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Discharge Planning in Chronic Conditions: An Evidence-Based Analysis

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About Health Quality Ontario

Health Quality Ontario (HQO) is an arms-length agency of the Ontario government. It is a partner and leader in transforming Ontario's health care system so that it can deliver a better experience of care, better outcomes for Ontarians and better value for money.

Health Quality Ontario strives to promote health care that is supported by the best available scientific evidence. HQO works with clinical experts, scientific collaborators and field evaluation partners to develop and publish research that evaluates the effectiveness and cost-effectiveness of health technologies and services in Ontario.

Based on the research conducted by HQO and its partners, the Ontario Health Technology Advisory Committee (OHTAC) — a standing advisory sub-committee of the HQO Board — makes recommendations about the uptake, diffusion, distribution or removal of health interventions to Ontario's Ministry of Health and Long-Term Care, clinicians, health system leaders and policy-makers.

This research is published as part of Ontario Health Technology Assessment Series, which is indexed in CINAHL, EMBASE, MEDLINE, and the Centre for Reviews and Dissemination. Corresponding OHTAC recommendations and other associated reports are also published on the HQO website. Visit http://www.hqontario.ca for more information.

About the *Ontario Health Technology Assessment Series*

To conduct its comprehensive analyses, HQO and/or its research partners reviews the available scientific literature, making every effort to consider all relevant national and international research; collaborates with partners across relevant government branches; consults with clinical and other external experts and developers of new health technologies; and solicits any necessary supplemental information.

In addition, HQO collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits; economic and human resources; and ethical, regulatory, social, and legal issues relating to the intervention assist in making timely and relevant decisions to optimize patient outcomes.

The public consultation process is available to individuals and organizations wishing to comment on reports and recommendations prior to publication. For more information, please visit: http://www.hqontario.ca/en/mas/ohtac_public_engage_overview.html.

Disclaimer

This report was prepared by HQO or one of its research partners for the *Ontario Health Technology Advisory Committee* and developed from analysis, interpretation, and comparison of scientific research. It also incorporates, when available, Ontario data and information provided by experts and applicants to HQO. It is possible that relevant scientific findings may have been reported since completion of the review. This report is current to the date of the literature review specified in the methods section, if available. This analysis may be superseded by an updated publication on the same topic. Please check the HQO website for a list of all publications: http://www.hqontario.ca/en/mas/mas_ohtas_mn.html.

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Abstract

Background

Chronically ill people experience frequent changes in health status accompanied by multiple transitions between care settings and care providers. Discharge planning provides support services, follow-up activities, and other interventions that span pre-hospital discharge to post-hospital settings.

Objective

To determine if discharge planning is effective at reducing health resource utilization and improving patient outcomes compared with standard care alone.

Data Sources

A standard systematic literature search was conducted for studies published from January 1, 2004, until December 13, 2011.

Review Methods

Reports, randomized controlled trials, systematic reviews, and meta-analyses with 1 month or more of follow-up and limited to specified chronic conditions were examined. Outcomes included mortality/survival, readmissions and emergency department (ED) visits, hospital length of stay (LOS), health-related quality of life (HRQOL), and patient satisfaction.

Results

One meta-analysis compared individualized discharge planning to usual care and found a significant reduction in readmissions favouring individualized discharge planning.

A second meta-analysis compared comprehensive discharge planning with postdischarge support to usual care. There was a significant reduction in readmissions favouring discharge planning with postdischarge support. However, there was significant statistical heterogeneity.

For both meta-analyses there was a nonsignificant reduction in mortality between the study arms.

Limitations

There was difficulty in distinguishing the relative contribution of each element within the terms "discharge planning" and "postdischarge support." For most studies, "usual care" was not explicitly described.

Conclusions

Compared with usual care, there was moderate quality evidence that individualized discharge planning is more effective at reducing readmissions or hospital LOS but not mortality, and very low quality evidence that it is more effective at improving HRQOL or patient satisfaction.

Compared with usual care, there was low quality evidence that the discharge planning plus postdischarge support is more effective at reducing readmissions but not more effective at reducing hospital LOS or mortality. There was very low quality evidence that it is more effective at improving HRQOL or patient satisfaction.

Plain Language Summary

Chronically ill people experience frequent changes in their health status and multiple transitions between care settings and care providers (e.g., hospital to home). Discharge planning provides support services, follow-up activities and other interventions that span pre-hospital discharge to post-hospital settings.

A review of the effects of different discharge plans was conducted. After searching for relevant studies, 11 studies were found that compared discharge planning with routine discharge care.

This review indicates that:

- Individualized discharge planning reduces initial hospital length of stay and subsequent readmission to hospital but does not reduce mortality. The effect on health-related quality of life (HRQOL) or patient satisfaction is uncertain.

- Discharge planning plus postdischarge support reduces readmissions but does not reduce the initial hospital length of stay or mortality after discharge. The effect on HRQOL or patient satisfaction is uncertain.

List of Abbreviations

6MWT	6-minute walking test
APN	Advanced practice nurse
CAD	Coronary artery disease
CI	Confidence interval
COPD	Chronic obstructive pulmonary disease
EPOC	Effective Practice and Organization of Care Group
HQO	Health Quality Ontario
HRQOL	Health-related quality of life
LOS	Length of stay
RCT	Randomized controlled trial
RR	Relative risk
SD	Standard deviation

Background

In July 2011, the Evidence Development and Standards (EDS) branch of Health Quality Ontario (HQO) began developing an evidentiary framework for avoidable hospitalizations. The focus was on adults with at least 1 of the following high-burden chronic conditions: chronic obstructive pulmonary disease (COPD), coronary artery disease (CAD), atrial fibrillation, heart failure, stroke, diabetes, and chronic wounds. This project emerged from a request by the Ministry of Health and Long-Term Care for an evidentiary platform on strategies to reduce avoidable hospitalizations.

After an initial review of research on chronic disease management and hospitalization rates, consultation with experts, and presentation to the Ontario Health Technology Advisory Committee (OHTAC), the review was refocused on optimizing chronic disease management in the outpatient (community) setting to reflect the reality that much of chronic disease management occurs in the community. Inadequate or ineffective care in the outpatient setting is an important factor in adverse outcomes (including hospitalizations) for these populations. While this did not substantially alter the scope or topics for the review, it did focus the reviews on outpatient care. HQO identified the following topics for analysis: discharge planning, in-home care, continuity of care, advanced access scheduling, screening for depression/anxiety, self-management support interventions, specialized nursing practice, and electronic tools for health information exchange. Evidence-based analyses were prepared for each of these topics. In addition, this synthesis incorporates previous EDS work, including Aging in the Community (2008) and a review of recent (within the previous 5 years) EDS health technology assessments, to identify technologies that can improve chronic disease management.

HQO partnered with the Programs for Assessment of Technology in Health (PATH) Research Institute and the Toronto Health Economics and Technology Assessment (THETA) Collaborative to evaluate the cost-effectiveness of the selected interventions in Ontario populations with at least 1 of the identified chronic conditions. The economic models used administrative data to identify disease cohorts, incorporate the effect of each intervention, and estimate costs and savings where costing data were available and estimates of effect were significant. For more information on the economic analysis, please contact either Murray Krahn at murray.krahn@theta.utoronto.ca or Ron Goeree at goereer@mcmaster.ca.

HQO also partnered with the Centre for Health Economics and Policy Analysis (CHEPA) to conduct a series of reviews of the qualitative literature on “patient centredness” and “vulnerability” as these concepts relate to the included chronic conditions and interventions under review. For more information on the qualitative reviews, please contact Mita Giacomini at giacomin@mcmaster.ca.

The Optimizing Chronic Disease Management in the Outpatient (Community) Setting mega-analysis series is made up of the following reports, which can be publicly accessed at http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/ohtas-reports-and-ohtac-recommendations.

- Optimizing Chronic Disease Management in the Outpatient (Community) Setting: An Evidentiary Framework
- Discharge Planning in Chronic Conditions: An Evidence-Based Analysis
- In-Home Care for Optimizing Chronic Disease Management in the Community: An Evidence-Based Analysis
- Continuity of Care: An Evidence-Based Analysis
- Advanced (Open) Access Scheduling for Patients With Chronic Diseases: An Evidence-Based Analysis
- Screening and Management of Depression for Adults With Chronic Diseases: An Evidence-Based Analysis
- Self-Management Support Interventions for Persons With Chronic Diseases: An Evidence-Based Analysis
- Specialized Nursing Practice for Chronic Disease Management in the Primary Care Setting: An Evidence-Based Analysis
- Electronic Tools for Health Information Exchange: An Evidence-Based Analysis
- Health Technologies for the Improvement of Chronic Disease Management: A Review of the Medical Advisory Secretariat Evidence-Based Analyses Between 2006 and 2011
- Optimizing Chronic Disease Management Mega-Analysis: Economic Evaluation
- How Diet Modification Challenges Are Magnified in Vulnerable or Marginalized People With Diabetes and Heart Disease: A Systematic Review and Qualitative Meta-Synthesis
- Chronic Disease Patients’ Experiences With Accessing Health Care in Rural and Remote Areas: A Systematic Review and Qualitative Meta-Synthesis
- Patient Experiences of Depression and Anxiety With Chronic Disease: A Systematic Review and Qualitative Meta-Synthesis
- Experiences of Patient-Centredness With Specialized Community-Based Care: A Systematic Review and Qualitative Meta-Synthesis

Objective of Analysis

The objective of this analysis was to determine if discharge planning bundles (e.g., support services, follow-up activities, and other interventions that span pre-hospital discharge to the home setting) are effective at reducing health resource utilization and improving patient outcomes compared with usual care alone.

Clinical Need and Target Population

Chronically Ill People and Transitions Between Care Settings

Chronically ill people experience frequent changes in health status accompanied by multiple transitions between care settings and care providers. (1) It is during these transitions that mistakes frequently occur, for example, information about medication that a patient was prescribed while in hospital may not be accurately communicated to the family physician. Transitions may also give rise to adverse clinical events, patients' serious needs not being met, and poor satisfaction with care. (1)

Transitions have also been reported to be associated with increased rates of potentially avoidable hospitalizations. (1) Innovative solutions that aim to improve integration and continuity across episodes of care discourage patterns of frequent use of health care services among the chronically ill and address the negative effects on quality and costs. Such solutions are referred to as "discharge planning."

Discharge Planning

The few definitions of hospital discharge planning indicate that this is a process that takes place between hospital admission and the discharge event. (2) Pre-hospital discharge and communication is important as a start to the discharge planning process: it provides an opportunity to summarize the visit, teach patients how to safely care for themselves at home, and address any remaining questions or concerns. Discharge planning helps patients communicate with caregivers and primary care providers about how best to manage their chronic needs after leaving the hospital.
(3)

The emphasis on discharge planning varies between countries. (4) Discharge planning is mandatory in the United States in hospitals that participate in the Medicare and Medicaid programmes. In the United Kingdom, the Department of Health has published guidelines on discharge practice for health and social care. However, procedures vary between specialities in the same hospital, and discharge planning may be embedded in another intervention, such as specialized assessment units. (4) These differences make it difficult to interpret data on the effectiveness of discharge planning.

Ontario Context

There is a process for discharge planning in approximately 80%–90% of hospitals in Ontario. However, this practice is not standardized throughout the province. It is likely more of an organic process with varying elements tailored to suit the needs of the community(e.g., some hospitals may have discharge planners and some may use the services of Community Care Access Centres in order to try and bridge the care a patient receives from the hospital to that from their health care provider).

Evidence-Based Analysis

Research Questions

What is the effectiveness of discharge planning bundles at reducing health resource utilization and improving patient outcomes compared to usual care alone?

Research Methods

Literature Search

Search Strategy

A literature search was performed on December 13, 2011, using OVID MEDLINE, OVID MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), the Wiley Cochrane Library, and the Centre for Reviews and Dissemination database for studies published from January 1, 2004, until December 13, 2011. Studies published from 2004 onwards were of interest because a meta-analysis of discharge planning for patients with heart failure was published in that year. Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

Inclusion Criteria

English language full-text reports

- published between January 1, 2004, and December 13, 2011
- randomized controlled trials (RCTs), systematic reviews, and meta-analyses
- enrolled adult patients
- ≥ 1 month follow-up
- limited to identified chronic conditions
  - chronic obstructive pulmonary disease (COPD)
  - coronary artery disease (CAD)
  - congestive heart failure
  - atrial fibrillation
  - diabetes
  - stroke
  - chronic wounds
- also included general terms
  - chronic conditions
  - multiple chronic conditions/multi-morbidity
- explicitly described bundles of services to ensure transition from inpatient to community (outpatient) care (e.g., discharge planning, support services, follow-up activities, monitoring and/or other interventions that span pre-hospital discharge to the home setting)

Exclusion Criteria

- studies where discrete results on discharge planning cannot be extracted
- studies that examined pediatric patients
- observational studies

Outcomes of Interest

- mortality/survival
- acute hospital admissions (readmissions)
- emergency department (ED) visits
- hospital length of stay (LOS)
- health-related quality of life (HRQOL)
- functional status
- disease-specific clinical measures
- patient satisfaction

Quality of Evidence

The quality of the body of evidence for each outcome is examined according to the GRADE Working Group criteria. (5) The overall quality is determined to be very low, low, moderate or high using a step-wise, structural methodology.

Study design is the first consideration; the starting assumption is that RCTs are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision and publication bias—are then taken into account. Limitations or serious limitations in these areas result in downgrading the quality of evidence. Finally, 4 factors are considered which may raise the quality of evidence: large magnitude of effect, dose response gradient and accounting for all residual confounding. (5) For more detailed information, please refer to the latest series of GRADE articles. (5)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	Very confident that the true effect lies close to that of the estimate of the effect
Moderate	Moderately confident in the effect estimate – the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low	Confidence in the effect estimate is limited – the true effect may be substantially different from the estimate of the effect
Very Low	Very little confidence in the effect estimate – the true effect is likely to be substantially different from the estimate of effect

Results of Evidence-Based Analysis

The database search yielded 2,707 citations published between January 1, 2004, and December13, 2011 (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment. Figure 1 shows the breakdown of when and for what reason citations were excluded in the analysis.

Eleven studies (7 systematic reviews and 4 RCTs) met the inclusion criteria.

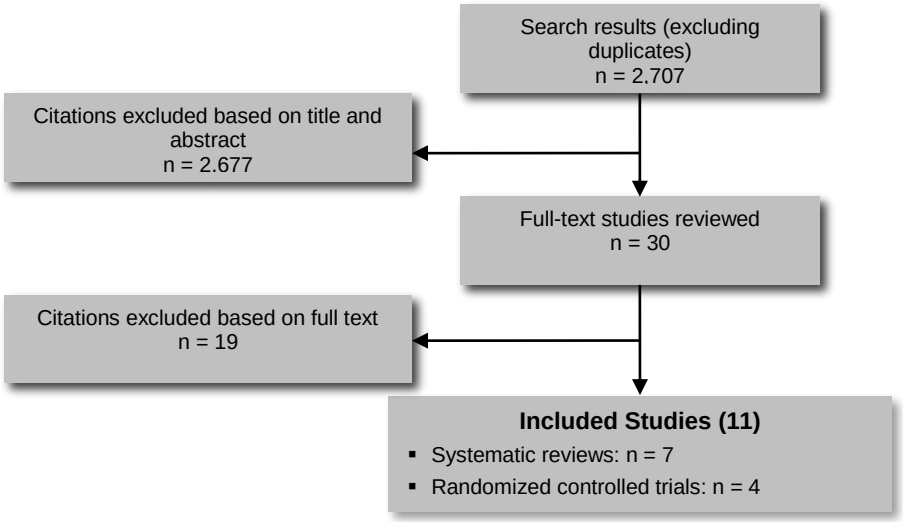

Figure 1: Citation Flow Chart

For each included study, the study design was identified. These are summarized in Table 1, which is a modified version of a hierarchy of study design by Goodman. (6)

Table 1: Body of Evidence Examined According to Study Design

Study Design	Number of Eligible Studies
RCT Studies	
Systematic review of RCTs	7
Large RCT	4
Small RCT	
Observational Studies	
Systematic review of non-RCTs with contemporaneous controls	
Non-RCT with non-contemporaneous controls	
Systematic review of non-RCTs with historical controls	
Non-RCT with historical controls	
Database, registry, or cross-sectional study	
Case series	
Retrospective review, modelling	
Studies presented at an international conference	
Expert opinion	
Total	11

Abbreviation: RCT, randomized controlled trial

Systematic Reviews

Table 2 includes a summary of the results and limitations for the 7 systematic reviews. (1;4;7-11) Four of these (1;8-10) were of low quality for a number of reasons including a lack of reported literature search cut-off dates; a lack of critical assessments of the studies in the narrative reviews; an unbalanced focus on studies that showed positive effects of discharge planning; the inclusion of numerous studies written by the lead author of the systematic review; the inclusion of grey literature; and uncritical narrative review of systematic reviews.

