Sailing home

A better journey for patients through transitions of care

Verhaegh, K.J.M.

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ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor
aan de Universiteit van Amsterdam
op gezag van de Rector Magnificus
prof. dr. ir. K.I.J. Maex
ten overstaan van een door het College voor Promoties ingestelde commissie,
in het openbaar te verdedigen in de Aula der Universiteit
op woensdag 4 september 2019, te 13:00 uur

door

Kim Johannes Maria Verhaegh
geboren te Tegelen

Promotiecommissie:

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Faculteit der Geneeskunde

Voor Joost, Hannah en Steffi

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General introduction

Impact of acute hospitalization

With an aging population and changing lifestyles, the incidence and prevalence of chronic diseases have grown steadily worldwide. It is estimated that half of the population in the Netherlands is living with a chronic disease (1). Especially, the prevalence of chronic diseases among elderly is common. More than 90% of 75-plus older adults are diagnosed with a chronic disease (1, 2). Multimorbidity, the presence of two or more chronic diseases in one patient, is prevalent in 50% of the people living with a chronic disease (1). From the age of 40, the prevalence of multimorbidity increases. More than two third of people 65 years and older have multimorbidity (1, 2). Given their high prevalence, it is presumed that people with multiple chronic diseases account for a very large proportion of healthcare utilization and costs. The care for patients with multiple coexisting diseases is complex and requires care coordination across multiple providers and settings. Almost all chronically ill patients have contact with their primary caregiver or medical specialist several times per year (3). The high healthcare costs may also be related to an increased risk for acute hospitalization. On average, 20% of chronically ill patients is hospitalized every year compared to 7% of the total population and 12% to 16% of elderly people (65+) (2, 4). The reason for acute hospitalization is often complex and caused by multiple health issues. Many of the hospitalized chronically ill patients present themselves with other pre-existing conditions apart from the acute onset of disease. Therefore, involvement of several different healthcare care professionals in managing the multiple chronic conditions is necessary. Chronically ill patients aged 65 and over are especially vulnerable for acute hospitalization when functional limitations are present (5, 6). Also, multimorbidity often leads to treatment with multiple medications (polypharmacy), which may predispose patients to a number of adverse consequences, including adverse drug reactions, geriatric syndromes, such as mobility problems and malnutrition, and mortality (7-9).

Hospital admission itself is considered a health risk, especially for older patients. Patients can experience substantial stress in addition to disruption of their normal physiological systems (10). During the first days of hospitalization functional decline can occur due to the medical illness or other factors such as iatrogenic effects of the treatment, immobilization, impaired cognitive status, or lower functional status before the hospitalization (11). The hospital environment has traditionally focused on medically managing the disease and therefore is designed for the rapid and effective delivery of care, not so much on improving patient function (12). Many hospitalized patients may never regain their previous health state or activities of daily living and have to adjust to a new normal (13, 14).

The healthcare system and resources available for delivering services to chronically ill patients have undergone major changes in the last decade. Progress in medical technologies and treatment procedures has reduced the need for long hospitalizations. Also, the financial and economic crisis, which started in the Netherlands 2008, provided a further stimulus to reduce hospital capacity as part of governmental policies to reduce public spending on health. Since 2000, the number of hospital beds per population has decreased. In the Netherlands, on average, the number fell from 6.7 beds per 1000 population in 2000 to 5.2 in 2014, a reduction of over 20% on a per capita basis (15). This reduction in number of hospital beds has been accompanied by a reduction in the average length of stay. As a consequence, patients are discharged in a more vulnerable condition and recovery starts when people are discharged home.

In the Netherlands, also intermediate- and long-term care health policies on have been revised in the last decade. Due to budget reforms in long-term care, more and

more people with complex care needs are to be cared for at home with the support of their informal caregivers. Therefore, hospitals need to prepare patients and their caregivers for their return back home, promote recovery and prevent any negative health outcomes or adverse events after hospital discharge.

Organization of hospital discharge for acutely hospitalized patients

As rates of chronic conditions rise, preparing patients for hospital discharge becomes increasingly important to improve health outcomes and costs. To control exposure to risk factors the majority of chronically ill patients need to be supported in self-care. Studies have shown that hospitals can support these patients by providing a wide mix of basic interventions, such as discharge planning, patient education, providing discharge summaries, medication reconciliation, and post-discharge follow-up (16, 17). Furthermore, engagement of patients and their families in the management of healthcare is imperative to improve health outcomes. Patient and family engagement are an important dimension of patient-centered care. The Institute of Medicine defines patient-centered care as: "Providing care that is respectful of, and responsive to, individual patient preferences, needs and values, and ensuring that patient values guide all clinical decisions." (18). In total, the Picker Institute has identified eight dimensions of patient-centered care necessary to include in the delivery of patient-centered care:
- Respect for patients' values, preferences, and expressed needs;
- Coordination and integration of care;
- Information, communication and education;
- Physical comfort;
- Emotional support and alleviation of fear and anxiety;
- Involvement of family and friends;
- Transition and continuity;
- Access to care (19).

In addition, a central focus of improving patient discharge is interprofessional communication and collaboration (20).

Unplanned hospital readmission

Hospital readmission is an unplanned admission to an acute care hospital within a subsequent timeframe (mostly within 30 days) of a discharge from the same or another hospital. Nearly twenty percent of patients who have been discharged from the hospital are readmitted within 30 days (21, 22). Poor organization of hospital care, communication failures and follow-up care are factors that contribute to an unplanned hospital readmission (23). Many of these hospital readmissions are potentially preventable. Although there is much variation, it is estimated that the mean proportion of readmissions deemed avoidable is 27% (24).

Reasons for hospital readmission are multi-factorial and often not related to the condition that led to the index hospitalization (25). Patient-level factors such as age, multimorbidity and functional status might increase the risk for unplanned hospital readmission (26, 27). Also, social determinants of health could influence unplanned hospital readmissions. Social determinants of health are defined as: "the conditions in which people are born, grow, live, work and age. These conditions are shaped by families and communities and by the distribution of money, power, and resources worldwide, national, and local levels, and affected by policy choices at each of these levels" (28).

This means that patients with identical conditions may have different post-discharge outcomes, depending on the supports or resources available to them.

Unplanned hospital readmission may also be related to hospital or health-system level factors, such as inappropriate assessment of discharge readiness (29). Shortened lengths of stays heighten the challenge to properly assess and address the discharge care needs of chronically ill patients during the index hospitalization. Research shows that countries with a longer median length of stay for heart failure hospitalizations appear to have lower rates of readmissions within 30 days (30). Keeping some patients one extra day in the hospital may be an opportunity to improve the quality of hospital discharge care by reducing 30-day hospital readmission (31).

Patient who are recently hospitalized are not only recovering from their acute illness, they also experience a period of generalized risk for a range of adverse health events that can lead to an unplanned hospital readmission (10). For instance, many of the adverse events that result in unplanned hospital readmissions are related to medication complexity regimen or medication errors due to inadequate medication reconciliation during care transitions (32). Patients who experience one or more adverse events during hospitalization may be at greater risk for hospital readmission (29, 33-35). Furthermore, hospitalized patients often present themselves with complex care needs who require more intensive medical services coordinated across multiple providers and possibly community (home)-based care (36). Receiving care from multiple healthcare professionals across different care settings increases the possibility for fragmented care and miscommunication (23, 37, 38). Also, the timeliness of post discharge follow-up may be associated with readmission risk (39, 40). It is assumed that unplanned hospital readmission can be partly prevented if appropriate interventions are provided adequately. For this reason, a systematic and integrated approach is necessary that is targeted to the specific needs of patients with long-term conditions.

Preventing unplanned hospital readmission

Internationally, increased attention has been paid to reduce the number of unplanned hospital readmissions. Especially hospital readmissions occurring shortly (defined as short-term, 30 days or less, readmissions) after hospital discharge of the index hospitalization is thought to be more under hospital's control and more preventable than later ones (41). The majority of preventable readmissions appear to occur shortly in the days immediately following hospital discharge and may reflect factors related to the discharge process and care coordination (42). Hospital readmissions have been used increasingly as an outcome measure for assessing the performance of hospitals (43). In the USA and the UK hospital readmission policy has been linked to financial and quality incentives to decrease the number of hospital readmission rates (44, 45). In the Netherlands, unplanned hospital readmission within 30 days of the index hospitalization is used as a quality indicator and regarded as a major adverse event after hospital discharge (46). However, this approach is useable only when we know what hospital readmissions are preventable and what practical and effective interventions can be implemented to improve transitions of care.

Although hospitals are stimulated to improve discharge planning, the actual recovery of patients takes place after hospital discharge. To improve care transitions, hospitals need to focus on the post-acute care and implement a coherent set of interventions designed to create connectivity, alignment and collaboration between primary and secondary care settings. The goal of these transitional care interventions is

to enhance quality of care and life, patient satisfaction, and system efficiency for patients by cutting across multiple services, providers and settings (47). In order to provide these interventions adequately it is necessary to identify which patients need what type of support during care transitions. The majority of chronic care patients (70-80%) receive basic discharge interventions, which includes support for self-management of their illness. Only high-risk and highly complex patients receive transitional care interventions, which combines disease and case management and self-management. This service delivery model has a proactive approach that is focused on integrating organizations and disciplines (48).
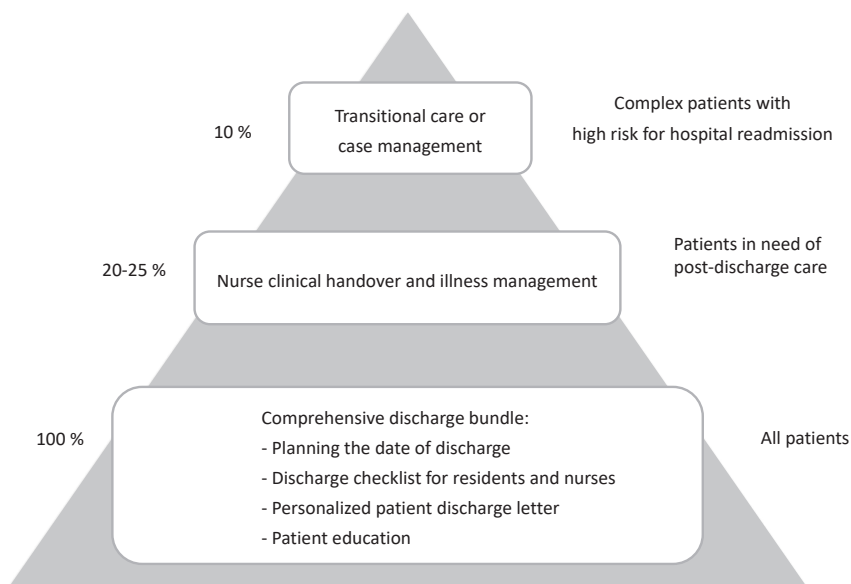
Figure 1 Adapted from the Kaiser Permanente model (49) and Seben et al. (50). Illustrating different levels of care coordination from hospital to home. Higher risk for hospital readmission indicates more intensive care coordination. The population of chronically ill people is stratified into three groups and supply of different type of services according to needs.

The rational for transitional care interventions

A more integrative or interprofessional focus on health care is needed for the future care demands of patients at high risk for hospital readmission. These patients are often discharged from the hospital in a state of physiologic, psychological and functional vulnerability, which can have a negative effect on their capacity of enacting self-care (10). Therefore, patients at high risk for poor outcomes after hospital discharge and their informal caregivers may benefit from transitional care interventions (51, 52). Transitional care interventions are defined as a "broad range of services and environments designed to promote the safe and timely passage of patients between levels of health care across care settings" (53). The bundle of interventions should be initiated during hospitalization and continued after discharge through home visits or telephone follow-up for a minimum of one month (54). From the first introduction in the 1990s (52, 55), many studies have supported its value in different patient populations with complex care

needs (16, 17, 56). It has been shown that transitional care interventions are effective in reducing all-cause hospital readmissions (57). The focus on all-cause readmission rates stimulates hospitals to focus not only on the acute disease, but also on patient's comorbidity, psychological, social and environmental conditions. Besides, this patient-centered care approach aims to view health and illness that affects a person's general well-being and an attempt to empower the patient by expanding his or her role in the patient's healthcare (58).

Content of the thesis

The overall aim of this thesis is to improve patient-centered care for acutely admitted chronically ill patients in the transition from hospital to home to prevent unplanned hospital readmission. Specific aims were to provide insight into organizational, behavioral, and social factors associated with unplanned hospital readmission. We assessed the effectiveness of a comprehensive discharge bundle to improve the transition from hospital to home for chronically ill patients, explored patients' perspective on care transitions, and tried to summarize the impact of transitional care interventions to prevent unplanned hospital readmission.

The discharge process starts on the day patients are acutely admitted to the hospital. This thesis investigated the effect of multiple strategies to improve the transition from hospital to home for acutely hospitalized patients. In **part 1** of this thesis we aimed to improve the transition from hospital to home for chronically ill patients and interprofessional collaboration and communication between healthcare professionals. In **chapter 2** we describe the effect of a comprehensive discharge bundle on hospital readmission in acutely hospitalized medical patients. We also determined the effect of the discharge bundle on duration of the readmission, time to readmission, length of stay, total number of general practitioner and emergency department visits, mortality, time until sending the medical discharge letter to the general practitioner and patient satisfaction on the overall discharge process. In **chapter 3** we describe the findings of a quality improvement project, in which the development and implementation of a personalized patient discharge letter is evaluated on information provision at hospital discharge. We also studied the feasibility, barriers and facilitators of integrating the personalized patient discharge letter into daily practice. In **chapter 4** we present the findings of a focus group study, in which the views of healthcare professionals are explored on establishing effective interprofessional communication and collaboration between healthcare professionals and patients during the medical round. We consider the daily medical round as one of the most important steps in discharge planning.

In **part 2** of this thesis we focused on patient-centered care for chronically ill patients at risk for unplanned hospital readmissions. In **chapter 5** we describe the findings of a qualitative study, in which we explore the views of chronically ill patients on unplanned hospital readmissions. Chapter 5 also describes barriers in the transition from hospital to home from the perspective of chronically ill patients that might have resulted in an unplanned hospital readmission. In **chapter 6** we investigate if social determinants of health, like social support and social network, are associated with unplanned readmissions within 180 days after hospital discharge.

In the third part we focus on transitional care interventions for patients at high risk for unplanned hospital readmissions. In **chapter 7** we examine the effectiveness of transitional care interventions on the rates of readmission for patients discharged from a hospital to their homes through a systematic review and meta-analysis of the

literature.

Chapter 8 provides a discussion of the results from the preceding chapters, describing the implications for clinical practice and recommendations for future education and research.

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Part

1

Managing hospital discharge for chronically ill patients

2

The implementation of a comprehensive discharge bundle to improve the discharge process: a quasi-experimental study

Kim J Verhaegh, Bianca M Buurman, Gwenda C Veenboer,
Sophia E de Rooij, Suzanne E Geerlings

Abstract

Background: Hospitalised patients are especially vulnerable in times of transitions in care. Structured discharge planning might improve patient outcomes. We implemented and assessed the effect of a multidisciplinary discharge bundle to reduce 30-day readmission.

Methods: A pre-post-test design study with a follow up of one month at four internal medicine wards in a Dutch university teaching hospital. Eligible patients were 18 years and older, acutely admitted and hospitalized for at least 48 hours. The discharge bundle consisted of (1) planning the date of discharge within 48 hours after admission, (2) a discharge checklist, (3) a personalized patient discharge letter, and (4) multidisciplinary patient education. The primary outcome measure was unplanned 30-day readmission.

Results: Participants in the post-test group (n = 204) did not have a lower rate of unplanned hospital readmission than those receiving usual care (n = 224) (12.9% vs. 13.2%, p = 0.93). The medical discharge summaries were sent to the GP faster in the post-test period (median of 14 days pre-test vs. 5 days post-test, p < 0.001) and this group had also a trend towards a longer time to first readmission (14 vs. 10 days, p = 0.06). Patient satisfaction was high in both groups (7.5 and 7.4 points, (p = 0.49)).

Conclusions: The comprehensive discharge bundle was not effective in reducing the rate of readmission and increasing patient satisfaction, but medical discharge summaries were sent faster to the general practitioner and a trend to a longer time to readmission was present.

Introduction

Over 20% of the patients who have been recently discharged from the hospital are readmitted within 30 days (1, 2). One in five patients experience an adverse event after discharge. Almost half of the adverse events are potentially preventable (3) and are likely to be associated with discontinuities in the discharge period, such as the lack of a standardised discharge planning (4), pending test results at discharge (5), medication changes during hospitalisations (6), poor communication between hospital professionals and primary care providers (7, 8) and between inpatient and outpatient pharmacies (9). Furthermore, patients and their caregivers are often not prepared to perform self-care at discharge because they might have an inadequate understanding of their diagnosis, medications, and follow-up needs (10). Currently, in the USA unplanned hospital readmission within a 30-day period is used as an outcome indicator for hospitals to assess quality of care and for some diagnosis, readmissions are not reimbursed under the Affordable Care Act (11).

Research on improvement of the hospital discharge process (12-16) showed that structured discharge planning (12), patient education (13, 14), medication reconciliation (15), and programmed care follow-ups (16) are associated with a decrease of adverse events including readmission. Most of these studies were focused on specific patient populations or diagnoses or consisted of single-component interventions offered by one discipline (12, 15, 16). Multi-disciplinary interventions, joined in a so-called bundle of interventions addressing patient-centeredness, effective communication and a standardised discharge process seem to be more promising in reducing post-discharge emergency department visits and unplanned hospital readmissions together with increased patient satisfaction (13, 14, 17, 18).

The primary aim of this study in medical patients was to evaluate whether the implementation of a comprehensive discharge bundle was associated with a reduction of hospital readmission within 30 days of discharge. The secondary aim of our study was to evaluate the effect of the discharge bundle on duration of the readmission, time to readmission, length of stay, total number of general practitioner (GP) and emergency department visits, mortality, time until sending the medical discharge letter to the GP and patient satisfaction on the overall discharge process.

Methods

Design and setting

This pre-post-test design study was conducted between September 2010 and December 2012 at four general medicine wards in the Academic Medical Center (AMC) in Amsterdam, the Netherlands, as in a previous comparable project (19). The AMC is a 1024-bed university teaching hospital. The attending staff consisted of residents, registered nurses, and medical specialists. The study was subdivided in three time periods. The pre-test period ranged from September 2010 to March 2011, the intervention was implemented between April 2011 and January 2012, and the post-test period ranged from January 2012 to December 2012. After the post-test phase the discharge bundle was implemented on all wards throughout the whole hospital.

Patients

Eligible patients had to meet the following criteria: (1) 18 years or older, (2) acutely admitted at one of the four general medicine wards for more than 48 hours, (3) discharged home, (4) able to speak or understand Dutch, (5) have a working telephone, (6) showed no notification of cognitive impairment in the medical record, and (7) had an estimated life expectancy of more than three months. Written informed consent was obtained prior to enrolment. The study was approved by the Medical Ethics Committee of the Academic Medical Center, University of Amsterdam, the Netherlands.

Data collection procedure

Data collection, performed by a trained research nurse, was equal in the pre-intervention and post-intervention period. The research nurse identified eligible patients daily before hospital discharge of the index admission and approached them in the hospital or by telephone within 48 hours of discharge to obtain informed consent. At discharge, a questionnaire was sent to their home address consisting of questions addressing (1) demographic variables, (2) patient satisfaction on the overall discharge procedure, (3) communication of the date of discharge, (4) the personalized patient discharge letter, and (5) topics that were included in verbal patient education before discharge. Four weeks after discharge patients were contacted once again for a follow-up telephone survey to assess the patients' hospital readmission and healthcare utilisation over a four-week period after hospital discharge. Baseline data of participants, including length of index hospital stay, admission diagnoses and comorbidities, were obtained at the time of recruitment by review of the hospital medical electronic file and discharge summaries. We determined the number of hospital admissions and emergency department visits in the six months before index admission through medical record review (AMC hospital utilisation) and calculated the Charlson Comorbidity Index (CCI) score by using primary and secondary diagnoses recorded on the index admission discharge summary (20).

The pre-test group received standard level of personal health information and communication during hospital stay and discharge. This included a protocolised telephone follow-up within 48 hours after discharge to address critical questions or health problems of the patient and sending a medical discharge letter to the GP.

Construction of the discharge bundle

The discharge bundle was constructed based on focus group meetings with professionals, patient satisfaction surveys, and literature (12-14, 17, 21, 22). The bundle consisted of four elements: (1) planning the date of discharge within 48 hours after admission, (2) a discharge checklist for residents and nurses, (3) a personalized patient discharge letter and (4) patient education.

Concerning the first element, in collaboration with a nurse, the medical resident had to plan and communicate the date of discharge within 48 hours after admission to the patient and his/her caregiver, which was reviewed on a daily basis.

The second element was a discharge checklist for residents and nurses in order to provide a uniform and standardised discharge procedure, which was developed in collaboration with residents and medical specialists and nurses of all four medical wards.

A clear distinction was made between tasks and responsibilities for either physicians or nurses. The checklist contained all the proceedings organized in time schedules from admission to hospital discharge, which had to be completed in the electronic patient medical record before hospital discharge and took the planned date of discharge as the starting point.

Patient education was improved in two ways. Patients and their caregivers received a personalized patient discharge letter at discharge, the third element of the discharge bundle, which was a plain language handover and consisted personalized information about diagnosis, tests, results, diet, medication, daily activities, warning signs, date of clinical follow-up, home-based care, and contact information. Residents and interns were trained monthly in the use of this discharge letter. As part of the intervention, the personalised patient discharge letter was built into the electronic patient medical record and could also be sent digitally to the GP at discharge.

The fourth element, verbal patient education about diagnosis and treatment during hospital stay, lifestyle advices, (changes in) medication and early warning signs after discharge took place by the resident and nurse as a team. Topics of education were derived from the personalized patient discharge letter and discharge checklist, as a combination of written and verbal information has been shown to be most effective in educating patients how to manage their care at home (23). Medication reconciliation was performed when providing the personalised patient discharge letter and during patient education.

