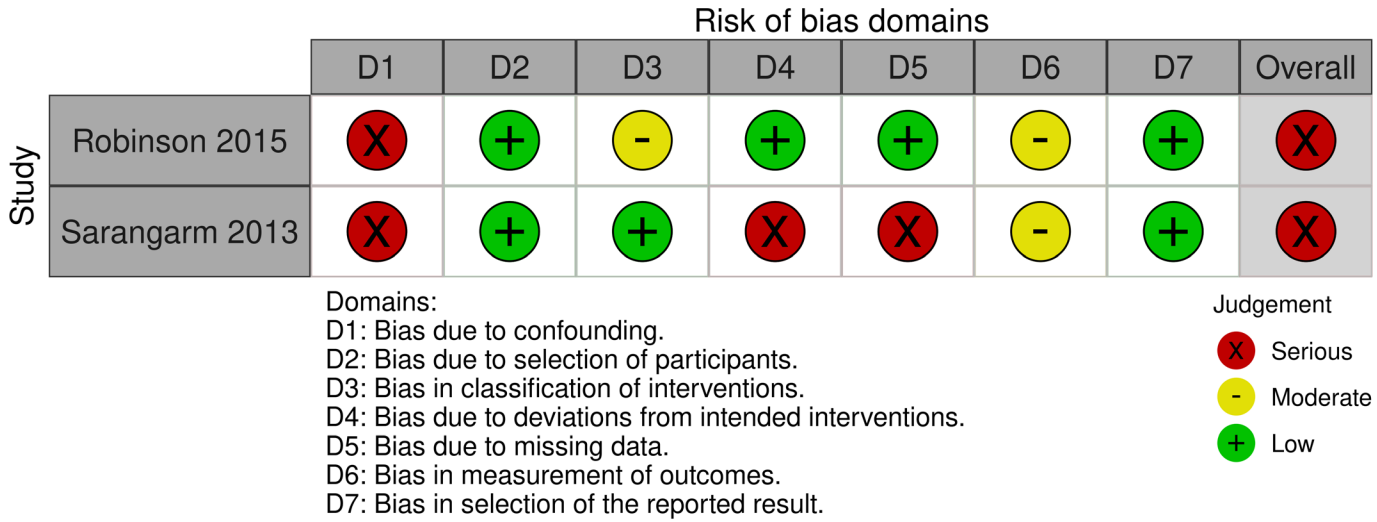
RISK OF BIAS ASSESSMENTS

RANDOMIZED CONTROLLED TRIALS (ROB-2)



NONRANDOMIZED COMPARISON STUDIES (ROBINS-I)



PEER REVIEW COMMENTS AND RESPONSES

Comment #	Reviewer #	Comment	Author Response
Are the objectives, scope, and methods for this review clearly described?			
1	1	Yes	Thank you.
2	2	Yes	Thank you.
3	3	Yes	Thank you.
4	4	Yes	Thank you.
5	5	Yes	Thank you.
6	6	Yes	Thank you.
7	7	Yes	Thank you.
Is there any indication of bias in our synthesis of the evidence?			
8	1	No	Acknowledge.
9	2	No	Acknowledge.
10	3	Yes - Am surprise that there are many digital / technology facilitated approaches for post-discharge contacts. For example there are emerging examples / studies of electronic symptom monitoring in oncology, surgery that I've come across. While this may not have been specified in the definition of post-discharge contacts, I think it is important to consider such types of interventions as a type of touch-points which will likely increase in the near future. I would state that the search strategy may have introduced some bias in this regard. For example, I was unable to find some specific search terms for 'automated', 'symptom monitoring', etc. in the search strategies. At the minimum, consider including as a limitation. Otherwise I think the synthesis was good.	Thank you. These types of interventions were not a part of the conceptualization of post-discharge contact approaches. We have noted this in the limitations.
11	4	No	Acknowledge.
12	6	No	Acknowledge.
13	7	No	Acknowledge.
Are there any published or unpublished studies that we may have overlooked?			
14	1	Yes - not within your search criteria timeframe - but see below for what I believe are some important contextual literature	Thank you and we address this comment below.
15	2	No	Acknowledge.
16	3	No	Acknowledge.
17	4	No	Acknowledge.
18	6	No	Acknowledge.
19	7	Yes - AHRQ Reengineered Discharge https://www.ahrq.gov/patient-safety/settings/hospital/red/toolkit/index.html	This toolkit is now cited in the Background and again in the Discussion sections of the main report, as is the original paper