Table 2: Summary of Systematic Reviews

Author, Year, Country	Purpose	Inclusion Criteria	Results	Conclusion	Limitations
Hansen et al, 2011 (7) United States Literature search up to January 2011	Describe interventions evaluated in studies aimed at reducing rehospitalization within 30 days of discharge	RCTs (the authors also included observational studies, but HQO did not examine them in this analysis) Adults Interventions did not require disease-specific approaches (e.g., measurement of brain natriuretic peptide before HF discharge)	43 studies (16 RCTs) identified and divided into: -predischarge interventions; -patient education, medication reconciliation, discharge planning, and scheduling of follow-up appointments before discharge; -postdischarge interventions; -follow-up telephone calls, patient-activated hotlines, timely communication with ambulatory providers, timely ambulatory provider follow-up, and postdischarge home visits; -bridging interventions; and -transition coaches, physician continuity across the inpatient and outpatient setting, and patient-centred discharge instruction. 5 of 16 RCTs documented statistically significant improvement in rehospitalization outcomes within 30 days. Of these 5 trials, 1 consisted of a single intervention in which high-risk patients received early discharge planning or usual care; the treatment group experienced an absolute 11 percentage point reduction in 30-day rehospitalization. The remaining 4 RCTs tested multicomponent discharge bundles. However, 1 RCT did not report results for 30-day readmission but for 2 weeks, and 1 RCT combined readmission and ED visits. The 2 remaining RCTs demonstrated absolute reductions in 30-day readmission of between 3.6 and 6.0 percentage points. The patient-centred discharge instructions and postdischarge telephone call were included in all 4 RCTs showing significantly effective discharge bundles.	No single intervention implemented alone was regularly associated with reduced risk for 30-day rehospitalization.	Inadequate description of individual studies' interventions precluded meta-analysis of effects. Many studies were single-institution assessments of quality improvement activities rather than those with experimental designs. Several interventions have not been studied outside of multicomponent "discharge bundles."

Author, Year, Country	Purpose	Inclusion Criteria	Results	Conclusion	Limitations
Naylor et al, 2011 (1) United States Literature search cut-off date not reported	To identify and synthesize available evidence regarding discharge planning for adult, chronically ill populations	RCTs conducted in the United States Adults	21 RCTs identified. Naylor et al focused on 9 studies (3 of which were by the lead author) demonstrating positive effects of discharge planning on readmissions. "Because a key aim of the *Affordable Care Act* is to reduce avoidable hospital readmissions, we were particularly interested in the 9 interventions that reported a statistically significant positive effect on at least one measure of readmissions..." All but 1 of the 9 studies reported reductions in all-cause readmissions through at least 30 days after discharge. Of the remaining 8 interventions, 3 found positive, long-term effects in all-cause readmissions through 6 or 12 months following the index hospital discharge. These included 2 comprehensive discharge planning and follow-up interventions with home visits that were conducted by the lead author of the systematic review. The third intervention was a telehealth-facilitated intervention in which HF patients received either a videophone or telephone postdischarge support program. The study reported reduced all-cause readmissions through 12 months only when the 2 interventions groups were combined. There were no differences between the intervention group and the control group at 3 or 6 months. Discharge planning was not examined in this study.	"Our evidence review reveals nearly a dozen interventions that have demonstrated some positive effect on hospital readmissions."	No overall systematic assessment of the 21 RCTs. Authors focused solely on the 9 studies that demonstrated positive effects of discharge planning on readmissions. Seven of the 21 studies focused on discharge management plus follow-up. Meta-analysis was not conducted due to heterogeneity of study design. "The nature and practice of transitional care is evolving, and a standardized definition has not yet been established. The *Affordable Care Act*'s interpretation of transitional care is broad, so we chose to be inclusive in our search. Thus the interventions retained in our synthesis are diverse and in some cases could reasonably be categorized in other ways (for example, as telehealth and case management interventions)."

Author, Year, Country	Purpose	Inclusion Criteria	Results	Conclusion	Limitations
Shepperd et al, 2010 (4) United Kingdom Literature search up to March 2009	To determine the effectiveness of planning the discharge of patients moving from hospital	RCTs that compared an individualized discharge plan with routine discharge care that was not tailored to the individual patient	21 RCTs (7,234 patients). Follow-up ranged from 2 weeks to 9 months. Readmission to hospital was significantly reduced for patients allocated to discharge planning (readmission rates RR, 0.85; 95% CI, 0.74–0.97, 11 trials). For elderly patients with a medical condition (usually HF), there was insufficient evidence for a difference in mortality (RR, 1.04; 95% CI, 0.74–1.46, 4 trials). In 3 trials, patients allocated to discharge planning reported increased satisfaction.	A structured discharge plan tailored to the individual patient probably brings about small reductions in readmission rates for older people admitted to hospital with a medical condition. The impact of discharge planning on mortality and health outcomes remains uncertain.	Key issue in interpreting the evidence is the definition of the intervention and the subsequent understanding of the relative contribution of each element. It was not possible to assess how some components of the process compared between trials. Inclusion of the caregiver or family was mentioned by some of the trials, but the degree to which this was done was not always apparent or reported. Monitoring of patient discharge planning differed (e.g., telephone or visiting primary care clinics). Three trials examined the effectiveness of a pharmacy discharge plan. The context in which an intervention such as discharge planning is delivered may also play a role, not only in the way the intervention is delivered, but in the way services are configured for the control group. Orientation of primary care services differs between countries, which may affect communication between services. Different perceptions of care by professionals of alternative care settings and country-specific funding arrangements may also influence discharge. Two studies reported discharge planning commencing from the time a patient was admitted to hospital, and another reported that discharge planning was implemented 3 days prior to discharge. The timing of delivery of discharge planning, which depends on other services, will have some bearing on how quickly these services can begin providing care. The patient population may also impact outcome (e.g., patients experiencing major complications from their chronic disease combined with an intervention designed to increase the intensity of primary care services may explain the observed increase in readmission days for those receiving the intervention.) Shepperd et al excluded RCTs evaluating interventions where discharge planning was not the main focus of a multifaceted package of care.

Author, Year, Country	Purpose	Inclusion Criteria	Results	Conclusion	Limitations
Scott, 2010 (8) Australia Literature search up to March 2009	To determine the relative efficacy of peridischarge interventions categorized into 2 groups: -single component interventions (sole or predominant) implemented either before or after discharge -integrated multicomponent interventions that have pre- and postdischarge elements	Controlled trials or systematic reviews that reported data on interventions targeting hospitalized patients and measured readmission rates	7 systematic reviews were key sources of data for analysis. Studies (not all RCTs) summarized as a narrative review. Formal meta-analysis not applied due to considerable study heterogeneity in design and outcome measures. Single component interventions that reduced readmissions: -intense self-management -transition coaching of high-risk patients -nurse home visits Telephone support of patients with HF Multicomponent interventions that reduced readmissions: -early assessment of discharge needs -enhanced patient and caregiver education and counselling -early postdischarge follow-up of high-risk patients	Peridischarge interventions are highly heterogeneous and reported outcomes show considerable variation. Multicomponent interventions targeted at high-risk populations that include pre- and postdischarge elements seem to be more effective in reducing readmissions than most single component interventions that do not span the hospital-community interface.	No critical review of single studies within the systematic review was undertaken Non-RCTs included in some of the systematic reviews "It is not an exhaustive systematic review of all individual trials of clinical interventions that relate to discharge processes in some way."
Kumar and Grimmer-Somers, 2007 (9) Australia Literature search cut-off dates not reported	To systematically evaluate the secondary literature on hospital avoidance and discharge programs using a framework of best practice principles in health care (safety, effectiveness, timeliness, equity, efficiency, and patient-centredness)	Systematic reviews and grey literature reflecting the descriptive reviews of published and unpublished literature Patients of any age and with any condition who had been discharged from hospital to home RCTs and observational studies	48 publications "Overall, the health outcome, hospital LOS, and readmission rates associated with community/home-based care were no worse than those derived from hospital-based care. However, patients and caregivers mostly preferred care provided out of hospital, and this was often reflected in positive functional change and improved satisfaction scores."	"While there was evidence for improved patient-centred outcomes, the evidence for safety, effectiveness, and efficiency of hospital avoidance and discharge programs was equivocal."	Lack of description in many of the publications of "standard hospital care" as a comparator

Author, Year, Country	Purpose	Inclusion Criteria	Results	Conclusion	Limitations
Mistiaen et al, 2007 (10) Netherlands Literature search up to November 2006	To systematically examine reviews of the effectiveness of interventions aimed at reducing postdischarge problems in adults discharged home from an acute general care hospital	Systematic reviews Adult patients hospitalized primarily for a physical problem. Outcomes measured include patient status at discharge, patient functioning within 3 months of discharge, or health care service use and costs after discharge	15 systematic reviews All reviews dealt with considerable heterogeneity in interventions, populations and outcomes making synthesizing and pooling difficult. Although a statistically significant effect was occasionally found, most review authors reached no firm conclusions about the effectiveness of the discharge interventions. Limited evidence that some interventions may improve patients' knowledge, may help in keeping patients at home, or may reduce readmissions to hospital Interventions that combine discharge planning and discharge support tend to lead to the greatest effects. There is little evidence that discharge interventions have an impact on hospital LOS, discharge destination, or dependency at discharge. No evidence that discharge interventions have a positive impact on the physical status of patients after discharge or on health care use after discharge.	Based on 15 high quality systematic reviews, there is some evidence that some interventions, particularly those with educational components and those that combine predischarge and postdischarge interventions, may have a positive impact. However, on the whole there is limited summarized evidence that discharge planning and discharge support interventions have a positive impact on patient status at hospital discharge, on patient functioning after discharge, or on health care use after discharge and costs.	"The umbrella concept of 'discharge interventions' is too broad to endeavour synthesizing by means of a review of systematic reviews already dealing with vast heterogeneity." Poor description of interventions and control conditions
Phillips et al, 2004 (11) United States Literature search up to October 2003.	To evaluate the effect of comprehensive discharge planning plus postdischarge support on the rate of readmission, all-cause mortality, hospital LOS, and HRQOL	RCTs that described interventions to modify hospital discharge for older patients with HF compared with usual care Studies with clearly defined inpatient and outpatient components Studies that reported readmission as the primary outcome	18 RCTs (3,304 patients) Mean follow-up 8 months (range 3–12 months) Intervention vs. usual care: **Readmission** 555/1590 vs. 741/1714 RR, 0.75; 95% CI, 0.64–0.88 **All-cause mortality** RR, 0.87; 95% CI, 0.73–1.03; n = 14 studies **Percent improvement in HRQOL scores compared with baseline** 25.7% (95% CI, 11.0%–40.4%) vs. 13.5% (95% CI, 5.1%–22.0%), n = 6, *P* = 0.01	Comprehensive discharge planning plus postdischarge support for older patients with HF significantly reduced readmission rates and may improve health outcomes such as survival and HRQOL.	For most studies, usual care was not explicitly described. No studies evaluated the efficacy of comprehensive discharge planning without components for postdischarge support for patients with HF. The duration of components for postdischarge support was not consistently reported and varied by study. Components for postdischarge support varied by study. Unable to ascertain whether events that occurred distant from the index discharge were related to the initial DRG or new problems for patients who were readmitted or those who died.

Abbreviations: CI, confidence interval; DRG, diagnosis related group; ED, emergency department; HF, heart failure; HQO, Health Quality Ontario; HRQOL, health-related quality of life; LOS, length of stay; RCT, randomized controlled trial; RR, relative risk.

Overall General Results of Published Meta-Analyses

Of the 3 high quality systematic reviews, 2 included a meta-analysis. (4;11) Hansen et al (7) did not conduct a meta-analysis because "inadequate description of individual studies' interventions precluded meta-analysis of effects."

Table 3 shows a comparison of the summary statistics reported in the meta-analyses. Shepperd et al (4) compared individualized discharge planning with usual care, and Phillips et al (11) compared comprehensive discharge planning plus postdischarge support to usual care. There was a significant reduction in readmissions favouring individualized discharge planning compared with usual care (with no significant statistical heterogeneity). There was also significant reduction in readmissions favouring discharge planning with postdischarge support compared with usual care, though in this case heterogeneity was significant (despite that Phillips et al (11) removed a large study from the meta-analysis due to significant heterogeneity).

For both meta-analyses, there was a nonsignificant reduction in mortality between the study arms.

Shepperd et al (4) found a significant difference in the hospital LOS favouring individualized discharge planning. Conversely, Phillips et al (11) did not find a significant difference in LOS between discharge planning with postdischarge support compared with usual care.

Table 3: Results of Two Meta-Analyses – Comparison of Individualized Discharge Planning Versus Usual Care and Comprehensive Discharge Planning With Postdischarge Support Versus Usual Care

Intervention/Author	Summary Statistic RR (95% CI)	Number of RCTs	N	Heterogeneity *P* Value
Readmission to Hospital				
Individualized discharge planning Shepperd et al, 2009[a] (4)	0.85 (0.74–0.97) (Follow-up from 2 weeks to 9 months)	11	2,552	0.47
Individualized discharge planning WITH postdischarge support Phillips et al, 2004[b] (11)	0.74 (0.67–0.81) (Follow-up from 3–12 months; mean, 8 months)	17	2,941	0.04 (significant heterogeneity remained even after a large study was removed due to considerable significant heterogeneity [$P < 0.001$] in 18 studies)
Mortality				
Individualized discharge planning Shepperd et al, 2009 [a] (4)	1.04 (0.74–1.46)	4	978	0.44
Individualized discharge planning WITH postdischarge support Phillips et al, 2004 (11)	0.87 (0.73–1.03)	14	2,847	0.06
Length of Stay				
Individualized discharge planning Shepperd et al[b], 2009 (4)	Mean difference −0.91 (−1.55 to −0.27)	10	1,765	0.50
Individualized discharge planning WITH postdischarge support Phillips et al, 2004 (11)	Mean difference −0.37 (−0.15 to 0.60)	10	1,682	Not reported

Abbreviations: CI, confidence interval; RCT, randomized controlled trials; RR, relative risk.

[a] This systematic review specifically focused on discharge planning. Studies were excluded if it was not possible to separate the effects of discharge planning from the other components of the intervention, if discharge planning appeared to be a minor part of a multifaceted intervention, or if the focus was on the provision of care after discharge from hospital. The control group had to receive standard care with no structured discharge planning.

[b] Included studies specifically addressed congestive heart failure, described components for inpatient care *plus* postdischarge support, compared the effects with usual care, and reported readmission rates as the primary outcome.

Detailed Results of Published Systematic Reviews

Systematic Review of Interventions Aimed at Reducing 30-Day Rehospitalization

The objective of the most recent systematic review identified in the literature search was to describe interventions evaluated in studies aimed at reducing rehospitalization within 30 days of discharge. (7) Hansen et al. (7) identified 16 RCTs (12-27) from a literature search that spanned from January 1975 to January 2011. Because of the overlapping nature of intervention components and the heterogeneity of interventions in these included studies, meta-analysis of interventions was not feasible and the authors reported a narrative synthesis.

The authors developed a taxonomy for categorizing individual components of interventions into 3 groups:

- Predischarge interventions
- Postdischarge interventions
- Interventions active both before and after discharge as a "bridge" across care settings. These "bridge interventions" provided a longitudinal service with activity spanning the pre- and postdischarge periods.

Table 4 shows a listing of interventions in each of the 3 categories.

Of the 16 RCTs Hansen et al. (7) identified, 5 documented a statistically significant improvement in rehospitalization outcomes within 30 days. (14;17;20;21;24) One of the 5 trials consisted of a single intervention in which high-risk patients received early discharge planning or usual care; the treatment group experienced an absolute 11 percentage point reduction in 30-day rehospitalization. (17) Hansen et al (7) stated that isolated interventions may have small effects, but bundled interventions may have an additive effect or additional value through change in cultural or organizational factors.

The remaining 4 RCTs tested multicomponent discharge bundles. However, Naylor et al (24) did not report results for 30-day readmission (results were reported at 2 weeks), and Koehler et al (21) combined readmission and ED visits. The 2 remaining RCTs (14;20) demonstrated absolute reductions in 30-day readmission of between 3.6 and 6.0 percentage points. Interventions common to these 4 RCTs were the postdischarge telephone call (either by a hospital, or more usually, a nurse from the primary provider's office) and patient-centred discharge instructions. However, 2 separate RCTs (12;25) that included these 2 interventions with others in a bundle did not show significant reductions in rehospitalization within 30 days, and 2 RCTs that tested them in isolation found no effect. (13;15) This difference, along with the higher frequency of bundled interventions in RCTs showing effect, may suggest limited efficacy of isolated interventions.