Implementation strategies

Several activities were planned to ensure thorough implementation (24). Firstly, the medical and nursing staff were educated about all four elements of the discharge bundle by the project coordinator (KV). Secondly, focus group meetings were held on a monthly basis with the leadership team to evaluate the implementation process. The leadership team consisted of the project coordinator, the staff nurses and medical specialist, one senior level registered nurse and three residents. Furthermore, personal visits to residents and their supervisors took place every two months to explain the bundle. The final purpose was to create a combination of tailored change strategies to sustain involvement in the implementation of the interventions and provide optimal support for the other nurses and residents. Thirdly, the personalised patient discharge letter was developed in collaboration with the leadership team, and it was included in the education of all medical Master students. The checklist and personalised patient discharge letter were made electronically available.

Outcomes and definitions of outcomes

The primary endpoint was an unplanned hospital readmission within 30 days after discharge from the index hospitalisation. This was measured in two ways: (1) with data from the medical records and (2) with self-reports by the patients. Any emergency department visit in which a participant was subsequently hospitalised was counted as an unplanned readmission.

Secondary outcomes included length of initial hospital stay, time to readmission, number and duration of readmission, total number of GP and emergency department visits, mortality, overall patient satisfaction of discharge process, and time until sending the medical discharge letter to the GP. Furthermore, patients reported on the topics that

were covered during verbal patient education with closed and open questions using a standardized questionnaire. We assessed if participants who could not be reached by telephone were alive 30 days after hospital discharge through medical record review.

We conducted a structured process evaluation during the implementation of the discharge bundle with predefined process indicators (25, 26) focused on the discharge process (e.g. number of patients in which the discharge checklist was completed and the personalised patient discharge letter and verbal patient education was provided). The results of these rates were discussed during the focus group meetings.

Data analysis

Descriptive statistics were obtained on the patient characteristics, differences between the pre- and post-test group was examined using Chi-square or Student t-tests. A two sided p-value of < 0.05 was considered to be statistically significant. As we observed significant difference between the pre-test (control) and post-test (intervention) group at baseline, we adjusted the outcome analyses on unplanned 30-day readmission for important covariates. We performed a logistic regression analysis in which unplanned readmission (data from the medical records) served as dependent variable and the group allocation (pre-test or post-test) was the independent variable. Based on literature (27, 28), the following variables as well as those which significantly differed between the two groups were treated as covariates: age, sex, ethnicity, living arrangement, discharge diagnosis, CCI score, total number of readmissions in the six months before the index admission, and length of stay. Because it is known from other studies that patients with previous admission in the six months before the index admission are at increased risk for a readmission, we also performed a subgroup analysis on outcomes only including those high-risk patients. All analyses were conducted using SPSS 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.).

Results

Patient characteristics

During the study period, 2678 patients from the four medical wards were assessed for eligibility. As listed in Figure 1, 61% did not meet the study criteria because they were not admitted more than 48 hours (28%), were not discharged home (15%), could not speak or understand Dutch (3%), had a notification of cognitive impairment in the medical record (5%), or did not have an estimated life expectancy of more than three months (10%). Ultimately, 428 patients (224 in the pre-test period and 204 in the post-test period) were included in our study of which 30-day readmission data were complete for 428 (100%) of the participants. Table 1 compares the demographic and clinical characteristics of the study population. The pre- and post-test study groups showed significant differences on country of birth (p = 0.01), education level (p = 0.02), living arrangement (p = 0.04), and discharge diagnosis (p ≤ 0.001). No differences were present between the two groups on number of hospital admissions in the preceding six months.

We had missing data on some outcomes; only 342 (80%) patients (161 pre-test and 181 post-test) provided data on GP and emergency department visits after 30 days and

237 (55%) patients (121 pre-test and 116 post-test) rated their satisfaction with the discharge procedure. No differences were present regarding age, sex, and comorbidity between the group with complete data, those without data on their healthcare utilisation and those without data on satisfaction with the discharge procedure between patients with complete and missing data on secondary outcomes.
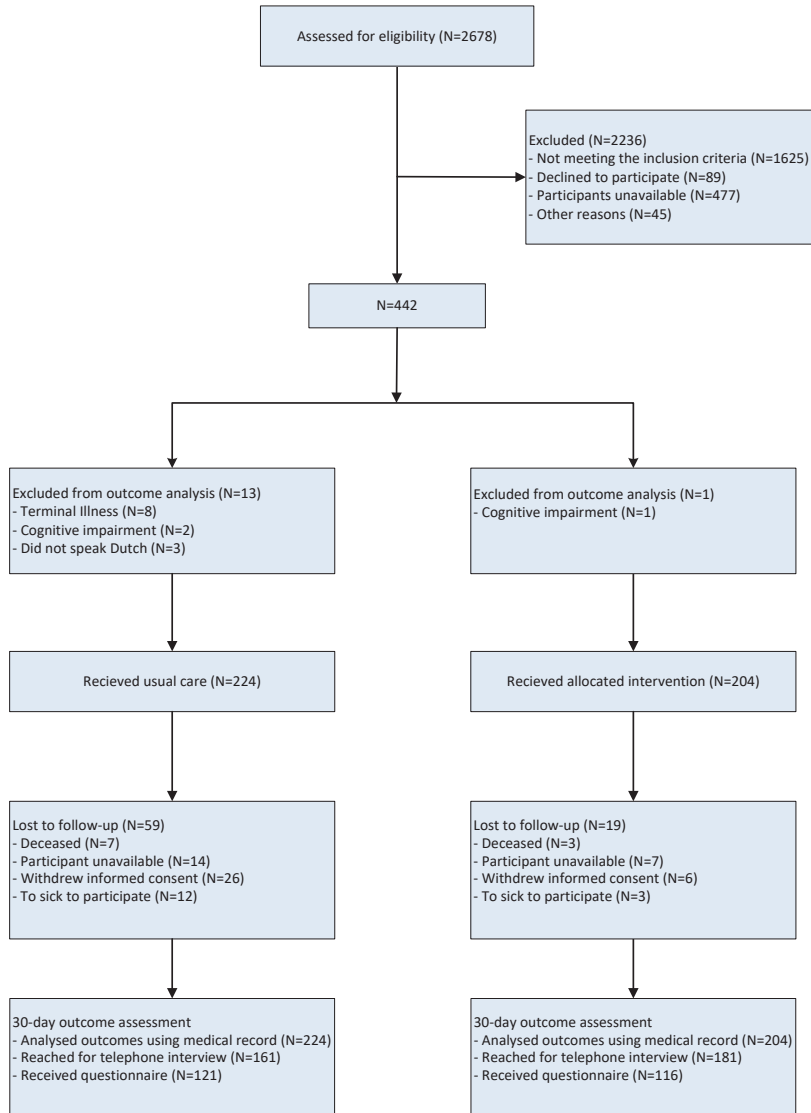
Figure 1 Study flow diagram

Table 1 Baseline characteristics of the study population

Characteristics	Pre-test N (%)	Post-test N (%)	*P* value[1]
Patients, n	224	204	
Age, mean (SD), years	55 (17)	58 (16)	0.20
Female, n (%)	101 (45)	95 (47)	0.77
Country of birth			0.01
The Netherlands	136 (85)	123 (70)	
Other	25 (15)	54 (30)	
Education level, n (%)			0.02
Less than 6 classes of primary school	1 (1)	9 (5)	
6 primary school classes	9 (6)	17 (10)	
More than primary school/primary school with uncompleted further education	5 (3)	2 (1)	
Practical training	18 (11)	23 (13)	
Secondary vocational education	77 (48)	73 (42)	
Pre-university education	11 (7)	23 (13)	
University/higher professional education	39 (24)	29 (17)	
Social status, n (%)			0.70
Alone	41 (25)	55 (31)	
Living with partner	109 (67)	109 (62)	
Other	12 (7)	13 (7)	
Living arrangement, n (%)			0.04
Independent	159 (98)	166 (94)	
Other	3 (2)	11 (6)	
Socio-economic status, mean (SD)[2]	-.1995 (1.24)	-.2208 (1.46)	0.87
Discharge diagnosis, n (%)			≤0.001
Internal medicine	69 (31)	51 (26)	
Infectious disease	32 (14)	35 (18)	
Rheumatology	16 (7)	4 (2)	
Disease of the digestive system	44 (20)	44 (23)	
Chronic kidney disease	16 (7)	56 (29)	
Malignancy	14 (6)	5 (3)	
Cardiovascular disease	33 (15)	0 (0)	
Charlson score, mean (SD)[3]	1.77 (1.95)	1.75 (1.56)	0.91
Readmitted ≤ 6 months before initial hospitalization, n (%)	66 (30)	64 (31)	0.68
Length of index hospital stay, median (range)	6 (2-75)	7 (2-46)	0.04

Note: Numbers in tables are n (%) unless otherwise indicated. Abbreviations: SD, standard deviation; Y, years.
[1] Significant at *P* < 0.05. [2] SES scores of -1< indicating low SES, >-1 and <1 indicating medium SES, and 1> indicating high SES. [3] Charlson Comorbidity Index range of scores 0-31, 0 indicating no comorbidities, and 31 indicating presence of severe comorbidities.

Primary outcomes after 30-days: readmission

No differences were present between the pre-test and post-test group in unplanned readmission rates within 30 days after discharge (12.9 vs. 13.2%, p = 0.93), as shown in Table 2. Post-test patients had a trend toward a longer time to first readmission (10 vs. 14 days, p = 0.06). Logistic regression analysis, adjusted for covariates, showed that the odds ratio for readmission did not decrease for the post-test group (OR 1.28; 95% confidence interval 0.63-2.62). The self-reported readmission rate of patients was higher, but these also included planned readmissions.

Table 2 Healthcare utilization and patient satisfaction four weeks after hospital discharge

Characteristics	Pre-test N (%)	Post-test N (%)	P value[1]
Patients, n	224	204	
Length of index hospital stay			
Length of index hospital stay, median (range)	6 (2-75)	7 (2-46)	0.04
Readmission			
Readmission within 30 days, % (n)	12.9 (29)	13.2 (27)	0.93
Time to first readmission, mean (SD)	10.4 (7.1)	14.2 (7.9)	0.06
Number of readmissions within 30 days, mean (SD)	0.19 (0.59)	0.19 (0.57)	0.99
Duration of first readmission, median (range)	4 (0-28)	1 (0-65)	0.52
Other health care utilization			
GP visits, % (n)	52.8 (85)	59.0 (102)	0.26
ED visits, % (n)	24.9 (43)	21.0 (38)	0.39
Mortality within 30 days			
Died, % (n)	1.8 (4)	0 (0)	0.06
Patient satisfaction with discharge procedure			
Overall patient satisfaction, mean (SD)	7.5 (1.4)	7.4 (1.5)	0.49
Medical discharge letter in days, median (range)	14 (0-182)	5 (0-248)	<0.001

Note: Numbers in tables are n (%) unless otherwise indicated. Abbreviations: CI, confidence interval; SD, standard deviation; GP, general practitioner; ED, emergency department. [1] Significant at $P < 0.05$.

Secondary outcomes: healthcare utilization, mortality and patient satisfaction

More than half of all patients visited their GP and over 20% visited the emergency department in the post-discharge period, but no differences between the pre- and post-test groups were found (Table 2). Mortality within 30 days after hospital discharge was only observed in the pre-test group and showed a trend towards significance compared to the post-test group (1.8 vs. 0.0%, p = 0.06). Overall satisfaction of the discharge process was high in both groups (7.5 vs. 7.4 points, p = 0.49). In the post-test period the medical discharge summaries were sent to the GP much faster than in the pre-test period (median of 5 days post-test vs. 14 days pre-test, p < 0.001).

In a subgroup analysis with patients hospitalised in the six months before study inclusion (index hospitalization) we also found that the medical discharge letter was sent faster to the GP in the post-test group (14 vs. 5 days, p < 0.001) (Table 3). Also in this high-risk group a trend to a decrease in mortality within 30 days was seen after the intervention period (3 vs. 0% p = 0.08).

Table 3 Analysis in "high risk group": patients that were admitted to the hospital in the six months prior to the index hospital stay

Characteristics	Pre-test N (%)	Post-test N (%)	P value[1]
Patients, n	66	64	
Readmission			
Readmission within 30 days, % (n)	18.2 (12)	18.8 (12)	0.93
Time to first readmission, mean (SD)	8.5 (6.0)	12.5 (8.3)	0.22
Number of readmissions within 30 days, mean (SD)	0.26 (0.62)	0.31 (0.77)	0.66
Duration of first readmission, median (range)	3 (0-23)	1 (0-65)	0.42
Other health care utilization			
GP visits, % (n)	52.4 (22)	59.3 (32)	0.50
Emergency department visits, % (n)	32.7 (16)	25.9 (15)	0.44
Mortality within 30 days			
Died, % (n)	4.7 (3)	(0)	0.08
Patient satisfaction with discharge procedure			
Overall patient satisfaction, mean (SD)	7.6 (1.1)	7.1 (1.8)	0.10
Medical discharge letter in days median (range)	14 (0-182)	5 (0-78)	<0.001

Note: Numbers in tables are n (%) unless otherwise indicated. Abbreviations: SD, standard deviation. [1] Significant at $P < 0.05$.

Adherence to the discharge bundle

Patients self-report on the number of topics that were covered during verbal patient education showed some improvements, but no significant differences were seen between the pre- and post-test groups respectively: diagnosis (80% to 80%, p = 0.91), pain management (61% to 76%, p = 0.10), post-discharge care (47% to 59%, p = 0.14), warning signs (46% to 59%, p = 0.13) and medication reconciliation (60% to 75%, p = 0.15).

Process indicators (all started at 0% before the intervention) showed that discharge planning within 48 hours after hospital admission was performed in 67% (range 0%-100%), over a period of 33 weeks during the intervention period. Nurses completed the discharge checklist in 76% (range 53%-100%) and residents in 10% (range 0%-43%). The personalized patient discharge letter (35%, range 0%-71%) and verbal patient education (33%, range 0%-80%) were provided to patients before hospital discharge.

Discussion

In this pre-post-test design study we did not find that implementation of a comprehensive discharge bundle was associated with a reduction of unplanned hospital readmission within 30 days after discharge and an increase in patient satisfaction on the overall discharge process. However, we observed trends to longer time to readmission and lower mortality rate in the post-test group. In addition, the intervention was successful in reducing time until sending the medical discharge summary to the GP after hospital discharge, which might contribute to effective communication and information transfer with the GP and patient safety (7, 8, 29). The discharge bundle consisted of planning the date of discharge, a discharge checklist, a personalized patient discharge letter, and

patient education.

Our findings are inconsistent with other reports (14, 18, 30) describing a decrease of hospital readmission rates. This might be due to several reasons. Adherence to some components of the discharge bundle was low. While compliance to the discharge bundle among nurses was satisfactory, compliance of residents to the checklist was poor. A possible explanation for this could be the staff rotation system. Every six months a new group of residents started and had to be trained about the discharge bundle. In the period just after they started, the adherence to the discharge bundle was low. Studies about influences on doctors' behaviour conclude that a combination of successful methods, such as education, feedback, participation, administrative interventions, and financial incentives and penalties, could change doctor's behaviour and contribute to the patient safety climate (31). We used a multidisciplinary multifaceted implementation strategy (32, 33) consisting of these methods. Some researchers (24, 34) have also found differences in compliance by nurses and doctors and suggest that different dissemination and implementation strategies are needed for generating compliance by different disciplines. Furthermore, residents and nurses were not tested on a regular basis by the management on their performance of the elements of the discharge bundle except the personalised patient discharge letter, which might have led to a decrease of commitment and sense of urgency (24, 35, 36). Future studies should adjust implementations strategies to specific needs of participating disciplines.

Implementation of the personalized patient discharge letter, which was a plain language handover and consisted personalised information about different relevant topics, was relatively successful. The writing of this letter was structurally implemented in medical students' Masters education program and the quality and number was examined during their internship. We hypothesize that the top-down approach, its fast electronic sending to the GP, and the examination of the personalized patient discharge letter was the reason for the successful implementation and also the faster sending of the medical discharge letter by the residents.

We included all adult medical patients who were hospitalised for more than 48 hours, which might explain the unexpected lower rate of unplanned readmissions of about 13%, compared with others who found readmission rates as high as 39% in older people or those admitted with COPD or heart failure (37). However, in our group of high-risk patients, defined as patients who were hospitalized in the six months prior to the index admission, we found a readmission rate of 19%. Presumably, only this high-risk group of patients may specifically benefit from a multicomponent intervention targeted at reduction of hospital readmission (13, 38, 39).

The strength of this study is that the discharge bundle consists of several multidisciplinary interventions and demonstrates a positive trend toward longer time until readmission and a reduction in mortality. Furthermore, the effect and adherence to the discharge bundle was measured in several ways and at several moments.

Our study has some limitations, the first concerns the relatively short duration of follow-up period. We selected a 30-day follow-up interval based on previous studies suggesting that patients are at highest risk for adverse events in the first 30 days after hospital discharge (27). Other studies (40) have used a follow-up period of three months to indicate the effect of interventions on patient-related outcomes. Our study might have underestimated the effect of mortality due to restricted follow-up period.

A second limitation, due to the restricted time period of this quality improvement project, was that we could only include a certain number of patients and did not perform a sample size calculation in advance. Since we had a low rate of readmissions in the pre-test group the room for improvement was lower than expected.

Conclusions

In summary we conclude that the comprehensive discharge bundle was not effective in reducing the 30-day readmission rate and increasing the patient satisfaction, but medical discharge summaries were sent faster to the GP and a trend to a longer time to readmission and lower mortality rate was present in the post-test group.

Future research should focus on adjusting implementations strategies to the specific needs of participating disciplines and is warranted for improvement strategies concerning the discharge process outside the hospital.

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3

Improving handoff communication from hospital to home: the development, evaluation and implementation of a personalized patient discharge letter

Bianca M Buurman, Kim J Verhaegh, Marian Smeulers,
Hester Vermeulen, Suzanne E Geerlings, Sophia E de Rooij

Abstract

Objective: To develop, implement and evaluate a personalized patient discharge letter (PPDL) to improve the quality of handoff communication from hospital to home.

Design: From the end of 2006-09 we conducted a quality improvement project; consisting of a before-after evaluation design, and a process evaluation.

Setting: Four general internal medicine wards, in a 1024-bed teaching hospital in Amsterdam, the Netherlands.

Participants: All consecutive patients of 18 years and older, admitted for at least 48 h.

Interventions: A PPDL, a plain language handoff communication tool provided at hospital discharge.

Main outcome measures: Verbal and written information provision at discharge, feasibility of integrating the PPDL into daily practice, pass rates of PPDLs provided at discharge.

Results: A total of 141 patients participated in the before-after evaluation study. The results from the first phase of quality improvement showed that providing patient with a PPDL increased the number of patients receiving verbal and written information at discharge. Patient satisfaction with the PPDL was 7.3. The level of implementation was low (30%). In the second phase, the level of implementation improved because of incorporating the PPDL into the electronic patient record (EPR) and professional education. An average of 57% of the discharged patients received the PPDL upon discharge. The number of discharge conversations also increased.

Conclusion: Patients and professionals rated the PPDL positively. Key success factors for implementation were: education of interns, residents and staff, standardization of the content of the PPDL, integrating the PPDL into the electronic medical record and hospital-wide policy.

Introduction

Annually around 35 and 1.8 million patients are discharged in the USA and the Netherlands (1, 2). The transition from hospital to home is a complex and vulnerable period for patients (3, 4). Ineffective discharge planning and lack of coordination of care can lead to decreased patient satisfaction, adverse events (AEs), and a higher number of hospital readmissions due to complications (5, 6). Studies have shown that almost 20% of medical patients experience an AE within 5 weeks of hospital discharge (7, 8). The most common AEs are adverse drug events (66%) and process- and procedure-related injuries, such as an incorrect medication prescription (17%) (7, 9, 10). Many AEs result from an inadequate communication between the hospital personnel and the patient or his general practitioner (GP) (8, 11). Incomplete handover from the hospital to the GP is common, particularly for medication management (12).

In addition, treatment or care provided during hospital admission might have (permanent) consequences for a patient's lifestyle in terms of a new medication regimen, consequences or delayed complications of hospitalisation and restrictions in nutrition or activities of daily living (13). Approximately 70% of patients face permanent medication changes after hospitalization (14).

Moreover, over the last few decades the length of hospital stay has decreased (15). Yet more patients with complex care needs and multimorbidity are admitted to the hospital. The consequence of these changes is that the delivery of in-hospital care has to be provided in a shorter period of time, and might suggest that patients with complex care needs are send home before they are fully recovered.

Therefore, it is important to prepare these high-risk patients for hospital discharge and provide them with well-defined patient-centered instructions, which enables them to maintain independent living, perform self-management activities and reduce complications after hospital discharge (16, 17). Research has been moderately effective at improving discharge services such as early discharge planning, medication reconciliation, telephone calls after discharge and home visits to prevent avoidable AEs after discharge (18, 19). The most effective interventions seem to be those that combine pre-discharge and post-discharge interventions with educational components (18). Initiatives directed towards patients to improve patient empowerment and to improve the information provided to them at discharge are relatively scarce.

The objective of this quality improvement project was to evaluate the development and implementation of a personalized patient discharge letter (PPDL) on information provision at hospital discharge and to study the feasibility, barriers and facilitators of integrating the PPDL into daily practice.

Methods

Design, setting and ethical considerations

From 2006 to 2009, we conducted a quality improvement trajectory at the Academic Medical Center), a 1,024-bed university teaching hospital in Amsterdam, the Netherlands, with the aim to improve handoff communication directed toward patients. We used two evaluation methods; a before–after study design interviewing patients about the discharge information they received and how they valued the PPDL (post-implemen-

tation only) and a process evaluation to study the feasibility, barriers and facilitators of integrating the PPDL into daily practice. Figure 1 shows the timeline of the quality improvement trajectory. The measurements and data collection are described below. The patients that participated were interviewed on how they perceived the information at hospital discharge and not on personal information. The study was checked by the Institutional Review Board (IRB), but did not meet the criteria for formal IRB-approval as formulated by the Medical Research in Humans Act.
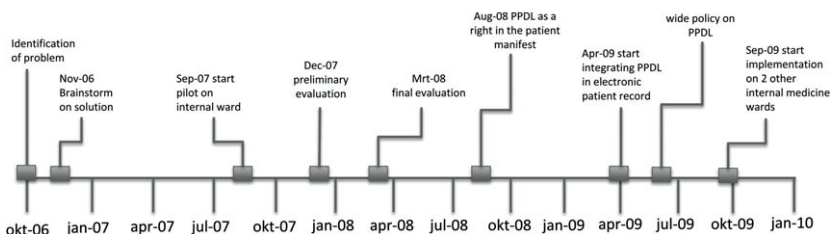
Figure 1 Timeline of the development and implementation of the PPDL.