Comment #	Reviewer #	Comment	Author Response
			which studied Project RED. Additionally, the toolkit webpage cites a Cochrane review from 2004, and we have included the updated review from 2022 in our citations and background (the Goncalves paper). These references note a small reduction in readmissions when the full toolkit is used. For the purposes of our review on post-discharge contacts, 10 (and likely 11) of the 12 steps in the toolkit should occur prior to discharge, which we have also highlighted in the discussion.
Additional suggestions or comments can be provided below.			
20	1	Overall, I think this report is excellent. Thank you for doing this excellent work. My note is that, when reading it I was surprised that there was no mention of the works by Coleman's Care Transitions Intervention or Naylor Home Follow-up program. Coleman EA, Parry C, Chalmers S, Min S. The Care Transitions Intervention: Results of a Randomized Controlled Trial. Arch Intern Med. 2006;166(17):1822–1828. doi:10.1001/archinte.166.17.1822 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. doi:10.1001/jama.281.7.613 I appreciate why they did not make it into your review (they were not in your time horizon) and, based on the studies that made it in, these may have been too intensive of programs to meet your criteria. Based on this, I have two suggestions for you to consider 1) If interventions such as these would have not made it into your sample for reasons other than the time horizon, make it more explicit that studies of more comprehensive approaches such as these were excluded. 2) Consider mentioning these studies in your discussion as examples of more resource-intensive interventions that have been shown	Thank you for your comments. You are correct that these studies did not make it in due to their publication dates and that the interventions were not conceptually aligned with the type of post-discharge interventions studied here. The focus of this review was on the effectiveness of interventions, in which the majority of the patient contacts are deployed in the post-discharge 7-day window. We state in our discussion that we are focused on a subset of care transition interventions and that more intensive programs have shown positive results. We now cite these studies as historical examples of such programs.

Comment #	Reviewer #	Comment	Author Response
		to have impact. I appreciate that one might argue that they are now dated enough that the standard of care has changed so that updated studies are needed. However, I would not want your readers to come away with the impression that there are no studies of post-discharge interventions have been shown as being effective.	
21	2	Overall, the report is outstanding. My recommendations are very minor.	Thank you.
22	2	Pages 12 (line 4) and 20 (line 6) according to Adobe (but says ix and 5 at the bottom left corner of the pages) is incorrect. It was not the "Office of Connected Care", it was the "Office of Primary Care" that requested this review.	Thank you. We have made that correction.
23	2	Throughout the document you mention medication reconciliation 35 times, but nurses cannot conduct medication reconciliation, we can only conduct medication review due to our scope of practice. I recommend you update the term "medication reconciliation" to "medication review" when referring to post-discharge contact.	Thank you. We have made this change.
24	2	You mention a couple of times how the VHA is the largest integrated health system in the US, but I wonder if it would be valuable to add how many patients we care for, how many facilities we have, etc. to give context. Non-VA folks who may read this likely have no idea how large we are.	Thank you. We have added this detail to the background section.
25	3	With regard to evidence gaps (PICO), would consider specifying older adult patients with multiple chronic conditions as high risk population where there is little or no evidence. With regard to intervention types, I think it would be worthwhile to clarify that multi-contact approaches could be multi-modal, specific digital vs non-digital approaches, automated vs in-person.	Thank you. We have added these suggestions to Table 3.
26	4	1. page ix rows 37 -42 PDC and ED abbreviation is present but unlike other abbreviation it is not identified anywhere prior for APA format.	Thank you.
27	4	2. page x- section Results of literature- Format of numbers is confusing some are written out some are not? Does this follow APA?	Thank you. Number style follows the rules of the VA ESP program, which asks for all numbers to be numerals. The exception is when a number begins a sentence—then it is spelled out.

Comment #	Reviewer #	Comment	Author Response
28	4	3. page 9 row 20- typo for the word " documenting" it reads docum2enting.	Thank you; we have corrected this.
29	6	Page x, line 45 - page xi line 31 would be helpful to see information presented in table form, maybe a matrix table that shows study components in one section, outcomes in another, with a list of titles and x's to show which studies covered what in each area.	Thank you. We have a study characteristics table in the Appendix that gives these details for each included study.
30	6	page xi, line 46-49 is making an assumption about whether the half of studies that did not mention a pre-discharge component actually had this due to it being "standard of care". If the assumption is not true in a particular setting, the post-discharge contact still could make little difference, but for very different reasons.	We agree with this statement and further contextualize the other reasons why a post-discharge contact as defined in this review may not be impactful in the Discussion.
31	6	Line 20 on p. 9 has a superscript in the middle of a word	Thank you.
32	6	page 17 line 15- explains "elevated risk". In the ES, I assumed this was "elevated risk" for a psychiatric hospitalization, when in fact, this line shows this is not the case. It would be helpful to clarify this sooner.	Thank you. We define “elevated risk” in the Executive Summary.
33		Page 11- line 59 Currently, there is no standard post-discharge practice for Veteran patients transitioning back home from VHA hospitals. This is not completely accurate: Suggest different verbiage. While VHA requires primary care Patient Aligned Care Teams (PACT)(2-days) and mental health teams (7-days) to contact Veterans post discharge, there is variability in implementation.	Thank you for the detailed information on VHA PDC implementation for primary care and mental health hospitalizations. We have added this to the background section.