Eleven RCTs identified in the review by Hansen et al (7) did not show a significant effect of isolated *or* bundled interventions. These included negative studies of *isolated* application of discharge planning (18), patient education (26), home visits (16;27), and postdischarge telephone calls. (13;15)

Limitations to the systematic review included the following:

- Diverse interventions or scant details which made it difficult to analyze the relative efficacy of individual interventions. Staffing and scope of intervention components or the population targeted for intervention varied between studies, and in particular for patient education and discharge planning.
- A paucity of high quality RCTs. The 2 highest quality studies (25;26), which scored 7 out of 9 on the Cochrane Collaboration's Effective Practice and Organization of Care (EPOC) Group Risk of Bias Criteria used by the authors, did not demonstrate a significantly reduced 30-day rehospitalization in the intervention groups. Details about the quality of the studies are shown in Appendix 2, Table A2-1.

- The RCTs examining the effectiveness of discharge planning care predominantly focused on the academic health care environment, and the results may not transfer to non-academic sites of care. (7) The importance of organizational context to organizational change raises concerns that many hospitals may be frustrated if they seek improvement by replicating the processes reviewed. (7)

Table 4: Summary of Interventions Tested in Randomized Controlled Trials Included in Systematic Review

Author, Year, Size, Country	Population	Interventions												EPOC Quality Criteria Satisfied (9 possible), n	Absolute Risk Reduction, percentage points
		Predischarge Interventions				Postdischarge Interventions				Interventions Bridging the Transition					
		Patient Education	Discharge Planning	Medication Reconciliation	Appointment Scheduled Before Discharge	Timely PCP Communication	Timely Clinic Follow-up	Follow-up Telephone Call	Postdischarge Hotline	Home Visit	Transition Coach	Patient-Centred Discharge Instructions	Provider Continuity		
Balaban et al, 2008 (12) N = 96 United States	Community hospital					X		X				X		5	−0.3
Braun et al, 2009 (13) N = 309 Israel	General medicine ward							X						5	0.5
Coleman et al, 2006 (14) N = 750 United Sates	Geriatric							X		X	X	X		5	3.6[a]
Dudas et al, 2001 (15) N = 221 United States	General medicine ward							X						4	10
Dunn et al, 1994 (16) N = 59 United Kingdom	Geriatric									X				4	−2
Evans et al, 1993 (17) N = 835 United States	Veterans Affairs; **high risk**		X											4	11.0[a]
Forster et al, 2005 (18) N = 620 Canada	General medicine ward		X											5	−7.8 (readmission or death)
Jaarsma et al, 1999 N = 179 Netherlands	HF	X						X	X	X	X			5	2
Jack et al, 2009 N = 738 United States	Medical/ surgical ward	X	X	X		X		X				X		6	6.0[a]
Koehler et al, 2009 (21) N = 41 United States	Geriatric, high risk	X	X	X		X		X			X	X		6	28.1[a] (readmission or ED visit)
Kwok et al, 2004 (22) N = 149 Hong Kong	Chronic lung disease, geriatric								X	X				6	−10
McDonald et al, 2001 (23) N = 70 Ireland	HF, geriatric	X						X						4	0
Naylor et al, 1994 (24) N = 142 United States	Cardiac (medical/ surgical), geriatric	X	X					X	X		X	X		5	12.0[a] (2 weeks, medical); 4 (surgical)

Author, Year, Size, Country	Population	Interventions												EPOC Quality Criteria Satisfied (9 possible), n	Absolute Risk Reduction, percentage points
		Predischarge Interventions					Postdischarge Interventions				Interventions Bridging the Transition				
		Patient Education	Discharge Planning	Medication Reconciliation	Appointment Scheduled Before Discharge	Timely PCP Communication	Timely Clinic Follow-up	Follow-up Telephone Call	Postdischarge Hotline	Home Visit	Transition Coach	Patient-Centred Discharge Instructions	Provider Continuity		
Parry et al, 2009 N = 98 (25) United States	Geriatric	X		X			X	X		X	X	X		7	9.9
Rainville, 1999 (26) N = 34 United States	HF	X												7	7.1
Wong et al, 2008 (27) N = 332 Hong Kong	General medicine ward									X				5	2.4

Abbreviations: ED, emergency department; EPOC, Effective Practice and Organization of Care Group; HF, heart failure; PCP, primary care provider.

[a]Statistically significant improvement in rehospitalization outcomes within 30 days.

Source: Hansen et al, 2011 (7)

Systematic Review of Discharge Planning From Hospital to Home

Shepperd et al (4) conducted a systematic review of RCTs to determine the effectiveness of planning patient discharge from hospital to home. The objectives were to determine the effectiveness of discharge planning on

- unscheduled readmission rates compared with usual care
- length of stay (LOS) in hospital compared with usual care
- incidence of complications related to the initial admission compared with usual care
- mortality rate compared with usual care
- patient health outcomes compared with usual care
- patients' and caregivers' satisfaction compared with usual care

The researchers defined discharge planning as the "development of an individualized discharge plan for a patient *prior* to them leaving hospital for home." (4) The discharge planning process was divided into the following steps:

1. preadmission assessment (where possible);
2. case finding on admission;
3. inpatient assessment and preparation of a discharge plan based on individual patient needs, e.g., multidisciplinary assessment involving the patient and their family and communication between relevant professionals within the hospital;
4. implementation of the discharge plan;
5. monitoring.

Shepperd et al excluded those studies

- that did not include an assessment and implementation phase of discharge planning;
- where it was not possible to separate the effects of discharge planning from the other components of the intervention or if discharge planning appeared to be a minor part of a multifaceted intervention; and/or
- if the focus was on the provision of care after discharge from hospital.

The control group had to receive standard care with no structured discharge planning. The literature search cut-off date was March 2009.

Shepperd et al (4) identified 21 RCTs (N = 7,234 patients), details of which are shown in Appendix 2, Tables A2-2 and A2-3. (12;17;20;24;28-44) Follow-up duration ranged from 2 weeks to 9 months. The trials evaluated a broadly similar intervention of discharge planning that included an assessment, planning, implementation and monitoring phase, although 6 trials (17;33;34;38;42;43) did not describe a monitoring phase. The interventions were implemented at different times during the patient's stay in hospital, from admission to 3 days prior to discharge. Three trials (28;36;42) evaluated a pharmacy discharge plan implemented by a hospital pharmacy. The patient's medication was rationalized, the family physician, community pharmacist, or both were sent a pharmacy discharge plan, and patients were given information about their medication.

The description of the type of care the control group received varied. One trial (31) did not describe the care received by the control group. Sixteen trials (12;17;20;24;29;30;32-35;37-41;44) described the control group as receiving usual care with some discharge planning but without a formal link through a co-ordinator to other departments and services although other services were available on request from nursing or medical staff. The control groups in the 3 trials (28;36;42) that evaluated the effectiveness of a pharmacy

discharge plan did not have access to a review and discharge plan by a pharmacist. The control group in one trial (43) received multidisciplinary care that was not defined in advance but was determined by the patients' progress.

Twelve RCTs reported adequate concealment of allocation. (20;29;31;34-36;38;39;41-44) All but 2 trials (12;37) collected data at baseline, and 15 trials reported blinded measurement of outcomes (mostly for objective outcomes such as hospital LOS and readmission). (12;17;20;30-38;40;41;44)

Results of discharge planning compared with usual care are shown in Table 5.

Table 5: Results of Discharge Planning Compared with Usual Care

Outcome	Summary Statistic (95% CI)	Number of Trials	N
Readmission within 3 months of discharge from hospital	RR, 0.85 (0.74–0.97)	11	2,552
Hospital LOS (days)	Mean difference, −0.91 (−1.55 to −0.27)	10	1,765
Mortality at 6–9 months	RR, 1.04 (0.74–1.46)	4	978

Abbreviations: CI, confidence interval; LOS, length of stay; RCT, randomized controlled trial; RR, relative risk.
Source: Shepperd et al, 2009 (4)

Patients' and caregivers' satisfaction were reported in 3 studies. (33;36;44) Overall, results were inconsistent. Moher et al (33) reported on a subgroup of 40 patients; 18 in the treatment group and 21 in the control group responded. The difference in terms of their satisfaction was significantly in favour of the treatment group (89% vs. 62%; mean difference, 27%; 95% CI, 2% – 52%, $P < 0.05$) on day 4 of their hospital stay. Nazareth et al (36) reported results from a client satisfaction questionnaire, but found no significant difference between the treatment and control groups at 3- or 6-months' follow-up. Weinberger et al (44) measured patient satisfaction at 1 and 6 months and found the intervention group significantly more satisfied than the control group ($P < 0.001$ at both time points).

Ten trials (17;24;29;31;36;37;39;41;43;44) measured patient outcomes including functional status, mental well-being, perception of health, self-esteem, and affect. Of these, 3 (24;31;44) did not report follow-up data, and 5 trials (17;29;36;37;39) observed no significant difference between study arms. Rich et al (41) reported a significant improvement on the total score for the Chronic Heart Failure Questionnaire (mean [SD] difference = 22.1 [20.8]); $P < 0.01$). Sulch et al (43) recruited patients recovering from a stroke and reported a significant functional improvement between 4 and 12 weeks' follow-up for the control group using the Barthel score (median within-group change of 6 points for the control group vs. 2 points for the treatment group; $P < 0.01$). However, between-group differences of the Barthel score were not statistically significant. HRQOL measured using the EuroQol showed significant between-group differences at 26 weeks' follow-up in favour of the control group (control group 72 points vs. treatment group 63 points; $P < 0.005$) but no differences were reported between groups for the Rankin score and the Hospital Anxiety and Depression Scale.

The systematic review by Shepperd et al (4) had a number of limitations:

- The reporting of different outcomes restricted the ability to pool data.
- A key issue in interpreting the evidence was the definition of the intervention and the subsequent understanding of the relative contribution of each element.
  - Authors of the trials did describe the interventions, but it was not possible to assess how some components of the process compared between trials. For example, the trial by Naylor et al (24) formalized the inclusion of the patient's caregiver into the assessment process and the

development of the discharge plan. Inclusion of the caregiver or family was mentioned by some of the other trials (17;30-32;35), but the degree to which this was done was not always apparent.

  - In terms of the discharge planning, one trial included a predischarge home visit by an occupational therapist and rehabilitation doctor, (37) another trial had hospital and community nurses working together on the discharge plan, (29) and 2 trials used an assessment tool to find cases eligible for discharge planning. (17;38)

- The majority of trials included a patient education component within the discharge planning process.
- The monitoring of discharge planning differed among trials. For example, one trial (24) did this primarily by telephone, while in another, (44) patients were given appointments to attend a primary care clinic.
- Three trials evaluated the effectiveness of a pharmacy discharge plan. (28;36;42)
- Assessing the extent to which contamination between the intervention and control groups occurred was difficult.
- The context in which discharge planning is delivered may play a role not only for the intervention but in the way services are configured for the control group.
  - Studies in the review were based in the United States, United Kingdom, Canada, Australia, Denmark, and France. In each country the orientation of primary care services differs in a way that may affect communication between services.
  - Different perceptions of care by professionals of alternative care settings and country-specific funding arrangements may also influence discharge.
- The point when discharge planning was implemented also varied across studies. For example, 2 trials (38;43) commenced discharge planning when patients were admitted to hospital, while another (44) implemented discharge planning 3 days prior to discharge.
- The patient population may also affect outcome. For example, 99 patients in the trial by Weinberger et al (44) had major complications related to their chronic disease. This, together with an intervention designed to increase the intensity of primary care services, may explain the observed increase in readmission days for those receiving the intervention.

Systematic Review of Comprehensive Discharge Planning with Postdischarge Support for Older Patients with Congestive Heart Failure

Phillips et al (11) evaluated the effect of comprehensive discharge planning plus postdischarge support for patients with congestive heart failure. Outcomes of interest included:

- rate of readmission
- all-cause mortality
- hospital LOS
- HRQOL

Inclusion criteria consisted of RCTs that

- described interventions to identify hospital discharge for older patients with congestive heart failure,
- delineated clearly defined inpatient and outpatient components,
- compared efficacy with usual care, and
- reported readmission as the primary outcome.

The literature search cut-off date was October 2003.

The analysis included 18 RCTs. (19;24;26;29;32;40;41;44-55) Characteristics of these are shown in Appendix 2, Tables A2-4 and A2-5.

Studies were assessed for quality using the Jadad scale. The most common reason for point deduction was the absence of double blinding, which was impossible due to the nature of the interventions. Of the 18 studies, 16 received a Jadad score of 4 out of 5, whereas 2 (26;51) received a score of 3 because they did not report data for loss to follow-up and blinding. However, most studies reported blinded assessment of outcomes. The pooled attrition rate due to nonresponse, withdrawals, or loss to follow-up was less than 5%, except for 1 study (32) with a rate of 8%.

Overall, fewer patients in the intervention group had to be readmitted compared with usual care (RR, 0.75; 95% CI, 0.64–0.88; *P* for heterogeneity < 0.001). Most of the heterogeneity was accounted for by results from a single large study. When this was omitted from the analysis, heterogeneity was reduced but nevertheless remained significant (RR, 0.74; 95% CI, 0.67–0.81; *P* for heterogeneity = 0.04). Results for the studies are shown in Table 6.

The evidence did not support the implicit assumption of incremental efficacy with more intensive postdischarge interventions. Comparable benefit resulted from a home visit, home visits and/or frequent telephone follow-up, and extended home care services. Increased clinic visits and/or frequent telephone contact did not result in a significant decrease in readmission rates. Day hospital visits, of which there was only 1 study, yielded a significant reduction in readmissions compared with usual care.

The authors found no significant difference in baseline use of angiotensin-converting enzyme (ACE) inhibitors in 14 trials ($P = 0.40$). Only 3 studies assessed the use of ACE inhibitors during follow-up (32;44;47;48), and the data did not show a significantly higher rate of ACE inhibitor use among the intervention groups, although these studies also showed no overall effect of the intervention on readmission rates.

Table 6: Readmission Rates with Comprehensive Discharge Planning Plus Postdischarge Support Compared with Usual Care

Author, Year	Intervention Events/Patients (%)	Control Events/Patients (%)	Absolute Risk Reduction, %	Relative Risk Reduction (95% CI)	*P* Value for Heterogeneity	Single or Combination (for "and/or" interventions)
Single Home Visit						
Stewart et al, 1998 (45)	24/49 (49)	31/48 (65)	16	0.76 (0.53–1.08)		NA
Stewart et al, 1999 (46)	40/100 (40)	51/100 (51)	11	0.78 (0.58–1.07)		NA
Jaarsma et al, 1999 (19)	31/84 (37)	47/95 (49)	12	0.75 (0.53–1.05)		NA
Subtotal	**95/233 (41)**	**129/243 (53)**	**12**	**0.76 (0.63–0.93)**	**0.97**	
Increased Clinic Follow-up and/or Frequent Telephone Contact						
Cline et al, 1998 (47)	22/80 (28)	43/110 (39)	13	0.70 (0.46–1.08)		Clinic only
Rainville, 1999 (26)	4/17 (24)	10/17 (59)	35	0.40 (0.16–1.03)		Telephone only
Oddone et al, 1999 and Weinberger et al. 1996 (44;48)	124/222 (56)	97/221 (44)	12+	1.27 (1.05–1.54)		Combination
McDonald et al, 2002 (49)	1/51 (2)	11/47 (23)	21	0.08 (0.01–0.62)		Telephone only
Subtotal	**151/370 (41)**	**161/395 (41)**	**0**	**0.64 (0.32–1.28)**	**< 0.001**	
Home Visits and/or Frequent Telephone Contact						
Naylor et al, 1994 (24)	16/72 (22)	23/70 (33)	11	0.68 (0.39–1.17)		Combination
Naylor et al, 1999 (50)	18/52 (35)	26/56 (46)	11	0.75 (0.47–1.19)		Combination
Serxner et al, 1998 (51)	15/55 (27)	27/54 (50)	23	0.55 (0.33–0.91)		Telephone only
Blue et al, 2001 (52)	47/84 (56)	49/81 (60)	4	0.92 (0.71–1.20)		Combination
Riegel et al, 2002 (53)	56/130 (43)	114/228 (50)	7	0.86 (0.68–1.09)		Telephone only
Krumholz et al, 2002 (54)	16/44 (36)	23/44 (52)	16	0.69 (0.43–1.13)		Telephone only
Subtotal	**168/437 (38)**	**262/533 (49)**	**11**	**0.79 (0.69–0.91)**	**0.59**	
Extended Home Care Services						
Rich et al, 1993 (40)	21/63 (33)	16/35 (46)	12	0.73 (0.44–1.02)		NA
Rich et al, 1995 (41)	41/142 (29)	59/140 (42)	13	0.69 (0.50–0.95)		NA
Harrison et al, 2002 (29)	21/92 (23)	31/100 (31)	8	0.74 (0.46–1.19)		NA
Laramee et al, 2003 (32)	49/141 (35)	46/146 (32)	3+	1.10 (0.79–1.53)		NA
Subtotal	**132/438 (30)**	**152/421 (36)**	**6**	**0.82 (0.68–1.00)**	**0.19**	
Day Hospital Services (with specialized HF unit)(49)						
Capomolla et al, 2002 (55)	9/112 (8)	37/122 (30	22	0.25 (0.15–0.44)		NA
Total	**555/1590 (35)**	**741/1714 (43)**	**8**	**0.75 (0.64–0.88)**	**< 0.001**	

Abbreviations: CI, confidence interval; HF, heart failure; RCT, randomized controlled trial; RR, relative risk; +, increased risk.
Source: Phillips et al, 2004 (11)

Data for all-cause mortality were reported in 14 studies. (19;26;29;32;41;44-48;52-55) There was no significant difference in all-cause mortality between the study arms (RR, 0.87; 95% CI, 0.73–1.03; *P* for heterogeneity = 0.06).