Development of the PPDL

The PPDL was developed based on literature research and clinical experiences of physicians and nurses of two internal medicine wards. Potential interventions for improving the handoff communication from hospital to home were explored in focus group meeting with physicians and nurses of the department of internal medicine. Research has shown that the most effective approach of providing information to patients is combining written and verbal information (20, 21). The use lay language in patient communication is essential to enhance compliance (22). As a result, the PPDL was designed to provide patient-centered communication. The PPDL is a standardized document addressed to the patient and drafted in a language that is understandable to the patient and his informal giver(s). The goal of the PPDL was to educate patients and/or their informal caregivers about problem-solving skills when discharged to home (23, 24).

The structure and contents of the PPDL were established through an exploratory pilot phase on one (nursing) ward of the department of internal medicine. This first version of the PPDL contained information on the reason for admission, the treatment during hospitalisation, the course of the disease(s), possible sustained consequences or complications and information on medication. The PPDL was written and verbally explained to the patient or the informal caregivers of cognitively impaired patients by medical interns before hospital discharge. Residents mentored the medical interns during this process. All medical interns and residents were trained in drafting and explaining the PPDL and educated about issues related to health literacy (22). The training was performed on the job. A standard format for creating the PPDL was provided on local computers on the wards (there was no electronic medical record (EMR) during the pilot phase).

First phase of quality improvement

Before-after evaluation study
Implementation of the first version of the PPDL was initiated at two medical wards. To evaluate information provision, satisfaction and content of this first version of the PPDL, the following study questions were formulated. Does the implementation of the PPDL improve (i) verbal and written information provision at hospital discharge and (ii) how do patients value the content of the PPDL (post-implementation only)?

Participants of before-after evaluation study
Eligible patients had to meet the following criteria: (i) 18 years or older; (ii) admitted at one of the four internal medicine wards for more than 48 h and (iii) discharged to home. Patients were mainly acutely hospitalised with a broad range of internal medicine problems, such as infections, gastro-intestinal diseases and kidney problems. The participating internal medicine wards were staffed with nurses and physicians. The wards had an important role in the professional education and training of nurses and physicians. In the post-test phase only those receiving the PPDL were included.

Data collection

Data collection on provision of discharge information was equal in the before and after study group. A research nurse conducted structured telephone interviews 1 week after discharge. The interview contained questions regarding overall satisfaction with the information provided upon discharge as well as whether the patients had been informed about medication, complications and lifestyle. Furthermore, the interview contained questions regarding by whom and how they had been informed (verbal, written or both) and whether the information provided was deemed necessary and complete. Patient satisfaction with the PPDL was measured in the after study group only. Patients were asked to appraise the PPDL on a numeric rating scale (between 0 and 10; where 0 = not satisfied and 10 = totally satisfied).

Data analysis

Descriptive statistics were obtained on the patient characteristics and information provision. We did not perform a formal sample size calculation. As in the post-implementation phase only those receiving the PPDL were included, and this was 30% of the study sample, we did not calculate statistical differences between the before and after groups and present the data as descriptive.

Feasibility of the PPDL into daily practice

A process evaluation of the implementation of the intervention was conducted. A focus group session with seven professionals (nurses, medical interns and residents) was held to evaluate the acceptability and feasibility of the PPDL in daily practice, including barriers and facilitators.

Second phase of quality improvement

In the second phase of the QI we used the evaluations of the first phase of quality improvement to improve the PPDL. In addition, we implemented the PPLD in the EMR, which was evaluated by measuring the number of PPDLs provided to patients at discharge. Pass rates were calculated from this information after implementation of the intervention. Furthermore, we developed hospital wide policy and professional education on discharge communication to alter patient-centered communication during the handover process.

Results

First phase of quality improvement

Evaluation of pre/post-test of PPDL implementation
A total of 141 patients participated in this study of which 111 patients participated in the pre-implementation phase and 30 patients in the post-implementation phase. The median age in both groups was 59 years and 48 versus 41% were male in the pre- and post-implementation group (P=0.67). Table 1 demonstrates about what topics and how patients were informed at discharge. Most patients of the pre-implementation group received verbal information about their disease (90%) and treatment (90%), but rates of information provision were much lower for medication (69%), complications (47%) and lifestyle (36%).

After the implementation of the PPDL, the amount of patients receiving information on medication, complications and lifestyle was improved on almost all domains, in particular in terms of medication. More patients received a combination of written and verbal information for the topics of medication and complications, respectively.

Overall, patients of the post-implementation group were satisfied with the PPDL as indicated by a score of 7.3 (SD 1.0). Positive remarks were made about the clear language of the PPDL, and patients viewed it as a useful discharge service. Suggested improvements for the PPDL included elaboration on complications and lifestyle, include a contact person for questions and professionalise the layout.

Level of implementation
Four months after the implementation of the first version of the PPDL on the two medical wards, the average level of implementation was 32%. On the first ward 76 of 173 discharged patients received the PPDL upon discharge (44%). On the second internal medicine ward the pass rate was 23%, 58 out of 249 patients received a PPDL.

Feasibility of the PPDL into daily practice
Overall, nurses and physicians that participated in the focus group sessions were positive about the PPDL and rated the initiative as important to improve the quality of care. The participants concluded that the process of preparing and supervising the PPDL could be improved. Furthermore, medical interns felt that explaining medical terms in understandable plain language was a difficult task. They also felt great responsibility to ensure the correctness of the content and felt insecure about this

Table 1 Information needs of patients discharged from the hospital before and after implementation of the PPDL

Variables	Before implemen-tation (n = 111)	After implemen-tation (n = 30)
Age (median, IQR)	59 (42-70)	59 (46-67)
Gender (% male)	47.7	41.4
Previous admission in the past 4 weeks (% yes)	26.1	27.6
Information on diagnosis and treatment		
Do you understand the reason for your admittance to the hospital? (% yes)	90.2	93.1
Do you understand the treatment that was given? (% yes)	90.2	89.7
Information on medication		
Did you use medication before admission? (% yes)	87.6	86.2
Where there changes in the medication regimen at discharge? (% yes)	64.0	75.9
Did you receive information on the medication that you should use after discharge? (% yes)	69.0	84.6
How did you receive this information?		
Only verbally	54.2	13.0
Verbally and in writing	45.8	87.0
Information on complications		
Did you receive information on possible complications that might occur after discharge?	46.8	67.9
How did you receive this information?		
Only verbally	82.0	26.3
Verbally and in writing	18.0	73.7
Information on lifestyle advise		
Did you receive information on changes in your lifestyle, such as nutrition, movement and wound care?	36.0	55.2
How did you receive this information?		
Only verbally	89.0	58.8
Verbally and in writing	11.0	41.2

IQR, interquartile range

even though a resident supervised the PPDL. All professionals involved noted that the electronic preparation and availability of the PPDL within the EMR was a key component for successful implementation and secure the use of the PPDL into daily practice. On average interns spent 30 min preparing the PPDL, because an EMR was lacking.

Second phase of quality improvement

Establishing hospital-wide policy
An essential step for further implementation of the PPDL was developing a hospital-wide policy on handover summaries, to both the GP and patients. Furthermore, the PPDL had to be integrated into the hospital-wide policy on discharge procedures, which contained more interventions related to the discharge procedure (e.g., discharge conversation, telephone follow up) (25). The development of a hospital-wide policy was

enhanced by the release of a patient manifest in our hospital that contained 24 patient rights, including one on a personal patient discharge letter (26). The hospital-wide policy on handover summaries was launched in April 2009. This document enabled us to integrate the PPDL in the electronic patient record and contained three versions of the PPDL: one for adults, one for teenagers and one for parents of under-age children.

Integrating the PPDL in the electronic medical record

Next, to improve the feasibility of the PPDL, a project was started to facilitate the preparation and availability of the PPDL within the EMR. Standardization and quality of the content of the PPDL was ensured by using templates on common health conditions and predefined texts on diagnosis, treatments, medication and lifestyle. Standard information on who to contact in case of frequently asked questions was added, as well as the recommendation to bring the PPDL to each visit with a medical professional. This electronic version of the PPDL was made visible for all professionals in the hospital and could be sent directly to the general practitioner at hospital discharge (Appendix 1).

Integrating the PPDL and discharge conversation into professional training

The results from the first implementation phase indicated that health care professionals perceived difficulties in using lay language and other aspects related to health literacy in communicating with the patient and their informal caregivers about discharge instructions. Furthermore, the PPDL was considered as an important educational tool for addressing these issues for medical interns of the department of internal medicine. A 3-h communicating-training program was developed by focusing on hands-on practice of discharge communication skills and awareness of health literacy in cooperation with the department of clinical psychology, who already provided communication training before and during the internships. This training program was provided before the internship. During the internship, training opportunities in which medical interns had to videotape an admission interview were already in place. We added to this training the possibility of videotaping a discharge conversation instead. Furthermore, all medical interns were obligated to write ten PPDLs during their eight-week internship, and these PPDLS were discussed with the professor at the end of the internship. Throughout the entire process, the resident had the ultimate responsibility for the content of the PPDL and authorised the PPDL before it was provided to the patient.

Evaluation of second phase of quality improvement

The interventions that were adjusted and implemented to improve the feasibility of incorporating the PPDL into daily healthcare delivery processes were measured again by focusing on the percentage of PPDLs provided to patients at discharge. The evaluation was conducted on four internal medicine wards during a 3-month period. On these wards, the electronic version of the PPDL was implemented. The implementation rate in this cycle varied between 14 and 71% (Fig. 2a), with an average implementation rate of 51%, signifying an important improvement when compared with the first cycle. There were 2 weeks with low percentages of PPDLs provided; this was due to a change in both residents and medical interns. They had to be instructed in writing and authorising the PPDL in the electronic patient record. If not considering these 2 weeks, the average implementation rate was 57%. Moreover, we observed an improvement in the number of discharge conversations that were held (Fig. 2b).
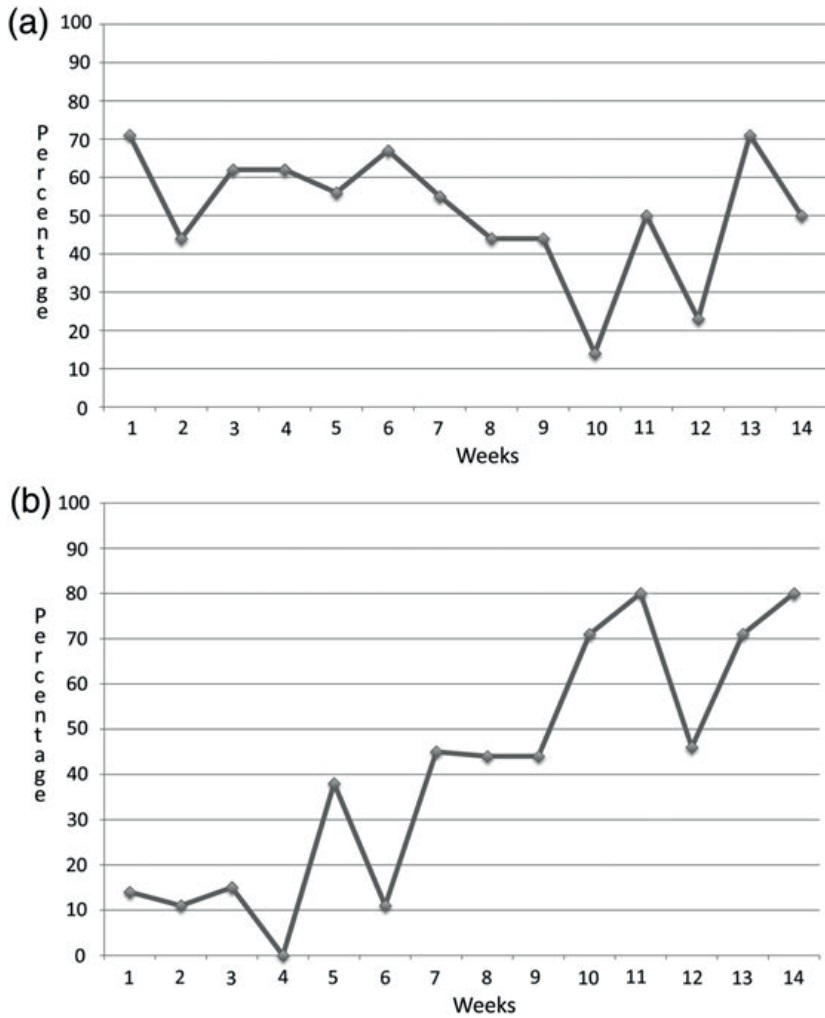
Figure 2
(a) Percentage of patients that received a PPDL at discharge from the hospital.
(b) Percentage of patient that had a discharge conversation prior to discharge.

Discussion

The objective of this study was to improve the information provided to patients at discharge. At the start of the quality improvement trajectory, patients felt poorly informed at discharge from the hospital. As a result, a PPDL was developed, implemented and evaluated. This PPDL consists of a structured plain language discharge summary accompanied with a verbal explanation of diagnosis, treatment, medication and recent changes in medication, potential complications and lifestyle. Providing patients with a PPDL increased the number of patients who recalled that they received a combination

of verbal and written information. Integrating the PPDL in the EMR, offering training to medical interns and integrating the PPDL in hospital-wide discharge policies facilitated the implementation. With these actions, we were able to achieve an implementation rate of 57%. Moreover, the number of discharge conversations improved.

Our study is not the first on that is performed on improving the discharge from hospital to home. Several studies have demonstrated the need for better discharge procedures (16, 17). These studies mainly focus on better information exchange between professionals and identified many deficits in the communication between the hospital and general practitioner. With the PPDL we improved the information provision to patients at discharge. More patients actually indicated that they received a combination of verbal and written information at discharge. This is important, because the length of hospital stay has decreased dramatically in the past 10 years, yet more patients are admitted with complex diseases and multiple morbidities (27, 28). For this group of patients a combination of verbal and written information on changes in treatment, new medication, what complications can occur and when to contact the hospital is essential to self-manage after hospital discharge and to recognize severe complications needing medical care. Only providing information orally in for example a discharge conversation is not sufficient; it limits the recall of information (20-22). The PPDL should be part of a bigger strategy to improve the discharge from hospital to home. In our hospital, the PPDL is part of a larger project on improving the discharge procedure (25).

Implementing the PPDL in daily practice proved to be challenging. The level of implementation in the first cycle was on average 30%. Several reasons have been indicated; first, the lack of integration of the PPDL into the EMR was a considerable barrier, since many items that could have been predefined through the EMR had to be entered manually. Moreover, the decision for discharge was often made on the day of discharge. This time pressure was an important implementation barrier for creating and supervising the PPDL. In the second quality improvement cycle we implemented many solutions for these barriers. The medical interns received training to prepare the PPDL and to held discharge conversations, the letters were supervised better, the PPDL was integrated in the EMR and a hospital-wide discharge procedure was implemented. Although there was an increase in the number of PPDL provided at discharge, the implementation rate was still 57%. We hypothesize that this is due to the extra handover that has to be made for patients, instead of putting the patient and informal caregiver at the center of the information handover. It would be well possible to use the PPDL as a formal handover for the patient and sent it to the GP as well. In the end, the patient is the only continuous factor in the transition from hospital to home. This would make the PPDL wider applicable and reduces the number of handovers that have to be written. Moreover, for specific patient groups (e.g. some surgical procedures) standardized letters could be prepared, where only limited amount of tailoring needs to be performed.

Our study has several limitations. We used a non-controlled before–after design, which is not the most strong evaluation design and did not collect information on health literacy, education and socio-economic status. Therefore, the results should be interpreted with caution. We did not perform a formal sample size calculation, as the project started as a quality improvement trajectory. The study was a small-scale initiative limited to only four medical wards in one university teaching hospital in the Netherlands, and therefore the generalizability and applicability of the PPDL in other patient populations and general hospitals needs further study. More knowledge is needed on the specific advantages and feasibility of the PPDL for certain age-groups

and patients with multiple morbidities. Additional research, in a broader patient population and in a multi-center context, is needed to establish external validity and study long-term effects on patient empowerment and AEs in the post-discharge phase. Currently, the PPDL is adopted by the Senior Friendly hospital concept and hospitals in the Netherlands have to demonstrate whether they provide a PPDL to patients.

In conclusion, the PPDL improved the provision of verbal and written information at discharge. Education of interns, residents and staff, standardization of content of the PPDL, integrating the PPDL into the EMR and hospital-wide policy to promote the PPDL were key success factors for feasible implementation. Further research should focus on the impact of the PPDL on adverse health outcomes.

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Appendix

An example of a personalized patient discharge letter (with a hypothetical patient)

AMC
Meibergdreef 9
Postbus 22660
1100 DD Amsterdam
www.amc.nl

Amsterdam, November 15th 2011
Patiëntnr : 1234567
Date of birth : 13-11-1934
General Practitioner: Dr. Hansen
Concerns: personalised information upon discharge

Dear Mrs. Jansen,
Hospitalization can be a stressful event in which a lot of information is provided to you. In this personalised discharge letter, we provide you with the necessary information you need at home. We advise you to bring this personalised discharge letter when visiting your general practitioner or specialist. Your general practitioner will receive a copy of this letter.

Admission:
You were admitted in the AMC from 19-10-2011 to 12-11-2011 and resided at F7zuid, general internal medicine & gastro-intestinal diseases
Telephone number: 020-5666666

Reason of admission:
Insufficient intake because your bowel is very short. You were unable to take enough food and take the necessary ingredients. It was follow-up treatment after discharge from the OLVG hospital.

The medical term for this disease is:
Insufficient intake/resorption due to short bowel syndrome (as a result of therapy-resistent Crohn's disease).

Your important medical background:
You were diagnosed with Crohn's disease in 1992. Since then you have had multiple resections of the bowel (subtotal colectomie and multiple resections of small intestine), complicated with fistulae. Your last operation was in August this year in the OLVG, where 50 cm of intestine was removed. Now there is approximately 120 cm of small intestine left.

Allergies reported: none
During your hospital stay the following diagnostic procedures were carried out
We did several blood tests, to see whether there were signs of infection in the blood and to see whether there were any nutritional deficiencies. The first days there were some signs of infection seen, but these values decreased after a few days. A few slight

electrolyte deficiencies were seen, but were corrected soon after start of the total parenteral nutrition (TPN).

We made some cultures of the pus from the rectum and from the wounds on the belly. Some bacteria were found, but it was not necessary to use antibiotics.

We also performed an endoscopy, on which the small intestine seemed healthy, not inflamed and no fistulae were seen. We did a rectal examination with a scope, but we could not see where the pus was coming from, since the rectum was very narrow after just a few centimeters.

We tried to do a MR-enterogram to make sure there were no fistulae under the wounds on the belly, but it was not possible for you to drink all the contrast fluid as it made you very nauseous.

During your hospital stay the following treatment was started We have placed a TPN-line, first in your left upper arm, later in the jugular vein, so you could be fed intravenously. This could be temporarily, the small intestine might adapt to the fact that there isn't much bowel left. But for now it is important to improve your nutritional status and your general condition.

You received training from the nurses so you'll know how to take care of the TPN-line and how to feed yourself with it. We also started medication (Sintrom) to prevent blood clots in your veins, which can occur in people with an intravenous line, especially in combination with active IBD.

We nursed the wounds on the belly, to let them heal properly. The inflammation had decreased by the time you went home.

Summary of the hospital stay:
You were admitted to our ward because of insufficient intake/resorption of food, due to a short bowel in combination with your therapy-resistent Crohn's disease.
We monitored the signs of infection in your blood, which had decreased after a few days in the hospital. We gave you an TPN-line so you can be fed intraveneously and we trained you to take care of the line and feed yourself with it at home. Since the small intestine seemed healthy on the endoscopy, we lowered the dosage of Humira to 40 mg every other week, instead of 40 mg every week. The Lanvis was stopped altogether, since you felt you did not benefit from taking it. We started Sintrom in order to prevent the forming of blood clots in your veins, due to the TPN-line. In the beginning you will have to go to the Thrombosis Service (Trombose Dienst) regularly, to achieve the right dosage for you.

For now it is important to improve your nutritional status and your general condition. Dr. One will be the doctor in the outpatient clinic who will check up on how the TPN is going and if alterations will have to be made in your nutrition. Dr. Two will be your IBD doctor in the outpatient clinic, together you will think of what will be the next step once you'll have strengthened.

Important information for you to take care of at home
Once you experience fever, increased abdominal pain or blood/pus in the stoma bag along with your stools, please contact the outpatient clinic and ask for Dr Two, telephone number 020-5666666

Advice for food and fluids
You will receive TPN for now, but if possible it is good to eat as well.

Advice for daily activities
You can resume your daily activities as much as is possible for you.

The following appointments are made with you
You have got an appointment with Dr. Two from the IBD outpatient clinic on the December 20th at 14.45u.

You have got an appointment with Dr. One, the TPN-doctor, on December 20th at 15.30u.

If you have any questions
Contact with the hospital
Within 48 hours after discharge a nurse of the ward you were admitted on will contact you, to see if you have any questions. The nurse will contact the medical resident if necessary.

Contact with the outpatient department
If you have an appointment scheduled with the outpatient department, please contact the outpatient department if your question cannot wait until the appointment. Telephone number 020-5666666

Contact with your general practitioner
If you do not have a scheduled appointment at the outpatient department, than contact your general practitioner in case you have questions. If any problems occur out of office hours, please contact the central emergency post related to your general practice.

Questions related to medication use
If you have any questions on the use, effects or side effects of medication, contact your general practitioner. The general practitioner will contact the hospital if necessary.
Do you have medication that is not prescribed anymore? Deliver these medications at your pharmacy.
Is your medication finished? Than call your general practitioner for a new receipt.

Frequently asked questions related to discharge and care
On the website of the AMC, you will find information on the frequently asked questions.
www.amc.nl/discharge

With kind regards,
Marije de Jager, medical intern
Harro Klein, med

4

The ideal medical round for hospital patients: an exploratory study of healthcare professionals' perceptions of interprofessional communication and collaboration

Kim J Verhaegh, Annamarike Seller-Boersma, Robert Simons,
Jeanet Steenbruggen, Suzanne E Geerlings,
Sophia E de Rooij, Bianca M Buurman

Abstract

Interprofessional communication and collaboration during hospitalization is critically important to provide safe and effective care. Clinical rounds are an essential interprofessional process in which the clinical problems of patients are discussed on a daily basis. The objective of this exploratory study was to identify health care professionals' perspectives on the "ideal" interprofessional round for patients in a university teaching hospital. Three focus groups with medical residents, registered nurses, medical specialists, and quality improvement officers were held. We used a descriptive method of content analysis. The findings indicate that it is important for healthcare professionals to consider how team members and patients are involved in the decision-making process during the clinical round and how current social and spatial structures can effect communication and collaboration between the healthcare team and the patient. Specific aspects of communication and collaboration are identified for improving effective interprofessional communication and collaboration during rounds.

Introduction

Clinical rounds are an essential organizational process and play an important role in the flow of clinical information and coordination of care (1). Key clinicians involved in the patients' care come together on a daily basis to appraise patients' progress, consult the medical record, inform the patient, and allow for collaborative planning in relation to the needs of the patient (2). Furthermore, clinical rounds have been a principal strategy for clinical education and are considered essential for helping physicians in training to achieve clinical competence (3, 4). However, too frequently the information exchange between nurses, physicians and patients during the clinical rounds is unstructured and often patients or relatives are not fully included in the discussion about their treatment goals (5). Furthermore, existing barriers between providers from all disciplines or between departments prevent hospitals in moving towards seamless patient care (6).

Previous research has shown that ineffective communication and collaboration among health care providers is one of the leading causes of preventable medical errors and patient harm (7). The Joint Commission International cites communication failures between providers as the root cause for more than 70% of sentinel events, such as fatal falls, or mortality (8). Therefore, the need for clear communication is imperative to improve the overall patient safety and quality of care. The Joint Commission International stimulates hospitals to structure and improve verbal or written communication among caregivers to achieve patient safety (8). Literature shows that embedding structured communication and behavior into the care process is associated with positive health outcomes and patient and caregiver satisfaction (9, 10). In addition, improving communication within the healthcare setting is associated with improved patient safety, quality of care, and decreased length of stay (11).

The objective of this study was to explore perceptions of healthcare professionals (nurses, physicians and other staff-members) on effective interprofessional communication and collaboration during clinical rounds.

Methods

Study design

Our qualitative study was conducted using an exploratory design with three focus group interviews (12, 13). We chose to use focus group meetings to allow participants to explore and clarify their views through discussion, and agree or disagree with the reasoning and strategies of other groups of participants. Furthermore, focus group meetings are based on social interaction within groups. Therefore, we wanted to examine meanings and specific topics that medical professionals talk about as most "ideal", in the context of peer-related activities, which had to take place in a group most similar to the "natural" group, just like the group as is constructed during the clinical round. The medical ethical committee approved the study.

Participants and Settings

Healthcare professionals from a 1024-bed university teaching hospital in the

Netherlands were invited to attend a focus group meeting were they explored and clarified their views about the ideal medical round through discussion. This study took place in March and April 2011 at the Academic Medical Center in Amsterdam. We used a purposive sampling approach to set up an interprofessional panel of healthcare professionals. Participants for the focus group interviews were invited to participate by e-mail. Selection was based on working experience of a minimum of five years and professional background (3 residents, 27 nurses, 5 medical specialist, and 13 hospital staff members who were engaged in quality improvement and had a background in medicine or nursing). The participants were divided over three smaller focus groups based on a mix of professional backgrounds. The interviews were carried out in a private room in the hospital without any interference from outside.

Data collection

An interview schedule was developed by the researchers and piloted in the first focus group, after which no adjustments were made (13). We used the data of the pilot session. Each focus group started with the question: "What is the goal of the ideal daily medical round?" The first question was followed by: "What has to be discussed during the ideal daily medical round?" Third, "Who has to participate?" Fourth, "Which decisions have to be made?" Fifth, "Who has to make the decisions?" And the last question was: "Where does the ideal daily medical round have to take place?" The third author (RS) moderated the meetings and attempted to encourage each participant to talk freely, while the second author (ASB) assisted by asking probing questions and keeping notes during the process. The moderator and assistant (RS and ASB) are health professionals trained in pediatrics and cardiology and currently involved in management. Each meeting was audiotaped and lasted approximately 60 minutes. The first author (KV) transcribed each meeting verbatim utilizing field notes, and entered into MAXqda2 (14). A debriefing session was held by the team after each meeting to evaluate the quality of the session, improving the skills of the team, and checking the responses.

Data analysis

We followed a general qualitative, descriptive method of content analysis (12). According to Krippendorff (15), content analysis is a research technique for making replicable and valid inferences from text (or other meaningful matter) to the contexts of their use. We read each transcript multiple times to obtain a sense of the whole. Next, the text was analyzed to generate a list of keywords and phrases, or initial codes, to be used to identify recurrent or dominant themes. Differences were resolved through discussion and consensus with the team of investigators. Asking the participants to confirm whether the interpretation of the results was correct increased the credibility of the data.

Ethical considerations

This study was approved in February 2011 by the Medical Ethics Committee of the Academic Medical Center in Amsterdam.

Results

Three major themes emerged that present suggestions to improve interprofessional communication and collaboration between the healthcare professionals and patients on a general medical ward.

Theme 1: Structure of the medical round

This theme was developed from three subthemes: preparation, timing of the medical round, and communication tool.

Preparation
The subtheme preparation was associated with statements such as 'if there is no good preparation, there will be no medical round'. A participant reported:

> What I do find important, before the doctor and the nurse start their ward round, is that they prepare for it. This means they've carried out the necessary checks, and the nurses know what questions they want to ask (Quality improvement officer D3:8).

Time-management
Most of the participants described that the medical rounds should have a central position in the organization of care, start on a fixed time of the day, and have a maximum duration. The participants discussed if the medical rounds should still be scheduled during the morning time when a lot of healthcare processes come together and often test results are still pending. One participant stated:

> I think you have to be prepared to shake off old habits. For example, we all talk about doing, say, ward rounds in the morning. We all have a fixed way of thinking. Why shouldn't you do ward rounds in the afternoon (Nurse D2:3)?

Communication tool
Several participants reported that the development of a plan of care and completion of a daily goals worksheet was considered important to structure communication, clarify tasks, and organize work. Several participants explained that health care workers should discuss the follow-up of the care plan. One participant, a physician, described:

> I'm not one for doing a ward round every day, but the patient does have a problem list, for which actions have been organized. And it's important that these actions are followed up. Has any action been undertaken? Have the tests been done? Have the things been measured that should have been measured (Physician D3:2)?

Participants stated that the daily goals worksheet should consist of several essential elements, which are: responsible practitioner, (admission) diagnosis, comorbidities, physical and psychosocial condition of the patient, treatment and therapy, medication, discharge management, questions and consent of the patient. Another participant explained that a daily goals worksheet could function as a communication tool between

physicians, nurses and other health care workers, when all the participants have access to the medical file of the patient.

Theme 2: Decision-making

This theme was developed from five subthemes: membership, roles and responsibilities, knowledge and expertise, care planning, and learning on the job.

Membership

The participants reported that the primary participants of the medical round are physicians and nurses. One participant explained:

> I think it's a very important opportunity for communication between the nurse and the doctor, where nurses explain their views about the patient, and where doctors explain how they are thinking and the direction in which they see the management of the patient going (Nurse D1:5).

Roles and responsibilities

Although the participants described that both physicians and nurses are involved in the decision-making process during the medical round, there was discussion about the responsibilities of the participants in the decision-making process. The participating physicians of the focus groups led most of the discussion. Several physicians discussed the level of responsibilities of nurses in the decision making process, as one participant described:

> I don't totally agree with that, always discussing things with a nurse. Because that suggests that the junior doctor should make decisions is such a way that the nurse agrees. After all, the junior doctor makes a lot of decisions in which the nurse has no input (Physician D3:4).

Another participant, a nurse, explained:

> When you make a decision about medical management, then it's the doctor that does it. And then you can say, yes, it was in cooperation with the nurse. But what if the nurse has said something completely different, something that doesn't fit in at all, then, that's hardly cooperation is it? The doctor will just overrule it. But we don't just make medical decisions during a ward round, so... I mean they (doctors, ed.) decide on management, and decisions are based on that. (...) It seems to me that you discuss something together and of course as a nurse you can give advice, but it's the doctor who makes the final decision. That seems perfectly clear to me (Nurse D3:9).

Knowledge and expertise

The third subtheme, *knowledge and expertise*, describes the participants view on the importance of the participation of a senior physician or staff nurse at the medical round. The participants of the medical round described that nurses and physicians participating in the medical round are generally at the beginning of their careers, which complicates the decision-making process. Therefore, a qualified and experienced member of the medical and nursing staff should support these physicians and nurses.

A participant reported:

> Yes, that should happen, and it saves a lot of time, because then decisions are made straight away. Doctors in training have to be able to think for themselves, that's a must. But in reality the supervisor is immediately involved in everything, and helps out straight away in making decisions; so the nursing staff doesn't have to wait an unnecessarily long time for an answer (Physician D2:2).

Another participant added:

> Yes, they're not the ones leading the discussion (senior nurse, ed.); the patient's primary nurse does that. But they're the ones who will report when things are going systematically wrong on the ward and who give feedback to the nurse (Nurse D3:5).

Care planning
Several participants explained that there were differences between physicians and nurses when discussing or evaluating the content of the care plan of the patient. Physicians described to be primarily focused on the present clinical situation of the patient and planning of care for the next twenty-four hours. One participant, a physician, stated:

> A 24-hour care plan is the maximum I think (Physician D2:5).

Nurses were, however, more focused on the long-term care planning, and mentioned the importance of discussing the discharge management during the medical round. One participant, a nurse, described:

> I'd also like to see a care plan for the patient. This should include discharge and transfer of course, but maybe it should also include what the patient's needs are if he's transferred to a nursing home or to home care; what the patient is physically and mentally capable of, and draw up a care plan for that (Nurse D2:5).

Learning on the job
Finally, the subtheme *learning on the job* emerged from the theme *decision-making*. The participants explained that the medical round is an educational moment and everybody has to learn how to prepare for and participate during the medical round. Furthermore, several participants explained that physicians and nurses should be equipped with knowledge that is based on best evidence in order to communicate with each other and respond to the increasing complexity of care. One participant, a nurse, explained:

> Well I think so; if I think of my own field, nursing, you have to make sure that after four years the nurses can do a ward round on their own. If you never let trainee nurses do the ward round and all of a sudden after qualifying they are expected to do it, then I wonder how capable they would be of doing it (Nurse D1:4).

Another participant, a physician, described:

> So you must be given the opportunity – it sounds a bit strange when you're talking about patient care – to make mistakes. Providing someone corrects you, these are

the sorts of mistakes – faulty reasoning, faulty decision-making – that you learn the most from. So the more you think for junior doctors (I'm really against it), the greater the risk that they never become independent (Physician D3:2).

Theme 3: Patients' role

The theme *patients' role* reflects participants' view on including patients in the decision-making process during the medical round. Two subthemes, *participating in the decision-making process* and *geographical movement across spaces*, emerged from the theme.

Participating in the decision-making process
Several participants expressed that the patient has an important role in the decision-making process during the medical round and therefore should be actively supported to participate in the decision-making process involving his care plan. One participant said:

> I think (…) that the patient has an important role to play in decision-making. You have to give the patient the opportunity to participate in what's happening (Nurse D1:6).

Several participants explained that the patient should be informed about the care plan, but were hesitating about giving the patient an active role in the decision-making process during the medical round. One participant described:

> I think the patient should know what tests he's going to have, but that's completely different from getting them involved in decision-making (Physician D2:5).

Geographical movement across spaces
There was some discussion among the participants about the spatial structure of the medical round. According to several participants the spatial structure of the medical round should contain a two-stage process. Most of these participants preferred to discuss the care plan of the patient in the staff station, or in the hallway (first stage), and then discuss the care plan at the bedside of the patient (second stage). One participant said:

> Patients should have a role. I think both, yes, maybe it's rather specific, but on our ward we have a 'sit-down' pre-ward-round briefing at the computer, when we look at everything in the system. And then we go to the patients to tell them what we've discussed. Takes a bit more time perhaps, but it means you've got the complete picture? (Physician D1: 3).

Other participants expressed that the patient has to be included from the beginning in the decision-making process during the medical round. Most of the participants described that informing the patient about his care plan is one of the main goals of the medical round. Therefore, the spatial structure should consist of only one phase, as one participant explained:

> In an ideal situation you'd do the whole ward round by the bedside, because then you can check everything with the patient, and the patient knows straight away

where he stands. And then you don't just give the patient a summary of something, which means things get overlooked (Quality improvement officer D1:1).

Discussion

This qualitative study investigated the perspectives of residents, nurses, medical specialist, and staff-members on the ideal medical round in an academic medical center. The results from this study suggest a number of barriers and facilitators, which affect effective interprofessional communication and collaboration during the medical round between health professionals and patients.

First, our results suggest that the structure of the medical round can be improved on several domains. Preparation was identified as a key element to conduct effective medical rounds. It has been suggested before that holding a pre-round briefing not only helps physicians and nurses in gathering all the relevant patient information, but also in raising their comfort level (16). Participants identified that the organization and planning of the medical round needs to be re-prioritized. Currently, the round takes place in the morning, which is one of the busiest moments of the day. Clinical rounds could be timetabled and hospitals could rethink their processes to ensure better collaboration and delivery of care (17). According to the participants, a communication tool can be used to improve interprofessional communication and collaboration. Others (18) have found that using a safety checklist in medicine to structure communication reduces adverse events, morbidity and mortality. In addition, the ward round lead could summarize the daily plan for the patient and set goals for the next 24 hours till discharge, which is also the primary goal of the daily round according to the participants.

Second, our results also suggest that members of the interprofessional team have different views on care planning. Nurses are focused on and have an active voice in decision-making about longer-term care planning, such as discharge planning. On the other hand, physicians are more focused on short-term care planning, such as diagnosis and treatment. However, participants agree that discussing both short- and long-term care planning are important in discharge planning. Furthermore, participants differed about the roles and responsibilities during the round. Physicians reported to have the leading and decisive role in medical decision-making. Therefore, a clear division of roles and responsibilities can support the organization of the round. However, strong leadership is required to strengthen communication between physicians and nurses and develop a team culture. Leaders of teams must ensure that all members of the team are involved in decision-making (19). Participants expressed that interprofessional communication and collaboration in clinical rounds improves when members of the team are equipped with the right clinical knowledge and expertise. Currently, junior health professionals lead the medical round, which are in a training process. The presence of a senior nurse or supervisor at the round could improve the efficiency and safety of the care process. Furthermore, training and educating needs of junior health professionals could be identified during the medical round (20-22).

Last, the participants, who were hesitant to include patients in decision-making, described that patients did not have the right resources to actively participate in decision-making. Our results are in line with others (23), showing that involving patients in decision-making has not been widely adopted by healthcare professionals. In addition, the spatial structure of the medical round can be another reason for patients' passive role in decision-making during the round. The participants expressed that

decisions are made across different spaces during the medical round and patients were not considered to be a member of the interprofessional team. Others (24) have described that the use of space is associated with the level of active engagement of nurses, physicians and patients. Patients are not able to actively participate in decision-making when they are confined to their beds or have no access to the private spaces of nurses and physicians were decisions are made. However, involving the patient in discharge management, for example, shows positive results in patient outcomes such as reduced length of stay and hospital readmission (25).

Strengths and limitations

Our study has several strengths. The sample size was adequate for the purpose of this qualitative study. In addition, there was sufficient heterogeneity of the study participants. Several authors analyzed the data of the focus group meetings separately, which contributed to objectivity. This study has several limitations. For example, we conducted a small explorative study at a single university teaching hospital, which limits the transferability of the findings from this study setting to others. This study is also limited as we did not explore the views of patients and other healthcare professionals such as therapists or social workers.

Recommendations for future research

The findings of this study provide new insights for future research. For example, nurses and physicians are currently not trained together in performing a medical round. Implementing interdisciplinary education and teamwork in health care could improve communication and collaboration between different healthcare professionals. However, more research is needed to investigate how interdisciplinary education should be incorporated into the medical education system, what skills should be learned and how roles can be redefined.

Concluding comments

In summary, the findings of our study indicate that it is important for healthcare professionals to consider how team members and patients are involved in the decision-making process during the medical round and how current social and spatial structures can effect communication and collaboration between the healthcare team and the patient. This study identified specific aspects of communication and collaboration for improving effective interprofessional communication and collaboration during the medical round. Future research should explore the views of patients on effective communication and collaboration during rounds.

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Part

2

**Patients' perspectives
on care transitions**

5

Not feeling ready to go home: a qualitative analysis of chronically ill patients' perceptions on care transitions

Kim J Verhaegh, Patricia Jepma,
Suzanne E Geerlings, Sophia E De Rooij, Bianca M Buurman

Abstract

Quality problem: Unplanned hospital readmissions frequently occur and have profound implications for patients. This study explores chronically ill patients' experiences and perceptions of being discharged to home and then acutely readmitted to the hospital to identify the potential impact on future care transition interventions.

Initial assessment and implementation: Twenty-three semistructured interviews were conducted with chronically ill patients who had an unplanned 30-day hospital readmission at a university teaching hospital in the Netherlands.

Choice of solution: A constructive grounded theory approach was used for data analysis.

Evaluation: The core category that was identified was, 'Readiness for hospital discharge', and the categories related to the core category are, 'experiencing acute care settings', and 'outlook on the recovery period after hospital discharge'. Patients' readiness for hospital discharge was influenced by the organization of hospital care, patients' involvement in decision-making and preparation for discharge. The experienced difficulties during care transitions might have influenced patients' ability to cope with challenges of recovery and dependency on others.

Lessons learned: The results demonstrated the importance of assessing patients' readiness for hospital discharge. Healthcare professionals are recommended to recognize patients and guide them through transitions of care. In addition, employing specifically designated strategies that encourage patient-centered communication and shared decision-making can be vital in improving care transitions and reduce hospital readmissions. We suggest that health care professionals pay attention to the role and capacity of informal caregivers during care transitions and the recovery period after hospital discharge to prevent possible postdischarge problems.

Introduction

It is increasingly common for chronically ill patients to experience a relatively high number of unplanned hospital readmissions (1, 2). Approximately 20% of chronically ill patients are readmitted to the hospital within 30 days (3, 4). Readmissions may result from failures in communication, poor coordination of care, incomplete discharge planning and inadequate access to care (5, 6).

For a patient, hospital readmissions may have profound implications. The urgent and unplanned hospital readmissions can disrupt patients' daily life and could cause difficulties in recovery after acute hospitalization and adjusting to a 'new' normal (7, 8). Many chronically ill patients have complex environmental and social issues, such as loneliness, anxiety or financial stress, that interfere with their abilities to care for themselves (9-11). Furthermore, an increasing number of readmitted patients are hospitalized for another chronic condition (3). Multimorbidity, having two or more chronic conditions, has been identified as a key risk factor for hospital readmission (12, 13).

Managing the complexity of individual patient's needs requires a different approach of health care organizations in order to prevent unplanned hospital readmission. However, evidence-based interventions applicable to patients at risk for readmission remain scarce (14). Greysen et al. (15) found that hospital-based discharge interventions that focus on traditional aspects of care may overlook social and functional gaps in postdischarge care at home for vulnerable older adults. Our knowledge about the patients' journey through transitions of care, integrating the role of environmental, social and interpersonal factors and practices of patients and health care professionals in relation to unplanned hospital readmission is incomplete. Readmitted patients move through cycles of care transitions, receiving care from different professionals as they go through these cycles of care transitions. Only patients and their informal caregivers see the whole journey. The patient journey principle involves analysing this complex process of care transitions in its entirety with the patient as the center of analysis (16).

To get a more complete view on the patient journey, the aim of this study is to explore the perceptions of chronically ill patients in relation to the experience of being discharged from the hospital to home and then subsequently being acutely readmitted to the hospital within 30 days.

Methods

Design

This study utilises a explorative qualitative design based on constructivist grounded theory of Charmaz (17). The methodological perspective is constructivist, which recognizes social life as being processual by nature (17). We used this theory (17) in an attempt to understand experience and its meaning in the same way as the participants who move through transitions of care. In the view of Charmaz (17) the data is constructed through an ongoing interaction between researcher and participant and include the experience and assumptions of the researcher. This was felt important because the researchers were working as health care professionals during the research project and had many years of experience talking to chronically ill patients.

Participants and setting

Participants of the study were purposively selected (18) from four different medical wards of an university teaching hospital in the Netherlands to ensure diversity of chronically ill patients. The inclusion criteria were chronically ill patients (patients with noncommunicable diseases with a long duration and slow progression), aged 18 years and older, with no reported dementia, who speak and understand Dutch, had a life expectancy of more than 3 months, who were acutely admitted for more than 48 hours, discharged to home and subsequently readmitted within 30 days. We defined readmission as all-cause unplanned hospital readmission within 30 days after discharge of the index hospitalization. A trained research nurse screened patients daily during weekdays by consulting the medical record files. Within 2 days after hospital readmission, the research nurse approached eligible patients face-to-face on the wards for participation in this study. Thereafter, an appointment was made for conducting the interview. The interviews were planned within 2 weeks after hospital readmission.

Data collection

A trained research nurse conducted the semi-structured interviews during a period of four months in 2013. Patients were interviewed in the hospital or in their own home. The interviewer used open and follow-up questions, as shown in the topic guide (Table 1), to invite the participants to talk freely about their experiences. The interviews were audio-recorded and field notes were made during and after the interview. The duration of the interviews was approximately one hour. In accordance with constructivist grounded theory, the data collection and data analysis were performed simultaneously and continued until no new themes were identified (17).