Ten studies (19;24;26;29;32;44-46;48;50) reported data for initial hospital LOS. This was similar for intervention and control patients (mean [standard error] 8.4 [2.5] vs. 8.5 [2.2] days, $P = 0.60$). The difference in LOS favoured intervention patients, but this difference was not statistically significant (difference −0.37; 95% CI, −0.15 to 0.60). Heterogeneity was not reported by the authors.

Six studies (19;29;41;46-48) reported data for HRQOL. All except for 2 used different measurement scales to assess this outcome. During 8 months of follow-up (range 3–12 months), HRQOL scores improved from baseline for patients in the intervention group (mean change, 25.7%; 95% CI, 11.0%–40.4%) and usual care group (mean change, 13.5%; 95% CI, 5.1%–22.0%), but the HRQOL scores of intervention patients improved significantly more than for the usual care patients (difference in mean change of scores, 12.2% [95% CI, 3.8%–20.6%], $P = 0.01$). Heterogeneity was not reported by the authors.

Limitations to the study by Phillips et al (11) included the following:

- There was significant heterogeneity among studies.
- Most studies did not explicitly describe usual care.
- 4 studies (26;40;41;52) did not report explicit data for the intervention duration.
- The duration of components for postdischarge support varied by study and was not consistently reported.
- For those studies that did not show a significant difference in readmission rates between comprehensive discharge planning with postdischarge support versus usual care, patients may already have been receiving optimal care, thereby minimizing the difference in effects of additional treatment.
- Several of the studies did not collect or report information about secondary outcomes such as hospital LOS or HRQOL scores.
- The optimal arrangement of components for individualized comprehensive discharge and postdischarge support was not determined.
- Inability to ascertain whether events that occurred distant from the index hospitalization were related to the initial admission or were new problems for patients who were readmitted or who died.

Recent Studies Not Included in Systematic Reviews

Four identified RCTs were not included in the systematic reviews. (56-59) A summary of results for the 4 studies is shown in Table 7.

Table 7: Summary of Recent Studies Not Included in Systematic Reviews

Author, Year, Country	Intervention	Control	Results	Limitations
Atienza et al, 2004 (59) Spain	n = 164 Patients and families received a predischarge formal education about disease from cardiac nurse Visit with primary care physician scheduled within 2 weeks of discharge Regular follow-up visits at the outpatient Heart Failure Clinic scheduled for every 3 months 24-hour phone contact number available to patients from discharge to end of study if patients experienced worsening symptoms	n = 174 Discharge planning according to the routine protocol of the study hospitals	Event-free survival Reduction of 47 events per 100 patients (95% CI, 29–65), P < 0.001 per year of observation in intervention patients Readmissions Reduction of 16% (95% CI, 4%–28%), P = 0.004 in rate of readmitted patients for any cause in intervention group Reduction of 37 all-cause readmissions per 100 patients (95% CI, 21–53), P < 0.001 per year of observation for intervention group Reduction of 19% (95% CI, 0.09–0.29), P < 0.001 in rate of readmitted patients for HF in intervention group Mortality Reduction of 10 deaths per 100 patients (95% CI, 0.02–0.18), P = 0.006 per observation year for intervention patients HRQOL at 1 year (Minnesota Quality of Life Score) Significantly higher improvement in intervention group (P = 0.01)	Unable to identify which elements of the intervention are responsible beneficial results
Naylor et al, 2004 (56) United States	n = 118 Comprehensive discharge planning and home follow-up directed by APNs APN visited at least daily during index hospitalization At least 8 APN home visits (one within 24 hours of discharge) Weekly visits during the first month (with one visit coinciding with the initial follow-up visit to the patient's physician); bimonthly visits during the second and third months. Additional APN visits based on patients' needs APN available by telephone 7 days/week	n = 121 Usual care for the control group included site-specific HF-patient management and discharge planning critical paths, and if referred, standard home agency care consisting of comprehensive skilled home health services 7 days a week.	**Time to first rehospitalization or death** Longer in intervention patients (log rank χ^2 = 5.0, *P* = 0.03) **Rehospitalization or death at 52 weeks** Intervention (n = 118 patients) vs. control (n = 121 patients) 56 (48%) vs. 74 patients (61%), *P* = 0.01 **Patients rehospitalized (1 time)** Intervention (n = 118 patients) vs. control (n = 121 patients) 53 (44.9%) vs. 67 (55.4%), *P* = 0.12; RR, 1.24 (95% CI, 0.95–1.60) **Rehospitalizations at 1 year** Intervention (n = 104 rehospitalizations) vs. control (n = 162 rehospitalizations) Index related: 40 vs. 72, *P* = 0.18 Comorbidity related: 23 vs. 50, *P* = 0.01 New health problem: 41 vs. 40, *P* = 0.88 **HRQOL** At 12 weeks, intervention group reported greater overall HRQOL (*P* < 0.05) No significant difference observed at other time points **Functional status** No significant difference observed at any time point **Satisfaction with care** Greater in intervention patients at 2 and 6 weeks (*P* < 0.001) No other time periods reported	Significantly more patients with hypertension in the control group than the treatment group, 71/121 (59%) vs. 54/121 (45%); *P* = 0.04 The primary outcome was time to first event (a combination of any cause readmission or death). There may not have been sufficient statistical power for assessment of some secondary outcomes e.g., patients rehospitalized or index-related rehospitalization at 1 year
Kwok et al, 2008 (57) China	n = 49 Community nurse visited before discharge, within 7 days of discharge, weekly for 4 weeks, then monthly Community nurses worked closely with designated hospital geriatricians or cardiologists; counselled patients on drug compliance and diet; encouraged patients to contact nurse via telephone hotline during office hours if symptoms developed	n = 56 Patients received usual care and follow-up in hospital outpatient clinics by same group of designated geriatricians or cardiologists used by intervention patients	**6-month readmission rate** No significant difference between intervention and control groups (46% and 57%, respectively, *P* = 0.23) Authors reported no significant difference for primary causes of readmission (no statistical test reported) **Unplanned readmissions** No significant difference (intervention: median 0 [quartile range 0, 1] vs. control: median 1 [quartile range 0, 2], *P* = 0.06) **Functional status (6MWT)** No significant difference between study groups **London Handicap Scale (6 domains)** Compared with controls, intervention group became significantly less limited in independence (median change in independence domain score 0 vs. 0.5, *P* < 0.005). No significant difference observed in other 5 domains	Intent-to-treat analysis not reported At baseline, more patients in intervention group receiving social security assistance than control group (23/49 [47%] vs. 14/56 [25%], respectively) Statistical comparisons not reported for baseline characteristics

Author, Year, Country	Intervention	Control	Results	Limitations
Zhao et al, 2009 (58) China	n = 100 A hospital nurse was responsible for the predischarge phase and 2 nurses in a community hospital were responsible for the postdischarge phase Key areas addressed were patients' understanding of and adherence to diet, medications, exercise, and health-related lifestyle Based on referral report from the hospital nurse, community nurses continued to follow-up the patients for 4 weeks via 2 home visits and 2 telephone calls.	n = 100 Physician talked to patients about special points that needed attention on returning home Free educational pamphlets on maintaining healthy eating and lifestyles were made available to patients	Endpoints measured at 2 days, 4 weeks, and 12 weeks postdischarge Patients in study group had significantly better understanding of diet, medications, and health-related lifestyle behaviour at 2 days, 4 weeks, and 12 weeks postdischarge and better understanding of exercise at weeks 4 and 12 Significant differences favouring intervention group in adherence to diet and health-related lifestyle at day 2, 4 weeks, and 12 weeks, medication at 4 and 12 weeks, and exercise at week 12 No significant difference between study groups for hospital readmission 82% of intervention patients considered community nursing follow-up very helpful, and 80% expressed high satisfaction with service Patient satisfaction not reported for control group	Instruments used to measure patient understanding, adherence and satisfaction were not standardized, validated measurement scales Outcome measures relied on self-reporting by patients. Data regarding extent of cardiovascular risk for the patients were not reported (e.g., weight, blood pressure, diabetes, etc.).

Abbreviations: χ^2, chi-square; 6MWT, 6-minute walking test**;** APN, Advanced Practice Nurses; CI, confidence interval; HF, heart failure; HRQOL, health-related quality of life; RR, relative risk.

Although the multicentre RCT by Naylor et al (56) was published in 2004, Hansen et al (7) excluded it from their systematic review because it did not report a 30-day readmission outcome. Similarly, the study by Naylor et al was excluded by Shepperd et al (4) from their systematic review because "the intervention was a complex package of care where the main emphasis was not on discharge planning." The RCT by Atienza et al, (59) also published in 2004, was excluded from the systematic review by Hansen et al (7) because it did not report a 30-day readmission outcome; however, it is unclear why it was excluded from the review by Shepperd et al. (4)

Atienza et al (59) evaluated the effectiveness of a discharge and outpatient management program in patients hospitalized for heart failure. Patients were randomized to usual care (n = 174) or an intervention (n = 164) consisting of a comprehensive hospital discharge planning and close follow-up at a heart failure clinic.

The intervention consisted of the following:

- patients and families received formal education about heart failure from a cardiac nurse before discharge;
- a visit with the patient's primary care physician was scheduled within 2 weeks of discharge;
- regular follow-up visits at the outpatient Heart Failure Clinic were scheduled every 3 months; and a 24-hour phone contact number was made available from discharge to the end of the study for patients to use if they experienced worsening symptoms.

The control group received discharge planning according to the routine protocol of the study hospitals.

The primary outcome was event-free survival defined on the basis of time to first event (any cause readmission or death) at 1 year. Secondary endpoints included rate of all-cause and heart failure readmissions per observation year, rate of death per observation year, and HRQOL.

Median follow-up was 509 days (interquartile range 365–649 days). Results are shown in Table 8.

Table 8: Summary of Results

Event-Free Survival	Readmissions	Mortality	HRQOL at 1 year (Minnesota Quality of Life Score)
Reduction of 47 events per 100 patients (95% CI, 29–65), *P* < 0.001 per year of observation in intervention patients. Intervention: 156 events (30 deaths and 126 all-cause readmissions) Control: 250 events (51 deaths 199 all-cause readmissions)	Reduction of 16% (95% CI, 4%–28%), *P* = 0.004 in the rate of ***readmitted patients for any cause*** in intervention group. Intervention: 68/164 patients Control: 101/174 patients Reduction of 37 ***all-cause readmissions*** per 100 patients (95% CI, 21–53), *P* < 0.001 per year of observation for intervention group. Intervention: 126 all-cause readmissions Control: 199 all-cause readmissions Reduction of 19% (95% CI, 0.09–0.29), P < 0.001 in the rate of ***readmitted patients for HF*** in the intervention group Intervention: 39/164 patients readmitted for HF Control: 79/174 patients readmitted for HF	Death rates per observation year were: Intervention: 0.14 Control: 0.24 Difference in rate of death per observation year: 0.10 (95% CI: 0.02–0.18), *P* = 0.006 Intervention: 30/164 deaths at end of follow-up Control: 51/174 deaths at end of follow-up	220 of 257 surviving patients completed questionnaire Significantly higher improvement in intervention group (*P* = 0.01) Intervention: baseline score 51.6; 1 year score 28.9 Control: baseline score 51.9; 1 year score 35.5

Abbreviations: CI, confidence interval; HF, heart failure; HRQOL health-related quality of life.
Source: Atienza et al, 2004 (59)

Limitations to the study by Atienza et al (59) included the following:

- The intervention elements that are responsible for beneficial results cannot be identified.
- This study had an additional component of postdischarge follow-up that the other studies in the systematic review by Phillips et al (11) did not have, namely patients were required to attend a heart failure clinic.

Naylor et al (56) examined the effect of a 3-month comprehensive discharge planning and home follow-up intervention directed by advanced practice nurses (APNs) compared with usual care for elders (aged 65 years or older) hospitalized with heart failure. The intervention consisted of the following:

- an initial APN visit within 24 hours of index hospital admission;
- APN visits at least daily during index hospitalization;
- at least 8 APN home visits (one visit within 24 hours of discharge);
- weekly visits during the first month (with one of these visits coinciding with the initial follow-up visit to the patient's physician);
- bimonthly visits during the second and third months;
- additional APN visits based on patients' needs; and
- APN telephone availability 7 days per week (8 AM to 8 PM on weekdays; 8 AM to noon on weekends).

A major focus of the APN's intervention during the hospitalization phase was collaboration with physicians and other providers to optimize the patient's health status at discharge, design the discharge plan, and arrange for needed home care services. Special emphasis was placed on preventing functional decline and streamlining medication regimens. After patients were discharged to their homes, APNs conducted assessments to identify changes in patients' health status and collaborated with each patient's physician regarding adjustments in medications and other therapies.

Usual care for the control group included site-specific heart failure-patient management and discharge planning critical paths and, if referred, standard home agency care consisting of comprehensive skilled home health services 7 days a week. The attending physician was responsible for determining the discharge date, and the primary nurse, discharge planner and physician collaborated in the design and implementation of the discharge plan. Standards and processes of care for the primary home care sites included use of liaison nurses to facilitate referrals to home care; availability of comprehensive intermittent skilled home care services in patients' residences 7 days per week and on-call registered nurse availability 24 hours per day. Of the control group, 58% (71/121) received referrals for skilled nursing or physical therapy after the index hospital discharge.

Patient telephone interviews were conducted at 2, 6, 12, 26, and 52 weeks after the index discharge to obtain information about rehospitalizations and unscheduled acute care visits to physicians, clinics, and EDs, HRQOL and functional status. The primary endpoint was time to first rehospitalization or death.

Results for the RCT by Naylor et al (56) are shown in Table 9.

Table 9: Results of Discharge Planning Compared with Usual Care

Outcome	Result
Time to first rehospitalization or death	Longer in intervention patients (log rank χ^2 = 5.0, *P* = 0.03) **Control vs. intervention** Incidence density ratio 1.65 (1.13–2.40), *P* = 0.001
Rehospitalization or death at 52 weeks	**Intervention (n = 118 patients) vs. control (n = 121 patients)** 56 (48%) vs. 74 patients (61%), *P* = 0.01
Patients rehospitalized	**Intervention (n = 118 patients) vs. control (n = 121 patients)**
1 time	53 (44.9%) vs. 67 (55.4%), *P* = 0.12; RR, 1.24 (95% CI, 0.95–1.60)
2 times	34 (28.8) vs. 44 (36.4%), *P* = 0.22; RR, 1.20 (95% CI, 0.89–1.60)
Rehospitalizations at 1 year	**Intervention (n = 104 rehospitalizations) vs. control (n = 162 rehospitalizations)** Index related: 40 vs. 72, *P* = 0.18 Comorbidity related: 23 vs. 50, *P* = 0.01 New health problem: 41 vs. 40, *P* = 0.88
HRQOL	At 12 weeks, intervention group reported greater overall HRQOL (*P* < 0.05) No significant difference observed at other time points
Functional status	No significant difference observed at any time point
Patient satisfaction	Satisfaction with care greater in intervention patients at 2 and 6 weeks (*P* < 0.001) No other time periods reported

Abbreviations: χ^2, chi-square; CI, confidence interval; RCT, randomized controlled trial; RR, relative risk
Source: Naylor et al, 2004 (56)

A limitation to the study by Naylor et al (56) was that the control group had significantly more patients with hypertension at baseline than the treatment group (71/121 [59%] versus 54/121 [45%]; $P = 0.04$, respectively.

Kwok et al (57) conducted an RCT to evaluate the effectiveness of a postdischarge community nursing program in older patients (aged 60 years or older) with chronic heart failure who had at least one hospital admission for heart failure in the 12 months prior to the index admission.

Patients in the intervention group (n = 49) received community nurse visits before discharge, within 7 days of discharge, weekly for 4 weeks, and then monthly. Community nurses worked closely with designated hospital geriatricians or cardiologists and counselled patients on drug compliance and diet. They also encouraged patients to contact the nurse via a telephone hotline during office hours when they developed symptoms.

Patients in the control group (n = 56) received usual care and were followed up in the hospital outpatient clinics by the same group of designated geriatricians or cardiologists.

The primary outcome was the rate of unplanned readmissions at 6 months postdischarge from hospital. Secondary outcomes included the number of unplanned readmission, the 6-minute walking test (6MWT) and London Handicap Scale domain scores. The 6 domains of handicap in this scale were mobility, independence, occupation, social, orientation, and economic.

Baseline characteristics were similar between the study groups except that more patients in the intervention group were receiving social security assistance than the control group (23/49 [47%] vs. 14/56 [25%], respectively). Statistical comparisons were not reported for baseline characteristics.

There was no significant difference in the 6-month readmission rate between the intervention and control groups (46% and 57% respectively, $P = 0.23$). The authors reported no significant difference between the groups in terms of primary causes of readmission (no statistical test reported).

There was no significant difference in the median number of unplanned readmissions between the study groups (intervention: median 0 [quartile range 0, 1] vs. control: median 1 [quartile range 0, 2], $P = 0.06$).

No significant difference was observed between the intervention and control group for change in functional status using 6MWT.

For the London Handicap Scale, there was a significant difference between the groups for the independence domain. Compared with the control group, patients in the intervention arm became significantly less limited in independence (median change in independence domain score 0 vs. 0.5, $P < 0.005$). No significant difference was observed in the other 5 domains.

Limitations to the RCT by Kwok et al (57) included:

- Small sample size. The authors conducted a sample size analysis that required 50 patients per group to have an 80% chance of detecting a 40% relative reduction in readmission rate at a confidence interval of 95%. There were 44/49 intervention patients and 46/56 control group patients who completed the study. Intent-to-treat analysis was not reported by the authors.
- A significant difference in economic status between the study arms at baseline.

Zhao et al (58) conducted an RCT (N = 200) to determine the effectiveness of a discharge planning program among patients with newly diagnosed coronary heart disease. Patients in the intervention arm (n = 100) received a discharge planning program consisting of 2 phases. A nurse from the hospital was responsible for the predischarge phase, and 2 nurses in a community hospital were responsible for the postdischarge phase. Key areas addressed by all nurses were patients' understanding of and adherence to diet, medications, exercise, and health-related lifestyle such as getting enough rest and quitting smoking. Based on the instructions in the hospital nurse's referral report, the community nurses continued to follow the patients for 4 weeks via 2 home visits and 2 telephone calls.

Patients in the control group (n = 100) received routine care, which involved a physician talking to them about special points that needed attention on returning home. Patients were given educational pamphlets on maintaining healthy eating habits and lifestyles.

Outcome measures were:

- patient understanding (ranked high, moderate or low) of diet, medications, exercise, and HRQOL;
- patient adherence (ranked high, moderate, or low) to diet, medications, exercise, and health-related lifestyle;
- health care utilization; and
- satisfaction with care.

The authors did not report a primary outcome. Endpoints were measured at 2 days, 4 weeks, and 12 weeks postdischarge.

Results of the RCT are shown in Table 10. Overall, patients in the study group had a significantly better understanding of diet, their medications, and health-related lifestyle behaviour at 2 days, 4 weeks, and 12 weeks postdischarge and a better understanding of exercise at weeks 4 and 12. In addition, there were significant differences favouring the intervention group in adherence to diet and health-related lifestyle at 2 days, 4 weeks, and 12 weeks; medication at 4 weeks and 12 weeks; and exercise at week 12.

There was no significant difference between the study groups for hospital readmission at 12 weeks postdischarge, $P = 0.83$.

Of the intervention patients, 82% considered the community nursing follow-up to be very helpful, and 80% expressed high satisfaction with the service. Patient satisfaction was not reported for the control group.

Table 10: Results of Discharge Planning Compared with Usual Care

Outcome	Result (Intervention Compared With Control)
Understanding of diet, medications, exercise, and HRQOL	
Diet	Intervention patients had a significantly better understanding of diet at all endpoints 2 days: $P = 0.00$; 4 weeks: $P = 0.00$; 12 weeks: $P = 0.00$
Medications	Intervention patients had a significantly better understanding of medications at all endpoints 2 days: $P = 0.00$; 4 weeks: $P = 0.00$; 12 weeks: $P = 0.00$
Exercise	Intervention patients had a significantly better understanding of exercise at 4 and 12 weeks 2 days: $P = 0.06$; 4 weeks: $P = 0.00$; 12 weeks: $P = 0.00$
Health-related lifestyle	Intervention patients had a significantly better understanding of health-related lifestyle at all endpoints 2 days: $P = 0.00$; 4 weeks: $P = 0.00$; 12 weeks: $P = 0.00$
Adherence to diet, medications, exercise, and health-related lifestyle	
Diet	Intervention patients had significantly better adherence to diet at all endpoints 2 days: $P = 0.00$; 4 weeks: $P = 0.00$; 12 weeks: $P = 0.02$
Medications	Intervention patients had significantly better adherence to medications at 4 and 12 weeks 2 days: $P = 0.68$; 4 weeks: $P = 0.01$; 12 weeks: $P = 0.00$
Exercise	Intervention patients had significantly better adherence to exercise at 12 weeks 2 days: $P = 0.92$; 4 weeks: $P = 0.17$; 12 weeks: $P = 0.00$
Health-related lifestyle	Intervention patients had significantly better adherence to health-related lifestyle at all endpoints 2 days: $P = 0.03$; 4 weeks: $P = 0.00$; 12 weeks: $P = 0.00$
Health care utilization	
Readmission related to CHD	No significant difference between intervention and control patients at 12 weeks, $P = 0.83$
Readmission related to other diseases	No significant difference between intervention and control patients at 12 weeks, $P = 0.25$
Satisfaction with care	
Patient satisfaction	82% of intervention patients considered postdischarge community nursing very helpful 80% of intervention patients expressed high satisfaction with postdischarge community nursing

Abbreviations: CHD, coronary heart disease; HRQOL, health-related quality of life.
Source: Zhao et al, 2009 (58)

Limitations to the study by Zhao et al (58) included the following:

- The study took place in an affluent city in China, therefore generalizability to other cities is limited.
- The instruments used to measure patient understanding, adherence, and satisfaction were not standardized, validated measurement scales.
- The outcome measures (including health care utilization) relied on patient self-reports.
- Data regarding the extent of cardiovascular risk for the patients were not reported (e.g., weight, blood pressure, diabetes, etc.).

Conclusions

Conclusions for this evidence-based analysis are shown in Table 11. Details about GRADE for each outcome are in Appendix 3.

Table 11: Conclusions of Evidence-Based Review

Outcome	Conclusion
Individualized Discharge Planning Compared With Usual Care	
Readmissions	Moderate quality evidence that individualized discharge planning is more effective at reducing readmissions
Hospital LOS	Moderate quality evidence that individualized discharge planning is more effective at reducing initial hospital LOS
Mortality	Moderate quality evidence that individualized discharge planning is not more effective at reducing mortality
HRQOL	Very low quality evidence that individualized discharge planning is more effective at improving HRQOL
Patient Satisfaction	Very low quality evidence that individualized discharge planning is more effective at improving patient satisfaction
Individualized Discharge Planning Plus Postdischarge Support Compared With Usual Care	
Readmissions	Low quality evidence that discharge planning plus postdischarge support is more effective at reducing readmissions
Hospital LOS	Low quality evidence that discharge planning plus postdischarge support is not more effective at reducing LOS
Mortality	Low quality evidence that discharge planning plus postdischarge support is not more effective at reducing mortality
HRQOL	Very low quality evidence that discharge planning plus postdischarge support is more effective at improving HRQOL
Patient Satisfaction	Very low quality evidence that discharge planning plus postdischarge support is more effective at improving patient satisfaction

Abbreviations: HRQOL, health-related quality of life; LOS, length of stay.

Overall limitations to the studies in this evidence-based analysis were as follows:

- It was difficult to distinguish the relative contribution of each element within the umbrella terms "discharge planning" and "postdischarge support."
- The context in which discharge planning is delivered may play a role not only for the intervention but in the way services are configured for the control group (i.e., for different countries, the orientation of primary care services differs, which may affect communication between services).
- The specific time point in a patient's hospital admission when discharge planning was implemented varied across studies (i.e., at time of admission vs. 3 days before discharge). The duration of components for postdischarge support also varied across studies.
- For most studies, "usual care" was not explicitly described.
- Some studies may have been underpowered to detect a statistically significant difference in outcomes (type 2 error).
- Many studies were unable to determine whether events that occurred distant from the index hospitalization were related to the initial admission or whether they were new problems for patients who were readmitted or died.

Acknowledgements

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Expert Panel for Health Quality Ontario: Optimizing Chronic Disease Management in the Community (Outpatient) Setting

Name	Title	Organization
Shirlee Sharkey (chair)	President & CEO	Saint Elizabeth Health Care
Theresa Agnew	Executive Director	Nurse Practitioners' Association of Ontario
Onil Bhattacharrya	Clinician Scientist	Li Ka Shing Knowledge Institute, St. Michael's Hospital, University of Toronto
Arlene Bierman	Ontario Women's Health Council Chair in Women's Health	Department of Medicine, Keenan Research Centre in the Li Ka Shing Knowledge Institute, St. Michael's Hospital, University of Toronto
Susan Bronskill	Scientist	Institute for Clinical Evaluative Sciences
Catherine Demers	Associate Professor	Division of Cardiology, Department of Medicine, McMaster University
Alba Dicenso	Professor	School of Nursing, McMaster University
Mita Giacomini	Professor	Centre of Health Economics & Policy Analysis, Department of Clinical Epidemiology & Biostatistics
Ron Goeree	Director	Programs for Assessment of Technology in Health (PATH) Research Institute, St. Joseph's Healthcare Hamilton
Nick Kates	Senior Medical Advisor	Health Quality Ontario – QI McMaster University Hamilton Family Health Team
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Wendy Levinson	Sir John and Lady Eaton Professor and Chair	Department of Medicine, University of Toronto
Raymond Pong	Senior Research Fellow and Professor	Centre for Rural and Northern Health Research and Northern Ontario School of Medicine, Laurentian University
Michael Schull	Deputy CEO & Senior Scientist	Institute for Clinical Evaluative Sciences
Moira Stewart	Director	Centre for Studies in Family Medicine, University of Western Ontario
Walter Wodchis	Associate Professor	Institute of Health Management Policy and Evaluation, University of Toronto

Appendices

Appendix 1: Literature Search Strategies

Search date: January 29th, 2012
Databases searched: OVID MEDLINE, OVID MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, Wiley Cochrane, EBSCO CINAHL, Centre for Reviews and Dissemination

Limits: 2004-current; English; MA/SR/HTA/RCT filter

Database: Ovid MEDLINE(R) <1946 to January Week 3 2012>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <January 27, 2012>, Embase <1980 to 2012 Week 04>
Search Strategy:

#	Searches	Results
1	exp Coronary Artery Disease/	212075
2	exp Myocardial Infarction/ use mesz	133578
3	exp heart infarction/ use emez	216992
4	(coronary artery disease or cad or heart attack).ti.	44463
5	((myocardi* or heart or cardiac or coronary) adj2 (atheroscleros* or arterioscleros* or infarct*)).ti.	149559
6	or/1-5	539975
7	exp Atrial Fibrillation/ use mesz	28093
8	exp heart atrium fibrillation/ use emez	55522
9	((atrial or atrium or auricular) adj1 fibrillation*).ti,ab.	73540
10	or/7-9	99451
11	exp heart failure/	300981
12	((myocardi* or heart or cardiac) adj2 (failure or decompensation or insufficiency)).ti,ab.	234590
13	11 or 12	381953
14	exp Stroke/	178088
15	exp Ischemic Attack, Transient/ use mesz	16370
16	exp transient ischemic attack/ use emez	19680
17	exp stroke patient/ use emez	5637
18	exp brain infarction/ or exp cerebrovascular accident/ use emez	101006
19	(stroke or tia or transient ischemic attack or cerebrovascular apoplexy or cerebrovascular accident or cerebrovascular infarct* or brain infarct* or CVA).ti,ab.	281375
20	or/14-19	391798
21	exp Diabetes Mellitus, Type 2/ use mesz	68223
22	exp non insulin dependent diabetes mellitus/ use emez	101711
23	exp diabetic patient/ use emez	12920
24	(diabetes or diabetic* or niddm or t2dm).ti,ab.	765351
25	or/21-24	790292
26	exp Skin Ulcer/	72073
27	((pressure or bed or skin) adj2 (ulcer* or sore* or wound*)).ti,ab.	28723
28	(decubitus or bedsore*).ti,ab.	8532
29	or/26-28	90816
30	exp Pulmonary Disease, Chronic Obstructive/ use mesz	17049
31	exp chronic obstructive lung disease/ use emez	54779

32	(chronic obstructive adj2 (lung* or pulmonary or airway* or airflow or respiratory) adj (disease* or disorder*)).ti,ab.	54491
33	(copd or coad).ti,ab.	45716
34	chronic airflow obstruction.ti,ab.	1063
35	exp Emphysema/	37444
36	exp chronic bronchitis/ use emez	6985
37	((chronic adj2 bronchitis) or emphysema).ti,ab.	50848
38	or/30-37	159366
39	exp Chronic Disease/	340792
40	((chronic* adj2 disease*) or (chronic* adj2 ill*)).ti,ab.	220217
41	39 or 40	506604
42	exp Comorbidity/	143585
43	(comorbid* or co-morbid* or multimorbid* or multi-morbid* or (complex* adj patient*) or "patient* with multiple" or (multiple adj2 (condition* or disease*))).ti,ab.	203652
44	42 or 43	284365
45	6 or 10 or 13 or 20 or 25 or 29 or 38 or 41 or 44	2823779
46	exp Patient Discharge/ use mesz	16001
47	exp hospital discharge/ use emez	48313
48	((post-discharge or postdischarge or post-hospital or posthospital or discharge) adj2 (patient or hospital or support* or service* or plan* or summar* or coordinat* or co-ordinat* or manage*)).ti,ab.	46581
49	exp Medication Reconciliation/ use mesz	85
50	exp Medication Errors/pc use mesz	3717
51	exp medication therapy management/ use emez	736
52	exp medication error/pc use emez	2159
53	((medication* or drug*) adj2 (reconcil* or manage*)).ti,ab.	9668
54	or/46-53	108369
55	45 and 54	27866
56	limit 55 to english language	25438
57	limit 56 to yr="2004 -Current"	16734
58	limit 57 to (controlled clinical trial or meta analysis or randomized controlled trial)	1072
59	exp Technology Assessment, Biomedical/ or exp Evidence-based Medicine/ use mesz	63494
60	exp Biomedical Technology Assessment/ or exp Evidence Based Medicine/ use emez	524160
61	(health technology adj2 assess*).ti,ab.	3066
62	exp Random Allocation/ or exp Double-Blind Method/ or exp Control Groups/ or exp Placebos/ use mesz	379985
63	Randomized Controlled Trial/ or exp Randomization/ or exp RANDOM SAMPLE/ or Double Blind Procedure/ or exp Triple Blind Procedure/ or exp Control Group/ or exp PLACEBO/ use emez	902695
64	(random* or RCT).ti,ab.	1256935
65	(placebo* or sham*).ti,ab.	414541
66	(control* adj2 clinical trial*).ti,ab.	35105
67	meta analysis/ use emez	58676
68	(meta analy* or metaanaly* or pooled analysis or (systematic* adj2 review*) or published studies or published literature or medline or embase or data synthesis or data extraction or cochrane).ti,ab.	253317
69	or/59-68	2167232
70	(57 and 69) or 58	2889
71	remove duplicates from 70	2308