Table 1 Topic guide

Topic guide	Why were you hospitalized? How long were you in the hospital? Can you tell me about the care you received? Can you tell me about your expectations before leaving the hospital? How did you communicate your expectations with hospital personnel? Can you tell me anything about changes you would like to make in the care you have received? What more could have been done to help you?
Discharge planning	Can you tell me about the way were you engaged in the discharge planning? Can you tell me about when you were first made aware of the discharge planning? Can you tell me anything about how you were prepared for hospital discharge? Can you tell me anything about how you were feeling at the time of hospital discharge?
Home	Can you tell me about your experiences the first days after hospital discharge? Can you tell me anything about how you were feeling when being at home? Can you tell me anything about the influence of the hospitalization on your daily life? Can you tell me about how long did it take before you were readmitted? Can you tell me if there was a critical point before readmission? Can you tell me anything about how you reacted to changes in your health? Can you tell me about your expectations when arrived home? Can you tell me anything about your social and communal environment?
Readmission	Can you tell me anything about the reason(s) for hospital readmission? Can you tell me about any conditions that may have influenced hospital readmission? Can you tell me anything about the decisions made that led up to hospital readmission? Can you tell me about anything that could have prevented hospital readmission? Can you tell me anything about the access to health care facilities? Can you tell me anything about the care you received?
Additional questions, time permitting	Is there anything else you would like to share about your experiences? Can you tell me about previous experiences with transitions from hospital to home and unplanned hospital readmission?

In addition, a self-report questionnaire was given to participants after completion of the interview. It comprised demographic data, the presence of multimorbidity (more than two different chronic diseases), physical functioning (Katz-(I)ADL index score) (19), health-related quality of life (EuroQol-5D (EQ-5D)) (20), geriatric depression scale-2 (modified GDS-2 scale) (21) and healthcare utilization. Health care utilization data were specified in (1) the number of in-patient hospital, emergency room, and intensive care visits in the last 12 months; (2) the number of hospital readmissions in the last 30 days and (3) self-reported GP visits within 30 days after hospital discharge. Health care utilization data and mortality were obtained from the medical record files until 90 days after discharge of index hospitalization.

Data analysis

Interviews were transcribed verbatim immediately after each interview, and a preliminary analysis was initiated using MAXqda2 (22). The first author (K.V.) wrote memos during the data collection and data analysis. To ensure reliability, the coding and theme development was undertaken by a three-person multidisciplinary team (K.V., P.J., and B.B.). The multidisciplinary team were trained nurses with research backgrounds in nursing, anthropology, and health sciences. The team worked in the same hospital but was not involved in the direct care of the participants. The constant comparative method (23) was used to identify novel concepts, refine or expand emerging conceptual categories, and consistently classify emergent themes. First, the researchers independently coded 10 transcripts and then met to discuss and revise the individual coding. Second, K.V. and B.B. met regularly after coding the remaining transcripts to achieve consensus throughout the process. Next, the entire team finalized a comprehensive code structure that captured all data concepts. Finally, K.V. systematically applied the final code structure to all transcripts.

Descriptive statistics were obtained on the patient characteristics. All analyses were conducted using SPSS 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.).

Ethical considerations

This study was approved by the Medical Ethics Committee of the Academic Medical Center in Amsterdam. Prior to participation, participants received written and oral information about the study with the option to refuse to participate. Informed consent was signed before the interviews were conducted.

Results

A total of 23 patients were interviewed (Table 2). At the time of inclusion, the median age was 57 years (Range 18-78), 65.2% were male, 47.8% and 82.6% had disabilities in activities of daily living and instrumental activities of daily living respectively, 39.1% had depressive symptoms, 87.0% had two or more chronic diseases, 87.0% used more than five medications, and 34.7% was living alone. The median length of the index hospitalization was 4 days (IQR 2.0-10.0) and 7 days (IQR 5.0-19.0) for the readmission. Patients were readmitted at a median of 12 days (IQR 9.0-19.0) after hospital discharge. After

3 months from the discharge of the index hospitalization, 17% of the patients were deceased.

Table 2 Participants' characteristics

Characteristics	Patients n=23
Age, median (range), *Y*	57.0 (18-78)
Male, n (%)	15 (65.2)
Country of birth other than Netherlands, n (%)	6 (27.2)
Education, n (%)	
Elementary/lower	3 (14.3)
Secondary	14 (66.7)
Higher/University	4 (19.1)
Social status, *n* (%)	
Single	8 (34.7)
Living with partner or child	15 (65.2)
Socio-economic status (SES), mean (SD) [a]	0.18 (1.21)
Health-related quality of life, mean (SD) [b]	0.68 (0.29)
Depressive symptoms, n (%) [c]	9 (39.1)
ADL impairment, n (%) [d]	11 (47.8)
IADL impairment, n (%) [e]	19 (82.6)
Multimorbidity, n (%) [f]	20 (87.0)
Polypharmacy, n (%)	20 (87.0)
ED visits ≤ 12months before index hospitalization, mean (SD)	2.8 (2.1)
Hospitalizations ≤ 12months before index hospitalization, mean (SD)	2.2 (1.5)
Length of index hospital stay in days, median (IQR)	4.0 (2.0-10.0)
Discharge diagnosis of the index hospitalization, n (%)	
Cardiovascular disease	3 (13.0)
Disease of the digestive system	8 (34.8)
Renal/urological disease	9 (39.1)
Pulmonary disease	3 (13.0)
Self-reported GP visit within 30 days after index hospital discharge, n (%)	11 (47.8)
Time to hospital readmission, median (IQR)	12.0 (9.0-19.0)
Length of hospital stay readmission in days, median (IQR)	7.0 (5.0-19.0)
Mortality 90 days after index hospital discharge, n (%)	4 (17.4)

Note: Numbers in tables are n (%) unless otherwise indicated. SD, standard deviation; Y, years; IQR, interquartile range; ADL, activities of daily living; IADL, instrumental activities of daily living; GDS, geriatric depression scale; ED, emergency department; GP, general practitioner. [a] SES, high score indicates high social economic status, low score indicates low social economic status, Dutch average score of 2014 is 0,28. [b] Health-related quality of life (EuroQol-5D (EQ-5D)) (24). [c] Geriatric Depression scale-2 (modified GDS-2 scale), 2 questions: 1. Have you felt sad, depressed or hopeless in the past month? 2. Have you lost interest in daily activities?, depressive symptoms present when both positive (21). [d] Modified Katz ADL index score, score ≥ 1 (25). [e] IADL questions of Lawton and Brody, score ≥ 1 (26). [f] More than two diseases.

The core category that was identified from the data was, 'readiness for hospital discharge', and reflects participants' perceptions that not being ready for hospital discharge was preventing them of experiencing a safe journey through the complex cycle of care transitions that resulted in a readmission. This main finding is based on the conceptual categories participants' *experiences of acute care settings* and their *outlook on recovery after hospitalization* related to an unplanned hospital readmission (Table 3). Participants' experiences of acute care settings were based on the categories *the organization of hospital care, decision-making support and patient discharge education*. The outlook on recovery was based on the categories *coping with challenges of recovery and being dependent on others*.

Table 3 Development of categories

Core category	Conceptual category	Category	Subcategory
Readiness for hospital discharge	1. Experience of being admitted to an acute care setting	1.1 Organization of hospital care	1.1.1 Being admitted to the emergency department
			1.1.2 Being cared for in a teaching hospital
		1.2 Decision-making support	1.2.1 Not knowing who the decision maker is
			1.2.2 Not being involved in decision-making
		1.3 Patient discharge education	1.3.1 Receiving and understanding self-ma-nagement instructions
			1.3.2 Importance of monitoring medication changes
	2. Outlook on the recovery period after hospitalization	2.1 Coping with challenges of recovery	2.1.1 Expectations about recovery
			2.1.2 Modifications of life situations
		2.1 Being dependent on others	2.2.1 Being a burden to informal caregivers

Experience of being admitted to an acute care setting

Three categories were identified from the data that appear to influence patients' experience of acute care settings.

Organization of hospital care

Being admitted to the emergency department
Patients described that they were fearful of having to start over with an unknown physician when being readmitted to the hospital. Not having prior knowledge of them as patients was mentioned as something that influenced patient safety. Talking to medical specialists who were up-to-date with their health situation and last hospitalization or care plan, in their view, was preventing loss of time and unnecessary treatment.

> You've got to tell your story all over again. Even though I was a patient on the ward a week earlier. Why can't you then just get in touch directly with the doctor on the

ward where you were recently a patient? Because they know so much more. They will have known you for at least a week (or however long you were there), and now downstairs in the ED you've got to go through the whole ritual yet again (P15, man, 55 years).

Being cared for in a teaching hospital
Patients were aware of being admitted to a teaching hospital. Every few months, there was a rotation of, in their view, mostly inexperienced residents. According to patients, the rotation system affected the relationship with their physician and had safety implications.

> The first time I thought it was a real mess. One person said this, the other said that. You're on a gastroenterology ward, and when do we see a gastroenterologist? I still haven't seen one. Yes, I've seen a medical student or a resident, but I'd like to see the gastroenterologist. [...] But look, I've not been admitted to that ward for nothing. If I want to buy a car, a Volkswagen say, then I don't go to look at a Fiat first (P18, women, 57 years).

Decision-making support

Not knowing who the decision maker is
Patients described having relationships with multiple medical specialists. Sometimes patients were confused about which medical specialist was in the lead of organizing the treatment plan at the time of hospitalization. Others were aware of difficulties in the collaboration between different medical specialists.

> It [the care] is chaotic sometimes. You see I came here for my kidney. But I've had contact with the lung specialist [...], and the cardiologist [...]. The internal medicine department have also interfered and so have urology. So that makes five departments and somehow they give the impression that they don't know what the others are doing. They're all just doing their own thing. [...] That's why I got medications that made my potassium suddenly go sky high. If they had looked, they wouldn't have given me the medication (P3, man, 65 years).

Not being involved in decision-making
Patients noticed they developed a more dependent and passive sick-role during hospitalization although they wanted to take part in developing and evaluating their care-plan goals. Patients illustrated that decisions about their care plan were mostly made during the daily medical rounds between the physician and the nurse. Patients explained that they were not physically present during these medical rounds and received little information afterwards about what had been discussed, such as discharge planning. Patients proposed that the hospital personnel should start the discharge process and needs assessment at the time of hospital admission in order for patients to organise their return home.

> I have experience of another hospital. When you're discharged from there, it's between ten and eleven o'clock. But here, you just don't know when someone's going to come [...] I mean you've got to organize transport haven't you, and there's someone waiting for you at the other end (P10, man, 50 years).

Some patients commented that they attempted to participate in decision-making by critically reflecting on their experience of previous exacerbations, but they did not feel heard.

> And I told them, I said you shouldn't treat me with Meronem for just five days, you should treat me for at least ten days. [...] Do it all at once and get it over with; what do I care if I have to be here for fourteen days? Then I can stay at home for two or three months, I'd like that (P2, women, 69 years).

Patient discharge education

Receiving and understanding self-management instructions
There were noticeable differences between patients with regard to the preference of receiving discharge education. Some patients, who had experienced many hospitalizations in the past, did not desire discharge instructions.

> There are some things, yeah, I don't think there's any need to for them to tell you the same stuff every time. [...]. No, I know all about that by now (P15, man, 55 years).

Others commented that receiving clear postdischarge instructions was crucial for them to manage self-care at home. Patients were very pleased with a personalized patient discharge letter, which provided information on diagnosis, treatment, clinical follow-up and contact information.

> Then the young doctor wrote up a letter for me. [...] In it was all the information about what had happened up to that time, written concisely and in simple language. And you can use it too, if something happens again and the ambulance comes. And that works really well because the last time I gave it to the ambulance people and they read it and it all went really smoothly. [...] They know immediately what's going on with you and that's that (P12, women, 56 years).

Patients noted that they often did not see a physician at the time of discharge. Also, patients described that verbal patient and family discharge education was often not performed at the time of discharge, but was provided in a fragmented way during their hospital stay. Patients experienced difficulties in processing discharge information when feeling too ill or when hospital personnel did not use plain language.

> I could follow it pretty well, but sometimes, with all those terms they used. They could have spoken a bit more normally (P14, man, 67 years).

Importance of monitoring medication changes
Patients expressed the importance of being in control of their medication regimen that is often changed during hospitalization. Patients commented that they received a list of medications at the time of discharge. However, some patients desired an enhanced focus on medication reconciliation at hospital discharge.

> The only thing that I noticed is that not enough is being written down. [...]. Like the changes [of tablets] aren't passed on properly and then you say 'I thought I was supposed to get other tablets?' So the doctor didn't communicate that, or the

nurse didn't read it properly. So, I am absolutely convinced that if you don't keep on top of it that you can be given the wrong medication (P9, man, 40 years).

Patients also encountered problems with medication interactions, wrong dosage and inappropriate prescribing after hospital discharge.

The first time I had to come back I did not feel ill at all. I had the idea that it all went fairly well. The only thing was the potassium was too high. Looking back, it was due to two medications. I'd been given two medications. I took them faithfully and they were what raised the potassium. So, I shouldn't have been given them (P3, man, 65 years).

Outlook on the recovery period after hospitalization

Two categories were identified from the data that explained patient's outlook on the rehabilitation period after hospitalization.

Coping with challenges of recovery

Expectations about recovery
Patients' narratives revealed that they expected to go into the hospital to get better. But in reality they were still feeling sick or not recovered to their normal physical and cognitive standard when they returned to their home environment. Although most patients were ready to leave the hospital, they described that their medical condition was not cured before hospital discharge took place and they therefore felt they were not ready for leaving the hospital. Patients frequently noted that they knew something was still wrong, but ignored their intuition or experience of previous exacerbations of the chronic illness.

Interviewer: Did you feel you were ready to go home? Patient: No, it was the same the first time too; I told them it didn't feel right. I never have pain in my bladder. If I could pee properly, that would've been normal. Just like getting in the car, or walking say (P14, man, 67 years).

Modifications of life situations
Patients explained that they had difficulties returning into society after hospital discharge. After each hospitalization, patients had to find a way to fulfil the expectations of society and return to 'normal' behaviour, within the limitations of their illness.

I feel like I'm in limbo. It's really awful. I dread getting out of hospital; I think oh here we go again, another day of messing around [by the patient himself]. I just don't know what I should do or what I shouldn't (P9, man, 40 years).

Being dependent on others

Being a burden to informal caregivers
Patients explained they did not want to bother others with their illness. They did not ask for help when they were having difficulties identifying alarm signals, such as developing an infection or when the skin is turning yellow, and making appropriate adjustments

to their (pharmalogical) treatment on time. This was often caused by the fact that they were living alone or had a problematic relationship with their family.

> You really don't want to bother anyone with your illness. [...] I want to deal with it myself. And if there is something, I can always call can't I? But you're alone at home. So you actually do have to ask someone for help. You have to bother someone with someone else's problems, or worries, or illness (P13, women, 48 years).

Other patients expressed that they want to do as much as possible themselves, but have someone in their surroundings they can ask for help when necessary. Patients noted that family members and friends have an important role in caregiving or relied completely on the help of others in performing their daily activities.

> I live alone, which is quite a problem. I have a brother who looks out for me and I have people I can go to. I have very sweet neighbours, a neighbour lady who cooks for me when I'm sick. I can always go there. At night, last time my neighbour took me to the hospital very late at night. It means I don't even have to bother my family. And my mother's moved in with me now. She is 78 and she does everything for me too (P12, women, 56 years).

Discussion

This study explored chronically ill patients' experiences and perceptions of being readmitted to the hospital. The results highlighted the importance of patients' readiness for hospital discharge in order to prevent unplanned hospital readmission. Patients' readiness for hospital discharge was influenced by the organization of hospital care, patients' involvement in decision-making and preparation for discharge. This might have affected patients' feelings of trust, recognition, self-confidence and power. The experienced difficulties during their stay in acute care settings might have decreased patients' ability to cope with challenges of recovery and dependency on others after hospital discharge.

   Our findings indicated that readiness for hospital discharge is influenced by the organization of hospital care. Patients experienced poor care continuity during their hospital readmission and desired relationship continuity. Guthrie et al. (27) defined relational continuity as building on accumulated knowledge of patient preferences and interpersonal trust based on experience of past and positive expectations of future care. Patients in this study expressed that when they were readmitted to the hospital, they were confronted with a physician that was unfamiliar with their illness history. Our results are consistent with several other studies showing a relationship between relational continuity and trust (28, 29). Also, one study showed (30) that the length of physician-patient relationship is associated with an increase of patients reporting accumulated knowledge, communication, and trust. Therefore, one could argue that the primary care physician (31) or a care transitions team (32, 33) could play an important role in care continuity and building a trust relationship with patients and serve as a clinical resource to the emergency department when patients are readmitted.

   Although continuity of care matters (27), our study revealed that it is also important to recognize patients in their experience of illness and health. The results of this study showed that patients wanted to be taken seriously by the health care professionals and

be actively involved in decisions concerning discharge planning during the medical round. Several studies (34-36) demonstrate that encouraging patients to be actively involved in care planning improves their healthy behaviour and reduces the rate of readmissions. However, in this study, the decisions about care were mostly made for the patients and not with the patient. Also, in a prior study about healthcare professionals' perspectives on the ideal medical round, we identified that patients are often not involved in decision-making during the medical round (37). Furthermore, the results suggest that patients who wanted to be more involved in decision-making were subjugated by the severity of the illness. We found that 17% of the patients participating in this study died within 3 months after discharge of the index-hospitalization. These severe ill patients described in the interview that they viewed the physician as responsible for guiding them through the care process. Therefore, health care professionals need to be aware of the differing informational needs of patients and adapt their communication approach or content to achieve informed decisions. Also, informal caregivers can provide assistance during decision-making when patients experience physical or cognitive limitations due to the severity of their illness.

Enhancing the quality of discharge education might have a strong impact on patient discharge readiness (38). Many patients in our study left the hospital uninformed about their individual care plan and could have had implications on identifying alarm signals. Some patients received a personalized patient discharge letter, in which discharge instructions were explained in plain language. This strategy can support patients in making judgments and making decisions in every day life concerning healthcare (39). Also, the information provided with the patient discharge letter was tailored to the health literacy skills and personal context of patients. In order to effectively communicate self-management instructions, it is important to be aware of patients' level of health literacy (40, 41). In addition, health care professionals could use the teach-back technique for assessing patients' comprehension of discharge instructions such as discharge warning signs and readmission risk (42).

Interviews suggest that many patients were still feeling ill when discharged home. Although, we cannot be certain that the patients who participated in this study were discharged before clinical stability, we can say that premature discharge is an important contributor to unplanned hospital readmission (43). Healthcare professionals need to clearly communicate to patients that they generally recover better at home and that this takes time. Healhtcare professionals can teach patients about realistic expectations and self-management instructions for the post-discharge period. Also, patients were having difficulties utilizing sources of help because they did not want to be a burden to others or did not have someone in their immediate surroundings they could ask for help. Not having adequate social support is a major risk factor for hospital readmission (44). Healthcare professionals could assess the capacity of and relationship with formal and informal care support that is available to patients when leaving the hospital to prevent possible post-discharge problems (38).

A possible limitation of the study is that some patients preferred to be interviewed in the hospital after they were readmitted. This could have increased social desirability bias. However, we were not involved in the care of participants and interviewed patients with no other persons present in the room and asked hospital personnel not to disrupt the interview if not necessary. Also, we did not see noticeable differences in the array of answers obtained from patients being interviewed in the hospital or at home. Furthermore, no interviews were held with informal caregivers or healthcare professionals. Including multiple perspectives on care transitions could provide data that can be used to tailor interventions to prevent unplanned hospital readmissions.

Conclusion

The core category, 'readiness for hospital discharge,' described the multifaceted concept that provides insight into the process of unplanned hospital readmission of chronically ill patients. The patients' experiences of acute care settings and the outlook on recovery after hospitalization provide useful information for quality improvement of clinical care, including organizational, professional directed and patient-related initiatives aimed at integrating care for chronically ill patients by placing them in a central position in the process of healthcare delivery. Health are professionals are recommended to recognize patients and guide them through transitions of care. In addition, employing specifically designated strategies that encourage patient-centered communication and shared decision-making can be vital in improving care transitions and reduce hospital readmissions. We suggest that healthcare professionals pay attention to the role and capacity of informal caregivers during care transitions and the recovery period after hospital discharge to prevent possible post-discharge problems.

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6

Social determinants of health do not play a role in unplanned hospital readmissions in the Netherlands

Kim J Verhaegh, Marjon van Rijn, Janet L MacNeil-Vroomen,
Suzanne E Geerlings, Sophia E De Rooij, Bianca M Buurman

Abstract

Background: It is unknown how social determinants of health are associated with unplanned readmissions in acutely hospitalized older adults. The objective of this study is to identify if social determinants of health, like social support and social network, are associated with unplanned readmissions within 180 days after hospital discharge.

Methods: This study is a secondary analysis of acutely hospitalized patients (65+) who were (1) re-admitted at 180 days, (2) deceased with no readmission, or (3) alive with no readmission. Social determinants of health were operationalized to social network (e.g. paid and unpaid help), social support (e.g. presence of informal caregiver, hours of caregiving, and caregiver characteristics), socio-economic status (SES), living situation, educational level, and country of birth. Odds ratios and 95% confidence intervals were estimated using a multivariate multinomial logistic regression model accounting for death.

Results: Of the 674 participants, 194 (28.7%) older adults experienced an unplanned readmission within 180 days. After adjustment, there was no association between unplanned hospital readmission and social determinants of health. After backward selection, only a higher Charlson Comorbidity Index score was associated with an increased risk of unplanned hospital readmission (OR 1.13; 95% CI 1.04-1.22).

Conclusions: Social determinates of health were not associated with unplanned hospital readmissions. There was a significant association between comorbidities and unplanned hospital readmissions within 180 days.

Trail registration: Netherlands Trial Registry: NTR2384.

Introduction

A growing number of frail older adults with chronic conditions are being acutely hospitalized (1, 2). At least 20 percent of the frail older adults with needs for complex care experience frequent unplanned hospital readmissions (3, 4). An important factor to higher readmissions is how patients recover after hospital discharge (5, 6). Recovery from hospitalization is a complex process for frail older adults and involves a multitude of elements, such as physical recuperation, psychological improvement, and the management of multiple chronic conditions and medication regimes (7, 8). In order to recover successfully, patients with complex health needs require both medical and social support services.

Social networks and social support play a pivotal role in the daily life of older adults. As persons with chronic diseases age and older people acquire more chronic diseases and comorbidities, older adults must increasingly rely on their informal social relationships for basic daily living needs and self-management support. A large amount of research on preventing unplanned hospital readmission has focused on patient-related and clinical factors, such as age, and cognitive status (9-11). The impact of social support, or the availability of support from network members remains relatively understudied, while it might be an important factor leading to an unplanned hospital readmission. Available research has focused on feelings of loneliness, whether or not people live alone, or marital status as social support factors individually (12, 13). Also, past findings have been mixed regarding whether social support (e.g. having someone to help in the home) (14, 15) has a direct effect on unplanned hospital readmissions. Currently missing, are studies that investigate social support and social network at a broader level, in which social support and social network are measured with multiple social determinants of health (16).