CINAHL

#	Query	Limiters/Expanders	Results
S45	S34 and S40 and S43	Limiters - Published Date from: 20040101-20121231; English Language; Exclude MEDLINE records Search modes - Boolean/Phrase	38
S44	S34 and S40 and S43	Search modes - Boolean/Phrase	369
S43	S41 or S42	Search modes - Boolean/Phrase	156355
S42	random* or sham*or rct* or health technology N2 assess* or meta analy* or metaanaly* or pooled analysis or (systematic* N2 review*) or published studies or medline or embase or data synthesis or data extraction or cochrane or control* N2 clinical trial*	Search modes - Boolean/Phrase	148276
S41	(MH "Random Assignment") or (MH "Random Sample+") or (MH "Meta Analysis") or (MH "Systematic Review") or (MH "Double-Blind Studies") or (MH "Single-Blind Studies") or (MH "Triple-Blind Studies") or (MH "Placebos") or (MH "Control (Research)")	Search modes - Boolean/Phrase	83647
S40	S35 or S36 or S37 or S38 or S39	Search modes - Boolean/Phrase	19853
S39	medication* N2 reconcil* or drug* N2 reconcil* or drug N2 manage* or medication N2 manage*	Search modes - Boolean/Phrase	1997
S38	(MH "Medication Errors/PC")	Search modes - Boolean/Phrase	3605
S37	(MH "Medication Reconciliation")	Search modes - Boolean/Phrase	241
S36	post-discharge or postdischarge or post-hospital or posthospital or discharge N2 plan* or discharge N2 summar* or discharge N2 co-ordinat* or discharge N2 coordinat* or discharge N2 manage*or discharge N2 service*	Search modes - Boolean/Phrase	5580
S35	(MH "Patient Discharge+")	Search modes - Boolean/Phrase	12852
S34	S5 OR S8 OR S11 OR S15 OR S19 OR S22 OR S27 OR S30 OR S33	Search modes - Boolean/Phrase	221088
S33	S31 OR S32	Search modes - Boolean/Phrase	28945
S32	comorbid* OR co-morbid* OR multimorbid* OR multi-morbid* OR (complex* N1 patient*) OR "patient* with multiple" OR (multiple N2 (condition* OR disease*))	Search modes - Boolean/Phrase	28945
S31	(MH "Comorbidity")	Search modes - Boolean/Phrase	16646
S30	S28 OR S29	Search modes - Boolean/Phrase	43734
S29	(chronic* N2 disease*) OR (chronic* N2 ill*)	Search modes - Boolean/Phrase	43734
S28	(MH "Chronic Disease")	Search modes - Boolean/Phrase	23647
S27	S23 OR S24 OR S25 OR S26	Search modes - Boolean/Phrase	8774
S26	chronic N2 bronchitis OR emphysema	Search modes - Boolean/Phrase	1820
S25	(MH "Emphysema")	Search modes - Boolean/Phrase	885
S24	chronic obstructive N2 disease* OR chronic obstructive N2 disorder* OR copd OR coad	Search modes - Boolean/Phrase	7349
S23	(MH "Pulmonary Disease, Chronic Obstructive+")	Search modes - Boolean/Phrase	5342
S22	S20 OR S21	Search modes - Boolean/Phrase	16179
S21	pressure N1 ulcer* OR bedsore* OR bed N1 sore* OR skin N1 ulcer* OR pressure N1 wound* OR decubitus	Search modes - Boolean/Phrase	9574
S20	(MH "Skin Ulcer+")	Search modes - Boolean/Phrase	14845
S19	S16 OR S17 OR S18	Search modes - Boolean/Phrase	70185

S18	diabetes OR diabetic* OR niddm OR t2dm	Search modes - Boolean/Phrase	70185
S17	(MH "Diabetic Patients")	Search modes - Boolean/Phrase	3536
S16	(MH "Diabetes Mellitus, Type 2")	Search modes - Boolean/Phrase	18233
S15	S12 OR S13 OR S14	Search modes - Boolean/Phrase	38210
S14	stroke OR tia OR transient ischemic attack OR cerebrovascular apoplexy OR cerebrovascular accident OR cerebrovascular infarct* OR brain infarct* OR CVA	Search modes - Boolean/Phrase	37713
S13	(MH "Cerebral Ischemia, Transient")	Search modes - Boolean/Phrase	1903
S12	(MH "Stroke") OR (MH "Stroke Patients")	Search modes - Boolean/Phrase	25676
S11	S9 OR S10	Search modes - Boolean/Phrase	18862
S10	myocardi* failure OR myocardial decompensation OR myocardial insufficiency OR cardiac failure OR cardiac decompensation OR cardiac insufficiency OR heart failure OR heart decompensation OR heart insufficiency	Search modes - Boolean/Phrase	18850
S9	(MH "Heart Failure+")	Search modes - Boolean/Phrase	14393
S8	S6 OR S7	Search modes - Boolean/Phrase	8072
S7	atrial N1 fibrillation* OR atrium N1 fibrillation* OR auricular N1 fibrillation*	Search modes - Boolean/Phrase	8072
S6	(MH "Atrial Fibrillation")	Search modes - Boolean/Phrase	6490
S5	S1 OR S2 OR S3 OR S4	Search modes - Boolean/Phrase	30133
S4	TI myocardi* N2 infarct* OR TI heart N2 infarct* OR TI cardiac N2 infarct* OR TI coronary N2 infarct* OR TI arterioscleros* OR TI atheroscleros*	Search modes - Boolean/Phrase	9643
S3	coronary artery disease OR cad OR heart attack*	Search modes - Boolean/Phrase	7706
S2	(MH "Myocardial Infarction+")	Search modes - Boolean/Phrase	19219
S1	(MH "Coronary Arteriosclerosis")	Search modes - Boolean/Phrase	4646

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ID	Search	Hits
#1	MeSH descriptor Coronary Artery Disease explode all trees	2183
#2	MeSH descriptor Myocardial Infarction explode all trees	7746
#3	(myocardi* or heart or cardiac or coronary) NEAR/2 (atheroscleros* or arterioscleros* or infarct*):ti or (coronary artery disease or cad or heart attack*):ti	8469
#4	MeSH descriptor Atrial Fibrillation explode all trees	2102
#5	(atrial NEAR/2 fibrillation* or atrium NEAR/2 fibrillation* or auricular NEAR/2 fibrillation*):ti	2310
#6	MeSH descriptor Heart Failure explode all trees	4710
#7	(myocardi* NEAR/2 (failure or decompensation or insufficiency)):ti or (heart NEAR/2 (failure or decompensation or insufficiency)):ti or (cardiac NEAR/2 (failure or decompensation or insufficiency)):ti	5252
#8	MeSH descriptor Stroke explode all trees	3899
#9	MeSH descriptor Ischemic Attack, Transient explode all trees	466
#10	(stroke or tia or transient ischemic attack or cerebrovascular apoplexy or cerebrovascular accident or cerebrovascular infarct* or brain infarct* or CVA):ti	9902
#11	MeSH descriptor Diabetes Mellitus, Type 2 explode all trees	6993
#12	(diabetes or diabetic* or niddm or t2dm):ti	16585
#13	MeSH descriptor Skin Ulcer explode all trees	1572
#14	(pressure or bed or skin) NEAR/2 (ulcer* or sore* or wound*):ti	669
#15	(decubitus or bedsore*):ti	98
#16	MeSH descriptor Pulmonary Disease, Chronic Obstructive explode all trees	1754
#17	(chronic obstructive NEAR/2 (lung* or pulmonary or airway* or airflow or respiratory)):ti	2415
#18	(copd or coad):ti	3319
#19	(chronic airflow obstruction):ti	72
#20	MeSH descriptor Emphysema explode all trees	91
#21	(chronic NEAR/2 bronchitis) or emphysema:ti	1183
#22	(Chronic Disease):ti	4464
#23	(chronic* NEAR/2 disease* or chronic* NEAR/2 ill*):ti	1670
#24	MeSH descriptor Comorbidity explode all trees	1941
#25	(comorbid* OR co-morbid* OR multimorbid* OR multi-morbid* OR (complex* NEXT patient*) OR "patient* with multiple" OR (multiple NEAR/2 (condition* OR disease*))):ti	649
#26	**(**#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25)	61123
#27	MeSH descriptor Patient Discharge explode all trees	863
#28	(post-discharge or postdischarge or post-hospital or posthospital or discharge) NEAR/2 (patient or hospital or support* or service* or plan* or summar* or coordinat* or co-ordinat* or manage*):ti	478
#29	MeSH descriptor Medication Reconciliation explode all trees	2
#30	MeSH descriptor Medication Errors explode all trees with qualifier: PC	103
#31	(medication* or drug*) NEAR/2 (reconcil* or manage*):ti	71
#32	(#27 OR #28 OR #29 OR #30 OR #31)	1285
#33	(#26 AND #32), from 2004 to 2012	131

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Line	Search	Hits
1	MeSH DESCRIPTOR coronary artery disease EXPLODE ALL TREES	230
2	(coronary artery disease or cad or heart attack*):TI	213
3	((myocardi* or heart or cardiac or coronary) adj2 (atheroscleros* or arterioscleros* or infarct*)):TI	224
4	MeSH DESCRIPTOR Atrial Fibrillation EXPLODE ALL TREES	225
5	(((atrial or atrium or auricular) adj1 fibrillation*):TI	0
6	((atrial or atrium or auricular) adj1 fibrillation*):TI	168
7	MeSH DESCRIPTOR heart failure EXPLODE ALL TREES	418
8	((myocardi* or heart or cardiac) adj2 (failure or decompensation or insufficiency)):TI	280
9	MeSH DESCRIPTOR stroke EXPLODE ALL TREES	549
10	MeSH DESCRIPTOR Ischemic Attack, Transient EXPLODE ALL TREES	32
11	(stroke or tia or transient ischemic attack or cerebrovascular apoplexy or cerebrovascular accident or cerebrovascular infarct* or brain infarct* or CVA):TI	622
12	MeSH DESCRIPTOR Diabetes Mellitus, Type 2 EXPLODE ALL TREES	511
13	(diabetes or diabetic* or niddm or t2dm):TI	1223
14	MeSH DESCRIPTOR Skin Ulcer EXPLODE ALL TREES	253
15	((pressure or bed or skin) adj2 (ulcer* or sore* or wound*)):TI	73
16	(decubitus or bedsore*):TI	0
17	MeSH DESCRIPTOR Pulmonary Disease, Chronic Obstructive EXPLODE ALL TREES	237
18	(chronic obstructive adj2 (lung* or pulmonary or airway* or airflow or respiratory)):TI	219
19	(copd or coad):TI	108
20	(chronic airflow obstruction):TI	0
21	MeSH DESCRIPTOR Emphysema EXPLODE ALL TREES	10
22	((chronic adj2 bronchitis) or emphysema):TI	47
23	MeSH DESCRIPTOR Chronic Disease EXPLODE ALL TREES	687
24	((chronic* adj2 disease*) or (chronic* adj2 ill*)):TI	252
25	MeSH DESCRIPTOR Comorbidity EXPLODE ALL TREES	146
26	((comorbid* OR co-morbid* OR multimorbid* OR multi-morbid* OR (complex* NEXT patient*) OR "patient* with multiple" OR (multiple adj2 (condition* OR disease*)))):TI	21
27	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26	4655

28	MeSH DESCRIPTOR Patient Discharge EXPLODE ALL TREES	146
29	(((post-discharge or postdischarge or post-hospital or posthospital or discharge) adj2 (patient or hospital or support* or service* or plan* or summar* or coordinat* or co-ordinat* or manage*))):TI	27
30	MeSH DESCRIPTOR Medication Errors EXPLODE ALL TREES WITH QUALIFIER PC	19
31	(((medication* or drug*) adj2 (reconcil* or manage*))):TI	20
32	#28 OR #29 OR #30 OR #31	189
33	#27 AND #32	32

Appendix 2: Results

Table A1: Quality (EPOC) of Randomized Controlled Trials[a]

Author, Year	Allocation Sequence Random	Allocation Concealed	Baseline Outcomes Similar	Baseline Characteristics Similar	Plan for Missing Data/ Incomplete Data for Primary Outcome	Blinding	No Contamination	Free of Selective Outcome Reporting Risk	No Other Bias	EPOC Group Risk of Bias Criteria (9 Maximum Score)
Balaban et al, 2008 (12)	1	Unclear	Unclear	1	1	1	0	1	0	5
Braun et al, 2009 (13)	0	1	Unclear	0	1	1	1	1	0	5
Coleman et al, 2006 (14)	1	1	Unclear	0	1	1	0	1	0	5
Dudas et al, 2001 (15)	1	Unclear	Unclear	1	Unclear	1	0	1	0	4
Dunn et al, 1994 (16)	1	Unclear	Unclear	0	0	1	1	1	0	4
Evans et al, 1993 (17)	1	Unclear	Unclear	1	Unclear	1	0	1	0	4
Forster et al, 2005 (18)	1	1	Unclear	1	Unclear	1	0	1	0	5
Jaarsma et al, 1999 (19)	1	1	Unclear	1	Unclear	1	0	1	0	5
Jack et al, 2009 (20)	1	1	Unclear	1	Unclear	1	1	1	0	6
Koehler et al, 2009 (21)	1	1	Unclear	1	Unclear	1	1	1	0	6
Kwok et al, 2004 (22)	1	1	Unclear	1	Unclear	1	1	1	0	6
McDonald et al, 2001 (23)	1	Unclear	Unclear	1	Unclear	1	1	Unclear	0	4
Naylor et al, 1994 (24)	1	0	Unclear	1	Unclear	1	1	1	0	5
Parry et al, 2009 (25)	1	1	Unclear	1	1	1	1	1	0	7
Rainville, 1999 (26)	1	1	Unclear	1	1	1	1	1	0	7
Wong et al, 2008 (27)	1	Unclear	Unclear	0	0	1	1	1	1	5

Abbreviations: EPOC, Effective Practice and Organization of Care Criteria.
[a]http://epoc.cochrane.org/epoc-author-resources.
Source: Hansen et al, 2011. (7)

Table A2: Randomized Controlled Trials

Author, Year, Size	Intervention	Patient Population	Outcomes	EPOC Risk of Bias	Limitations/Comments
Balaban et al, 2008 (12) N = 96	A comprehensive patient discharge form was given to patients to identify any communication problems during transition of care (i.e., lack of knowledge about condition and gaps in outpatient follow-up care or test results). Discharge form electronically transferred to the RN at patients' primary care facility. RN contacted patient and reviewed form and medication included in the discharge plan. RN phoned patient to assess status, review form, assess patient concerns and confirm follow-up appointments. Form and telephone notes forwarded electronically to PCP who reviewed the form.	Patients admitted to a 100-bed community teaching hospital as an emergency Patients with diabetes, HF, COPD, depression	Hospital LOS and readmission rates Follow-up at 21 and 31 days	Adequate sequence generation? Unclear Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? No	122 randomized 24 excluded after randomization because discharged to another institution; 2 died during hospital admission
Bolas et al, 2004 (28) N = 243	Use of a comprehensive medication history service, provision of an intensive clinical pharmacy service including management of patients' own drugs brought to hospital, personalized drug record and patient counselling to explain changes at discharge. Discharge letter outlining complete drug history on admission and explanation of changes to medication during hospital and variances to discharge prescription faxed to GP and community pharmacist. Personalized drug card, counselling, labelling of dispensed drugs for follow-up. Drug helpline. Control intervention: standard clinical pharmacy services.	Patients admitted to district general hospital Aged ≥ 55 years and taking ≥ 3 regular drugs	Patient satisfaction Knowledge of drugs Hoarding of drugs	Adequate sequence generation? Yes Allocation concealment? Unclear Blinding? No Incomplete outcome data addressed? No Free of selective reporting? Unclear Baseline data? Yes	Follow-up of patients: 67% (162/243) Low response rate in survey of GPs (55%) and community pharmacists (56%) Unclear how standard clinical pharmacy services differ from intervention.
Evans et al, 1993 (17) N = 835	Patients screened for risk factors that may prolong hospital LOS, increase risk of readmission, or discharge to a nursing home. During discharge planning, information on support systems, living situation, finances, and areas of need were obtained from medical notes, interviews with the patient and family, and by consulting with the physician and nurse. Discharge planning initiated on day 3 of hospital admission, with patients referred to a social worker. Plans implemented with measureable goals using goal attainment scaling. Control intervention: discharge planning only if referred by medical staff and usually on the 9th day of hospital admission, or not at all.	Patients screened for risk factors that would prolong their LOS at a VA hospital Older patients with a medical condition, neurological condition, or recovering from surgery	Hospital LOS Readmission to hospital Discharge destination Health status Follow-up at 3 months	Adequate sequence generation? Unclear Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	Controls could receive discharge planning
Harrison et al, 2002 (29) N = 200	Patients' notes were flagged at admission as a signal to the primary nurse to follow a checklist for discharge planning. Hospital and community nurses working together for a smooth transition from hospital to home. A structured protocol was used for counselling and education for HF self-management. Home nursing visits were the same number as the control group. Telephone outreach within 24 hours of discharge. Control intervention: usual care for hospital to home transfer that involved completing a medical history, nursing assessment form, and a multidisciplinary plan. Discharge planning meetings took place weekly. Regional home care co-ordinator consulted with the hospital team as needed. Patients received the same number of home nurse visits as the intervention group.	Older, cognitively unimpaired people with HF who were expected to be discharged (from a large urban teaching hospital) with home nursing care	HRQOL Symptoms distress and functioning ED visits and readmissions at 12 weeks	Adequate sequence generation? Yes Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? No Free of selective reporting? Yes Baseline data? Yes	