The present study, considers social support and social network as social determinants of health. The WHO defines social determinants of health as "the conditions in which people are born, grow, live, work and age. These conditions are shaped by families and communities and by the distribution of money, power, and resources worldwide, national, and local levels, and affected by policy choices at each of these levels" (17). This means that patients with identical conditions may have different post-discharge outcomes, depending on the supports or resources available to them. To validate this hypothesis, the objective of this study was to identify if these social determinants of health play an important role in preventing unplanned readmissions within 180 days after hospital discharge, when other important determinants are taken into account.

Methods

Design and setting

The data were obtained from a previously completed randomized controlled trial, the Transitional Care Bridge (TCB) randomized trial, which was conducted during 2010-2014 in three hospitals and community care organizations in the Netherlands. Primary aim of the TCB program was to assess the impact of an intervention of an in-hospital systematic Comprehensive Geriatric Assessment (CGA) by a geriatric consultation team followed by a transitional care program on functional decline within six months after

discharge in older adults acutely admitted to a medical ward, compared to older adults who received only systematic CGA during hospitalization. The TCB trial design and methodology and study results were published elsewhere (18, 19).

Study population

Participants were acutely admitted to an internal medicine department, aged over 65 years, at risk for functional decline (> 2 points in the Identification of Seniors At Risk-Hospitalized Patients (20)), ability to speak and understand Dutch, an estimated life expectancy of over three months, not being transferred to another ward within 48 hours after hospital admission, and not being admitted from another department, hospital, or a nursing home) and consented to participate were randomized in a 1:1 ratio double-blind fashion to receive either the TCB intervention or care as usual (18, 19). The institutional review board of the Academic Medical Center approved this study and all subjects gave their informed consent (protocol ID MEC10/082). For this current analysis, we identified patients with an unplanned readmission within 180 days after hospital discharge and patients without unplanned hospital readmission in this timeframe.

Measures

Unplanned hospital readmission
Unplanned hospital readmission was defined as an all cause readmission, occurring within six months after an index hospitalization that could not have been foreseen at the time of discharge from the index hospitalization (21). We included unplanned readmissions for all causes because it is not possible to determine which readmission is preventable and which are not. Index date was defined as the date of inclusion. Unplanned hospital readmission was measured by means of medical record data where readmission is an inpatient stay to the same hospital that can be for any cause and may or may not be related to the care received at the index admission.

Social determinants of health
We assessed social determinants of health by measuring social support, social networks, socio-economic status, educational level, living situation prior to admission and country of birth.

Social support
We operationalized social support with the available support from informal caregivers, who were defined as those who were family caregivers or volunteers without receiving payment. Hours of care per week reflect the intensity of caregiving aid. We also assessed caregiver context characteristics, namely gender, cohabitation status (living in the same household), and caregiver burden (subjective burden of providing informal care) (22).

Social network
We evaluated patients' social network by asking from which people they receive unpaid help and what paid health services they use on a regular basis. Social networks were assessed based on the number of unpaid help that participants reported that they regular received from family members, friends or neighbours. The number of paid help was assessed based on the number of paid homecare workers that provided home

nursing care and household care and other paid health services, including: receiving meals, access to an alarm system, dietician, psychologist, physiotherapy, home nursing care, and elderly day care.

Socio-economic status
We measured socioeconomic status (SES) at baseline. The economic classification commonly used in the Netherlands is based on postal code areas and measures the social status of neighbourhoods compared to other neighbourhoods in the Netherlands. This classification takes into account the attributes of the inhabitants, such as education, income, and labour market position (23). SES was divided in three categories: low (less than -1), intermediate (between -1 and +1), and high SES (more than +1). The categories were based on the standard deviations of the status scores of the neighbourhoods.

Educational level
We distinguished two categories in our measurement for educational level: primary school or less and secondary education or more.

Living situation
Living situation prior to admission was categorized into independent, alone independent, and elderly home.

Country of birth
Country of birth was categorized into born in the Netherlands or in another country.

Determinants previous found to be associated with unplanned readmission
Demographic characteristics, comorbidities, and cognitive impairment before unplanned hospital readmission were collected at baseline from medical record data. Demographic characteristics were age and gender. Age was measured in years. Gender was categorized into male or female. Comorbidities were assessed using the Charlson comorbidity index (24). Finally, cognitive impairment was assessed using the Mini Mental State Examination (MMSE) questionnaire (25).

Statistical analyses

Descriptive statistics were used to compare differences between groups and evaluate percentages of missing data of all variables. To detect statistically significant differences in continuous and categorical variables, respectively, independent sample t test and chi-square tests were performed with the patients who were alive with no readmission as reference group. All hospital readmissions were analysed irrespective of treatment arm, because no differences between groups (treatment/control) were detected in the primary study (19). We undertook a competing risk analysis to understand the robustness of our model in the presence of mortality. Therefore, we used the following groups: (1) patients who were readmitted to the hospital, (2) patients who had died with no hospital readmission, and (3) patients who were alive with no hospital readmission within the 180 days follow-up period (reference group). Univariate regression analysis was used to evaluate which determinants were important in determining unplanned hospital readmission. Differences in different groups of patients (readmitted, deceased with no readmission, alive with no readmission (reference group)) were evaluated

using multinomial models. Multivariate multinomial models considered only variables with a univariate p-value <0.20 and were constructed using backward selection with an elimination threshold of 0.10 (26). We examined the strength of linear relationship between variables by Pearson's correlation test. Model goodness of fit was assessed via Hosmer and Lemeshow testing (27). All analyses were conducted with SPSS 23 (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). A p-value of <0.05 was considered statistically significant.

Results

Characteristics of study participants

This study included 674 older adults (42.1% female) with a mean age of 79.8 (SD 7.5). In total, 189 patients deceased during the six months follow-up period of which 55 patients died during hospital admission (see flow diagram in previous published TCB trail (19) for more details on participant inclusion). We analysed the intervention group and CGA only group together, because no effect of the intervention was seen on unplanned readmission within six months after hospital discharge. Table 1 shows the baseline socio-demographic characteristics of the total population and comparing those who were readmitted or died within 180 days to those who were alive and not readmitted (reference group).

Older adults who were readmitted after discharge of the index hospitalization (n=194), deceased (n=126) or alive (n=354) with no hospital readmission within 180 days consisted of 29%, 19%, and 52% of the study population. In general, patients readmitted within 180 days after hospital discharge had a higher Charlson comorbidity score (3.5 vs. 2.8, P = < 0.0001) to those who were alive with no readmission. Patients who were deceased within six months after hospital discharge were older (81.6 vs. 79.8, P = 0.026), were more often female (0.4 vs. 0.3, P = 0.048), had a higher Charlson comorbidity score (3.9 vs. 2.8, P = ≤ 0.00) and were more often cognitive impaired compared (0.6 vs. 0.4, P = 0.000), to those who were alive after six months with no readmission (reference group). Also, significant differences were seen in the number of paid help (1.9 vs. 1.6, P = 0.030) in the group of older adults who were deceased within 180 days after hospital discharge compared to those who were not.

Factors associated with unplanned hospital readmission

To identify determinants of unplanned hospital readmissions, we performed an analysis in which we first ran a model with all variables independently (univariate logistic regression model) (Table 2). Then, we ran a multivariate multinomial logistic regression model with only the variables with a univariate p-value <0.20. In the univariate logistic regression model, no significant differences were found between groups regarding the social health determinants. However, people who were readmitted versus those non-readmitted had a significantly higher number of comorbidities (OR 1.13; 95% CI 1.04-1.23). Also, patients who died without a readmission within 180 days were more often female older adults with higher age, higher number of comorbidities, cognitive impairment and more unpaid help. There were no other significant differences between groups.

Table 1 Social determinants of health measures and other determinants of the study population readmitted within 180 days after hospital discharge

Variables	Total sample (n=674)	Readmitted (n=194)	Deceased with no readmission (n=126)	Alive with no readmission (n=354)	Missing data, %
Study allocation, treatment	337 (50)	106 (55)	58 (46)	173 (49)	0
Age, years	79.8 (7.5)	78.7 (7.3)	81.6 (7.5)*	79.8 (7.5)	0
Gender, female	284 (42)	88 (45)	61 (48)*	135 (38)	0
Charlson Comorbidity Index [a]	3.2 (2.2)	3.5 (2.1)*	3.9 (2.6)*	2.8 (2.1)	4
Cognitive impairment [b]	21.8 (8.3)	23.1 (7.2)	18.1 (10.2)*	22.4 (7.9)	0
Social support					
Informal caregiver, yes	428 (64)	127 (66)	72 (57)	229 (65)	37
Hours of caregiving per week	25.2 (28.6)	23.8 (35.2)	25.9 (35.2)	25.8 (41.5)	16
Age of informal caregiver, years	61.0 (13.0)	61.2 (13.4)	61.7 (14.9)	60.7 (12.4)	1
Gender of informal caregiver, female	274 (65)	81 (64)	48 (70)	145 (65)	1
Lives in the same household	157 (37)	51 (40)	26 (37)	80 (35.2)	2
Informal caregiver burden [c]	46.8 (26.6)	46.6 (24.1)	48.9 (29.2)	46.2 (27.3)	8
Social network					
Number of unpaid help [d]	1.1 (0.8)	1.1 (0.7)	1.2 (0.9)	1.1 (0.7)	7
Number of paid help [e]	1.7 (1.4)	1.7 (1.3)	1.9 (1.5)*	1.6 (1.3)	7
Socioeconomic status [f]					0
Low (≤1SD)	227 (34)	64 (33)	47 (37)	116 (33)	
Intermediate	286 (42)	77 (40)	52 (41)	157 (44)	
High (≥1SD)	161 (24)	53 (27)	27 (21)	81 (23)	
Educational level, secondary education or more	448 (67)	130 (68)	76 (62)	242 (69)	1
Country of birth, the Netherlands	575 (85)	159 (82)	111 (88)	305 (86)	0
Living situation prior to admission					1
Independent	452 (68)	137 (71)	84 (67)	231 (66)	
Senior residence	142 (21)	38 (20)	19 (15)	85 (24)	
Assisted living	57 (9)	12 (6)	19 (15)	26 (7)	
Other	19 (3)	6 (3)	4 (3)	9 (3)	
Deceased within 180 days after hospital discharge	189 (28)	63 (33)*	126 (100)	0 (0)	0

Note: The reference group is patients who are alive and have no readmission within 180 days. Data are n (%) or mean (SD); * Significance was defined as < .05. Abbreviations: SD, standard deviation. a Charlson comorbidity index, range 0-31, [a] higher score indicates more and/or more severe comorbidity (24); [b] Mini Mental State Examination (MMSE), range 0-30, cognitively impaired if ≤ 24 (25); [c] Summing the values for the seven dimensions, a score of 0 translates into the worst informal care situation (a lot of problems and no support or fulfilment); the higher the score, the better the care situation (22). [d] Number of unpaid help, help from partner, family, children, and or friends/neighbours; [e] Number of paid help, meal delivery, alarm, private help, housekeeping, nursing care, day-care, psychologists, physiotherapy, dietician; [f] Socioeconomic status (SES), high score indicates high status, low score indicates low status, Dutch average score of 2010 is 0,17 (23).

Table 2 Unadjusted and adjusted regression models of the association between social determinants of health and survival with readmission and mortality without readmission from hospital discharge to 180 days post-discharge and survival without readmission

	Univariate logistic regression model		Multivariate multinomial logistic regression model	
	Readmitted	Deceased with no readmission	Readmitted	Deceased with no readmission
Variables	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Study allocation, treatment	1.26 (0.88-1.79)	0.89 (0.59-1.34)	1.30 (0.91-1.89)	1.10 (0.71-1.68)
Age, years	0.98 (0.95-1.00)	1.03 (1.00-1.06)*	0.98 (0.96-1.01)	1.04 (1.01-1.07)**
Gender, female	1.34 (0.94-1.92)	1.52 (1.01-2.29)*	1.26 (0.86-1.83)	1.54 (0.99-2.39)
Charlson Comorbidity Index [a]	1.13 (1.05-1.23)**	1.22 (1.11-1.33)****	1.13 (1.04-1.23)**	1.23 (1.11-1.35)****
Cognitive impairment [b]	1.01 (0.98-1.03)	0.95 (0.92-0.97)****		
Social support				
Informal caregiver, yes	1.03 (0.71-1.49)	0.72 (0.48-1.10)		
Hours of caregiving per week	0.99 (0.99-1.00)	1.00 (0.99-1.00)		
Age of informal caregiver, years	1.00 (0.98-1.02)	1.00 (0.98-1.03)		
Gender of informal caregiver, female	0.98 (0.62-1.54)	1.25 (0.69-2.22)		
Lives in the same household	1.23 (0.78-1.92)	1.06 (0.61-1.84)		
Informal caregiver burden [c]	1.00 (0.99-1.00)	1.00 (0.99-1.01)		
Social network				
Number of unpaid help [d]	1.05 (0.92-1.20)	1.17 (1.01-1.36)*		
Number of paid help [e]	1.08 (0.86-1.35)	1.13 (0.87-1.46)		
Socioeconomic status [f]				
Low (≤1SD)	0.84 (0.53-1.33)	1.21 (0.70-2.11)	0.89 (0.55-1.45)	1.25 (0.69-2.24)
Intermediate	0.75 (0.48-1.16)	0.99 (0.58-1.69)	0.74 (0.46-1.17)	0.95 (0.54-1.69)
High (≥1SD)				
Country of birth, the Netherlands	0.73 (0.45-1.17)	1.18 (0.64-2.20)	0.67 (0.41-1.11)	0.87 (0.45-1.66)
Educational level, secondary education or more	0.94 (0.64-1.37)	0.72 (0.47-1.11)		
Living situation prior to admission				
Independent				
Senior residence	0.75 (0.48-1.16)	0.61 (0.35-1.07)		
Assisted living	0.77 (0.38-1.59)	2.01 (1.05-3.81)*		
Other	1.12 (0.39-3.22)	1.22 (0.36-4.07)		

Note: The reference group is patients who are alive and have no readmission within 180 days. Data are OR, odds ratio and CI, confidence interval. Univariate analysis: Odds ratio and Confidence Intervals are based on factors independently associated with unplanned hospital readmission and mortality versus alive with no hospital readmission within 180 days. Multivariate multinomial analysis: considered only variables with a univariate p-value <0.20. * p < .05; ** p < 0.01; *** p < 0.001; **** p < 0.0001. [a] Charlson comorbidity index, range 0-31, a higher score indicates more and/or more severe comorbidity (24); [b] Mini Mental State Examination (MMSE), range 0-30, cognitively impaired if ≤ 24 (25); [c] Summing the values for the seven dimensions, a score of 0 translates into the worst informal care situation (a lot of problems and no support or fulfilment); the higher the score, the better the care situation (22). [d] Number of unpaid help, help from partner, family, children, and or friends/neighbours; [e] Number of paid help, meal delivery, alarm, private help, housekeeping, nursing care, day-care, psychologists, physiotherapy, dietician; [f] Socioeconomic status (SES), high score indicates high status, low score indicates low status, Dutch average score of 2010 is 0,17 (23).

In the adjusted multivariate multinomial logistic regression model the variables study allocation, age, gender, comorbidities, and country of birth were included in the final model after backward selection. The adjusted multivariate multinomial logistic regression model did not show significant differences between groups concerning the social determinants of health variables included in the model. The Charlson Comorbidity Index variable seemed to be more important in determining unplanned hospital readmissions within 180 days. We found that an increase of comorbidities was associated with unplanned hospital readmission (OR 1.13; 95% CI 1.04-1.23) and mortality (OR 1.23; 95% CI 1.11-1.35) within 180 days after discharge. Furthermore, older adults with higher age had significantly higher odds (OR 1.04; 95% CI 1.01-1.07) of mortality without readmission within 180 days.

Discussion

In this study, we examined the relationship between social determinants of health and unplanned hospital readmissions within 180 days after discharge. In the study sample, representing 674 older adults at risk for functional decline, we found that social determinants of health were not associated with an increased likelihood of unplanned hospital readmission. However, comorbidities were associated with unplanned hospital readmissions and mortality within 180 days.

Our findings are inconsistent with other studies that have demonstrated associations between social determinants of health, such as a lack of social support, living alone, or having a low socio-economic status (28, 29) and unplanned hospital readmissions. However, these determinants were investigated independently and did not include social determinants of health simultaneously with adjustment for other known clinical and physical risk-factors for unplanned hospital readmission (28). The fact that we did not find an association between socio-economic status (SES) and unplanned hospital readmission within six months may be due to the organization of the healthcare system in the Netherlands. Our results may reflect that patients who are discharged from hospital to home have good healthcare access regardless of their socio-economic status (SES). In the Netherlands, primary care is well organized, with 24 hours a day access for acute patients, which is equally accessible for all inhabitants (30, 31). In addition, the primary care physician and emergency departments (ED) collaborate in urgent care and therefore select the most critically ill patients for referral to the ED, which may result in unplanned hospital readmissions. However, we speculate that the number of unplanned hospital readmission may increase in the near future. The Dutch healthcare system is changing due to the growing number of older adults and rising costs. Recently, the Dutch government has implemented policy changes to restrain long-term care spending (32, 33). Now, the local governments are responsible for social care and independent insurers took over responsibility for home nursing. This resulted in people being encouraged to draw on their own network and resources for support. However, not all older adults with complex care needs have a social support network they can rely upon (34). This may impact the recovery period after hospitalization and increase the risk of unplanned hospital readmissions (6). Therefore, healthcare professionals need to assess the available support before hospital discharge and involve them in patient care.

We found that comorbidity is significantly associations with unplanned hospital readmissions and mortality. In our study, older adults at risk for functional decline

are sicker and die sooner. Previous research (1, 14) has shown that the presence of comorbid conditions has a significant impact on the risk of unplanned hospital readmissions. Often, hospitalized patients are treated for their primary outcome. However, a comorbidity, that is a condition other than the index diagnosis, may influence the treatment outcome. The Charlson Comorbidity Index (35) could be used as a proxy measure of disease severity. By including a summary measure on an individual's comorbid conditions along with other clinical and demographic characteristics healthcare professionals are able to capture effectively an individual's general health status and risk for unplanned readmissions. Also, the post-discharge period is a precarious time for patients who suffer from certain comorbidities, such as COPD or congestive heart failure. This implies that healthcare professionals need to pay more attention to the comorbidities of these high-risk patients to be closely monitored after hospital discharge. Patients at high risk for hospital readmissions could benefit from an interprofessional approach focusing on a combination of case and disease management and organizing medical practice around medical conditions and care cycles (36). Currently, healthcare is often provided by specialty. However, for patients with comorbidities, healthcare professionals may have to come and manage the patient in an integrated way rather than the patients making various appointments, on different days to see each of these individual healthcare professional (37). Also, physician-led interprofessional team could manage care transitions and chronic care services in the home environment or workplace (36). In addition, transitional care interventions could be implemented for older adults with a high number of comorbidities and burden of disease (38, 39).

Strengths and limitations of this study

The strength of this study was that we simultaneously tested several social determinants of health proxies. For instance, we used social support and social network along with other social determinants of health on the individual and community level, such as socio-economic status (SES), education status and residual status. Also, our data allowed us to determine important determinants, such as comorbidities, which makes it possible to contribute important information to already existing evidence on the topic of social determinants of health, were some studies did not adjust for important known factors of unplanned hospital readmission (40). Furthermore, this study was based on data from several sources to measure the number of unplanned hospital readmissions from patient's discharge from several hospitals, which reduces selection bias. There were several limitations to this study. This was a secondary analysis with no measurements of the resources of the respondents' network members. Therefore, we measured social health determinants with two other network-based measurements based on existing literature on social network theory (41, 42). Another limitation of this study is the limited sample size. Only 194 (28.7%) patients were readmitted within 180 days. Also, we measured hospital readmission with an unplanned hospital readmission to the same hospital. Unplanned hospital readmission could have been missed when patients where readmitted elsewhere. Findings might have reached significance in a lager sample.

Conclusion

Taken together, these results suggest that social determinants of health are not associated with unplanned hospital readmission within 180 days. There was a significant positive association between comorbidities and unplanned hospital readmissions within 180 days. Hospital seeking to reduce readmissions might benefit from identifying older adults at risk for rehospitalisation using comorbidity measures and guide older adults with comorbid conditions through unplanned episodic care.

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Part

3

Transitional care interventions

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THE CARE SPAN
Transitional care interventions prevent
hospital readmissions for adults with chronic
illnesses

Kim J Verhaegh, Janet L MacNeil-Vroomen, Saeid Eslami, Suzanne E Geerlings,
Sophia E de Rooij and Bianca M Buurman

Abstract

Transitional care interventions aim to improve care transitions from hospital to home and to reduce hospital readmissions for chronically ill patients. The objective of our study was to examine if these interventions were associated with a reduction of readmission rates in the short (30 days or less), intermediate (31–180 days), and long terms (181–365 days). We systematically reviewed twenty-six randomized controlled trials conducted in a variety of countries whose results were published in the period January 1, 1980–May 29, 2013. Our analysis showed that transitional care was effective in reducing all-cause intermediate-term and long-term readmissions. Only high-intensity interventions seemed to be effective in reducing short-term readmissions. Our findings suggest that to reduce short-term readmissions, transitional care should consist of high-intensity interventions that include care coordination by a nurse, communication between the primary care provider and the hospital, and a home visit within three days after discharge.

Introduction

Nearly one-fifth of patients who have been discharged from a hospital in the United States are readmitted within thirty days, and almost half of these hospital readmissions are deemed to be preventable (1,2). The cost of unplanned readmissions has been estimated to be $12–$44 billion per year (3,4).

Patient-related factors such as multiple chronic illnesses (5), specific diagnoses (such as heart failure and chronic obstructive pulmonary disease)(6), and hospital readmission in the previous six months increase the risk for readmission (7). Additionally, organizational factors such as a poorly standardized discharge process (7,8), lack of timely follow-up arrangements (8), and poor communication between the hospital and primary care providers in the first weeks after discharge contribute to a higher rate of readmission (9).