Author, Year, Size	Intervention	Patient Population	Outcomes	EPOC Risk of Bias	Limitations/Comments
Hendriksen et al, 1990 (30) N = 273	Patients had daily contact with the project nurse who discussed their illness and discharge arrangements with them. Liaison between hospital and primary care staff. Project nurse visited patients at home after discharge and could make one repeat visit. Control intervention: described as "usual care."	Elderly patients admitted to a suburban hospital	Hospital LOS Readmission to hospital Discharge destination	Adequate sequence generation? Unclear Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Unclear Free of selective reporting? Unclear Baseline data? Yes	Details of measures of outcome not provided Translated from Danish
Jack et al, 2009 (20) N = 749	At admission, the nurse discharge advocate completed the discharge intervention components. With information collected from the hospital team and patient, the discharge advocate created the after-hospital care plan that contained medical provider contact information, dates for appointments and tests, an appointment calendar, a colour-coded drug schedule, a list of tests with pending results at discharge, an illustrated description of the discharge diagnosis, and information about what to do if a problem arises. Information for the after-hospital care plan was manually entered into a Microsoft Word template, printed, and bound to produce an individualized booklet. Discharge advocate used scripts from the training manual to review contents of the after-hospital care plan with the patients. On day of discharge, the plan and discharge summary were faxed to the PCP. Pharmacist telephoned patients 2–4 days after the index discharge to reinforce the discharge plan by using a scripted interview. Pharmacist had access to the care plan and discharge summary and over several days made at least 3 attempts to reach each patient. Pharmacist asked patient to bring drugs to the phone, review them, and address any problems. Pharmacist communicated these issues to the PCP or discharge advocate.	Patients who were emergency admissions to the medical teaching service and who were going to be discharged home	Readmission Patient satisfaction	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	
Kennedy et al, 1987 (31) N = 80	Discharge planning emphasized communication with the patient and family. A primary nurse assessed patients' postdischarge needs. A comprehensive discharge planning protocol was developed that included an assessment of health status, orientation level, knowledge and perception of health status, pattern of resource use, functional status, skill level, motivation, and sociodemographic data. Implementation of the discharge plan by the primary nurse and other members of the health care team. Follow-up visit made to assess discharge placement. Control intervention: not described.	Elderly acute care medical patients in a non-profit teaching hospital	Hospital LOS Readmission to hospital Discharge destination Health status	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	Not clear when intervention implemented
Laramee et al, 2003 (32) N = 287	Early discharge planning and co-ordination of care and individualized and comprehensive patient and family education. Case manager assisted in the co-ordination of care by facilitating the discharge plan and obtaining needed consultations from social services, dietary services, and physical/occupation therapy. If needed, arrangements were made for additional services or support once the patient had returned home. Case manager also facilitated communication in the hospital among patient and family, attending physician, cardiology team, and other practitioners by participating in	Patients admitted to an academic medical centre with confirmed HF who were at risk for early readmission	Readmissions Mortality Hospital bed days Resource use Patient satisfaction Follow-up at 3 months	Adequate sequence generation? Unclear Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting?	

Author, Year, Size	Intervention	Patient Population	Outcomes	EPOC Risk of Bias	Limitations/Comments
	daily rounds, documenting patient needs in the medical record, submitting progress reports to the primary care physician, involving the patient and family in developing the plan of care, collaborating with the home health agencies, and providing informational and emotional support to the patient and family. 12 weeks of enhanced telephone follow-up and surveillance. Control intervention: social services evaluation (25% for usual care group), dietary consultation (15% usual care), physiotherapy/occupational therapy (17% usual care), drug and HF education by staff nurses and any other hospital services. Home care (44%).			Unclear Baseline data? Yes	
Moher et al, 1992 (33) N = 267	A nurse employed as a team co-ordinator acted as a liaison between members of the medical team and collected patient information. The nurse facilitated discharge planning. Control intervention: standard medical care.	Elderly medical patients admitted to a teaching hospital	Hospital LOS Readmission to hospital Discharge destination Patient satisfaction	Adequate sequence generation? Yes Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	Baseline data recorded only on age, sex, diagnosis Not clear when intervention implemented
Naji et al, 1999 (34) N = 343	Psychiatrist telephoned GP to discuss patient and make an appointment for the patient to see the GP within 1 week following discharge. A copy of the discharge summary was given to the patient to hand deliver to the GP. Control intervention: standard care. Patients advised to make an appointment to see their GP and were given a copy of the discharge summary to hand deliver to the GP.	Acute psychiatric admissions	Readmission Mental health status Discharge process Follow-up at 1 month for patient assessed outcomes 6 months for readmissions	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? Yes Incomplete outcome data addressed? Unclear Free of selective reporting? Unclear Baseline data? Yes	Psychiatric patients
Naughton et al, 1994 (35) N = 111	A geriatric evaluation and management team assessed the patient's mental and physical health status and psychosocial condition to determine level of rehabilitation required and social needs. A geriatrician and social worker were the core team members. Team meetings with the team and nurse specialist and physical therapist took place twice a week to discuss patients' medical condition, living situation, family and social supports and patient and family's understanding of the patient's condition. Social worker responsible for identifying and co-ordinating community resources and ensuring the posthospital treatment place was in place at the time of discharge and 2 weeks later. Nurse specialist co-ordinated the transfer to home health care. Patients who did not have a primary care provider received outpatient care at the hospital. Control intervention: received "usual care" by medical house staff and an attending physician. Social workers and discharge planners were available on request.	Elderly medical patients admitted from ED in a non-profit academic medical centre	Hospital LOS Discharge destination	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	Intervention implemented at time of admission
Naylor et al, 1994 (24)	Discharge plan included a comprehensive assessment of the needs of the elderly patient and their caregiver, an education component for the patient and family, and interdisciplinary communication regarding	Elderly medical and cardiac surgery patients in an academic medical	Hospital LOS Readmission to hospital	Adequate sequence generation? Unclear	Intervention implemented at time of admission

Author, Year, Size	Intervention	Patient Population	Outcomes	EPOC Risk of Bias	Limitations/Comments
N = 276	discharge status. Implemented by geriatric nurse specialist and extended from admission to 2 weeks postdischarge with ongoing evaluation of the effectiveness of the discharge plan. Control intervention: routine discharge planning available in the hospital.	centre	Health status	Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	
Nazareth et al, 2001 (36) N = 362	Hospital pharmacist assessed and rationalized the patients' drug treatment, provided information, and liaised with caregiver and community professionals. Aim was to optimize communication between secondary and primary care professionals. Follow-up visit by community hospital 7–14 days after discharge to check drug and intervene if necessary. Subsequent visits arranged if appropriate. Copy of discharge plan given to the patient, caregiver, community pharmacist, and GP. Follow-up in the community by a pharmacist. Control intervention: discharge from hospital following standard procedures, which included a letter of discharge to the GP. Pharmacist did not provide a review of drugs or follow-up in the community.	Elderly patients on ≥ 4 drugs who were discharged from 3 acute wards and 1 long-stay ward	Hospital readmission Mortality HRQOL Client satisfaction Knowledge and adherence to prescribed drugs Consultation with GP	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	
Pardessus et al, 2002 (37) N = 60	All admitted patients during the trial period were screened for inclusion and exclusion criteria. 2-hour home visit by occupational therapist and a physical medicine/rehabilitation doctor to evaluate patient abilities in home environment. Enabled observation of patient in their living conditions.. Social supports addressed by social worker. Modification of home hazards and safety advice in home situation, adaptation of recommendations and prescriptions particularly for physical therapy, speedy evaluation of necessary technical aids and social supports. Telephone follow-up was conducted by an occupational therapist to check if the home modifications were completed and assist if necessary. Control intervention: received physical therapy and were informed of home safety and social assistance if required. No home visit.	Patients aged ≥ 65 years who were hospitalized due to falls and able to return home	Functional status Falls Readmissions Mortality Residential care at 6 and 12 months	Adequate sequence generation? Yes Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Unclear	
Parfrey et al, 1994 (38) N = 841	Developed a questionnaire to identify patients requiring discharge planning. Assessment based on the questionnaire that covered the patient's social circumstances at home, if the admission was an emergency admission or a readmission, use of allied health and community services, mobility and activities of daily living, and medical or surgical condition. Referrals to allied health professionals following completion of the questionnaire for discharge planning. Control intervention: did not receive the questionnaire. Discharge planning occurred if the discharge planning nurses identified a patient or received a referral.	Medical and surgical patients	Hospital LOS at 6 and 12 months	Adequate sequence generation? Unclear Allocation concealment? Yes Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	Intervention implemented at time of admission

Author, Year, Size	Intervention	Patient Population	Outcomes	EPOC Risk of Bias	Limitations/Comments
Preen et al, 2005 (39) N = 189	Discharge planning was based on the Australian Enhanced Primary Care Program and tailored to each patient. Discharge plan was developed 24–48 hours prior to discharge. Problems were identified from hospital notes and patient/caregiver consultation, goals were developed and agreed upon with the patient/caregiver based on personal circumstances and interventions, and community service providers who met patient needs and who were accessible and agreeable to the patient were identified. Discharge plan was faxed to the GP and consultation with the GP was scheduled within 7 days postdischarge. Copies faxed to all service providers identified on the care plan. Research nurse followed up if GP did not respond in 24 hours and the GP scheduled a consultation (within 7 days postdischarge) for patient review. Control intervention: patients were discharged under the hospitals' existing processes following standard practice in Western Australia where all patients have a discharge summary completed, which was copied to their general practitioner.	Patients with COPD, cardiovascular disease, or both in 2 tertiary hospitals	SF-12 Patient satisfaction and views of discharge process and GP views of the discharge planning process at 7 days postdischarge	Adequate sequence generation? Unclear Allocation concealment? Yes Blinding? No Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	
Rich et al, 1993 (40) N = 98	Intensive education about HF and its treatment during daily visits by cardiovascular research nurse to discuss diagnosis, symptoms, treatment, follow-up, and prognosis using a 15-page booklet. Dietary advice by dietician and study nurse. Assessment of medication with recommendations designed to improve compliance and reduce adverse effects. Drug card provided detailing the time, dose, and side effects of all drugs. Daily recording of weights emphasized and patients instructed to contact researchers for weight changes in excess of 3 to 5 pounds. Scales provided if needed. Early discharge planning. Patient seen by social worker and member of the home care team to facilitate discharge planning and ease the transition from the hospital to home. Economic, social, and transport problems identified and managed. Enhanced follow-up through home care and telephone contacts with additional assistance provided if needed. Patients visited at home within 48 hours of discharge and then 3 times in the first week and at regular intervals thereafter. At each visit, home care nurse reinforced the teaching materials, reviewed medications, diet and activity guidelines, physical assessment and cardiovascular examination plus assessed for additional problem areas. Study nurse contacted patients by phone and patients were encouraged to call researchers or personal physician with any new problems or questions. Control intervention: all conventional treatments as requested by the patient's attending physician. These included social service evaluation, dietary and medical teaching, home care, and all other available hospital services. Received study education materials and formal assessment of drugs.	Older people with HF in an academic medical centre	Hospital LOS Readmission to hospital Readmission days HRQOL	Adequate sequence generation? Yes Allocation concealment? Unclear Blinding? Yes Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	
Rich et al, 1995 (41) N = 282	Inpatient assessment included using a teaching booklet, individualized dietary assessment and instruction by dietician with reinforcement by the cardiovascular research nurse, consultation with social services, assessment of drugs by geriatric cardiologist, intensive follow-up after discharge through the hospital's home care services plus	Admitted to an academic medical centre with confirmed HF and at least one risk factor for readmission	Mortality Readmission to hospital HRQOL	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? Yes Incomplete outcome data	HRQOL data were collected from a subgroup of patients only (n = 126).

Author, Year, Size	Intervention	Patient Population	Outcomes	EPOC Risk of Bias	Limitations/Comments
	individualized home visits and telephone contact with the study team. Control intervention: received all standard treatment and services ordered by their primary physicians.			addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	
Shaw et al, 2000 (42) N = 97	Predischarge assessment with a pharmacy checklist that assessed patients' knowledge and identified particular problems such as therapeutic drug monitoring, compliance aid requirements, and side effects. Pharmacy discharge plan supplied to the patients' community pharmacist for the intervention group. Control intervention: not described.	Patients discharged from a psychiatric hospital or care of the elderly ward	Readmission to hospital Readmission due to noncompliance Drug problems after discharge	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? No Incomplete outcome data addressed? Unclear Free of selective reporting? Unclear Baseline data? Yes	Psychiatric patients
Sulch et al, 2000 (43) N = ?	Rehabilitation and discharge planning with regular review of discharge plan. Senior nurse implemented and integrated care pathway. Multidisciplinary training preceded implementation of the pathway. Pathway piloted for 3 months prior to recruitment to the trial. Control intervention: to avoid contamination, the multidisciplinary process of care received by the control group was reviewed with a 3-month run-in period to ensure implementation. Both groups received comparable amounts of physiotherapy and occupational therapy.	Patients recovering from stroke in a stroke rehabilitation unit at a teaching hospital	Hospital LOS Discharge destination Mortality at 26 weeks Mortality or institutionalization Activities of daily living HRQOL	Adequate sequence generation? Yes Allocation concealment? Yes Blinding? No Incomplete outcome data addressed? Yes Free of selective reporting? Unclear Baseline data? Yes	
Weinberger et al, 1996 (44) N = 1,396	3 days before discharge a primary nurse assessed the patient's postdischarge needs. 2 days before discharge the primary care physician visited the patient and discussed patient's discharge plan with the hospital physician and reviewed the patient. Primary nurse made an appointment for the patient to visit the primary care clinic within 1 week of discharge. Patient given educational materials and a card with the names and beeper numbers of the primary care nurse and physician. Primary care nurse telephoned the patient within 2 working days of discharge. Primary care physician and primary nurse reviewed and updated the treatment plan at the first postdischarge appointment. Control intervention: did not have access to the primary care nurse and received no supplementary education or assessment of needs beyond usual care.	Multicentre patients with diabetes, HF, and COPD	Readmission to hospital Health status Patient satisfaction Intensity of primary care		Discharge planning within 3 days of discharge 9 Veterans Administration hospitals participated in the trial

Abbreviations: COPD, Chronic Obstructive Pulmonary Disease; ED, emergency department; EPOC, Effective Practice and Organization of Care Group; HF, heart failure; HRQOL, health-related quality of life; LOS, length of stay; PCP, primary care provider; RN, registered nurse.

Source: Shepperd et al, 2009. (4).

Table A3: Summary of Interventions Tested in Randomized Controlled Trials

Author, Year, Sample Size, Country	Population	Interventions											
		Predischarge Interventions				Postdischarge Interventions					Interventions Bridging the Transition		
		Patient Education	Discharge Planning	Medication Reconciliation	Appointment Scheduled Before Discharge	Timely PCP Communication	Timely Clinic Follow-up	Follow-up Telephone Call	Postdischarge Hotline	Home Visit	Transition Coach	Patient-Centred Discharge Instructions	Provider Continuity
Balaban et al, 2008 (12) N = 96 United States	Community hospital					X		X				X	X
Bolas et al, 2004 (28) N = 243 Ireland				X					X				X
Evans et al, 1993 (17) N = 835 United States	Veterans Affairs; **high risk**		X										
Harrison et al, 2002 (29) N = 200 Canada		X						X		X			X
Hendriksen et al, 1989 (30) N = 273 Denmark		X	X							X			X
Jack et al, 2009 (20) N = 738 United States	Medical/ surgical ward	X	X	X		X		X				X	
Kennedy et al, 1987 (31) N = 80 United States			X							X		X	
Laramee et al (32) 2003, N = 287 United States		X						X				X	
Moher et al, 1992 (33) N = 267 Canada			X										
Naji et al, 1999 (34) N = 343 Scotland					X	X	X						X
Naughton et al, 1994 (35) N = 111 United States					X		X					X	
Naylor et al, 1994 (24) N = 142 United States	Cardiac (medical/ surgical), geriatric	X	X					X	X		X	X	
Nazareth et al, 2001 (36) N = 362 United Kingdom				X		X	X						X

Author, Year, Sample Size, Country	Population	Interventions											
		Predischarge Interventions					Postdischarge Interventions				Interventions Bridging the Transition		
		Patient Education	Discharge Planning	Medication Reconciliation	Appointment Scheduled Before Discharge	Timely PCP Communication	Timely Clinic Follow-up	Follow-up Telephone Call	Postdischarge Hotline	Home Visit	Transition Coach	Patient-Centred Discharge Instructions	Provider Continuity
Pardessus et al, 2002 (37) N = 60 France								X		X		X	
Parfrey et al, 1994 (38) N = 841 Canada			X									X	
Preen et al, 2005 (39) N = 189 Australia			X			X						X	X
Rich et al, 1993 (40) N = 98 United States		X	X	X				X		X		X	
Rich et al, 1995 (41) N = 282 United States		X						X		X			
Shaw et al, 2000 (42) N = 97 Scotland				X									X
Sulch et al, 2000 (43) N = 152 United Kingdom			X										
Weinberger et al, 1996 (44) N = 1,396 United States			X		X	X	X	X					X

Abbreviations: PCP, primary care provider.

Source: Shepperd et al, 2009. (4)

Table A4: Randomized Controlled Trials

Author, Year, Country	N	Comprehensive Discharge Plan Plus Postdischarge Support	Duration of Follow-up (months)
Single Home Visit			
Stewart et al, 1998 (45) Australia	97	Medication counselling and review by clinical pharmacist to promote medication adherence; home visit within 2 weeks of discharge	6
Stewart et al, 1999 (46) Australia	200	Medication review and counselling by clinical pharmacist to promote medication adherence; home visit within 2 weeks of discharge	6
Jaarsma et al, 1999 (19) Holland	179	Medication review and counselling; information card with advice about diet, sodium, and fluid restriction; psychosocial support; home visit within 10 days of discharge	9
Increased Clinic Follow-up and/or Frequent Telephone Contact			
Cline et al, 1998 (47) Sweden	190	7-day medication organizer; diary to record signs of worsening HF (e.g., body weight, ankle circumference, fatigue); diuretic adjustment; home visit within 2 weeks of discharge	12
Rainville, 1999 (26) United States	34	Medication review and counselling by clinical pharmacist; increased communication between providers; telephone follow-up	12
Oddone et al, 1999 (47) and Weinberger et al. 1996 (44;48) United States	443	Measurement of daily weights; diuretic adjustment, medication review; increased communication between providers; prescheduled clinic appointments in the 6 months after discharge	6
McDonald et al, 2002 (49) Ireland	98	Medication review and counselling; dietary counselling, salt restriction; measurement of daily weights; diuretic adjustment; telephone follow-up at 3 days, then weekly for 12 weeks after hospital discharge	3
Home Visits and/or Frequent Telephone Contact			
Naylor et al, 1994 (24) United States	142	Geriatric discharge protocol; co-ordination of home care; increased communication between providers, telephone follow-up, home visits over 2 weeks after discharge	3
Naylor et al, 1999 (50) United States	108	Geriatric discharge protocol; co-ordination of home care; increased communication between providers, telephone follow-up home visits over 4 weeks after discharge	6
Serxner et al, 1998 (51)	109	Reinforcement of medication adherence; daily weights; dietary restrictions; increased communication between providers; additional mailing of educational materials; telephone follow-up for 3 months after discharge	3

Author, Year, Country	N	Comprehensive Discharge Plan Plus Postdischarge Support	Duration of Follow-up (months)
United States			
Blue et al, 2001 (52) England	165	Dietary counselling; optimization of medications; increased communication between providers; home visits; telephone follow-up	12
Riegel et al, 2002 (53) United States	358	Computerized assessment of patient and caregiver support; telephonic case management; monitoring of weight gain and dyspnea; increased communication between providers; multiple telephone calls for 6 months after discharge	6
Krumholz et al, 2002 (54) United States	88	Nurse-recommended follow-up based on patients' reports of symptoms; telephone monitoring; follow-up for 12 months after discharge	12
Extended Home Care Services			
Rich et al, 1993 (40) United States	98	Dietary and social service consultation; medication review by geriatric cardiologist; increased communication between providers; intensive follow-up for 3 months after discharge	3
Rich et al, 1995 (41) United States	282	Dietary and social service consultation; mediation review by geriatric cardiologist; increased communication between providers; intensive follow-up for 3 months after discharge	12
Harrison et al, 2002 (29) Canada	192	Management of medications, diet, exercise, and stress through community nurse visits; increased communication between providers; telephone follow-up; home care for 2 weeks after discharge	3
Laramee et al, 2003 (32) United States	287	Guidance with medications, diet, fluid intake, and daily weights (e.g., home scales, pill boxes); increased communication between providers; telephone follow-up; home care for 12 weeks after discharge	3
Day Hospital Services			
Capomolla et al, 2002 (55) Italy	234	Exercise training; daily weight monitoring; fluid restriction; physical training; optimal medication regimen; increased communication between providers; available day hospital services for 12 months after discharge	12

Abbreviations: HF, heart failure.
Source: Phillips et al, 2004. (11)

Table A5: Summary of Interventions Tested in Randomized Controlled Trials

Author, Year, Size, Country	Interventions											
	Predischarge Interventions					Postdischarge Interventions				Interventions Bridging the Transition		
	Patient Education	Discharge Planning	Medication Reconciliation	Appointment Scheduled Before Discharge	Timely PCP Communication	Timely Clinic Follow-up	Follow-up Telephone Call	Postdischarge Hotline	Home Visit	Transition Coach	Patient-Centred Discharge Instructions	Provider Continuity
Blue et al, 2001 (52) N = 165 United Kingdom	X		X		X		X		X			X
Capomolla et al, 2002 (55) N = 234 Italy	X		X		X	X					X	
Cline et al, 1998 (47) N = 190 Sweden	X	X		X					X			
Harrison et al, 2002 (29) N = 200 Canada	X						X		X			X
Jaarsma et al, 1999 (19) N = 179 Holland	X						X	X	X	X		
Krumholz et al, 2002 (54) N = 88 United States	X					X	X					
Laramee et al, 2003 (32) N = 287 United States	X				X		X		X		X	
McDonald et al, 2002 (49) N = 98 Ireland	X						X					
Naylor et al, 1994 (24) N = 142 United States	X	X					X	X		X	X	
Naylor et al, 1999 (50) N = 108 United States		X			X		X		X			X
Oddone et al, 1999 (48) and Weinberger et al. (44) N = 443 United States	X			X	X	X	X					X
Rainville, 1999 (26) N = 34 United States	X						X					
Rich et al, 1993 (40) N = 98 United States	X	X	X				X		X		X	
Rich et al, 1995 (41) N = 282 United States	X						X		X			
Riegel et al, 2002 (53) N = 358 United States	X				X		X					X
Serxner et al, 1998 (51) N = 109	X				X		X					X

Author, Year, Size, Country	Interventions											
	Predischarge Interventions					Postdischarge Interventions				Interventions Bridging the Transition		
	Patient Education	Discharge Planning	Medication Reconciliation	Appointment Scheduled Before Discharge	Timely PCP Communication	Timely Clinic Follow-up	Follow-up Telephone Call	Postdischarge Hotline	Home Visit	Transition Coach	Patient-Centred Discharge Instructions	Provider Continuity
United States												
Stewart et al, 1998 (45) N = 97 Australia	X		X						X			
Stewart et al, 1999 (46) N = 200 Australia	X		X						X			

Abbreviations: PCP, primary care provider.

Source: Phillips et al, 2004 (11).

Appendix 3: GRADE Tables

Table A6: GRADE Evidence Profile for Comparison of Predischarge Planning Care and Usual Care

No. of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Readmissions							
2 systematic reviews of RCTs	Some serious limitations (-1) [a]	No serious limitations [b]	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕ Moderate
Length of Stay							
1 systematic review of RCTs	Some serious limitations (-1) [c]	No serious limitations [d]	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕ Moderate
Mortality/Survival							
1 systematic review of RCTs	Some serious limitations (-1) [e]	No serious limitations [f]	No serious limitations	No serious limitations	Undetected	None	⊕⊕⊕ Moderate
HRQOL							
1 systematic review of RCTs	Very serious limitations (-2) [g]	Some serious limitations (-1) [h]	No serious limitations	No serious limitations	Undetected	None	⊕ Very Low
Patient Satisfaction							
1 systematic review of RCTs	Very serious limitations (-2)[i]	Some serious limitations (-1) [j]	No serious limitations	No serious limitations	Undetected	None	⊕ Very Low

Abbreviations: EPOC, Effective Practice and Organization of Care Group; No., number; RCT, randomized controlled trial

[a]Average EPOC Risk of Bias score in studies included in systematic review by Hansen et al was 5 out of 9.

The systematic review by Shepperd et al focused on discharge planning and excluded RCTs evaluating interventions where discharge planning was not the main focus of a multifaceted package of care. It was not possible to assess how some components of the process compared between trials (e.g., inclusion of caregivers and the extent of their care). Adequate sequence generation and allocation concealment were reported in 14/21 and 12/21 trials respectively.

[b]Shepperd et al found a significant difference in readmission favouring discharge planning versus usual care. Hansen et al did not conduct a meta-analysis due to heterogeneity among the included studies and could not make a conclusion as to which comprehensive discharge bundle/package was most effective compared with usual care.

[c] The systematic review by Shepperd et al focused on discharge planning and excluded RCTs evaluating interventions where discharge planning was not the main focus of a multifaceted package of care. It was not possible to assess how some components of the process compared between trials (e.g., inclusion of caregivers and the extent of their care). Adequate sequence generation and allocation concealment were reported in 14/21 and 12/21 trials respectively.

[d]Shepperd et al found a significant difference in hospital LOS favouring discharge planning. Phillips et al (11) did not find a significant difference in hospital LOS between the comprehensive discharge planning and postdischarge follow-up and usual care. Not all studies in the systematic reviews reported on hospital LOS.

[e] The systematic review by Shepperd et al focused on discharge planning and excluded RCTs evaluating interventions where discharge planning was not the main focus of a multifaceted package of care. It was not possible to assess how some components of the process compared between trials (e.g., inclusion of caregivers and the extent of their care). Adequate sequence generation and allocation concealment were reported in 14/21 and 12/21 trials respectively.

[f] Shepperd et al did not find a significant difference in mortality between study arms. No significant heterogeneity in summary statistic.

[g] The systematic review by Shepperd et al focused on discharge planning and excluded RCTs evaluating interventions where discharge planning was not the main focus of a multifaceted package of care. It was not possible to assess how some components of the process compared between trials (e.g., inclusion of caregivers and the extent of their care). Adequate sequence generation and allocation concealment were reported in 14/21 and 12/21 trials respectively. HRQOL was a secondary endpoint in 3 studies that reported this outcome and measured using different scales in subgroups of patients.

[h] A meta-analysis was not conducted by Shepperd et al for the HRQOL outcome due to the heterogeneity and diverse measurement techniques used by the 3 individual studies. One study reported no significant difference between the study arms. Another study only provided HRQOL data for baseline measurements. A third study showed a significant difference between study arms at 26 weeks follow-up in favour of the control group.

[i] This outcome was reported in 3 studies in the systematic review by Shepperd et al and a meta-analysis was not conducted. Satisfaction was reported as a secondary outcome and performed on subgroups of patients using different measurement scales.

[j] Two studies reported a significant difference between study arms, one study did not.

Table A7: GRADE Evidence Profile for Comparison of Predischarge Planning Plus Postdischarge Support and Usual Care

No. of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Readmissions							
2 systematic reviews of RCTs 4 recent RCTs	Some serious limitations (-1) [a]	Some serious limitations (-1) [b]	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low
Length of Stay							
1 systematic review of RCTs	Some serious limitations (-1) [c]	Some serious limitations (-1) [d]	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low
Mortality/Survival							
1 Systematic Review of RCTs 1 recent RCT	Some serious limitations (-1) [e]	Some serious limitations (-1) [f]	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low
HRQOL							
1 systematic review of RCTs 2 recent RCTs	Very serious limitations (-2) [g]	Some serious limitations (-1) [h]	No serious limitations	No serious limitations	Undetected	None	⊕ Very Low
Patient Satisfaction							
1 recent RCT	Very serious limitations (-2) [i]	Some serious limitations (-1) [j]	No serious limitations	No serious limitations	Undetected	None	⊕ Very Low

Abbreviations: EPOC, Effective Practice and Organization of Care Group; HF, heart failure; No., number; RCT, randomized controlled trial

[a]Average EPOC Risk of Bias score in studies included in systematic review by Hansen et al was 5 out of 9.

The systematic review by Phillips et al (11) reported that 16/18 RCTs were assigned a Jadad score of 4 out of 5 and 2 studies reported a score of 3 out of 5. The overall summary estimate was significantly heterogeneous ($P < 0.001$). When a large study was removed from meta-analysis, heterogeneity was reduced but was still significant (P = 0.04)

Some significant differences in baseline characteristics between treatment arms in recent RCTs.

[b]Phillips et al (11) found a significant difference in readmissions favouring comprehensive discharge planning with postdischarge support, however, there was significant statistical heterogeneity. Hansen et al did not conduct a meta-analysis due to heterogeneity among the included studies and could not make a conclusion as to which comprehensive discharge bundle/package was most effective compared with usual care. Of the 4 recent RCTs that were not included in the previous systematic reviews, 1 found a significant difference in readmissions favouring comprehensive pre- and postdischarge care.

[c] The systematic review by Phillips et al (11) reported that 16/18 RCTs were assigned a Jadad score of 4 out of 5 and 2 studies reported a score of 3 out of 5. Hospital LOS was not reported in all studies included in the systematic reviews and of those that did, it was reported as a secondary outcome.

[d]Phillips et al (11) did not find a significant difference in hospital LOS between the comprehensive discharge planning and postdischarge follow-up and usual care. Not all studies in the systematic reviews reported on hospital LOS. None of the 4 recent RCTs reported on hospital LOS.

[e]The systematic review by Phillips et al (11) reported that 16/18 RCTs were assigned a Jadad score of 4 out of 5 and 2 studies reported a score of 3 out of 5. Mortality/survival was not reported in all studies included in the systematic reviews and of those that did, it was reported as a secondary outcome. One of the 4 recent RCTs reported a significant reduction in mortality for patients in the intervention group. (RCT incorporated an additional component to postdischarge follow-up [HF clinics]).

[f]Phillips et al (11) did not find a significant difference in mortality between study arms. One of the 4 recent RCTs reported mortality and found a significant difference favouring comprehensive discharge planning and follow-up (Unlike the studies included in Phillips et al, this RCT also incorporated HF clinic visits as part of the intervention.)

[g]The systematic review by Phillips et al reported that 16/18 RCTs were assigned a Jadad score of 4 out of 5 and 2 studies reported a score of 3 out of 5. HRQOL was not reported in all studies included in the systematic reviews and of those that did, it was assessed using different measurement tools and reported as a secondary outcome.
Two of the 4 recent RCTs reported HRQOL. One study had significant differences in baseline characteristics between study arms and the other RCT incorporated an additional component to postdischarge follow-up (HF clinics).

[h]Phillips et al (11) meta-analyzed data for this outcome and reported that HRQOL scores of intervention patients improved significantly more than usual care patients. (Statistical heterogeneity was not reported.) One of the 4 recent RCTs reported a significant improvement in HRQOL for patients receiving comprehensive discharge planning (this study also incorporated HF clinic visits in the postdischarge follow-up). One RCT reported a significant improvement in HRQOL at one time point during follow-up (12 weeks). No significant difference was found at any other time point (2, 6, 26, and 52 weeks).

[i] Significantly more patients with hypertension in the control group than the treatment group at baseline. This endpoint was a secondary outcome and performed on a subgroup of patients.

[j] Satisfaction with care was greater in intervention patients at 2 and 6 weeks, however, no other time points were reported in a study that lasted 12 weeks.

Table A8: Risk of Bias Among Randomized Controlled Trials for the Comparison of Predischarge Planning Plus Postdischarge Support to Usual Care

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Atienza et al, 2004 (59)	No limitations	Limitations[a]	No limitations	No limitations	No limitations
Naylor et al, 2004 (56)	No limitations	No limitations	No limitations	No limitations	Limitations[b]
Kwok et al, 2008 (57)	No limitations	Limitations[c]	Limitations[d]	No limitations	Limitations[e]
Zhao et al, 2009 (58)	No limitations	Limitations[f]	Limitations[g]	No limitations	Limitations[h]

[a]Blinding not discussed in paper.

[b] Significant difference in baseline hypertension between study arms.

[c] Patients knew their group assignment.

[d] Intent-to-treat analysis not performed.

[e] No statistical comparisons of baseline characteristics, yet differences noted. E.g., 47% (intervention) vs. 25% (control) on security assistance.

[f] Not reported.

[g] Intent-to-treat analysis not performed.

[h] Instruments used to measure patient understanding, adherence and satisfaction not standardized or validated. Data regarding extent of coronary heart disease in patient arms not reported (severity).

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