In the United States and England, there is a growing impetus to reorganize the discharge process to reduce avoidable readmissions. In the United States, the Affordable Care Act (ACA) promotes patient safety and quality of care by supporting innovative transitional care services. Ultimately, under the ACA hospitals may not be reimbursed for unplanned readmissions within a thirty-day period (10). And in England, guidance from the Department of Health has led the National Health Service to introduce a system in which local health commissioners do not pay for emergency readmissions within thirty days of an index hospital admission (11).

Interventions that target patients who are at risk for readmission based on their risk profile at admission and that promote the safe and timely transfer of patients from hospital to home are often described as transitional care (12,13). Previous studies of individual discharge interventions (14,15) have shown the beneficial effects of discharge planning, self-management education, and follow-up after discharge on the reduction of hospital readmission rates.

The objective of our systematic review and meta-analysis was to identify and summarize the effectiveness of transitional care interventions, which are a bundle of discharge interventions, on the rates of readmission for patients who are discharged from a hospital to their home. We addressed the following research questions: Are transitional care interventions associated with a reduction of short-term (30 days or less), intermediate-term (31–180 days), and long-term (181–365 days) all-cause hospital readmission rates in chronically ill patients, compared to usual care? Are there differences in the effect of transitional care interventions on hospital readmissions with regard to the intensity of the intervention, age and number of patients included in a study, health care system, or date of publication of a study? And what components of transitional care are associated with a reduction of hospital readmission rates?

Study data and methods

Data sources and searches

We searched PubMed MEDLINE, EMBASE, the Cochrane Library, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) for randomized controlled trials published in the period January 1, 1980–May 29, 2013. The searches were conducted on August 31, 2011, and updated on May 29, 2013 (for the search strategy we used, see

Appendix Exhibit A1) (16).

Because transitional care interventions are often not defined as such, we chose a broad search strategy, including all types of interventions that addressed hospital readmission. We also reviewed the lists of references in key articles and added relevant items that we found in the lists.

Definition of 'transitional care'

Transitional care in this systematic review was defined according to the core components of transitional care described by Mary Naylor and coauthors (10). According to this definition, the main goal of transitional care interventions is to prevent repeated and avoidable readmissions and negative health outcomes after a hospital discharge. The interventions target chronically ill adults or patients at risk for poor outcomes after discharge and their informal caregivers—that is, patients' relatives and friends. The interventions should be initiated during hospital admission and continued after discharge through home visits or telephone follow-up for a minimum of one month (12).

We defined *high-intensity transitional care interventions* as those with scores of 9–16 on a scale of 0 to 16 by summing eleven measures of intervention intensity (the measures are explained in Appendix Exhibit A6) (16). An important difference between transitional care and disease and case management programs is that transitional care is provided for a limited time, whereas disease and case management involves continuous guidance of chronically ill patients through the duration of the disease (10,17).

Study Selection

Two of the authors (Kim Verhaegh and Bianca Buurman) independently examined the study titles and abstracts from each article to determine if it might be relevant. Any disagreements were resolved by consensus between the two authors. Potentially relevant articles were acquired and full-text articles were independently assessed by both authors.

Readmission was defined as all-cause hospital readmission. The duration of the transitional care intervention had to be between thirty days and one year.

We excluded studies that primarily focused on rehabilitation after a hospitalization. We also excluded articles involving pediatric patients and patients with mental illnesses, because factors contributing to readmission risk might be different in these groups, compared to adults with chronic conditions (18) (for excluded studies based on full-text review, see Appendix Exhibit A2) (16).

Data Extraction

Verhaegh and Buurman extracted data from the selected full-text articles. A standardized piloted assessment form was used to record data on study characteristics (authors, publication year, journal, country, study setting, target group and study population, sample size, and follow-up interval) and patient characteristics (mean age and sex).

We extracted data on readmission were extracted from the study results, based on each study's initial treatment assignment—that is, intention-to-treat. These were classified as being related to short-, intermediate-, or long-term hospital readmissions.

Possible random assignments for patients were the intervention group (people who received transitional care interventions) and the control group (people who received care as usual).

In addition, we collected data on the statistical power (power, sample size, and p value used for significance) of the individual studies. Data on the nature of transitional care were also collected, including the in-hospital component, such as an assessment at admission; provider continuity, such as care coordination by a nurse; post-discharge follow-up, such as timely communication between the hospital and primary care provider after discharge; the number of scheduled home visits or telephone follow-up calls; and the total duration of the intervention.

Quality assessment

We used the Cochrane Collaboration's tool for assessing the risk of bias in randomized controlled trials (19). Verhaegh and Buurman separately assessed each study based on its sequence generation (such as using a computer random number generator); allocation concealment (such as web-based randomization); blinding of participants, members of the research team, and outcome assessors; and sources of bias (such as incomplete outcome data and selective outcome reporting).

Data synthesis

We used Review Manager software, version 5.1, to pool the original study data on rates of all-cause readmissions. Regarding statistical significance, *p* values of less than 0.05 were considered significant. For dichotomous outcomes, we used the odds ratio, absolute risk reduction, number needed to treat, and 95% confidence interval, which were computed as summary statistics.

Statistical heterogeneity across studies was evaluated by the Cochrane Q test. Statistical significance for heterogeneity was defined as $p < 0.10$.

We conducted a random-effects meta-analysis using the Mantel-Haenszel method (20). Analyses were conducted according to each study's intention to treat. We entered the study data for the meta-analyses into Review Manager and sorted participants based on whether they belonged to the intervention group or the control group.

From each study, we therefore extracted the number of patients allocated to the intervention and control groups and the number of patients experiencing one or more readmissions. We then used that information to calculate the odds ratios and absolute risk reduction. We categorized all analyses by the effect on short-, intermediate-, and long-term hospital readmissions. A study could be included only once in each category.

Some studies of intermediate-term readmissions measured multiple endpoints. We selected the endpoint that was indicated as the primary one. If no primary endpoint was clearly defined, we used the ninety-day readmission rate.

We conducted six subgroup analyses, using the following variables: the intensity of interventions, patient's age, patient's primary disease, health care system, date of publication of the study, and total number of included patients. The subgroup analyses were conducted according to the random effects model, testing the variables one at a time. Other study results are summarized narratively.

To assess the effect on readmission of the different core components of transitional care mentioned above (10), we conducted univariable meta-regression analyses using the statistical software Stata, version 12. Results of single covariate meta-regression

analyses with permutation tests were applied (21).

To estimate the number of missing studies, we assessed publication bias by Sue Duval and Richard Tweedie's nonparametric "trim-and-fill" method (22).

Limitations

Hospital readmission was the primary outcome of interest. Only a few studies measured whether readmissions were preventable or were for the same underlying diagnosis. Presumably, this is because a valid and reliable method to assess the preventability of readmission was lacking (23,24).

We focused only on readmission rates and did not include recurrent readmissions, number of readmission days, or other outcomes. Few studies have reported recurrent readmissions and readmission days or included cost-effectiveness.

In pooled analyses, we identified substantial heterogeneity, indicating variations between studies. Because of this heterogeneity, we conducted a random-effects meta-analysis. To identify sources of heterogeneity, we conducted both subgroup analysis and meta-regression, which revealed some differences between subgroups.

Study results

Study characteristics

Online database searches yielded 8,092 articles. We conducted our search strategy is according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (25). The search strategy is summarized in Appendix Exhibit A3 (16). Twenty-six randomized controlled trials were included in the meta-analysis (for a list of the included trials, see Appendix Exhibit A4) (16).

Collectively, the twenty-six trials included 7,932 people (3,992 in the intervention groups and 3,940 in the control groups). The trials were conducted in a broad variety of international health care systems. Eleven were from the United States (26–36); three from Hong Kong (37–39); two from Australia (40,41); and one each from Germany (42), Spain (43), Canada (44) Sweden (45), the United Kingdom (46), Ireland (47), Italy (48), China (49), Taiwan (50), and a collaboration between Spain and Belgium (51).

The studies' sample sizes ranged from 41 to 1,001 people. Eighteen of the twenty-six (26–29,33–36, 39,40,42,44–47,48,49,50) were single-center studies. Seventeen (27,30–35,37–39,41,42,44–46,49, 50) included only patients older than sixty years.

Six (28,30,32,34,36,38) of the twenty-six articles precisely defined readmission. Most authors did not specify whether the readmissions were elective or nonelective, planned or unplanned, or same-cause or all-cause. Furthermore, the duration of follow-up after the initial hospitalization varied widely: Eight studies were of short-term (27,30-32,36,37,39,40), seventeen of intermediate-term (27–33,35,37,38,41,44,46–50), and seven of long-term readmissions (26,31,34,42,43,45,51).

Risk of bias in included studies
The allocation process was described in twenty of the twenty-six studies (78 percent) (26–33,35–37,39–45,49,51) (for a summary of methodological quality, see Appendix Exhibit 5) (16). Sixteen (62 percent) (26–28,30,31,33,35–39,43,46,48–50) undertook

intention-to-treat analysis according to initial random allocation. Ten (38 percent) (30,37–40,43,46,48,49,51) performed power analysis.

Transitional care interventions

The elements of transitional care interventions in each study are shown in Appendix Exhibit A6 (16). In-hospital components of transitional care interventions varied across the studies. Fourteen of them (54 percent) (28,30,31,33–36,39,41–44,46,49) included a comprehensive patient assessment at admission, twenty-one (81 percent) (26,27,29–34,37–40,42–45,47–51) provided self-management education during admission, and fourteen (54 percent) (27–32,34,37,42,43,45,49–51) involved caregivers as secondary recipients of the study intervention. Care coordination by a nurse was present in nineteen studies (73 percent) (26–33,37–39,40–42,44,46,47,49–51).

Only seven studies (27 percent) (28–31,35,43,47) included communication between the hospital and a primary care provider within one week after discharge. On average, studies included three (range: 1–12) scheduled home visits and two (range: 1–13) scheduled telephone follow-up calls.

EXHIBIT 1 Characteristics of twenty-six studies of transitional care interventions, short-term readmission rate

Characteristics	Studies	Number I/C	OR[a]	p value	NNT
All studies	10	1,629/1,694	0.76	0.01	33
Intensity of the interventions					
High	7	1,190/1,217	0.59	0.03	20
Low	3	439/477	1.30	0.51	33
Mean age of study population (years)					
Older than age 60	8	1,365/1,416	0.66	0.01	25
Age 18 or older	2	264/278	1.24	0.27	33
Type of primary disease					
Heart failure, COPD, asthma	3	237/249	0.68	0.04	33
Conditions treated by general internal or surgical medicine	7	1,392/1,445	0.77	0.01	33
Region					
Europe	0	—[b]	—[b]	—[b]	—[b]
North America and Australia	8	1,220/1,268	0.67	0.01	25
Asia	2	409/426	1.03	0.08	50
Date of study publication					
2002 or before	2	266/278	0.49	0.03	14
After 2002	8	1,363/1,416	0.84	0.02	50
Number of patients					
Fewer than 100	4	266/284	0.74	0.07	25
100-200	4	645/692	0.74	0.00	50
More than 200	2	718/718	0.71	0.70	33

SOURCE Authors' analysis of the studies in Notes 26–51 in text. **NOTES** Short-term readmission rate is 30 days or less. Studies can be included in multiple categories. Significance for heterogeneity was defined as $p < 0.10$. For further information on random effects meta-analysis, see Appedix A8 (Note 16 in text). "Number" I/C is number of subjects with an evaluable outcome who were allocated to intervention versus control group. NNT is number needed to treat. COPD is chronic obstructive pulmonary disease. [a]Odds ratios (ORs) for rate of readmission of less than 1.00 indicate decreased risk of readmission. [b]Not applicable.

EXHIBIT 2 Characteristics of twenty-six studies of transitional care interventions, intermediate-term readmission rate

Characteristics	Studies	Number I/C	OR[a]	*p* value	NNT
All studies	18	2,884/2,754	0.77	0.00	20
Intensity of the interventions					
High	14	1,806/1,701	0.69	0.00	14
Low	4	1,078/1,053	0.94	0.65	100
Mean age of study population (years)					
Older than age 60	15	2,461/2,434	0.74	0.00	20
Age 18 or older	3	423/296	0.83	0.03	20
Type of primary disease					
Heart failure, COPD, asthma	9	946/968	0.90	0.02	33
Conditions treated by general internal or surgical medicine	9	1,938/1,786	0.65	0.00	14
Region					
Europe	3	614/587	0.82	0.02	20
North America and Australia	11	1,988/1,869	0.74	0.00	20
Asia	4	282/298	0.88	0.04	50
Date of study publication					
2002 or before	5	1,012/988	0.66	0.00	14
After 2002	13	1,872/1,766	0.80	0.00	25
Number of patients					
Fewer than 100	6	340/358	0.43	0.00	8
100-200	8	1,130/1,169	0.82	0.05	33
More than 200	4	1,414/1,227	0.87	0.40	33

SOURCE Authors' analysis of the studies in Notes 26–51 in text. **NOTES** Intermediate-term readmission rate is 31-180 days. Studies can be included in multiple categories. Significance for heterogeneity was defined as *p* < 0.10. For further information on random effects meta-analysis, see Appedix A8 (Note 16 in text). "Number" I/C is number of subjects with an evaluable outcome who were allocated to intervention versus control group. NNT is number needed to treat. COPD is chronic obstructive pulmonary disease. [a]Odds ratios (ORs) for rate of readmission of less than 1.00 indicate decreased risk of readmission.

Overall analysis

The primary analysis of unadjusted odds ratios included twenty-six trials with 7,932 participants in all. Our analysis of unadjusted ratios showed that transitional care was associated with an absolute risk reduction of 5 percent in intermediate-term readmissions (OR: 0.77; 95% CI: 0.62, 0.96) and 13 percent in long-term readmissions (OR: 0.58, 95% CI: 0.46, 0.75) (Exhibit 1-3; for an extended version of the exhibit, see Appendix Exhibit A8).[16] However, transitional care was not effective in reducing short-term readmissions (OR: 0.76; 95% CI: 0.52, 1.10).

The number needed to treat was thirty-three, twenty, and eight, respectively, in the three timeframes (Exhibit 1-3). The individual study and pooled odds ratios using a random-effects model are plotted in Appendix Exhibit A7 (16).

EXHIBIT 3 Characteristics of twenty-six studies of transitional care interventions, long-term readmission rate

Characteristics	Studies	Number I/C	OR[a]	p value	NNT
All studies	7	792/881	0.58	0.18	8
Intensity of the interventions					
High	3	422/436	0.57	0.05	8
Low	4	370/445	0.62	0.43	8
Mean age of study population (years)					
Older than age 60	4	513/571	0.71	0.64	13
Age 18 or older	3	279/310	0.41	0.70	5
Type of primary disease					
Heart failure, COPD, asthma	4	412/451	0.49	0.56	6
Conditions treated by general internal or surgical medicine	3	380/430	0.68	0.17	11
Region					
Europe	4	449/515	0.53	0.08	7
North America and Australia	3	343/366	0.67	0.62	10
Asia	0	—[b]	—[b]	—[b]	—[b]
Date of study publication					
2002 or before	2	220/251	0.75	0.36	14
After 2002	5	572/630	0.53	0.21	7
Number of patients					
Fewer than 100	2	115/136	0.46	0.54	5
100-200	5	677/745	0.61	0.12	8
More than 200	0	—[b]	—[b]	—[b]	—[b]

SOURCE Authors' analysis of the studies in Notes 26–51 in text. **NOTES** Long-term readmission rate is 181-365 days. Studies can be included in multiple categories. Significance for heterogeneity was defined as $p < 0.10$. For further information on random effects meta-analysis, see Appedix A8 (Note 16 in text). "Number" I/C is number of subjects with an evaluable outcome who were allocated to intervention versus control group. NNT is number needed to treat. COPD is chronic obstructive pulmonary disease. [a]Odds ratios (ORs) for rate of readmission of less than 1.00 indicate decreased risk of readmission. [b]Not applicable.

Subgroup analysis

High-intensity interventions were associated with reduced short-term (OR: 0.59; 95% CI: 0.38, 0.92), intermediate-term (OR: 0.69; 95% CI: 0.51 0.92), and long-term readmissions (OR: 0.57; 95% CI: 0.35, 0.92) (Exhibit 1-3). The absolute risk reduction for these interventions was 5 percent for short-term, 7 percent for the intermediate-term, and 13 percent for the long-term readmissions. For the three periods, the number needed to treat was twenty, fourteen, and eight, respectively. Meta-analysis of low-intensity interventions showed they were significantly associated only with reduced long-term readmission (OR: 0.62; 95% CI: 0.46, 0.82).

Transitional care was associated with a 5 percent lower rate of intermediate-term readmission (OR: 0.74; 95% CI: 0.59, 0.93) and an 8 percent lower rate of long-term readmission (OR: 0.71; 95% CI: 0.56, 0.91) in patients older than sixty (Exhibit 1).

Subgroup analysis based on health care systems showed no evidence that transitional care was associated with a reduction of short-term readmissions in specific health care systems.

Meta-regression

Appendix Exhibit A9 (16) contains the results of univariate meta-regression analyses on the association between intervention components as presented in Appendix Exhibit A6 (16) and readmission in the short, intermediate, and long terms. These analyses demonstrate that care coordination by a nurse (OR: 0.60; 95% CI: 0.37, 0.98]; p = 0.04), primary care communication with the hospital (OR: 0.33; 95% CI: 0.12 0.87; p = 0.03), and a home visit within three days of discharge (OR: 0.44; 95% CI: 0.26, 0.76; p= ≤ 0.001) were significantly associated with reduced rates of short-term readmission.

Analysis of publication bias

For all of the outcomes, the analysis demonstrated that no studies were missing and the pooled odds ratios did not change. This indicates that publication bias was not present.

Discussion

The results of this meta-analysis demonstrate that transitional care interventions are associated with reduced intermediate-term (31–180 days) and long-term (181-365 days) all-cause hospital readmission of chronically ill patients. In subgroup analyses, we found that only high-intensity interventions were associated with reduced short-term (30 days or less) readmissions. Moreover, transitional care was most effective among people older than sixty and those admitted to general internal medicine units. We did not find differences across international health care systems with regard to the effectiveness of transitional care.

We also found that a home visit within three days, care coordination by a nurse (most frequently a registered nurse or advanced practice nurse) and primary care communication with the hospital were components of transitional care that were significantly associated with reduced short-term readmission rates.

The United States and the United Kingdom have recently implemented policies to reduce thirty-day readmission rates. In the United States, section 3025 of the ACA provides penalties and reduces reimbursements for hospitals whose readmission rates are higher than the national average for heart failure, acute myocardial infarction, and pneumonia. The numbers of diagnoses affected as well as the severity of the penalties will increase during the next several years. In the United Kingdom, the National Health Service implemented a similar policy that reimburses hospitals for only one-third of the hospitalization cost for same-cause readmissions (11).

Our meta-analysis suggests that to prevent thirty-day readmissions, transitional care interventions should be of high intensity and should consist of at least care coordination by a nurse, communication between the hospital and primary care provider, and a home visit within three days of discharge. These are also core components in the definition of transitional care provided by Naylor and coauthors (10).

A home visit within three days of discharge by a nurse can address specific health care needs related to symptoms that patients experience. In addition, if the nurse performs a medication reconciliation, the number of adverse drug events can be reduced.

A new Current Procedural Terminology (CPT) code for transitional care (52) has been implemented in the United States. This means that physicians and other practitioners (clinical nurse specialists, midwives, nurse practitioners, and physician assistants) can furnish transitional care services. Under the law, these practitioners must contact the patient within two business days by telephone, e-mail, or face-to-face; and must visit the patient within seven to fourteen days, depending on the complexity of decision making. In addition, the practitioner needs to perform some non-face-to-face services, such as reviewing discharge information and test results that were not available when the patient was discharged from the hospital.

As noted above, there is evidence that a home visit within three days of discharge can reduce rates of readmission. However, the timeframe defined by the CPT code—seven or fourteen days—might be too long to effectively reduce the rates.

In our overall analysis, we found that transitional care had an impact only on intermediate- and long-term readmission rates. Three reasons might explain this result.

First, different approaches might be needed to prevent readmissions in the short, intermediate, and long terms. Patients are most vulnerable for readmission in the first weeks after hospital discharge. That is because in this period many people experience symptoms such as fatigue, memory problems, malnutrition, deconditioning, and muscle weakness (53). Therefore, to reduce short-term hospital readmission, high-intensity interventions might be needed, such as a home visit within three days of discharge. To prevent intermediate- and long-term readmissions, care coordination by a nurse could be more important. In fact, most interventions that had an effect on intermediate- and long-term readmissions did provide care coordination.

Second, most (27,29,30,32,34–39,42,43,45,47–49,51) of the transitional care interventions that showed an effect on intermediate- and long-term readmissions lasted longer than thirty days and measured the intermediate- and long-term rates of readmission only after thirty days. These interventions could also have had an effect within the first thirty days, but this was not measured.

The third possible explanation for the association of low-intensity interventions and reduced rates of readmission after more than 181 days is that three out of five low-intensity studies focused on patients ages eighteen or older. In people ages 18–25 the absolute risk reduction of readmission was also higher, compared to those older than sixty years. Patients in the older group often have multiple illnesses and geriatric conditions, which leads to the need for coordinated care (54,55). Long-term readmissions might be more difficult to prevent in older patients. However, we did find a small but significant effect on long-term hospital readmissions (an 8 percent reduction).

Future studies on reducing readmissions should focus on several aspects of providing transitional care. Besides interventions provided to individual patients, systemwide interventions focused on bundled payment and shared savings are of interest to policy makers and health care providers (3,56).

Furthermore, a stronger primary care structure could improve the performance of health systems (57). For example, within the UK National Health Service, greater availability of community-based care has been shown to be associated with reduced readmission rates.

In addition, developing a valid and reliable method to measure the preventability of a readmission is important. Doing so would enable clinicians and researchers to implement targeted readmission policies and penalties for those readmissions that really could have been prevented. Most interventions in our study did not implement telehealth interventions, but these might help reduce readmission rates.

Under section 3026 of the ACA, many US health care organizations are experimenting

with transitional care programs. The ideal content of these programs and their target group are still unclear. The results of our study could be used to formulate an evidence-based transitional care program for adults with chronic diseases.

Conclusion

The results of this meta-analysis suggest that transitional care interventions are associated with reduced hospital readmissions in the intermediate and long terms. We found that high-intensity transitional care interventions were associated with reduced readmissions in the short, intermediate, and long terms. Transitional care was associated with a reduced rate of readmission in patients older than sixty. New studies should consider the early effects of transitional care by examining the rates of readmission in the short term and including more information on the cost-effectiveness of these interventions.

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Appendix Exhibit A1 Search strategy

Database: MEDLINE, Initial search: 31-08-2011, Update search: 29-05-2013		
Search ID#	**Search terms**	**Results**
1	(("Patient Readmission"[Mesh]) OR (readmission*[tiab])	
2	OR (rehospitalization*[tiab]) OR (rehospitalisation*[tiab])	
3	OR (re admission*[tiab])	
4	OR (re hospitalisation*[tiab]) OR (re hospitalization*[tiab])	
5	OR (unnecessary hospitalization*[tiab]) OR (unnecessary hospitalisation*[tiab])	
6	OR (avoidable hospitalization*[tiab]) OR (avoidable hospitalisation*[tiab])	
7	OR (reducing hospitalization*[tiab]) OR reducing hospitalisation*[tiab]))	
8	AND randomized controlled trial[pt]	
9	OR controlled clinical trial[pt]	
10	OR randomized[tiab]	
11	OR placebo[tiab]	
12	OR clinical trials as topic[mesh:noexp]	
13	OR randomly[tiab] OR trial[ti])	
14	NOT (animals[mh] NOT (animals[mh] AND humans[mh]))	2219

Database: Embase, Initial search: 31-08-2011, Update search: 29-05-2013		
Search ID#	**Search terms**	**Results**
1	exp hospital readmission/	13094
2	"readmission*".ti,ab.	12820
3	(re admission* or re admissions).ti,ab.	1658
4	"re hospitali#ation*".ti,ab.	1081
5	"rehospitali#ation*".ti,ab.	3939
6	"unnecessary hospitali#ation*".ti,ab.	278
7	"avoidable hospitali#ation*".ti,ab.	176
8	"reducing hospitali#ation*".ti,ab.	254
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8	23389
10	controlled clinical trial/	396314
11	random*.tw.	806862

12	randomized controlled trial/	343760
13	follow-up.tw.	755154
14	double blind procedure/	114964
15	"placebo*".tw.	189036
16	"factorial*".tw.	20842
17	(crossover* or cross-over*).ti,ab.	65724
18	(double* adj blind*).ti,ab.	136609
19	(singl* adj blind*).ti,ab.	13364
20	"assign*".ti,ab.	222021
21	"allocat*".ti,ab.	75688
22	"volunteer*".ti,ab.	167761
23	crossover procedure/	37094
24	single blind procedure/	17463
25	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	2054897
26	(exp animals/ or nonhuman.mp.) not human/ [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	5094646
27	25 not 26	1864890
28	9 and 27	7709

Database: Cochrane, Initial search: 31-08-2011, Update search: 29-05-2013		
Search ID#	**Search terms**	**Results**
1	MeSH descriptor Patient Readmission explode all trees	678
2	(readmission*):ti,ab,kw	1437
3	(rehospitalization*):ti,ab,kw	443
4	(rehospitalisation*):ti,ab,kw	51
5	(unnecessary next hospitalization*):ti,ab,kw or (unnecessary next hospitalisation*):ti,ab,kw	5
6	(re next hospitalization*):ti,ab,kw or (re next hospitalisation*):ti,ab,kw	89
7	(re next admission*):ti,ab,kw	121
8	(avoidable next hospitalization*):ti,ab,kw or (avoidable next hospitalisation*):ti,ab,kw	3
9	(avoidable next hospitalization*):ti,ab,kw or (avoidable next hospitalisation*):ti,ab,kw	171
10	(#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9)	2080

Database: CINAHL, Initial search: 31-08-2011, Update search: 29-05-2013		
Search ID#	Search terms	Results
S1	(MH "Readmission")	4374
S2	TI readmission* OR AB readmission*	2996
S3	TI rehospitalization* OR AB rehospitalization*	834
S4	TI rehospitalisation* OR AB rehospitalisation*	60
S5	(TI re hospitalisation* OR AB re hospitalisation*) OR (TI reducing hospitalization* OR AB reducing hospitalization*) OR (TI reducing hospitalisation* OR AB reducing hospitalisation*)	222
S6	(TI re hospitalization* OR AB re hospitalization*) OR (TI unnecessary hospitalization* OR AB unnecessary hospitalization*) OR (TI avoidable hospitalization* OR AB avoidable hospitalization*) OR (TI avoidable hospitalisation* OR AB avoidable hospitalisation*)	303
S7	(TI re admission* OR AB re admission*) OR (TI unnecessary hospitalisation* OR AB unnecessary hospitalisation*)	281
S8	S1 or S2 or S3 or S4 or S5 or S6 or S7	6583
S9	(MH "Clinical Trials+")	161447
S10	PT Clinical trial	73654
S11	TX clinic* n1 trial*	196847
S12	TX ((singl* n1 blind*) or (singl* n1 mask*))	10904
S13	TX randomi* control* trial*	97120
S14	(MH "Random Assignment")	34960
S15	TX random* allocat*	7536
S16	TX placebo*	57476
S17	MH "Placebos"	8188
S18	(MH "Quantitative Studies")	10563
S19	TX allocat* random*	7536
S20	S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19	291720
S21	S8 and S20	993

Source: Author's search strategy. **Notes:** The tables represent the total number of articles retrieved from databases Medline, Embase, Cochrane, and CINAHL.

Appendix Exhibit A2 Excluded studies based on full-text review

Excluded studies	Reason
Ahmed NN, Pearce SE. Acute care for the elderly: a literature review. Popul Health Manag 2010;13:219-225.	No RCT
Albanese MC, Bulfoni A, Rossi P et al. [The SCOOP II trial in heart failure]. Ital Heart J Suppl 2001;2:390-395.	Readmission no primary outcome measure
Altfeld SJ, Shier GE, Rooney M et al. Effects of an enhanced discharge planning intervention for hospitalized older adults: a randomized trial. Gerontolist 2013;53:430-40	No TCI
Avlund K, Jepsen E, Vass M, Lundemark H. Effects of comprehensive follow-up home visits after hospitalization on functional ability and readmissions among old patients. A randomized controlled study. Scandinavian Journal of Occupational Therapy 2002;9:17-22.	Readmission no primary outcome measure
Balaban RB, Weissman JS, Samuel PA, Woolhandler S. Redefining and redesigning hospital discharge to enhance patient care: a randomized controlled study. J Gen Intern Med 2008;23:1228-1233.	No TCI
Batty C. Systematic review: interventions intended to reduce admission to hospital of older people... including commentary by Damiani G, Ahearn DJ, Graves N, and Abrahamson V. International Journal of Therapy & Rehabilitation 2010;17:310-322.	No RCT
Blue L, Lang E, McMurray JJ et al. Randomised controlled trial of specialist nurse intervention in heart failure. BMJ 2001;323:715-718.	No TCI
Borzak S. A disease management program reduced hospital readmission days after myocardial infarction. ACP Journal Club 2004;141:4.	Original study is Young, W et al, 2003
Brand CA, Jones CT, Lowe AJ et al. A transitional care service for elderly chronic disease patients at risk of readmission. Aust Health Rev 2004;28:275-284.	No RCT
Carroll DL, Rankin SH, Cooper BA. The effects of a collaborative peer advisor/advanced practice nurse intervention: cardiac rehabilitation participation and rehospitalization in older adults after a cardiac event. J Cardiovasc Nurs 2007;22:313-319.	No TCI
Chiu WK, Newcomer R. A systematic review of nurse-assisted case management to improve hospital discharge transition outcomes for the elderly. Prof Case Manag 2007;12:330-336.	No RCT
Coffey A. Discharging older people from hospital to home: what do we know? International Journal of Older People Nursing 2006;1:141-150.	No RCT

Coleman EA, Smith JD, Frank JC, Min S, Parry C, Kramer AM. Preparing patients and caregivers to participate in care delivered across settings: the care transitions intervention. Journal of the American Geriatrics Society 2004;52:1817-1825.	No RCT
Costa e Silva, Pellanda L, Portal V, Maciel P, Furquim A, Schaan B. Transdisciplinary approach to the follow-up of patients after myocardial infarction. Clinics (Sao Paulo) 2008;63:489-496.	No TCI
Counsell SR, Holder CM, Liebenauer LL et al. Effects of a multicomponent intervention on functional outcomes and process of care in hospitalized older patients: a randomized controlled trial of Acute Care for Elders (ACE) in a community hospital. J Am Geriatr Soc 2000;48:1572-1581.	No TCI
Courtney MD, Edwards HE, Chang AM et al. Improved functional ability and independence in activities of daily living for older adults at high risk of hospital readmission: a randomized controlled trial. J Eval Clin Pract 2011.	Secondary analysis (rehabilitation)
Cowan MJ, Shapiro M, Hays RD et al. The effect of a multidisciplinary hospitalist/physician and advanced practice nurse collaboration on hospital costs. J Nurs Adm 2006;36:79-85.	No RCT
Crotty M, Whitehead CH, Wundke R, Giles LC, Ben-Tovim D, Phillips PA. Transitional care facility for elderly people in hospital awaiting a long term care bed: randomised controlled trial. BMJ 2005;331:1110.	No TCI
Daley CM. A hybrid transitional care program. Critical Pathways in Cardiology 2010;9:231-234.	No RCT
Davies L. A randomised prospective controlled study to assess the effects of a respiratory case management model on hospital readmission rates in patients with moderate to severe COPD. National Research Register 2005.	Article not yet published
Del SD, Pulignano G, Minardi G et al. Two-year outcome of a prospective, controlled study of a disease management programme for elderly patients with heart failure. J Cardiovasc Med (Hagerstown) 2007;8:324-329.	No TCI
Egan E, Clavarino A, Burridge L, Teuwen M, White E. A randomized control trial of nursing-based case management for patients with chronic obstructive pulmonary disease. Lippincotts Case Manag 2002;7:170-179.	Readmission no primary outcome measure
Falces C, Lopez-Cabezas C, Andrea R, Arnau A, Ylla M, Sadurni J. [An educative intervention to improve treatment compliance and to prevent readmissions of elderly patients with heart failure]. Med Clin (Barc) 2008;131:452-456.	No TCI
Fitzgerald JF, Smith DM, Martin DK, Freedman JA, Katz BP. A case manager intervention to reduce readmissions. Arch Intern Med 1994;154:1721-1729.	No TCI

Friedberg MW. Nurse-led counseling had no effect on heart failure outcomes. Journal of Clinical Outcomes Management 2008;15:170-171.	Original study is Jaarsma, T. et al, 2008
Gow P, Berg S, Smith D, Ross D. Care co-ordination improves quality-of-care at South Auckland Health. J Qual Clin Pract 1999;19:107-110.	No RCT
Greenwald JL, Jack BW. Preventing the preventable: reducing rehospitalizations through coordinated, patient-centered discharge processes. Professional Case Management 2009;14:135-142.	Original study is Jack, W. et al, 2009
Griffiths P. Advanced practice nurse directed transitional care reduced readmission or death in elderly patients admitted to hospital with heart failure. Evidence Based Nursing 2004;7:116.	Original study is Naylor, M.D., et al 2004
Griffiths P. Moving elderly inpatients to a transitional care facility reduced hospital stay but increased time to transfer to long term care. Evidence Based Nursing 2006;9:90.	Original study is Crotty M, et al, 2005
Haggmark C, Nilsson B. Effects of an intervention programme for improved discharge-planning. Vard i Norden 1997;17:4-8.	No TCI
Hansen R. [Social intervention at discharge. Cooperation between a hospital department, general practice and the social sector]. Ugeskr Laeger 1990;152:2506-2510.	No TCI
Harrison MB, Browne GB, Roberts J, Tugwell P, Gafni A, Graham ID. Quality of life of individuals with heart failure - A randomized trial of the effectiveness of two models of hospital-to-home transition. Medical Care 2002;40:271-282.	Readmission no primary outcome measure
Hendriksen C, Stromgard E. [Cooperation concerning admission to and discharge of elderly people from the hospital. 2. The course 1 year after discharge]. Ugeskr Laeger 1989;151:1534-1536.	No TCI
Jaarsma T, Halfens R, Huijer Abu-Saad H et al. Effects of education and support on self-care and resource utilization in patients with heart failure. Eur Heart J 1999;20:673-682.	No TCI
Jaarsma T, van der Wal MH, Lesman-Leegte I et al. Effect of moderate or intensive disease management program on outcome in patients with heart failure: Coordinating Study Evaluating Outcomes of Advising and Counseling in Heart Failure (COACH). Arch Intern Med 2008;168:316-324.	No TCI
Jaarsma T, van der Wal MH, Lesman-Leegte I et al. [Value of basic and intensive management of patients with heart failure; results of a randomised controlled clinical trial]. Ned Tijdschr Geneeskd 2008;152:2016-2021.	Original study is Jaarsma, T. et al, 2008
Jack BW, Chetty VK, Anthony D et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. Ann Intern Med 2009;150:178-187.	No TCI

Kasper EK, Gerstenblith G, Hefter G et al. A randomized trial of the efficacy of multidisciplinary care in heart failure outpatients at high risk of hospital readmission. J Am Coll Cardiol 2002;39:471-480.	No TCI
Kircher TT, Wormstall H, Muller PH et al. A randomised trial of a geriatric evaluation and management consultation services in frail hospitalised patients. Age Ageing 2007;36:36-42.	No TCI
Koehler BE, Richter KM, Youngblood L et al. Reduction of 30-day postdischarge hospital readmission or emergency department (ED) visit rates in high-risk elderly medical patients through delivery of a targeted care bundle. J Hosp Med 2009;4:211-218.	No RCT (Pilot)
Ledwidge M, Ryan E, O'Loughlin C et al. Heart failure care in a hospital unit: a comparison of standard 3-month and extended 6-month programs. Eur J Heart Fail 2005;7:385-391.	No TCI
Linne AB, Liedholm H. Effects of an interactive CD-program on 6 months readmission rate in patients with heart failure - a randomised, controlled trial [NCT00311194]. BMC Cardiovasc Disord 2006;6:30.	No TCI
Lokk J. Geriatric rehabilitation revisited. Aging (Milano) 1999;11:353-361.	No RCT
Martin F, Oyewole A, Moloney A. A randomized controlled trial of a high support hospital discharge team for elderly people. Age Ageing 1994;23:228-234.	No RCT (Secondary analysis)
McCauley KM, Bixby MB, Naylor MD. Advanced practice nurse strategies to improve outcomes and reduce cost in elders with heart failure. Dis Manag 2006;9:302-310.	No RCT (Secondary analysis)
McInnes E, Mira M, Atkin N, Kennedy P, Cullen J. Can GP input into discharge planning result in better outcomes for the frail aged: results from a randomized controlled trial. Fam Pract 1999;16:289-293.	No TCI
Mudge A, Laracy S, Richter K, Denaro C. Controlled trial of multidisciplinary care teams for acutely ill medical inpatients: enhanced multidisciplinary care. Intern Med J 2006;36:558-563.	No RCT
Naylor MD, Aiken LH, Kurtzman ET, Olds DM, Hirschman KB. The care span: The importance of transitional care in achieving health reform. Health Aff (Millwood) 2011;30:746-754.	No RCT
Naylor M, Brooten D, Jones R, Lavizzo-Mourey R, Mezey M, Pauly M. Comprehensive discharge planning for the hospitalized elderly. A randomized clinical trial. Ann Intern Med 1994;120:999-1006.	No TCI (follow-up less than one month)
Oliva NL. The impact of RN case management on inpatient and ED utilization in a chronically ill, older adult, community-dwelling population [University of California, San Francisco; 2008.	No RCT

Peikes D, Chen A, Schore J, Brown R. Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. JAMA : the journal of the American Medical Association 2009;301:603-618.	No TCI
Phillips CO, Wright SM, Kern DE, Singa RM, Shepperd S, Rubin HR. Comprehensive discharge planning with postdischarge support for older patients with congestive heart failure: a meta-analysis. JAMA 2004;291:1358-1367.	No RCT
Pinkowish M. Managing transitions in care. American Journal of Nursing 2007;107:72C-72d.	Original study is Coleman, E.A. et al, 2006
Pugh LC, Havens DS, Xie S, Robinson JM, Blaha C. Case management for elderly persons with heart failure: the quality of life and cost outcomes. MEDSURG Nursing 2001;10:71-78.	Readmission no outcome measure
Rainville EC. Impact of pharmacist interventions on hospital readmissions for heart failure. Am J Health Syst Pharm 1999;56:1339-1342.	No TCI
Reble C, Jensen M, Schneider K, Koets S, Crisman T. Impact of heart failure telemanagement program on patient outcomes. Progress in Cardiovascular Nursing 2006;21:113.	No RCT
Reuben DB, Borok GM, Wolde-Tsadik G et al. A randomized trial of comprehensive geriatric assessment in the care of hospitalized patients. N Engl J Med 1995;332:1345-1350.	Readmission no outcome measure
Rice KL, Dewan N, Bloomfield HE et al. Disease management program for chronic obstructive pulmonary disease: a randomized controlled trial. American journal of respiratory and critical care medicine 2010;182:890-896.	No TCI
Rideout E. Review: comprehensive discharge planning plus post-discharge support reduced total readmissions in older patients with congestive heart failure. Evidence Based Nursing 2004;7:115.	Original study is Phillips, CO et al, 2004
Riegel B, Carlson B. Is individual peer support a promising intervention for persons with heart failure? J Cardiovasc Nurs 2004;19:174-183.	No TCI
Roccaforte R, Demers C, Baldassarre F, Teo K, Yusuf S. Effectiveness of comprehensive disease management programmes in improving clinical outcomes in heart failure patients. A meta-analysis. European Journal of Heart Failure 2005;7:1133-1144.	No RCT
Rosswurm MA, Lanham DM. Discharge planning for elderly patients. J Gerontol Nurs 1998;24:14-21.	No RCT
Rytter L, Jakobsen HN, Ronholt F et al. Comprehensive discharge follow-up in patients' homes by GPs and district nurses of elderly patients. A randomized controlled trial. Scand J Prim Health Care 2010;28:146-153.	No TCI

Sethares KA, Elliott K. The effect of a tailored message intervention on heart failure readmission rates, quality of life, and benefit and barrier beliefs in persons with heart failure. Heart Lung 2004;33:249-260.	No TCI
Shaughnessy A. Can a single home visit by a nurse and a pharmacist improve outcomes in patients with heart failure? Evidence-Based Practice 1998;1:8-9, insert.	Original study is Stewart, S. et al, 1998
Sochalski J, Jaarsma T, Krumholz HM et al. What works in chronic care management: the case of heart failure. Health Aff (Millwood) 2009;28:179-189.	No RCT
Sofer D. APNs: improved outcomes at lower costs: older adults with heart failure fare better with transitional care after hospitalization. Am J Nurs 2004;104:19.	Original study is Naylor, MD et al, 2004
Steeman E, Moons P, Milisen K et al. Implementation of discharge management for geriatric patients at risk of readmission or institutionalization. International Journal for Quality in Health Care 2006;18:352-358.	No RCT
Stewart S, Pearson S, Luke CG, Horowitz JD. Effects of home-based intervention on unplanned readmissions and out-of-hospital deaths. J Am Geriatr Soc 1998;46:174-180.	No TCI
Stewart S, Pearson S, Horowitz JD. Effects of a home-based intervention among patients with congestive heart failure discharged from acute hospital care. Arch Intern Med 1998;158:1067-1072.	No TCI
Stuck AE, Siu AL, Wieland GD, Adams J, Rubenstein LZ. Comprehensive geriatric assessment: a meta-analysis of controlled trials. Lancet 1993;342:1032-1036.	No RCT
Stuck AE. Comprehensive geriatric assessment in the acute care hospital and in the ambulatory setting. Schweizerische Medizinische Wochenschrift 1997;127:1781-1788.	No RCT
Tabidze GA, Kobaladze NI, Tsibadze TA. [Assessment of efficiency of patients' therapeutic education in chronic heart failure treatment]. Georgian Med News 2009;35-38.	No TCI
Tepper D. Randomized trial of an education and support intervention to prevent readmission of patients with heart failure. Congest Heart Fail 2002;8:58.	No TCI
Tett S, Ezzy J. Hospital therapeutic drug monitoring with community liaison: A pharmacokinetic study in the real world. Australian Journal of Hospital Pharmacy 1997;27:435-440.	No TCI
Thomas DR, Brahan R, Haywood BP. Inpatient community-based geriatric assessment reduces subsequent mortality. J Am Geriatr Soc 1993;41:101-104.	No TCI
Torp CR, Vinkler S, Pedersen KD et al. Model of hospital-supported discharge after stroke. Stroke 2006;37:1514-1520.	No TCI

Valle R, Carbonieri E, Tenderini P et al. [A comprehensive management system for heart failure improves clinical outcomes and reduces medical resource utilization]. Ital Heart J Suppl 2004;5:282-291.	No TCI
Wei C, Chang S. The effectiveness of case management model on inpatients with congestive heart failure [Chinese]. Tzu Chi Nursing Journal 2010;9:71-83.	No TCI
White P, Atherton A, Birchall B, Youlten L. Impact of nurse intervention on readmissions for asthma in adults. Thorax 2001;56:iii74.	Not published (no respond from author)
Williams EI, Fitton F. Factors affecting early unplanned readmission of elderly patients to hospital. British medical journal 1988;297:784-787.	No RCT
Williams H, Blue B, Langlois PF. Do follow-up home visits by military nurses of chronically ill medical patients reduce readmissions? Mil Med 1994;159:141-144.	No TCI
Young W, Rewa G, Goodman SG et al. Evaluation of a community-based inner-city disease management program for postmyocardial infarction patients: a randomized controlled trial. CMAJ 2003;169:905-910.	No TCI
Zugck C, Frankenstein L, Nelles M et al. 52 Telemedicine reduces hospitalisation rates in patients with chronic heart failure: results of the randomised HiTel trial. European Journal of Heart Failure Supplement 2008;7:9.	No TCI

Source: Authors analysis of retrieved articles. **Notes:** Abbreviation: TCI= Transitional care interventions; RCT= randomized clinical trial.

Appendix Exhibit A3 PRISMA Flow-diagram of included and excluded Transitional Care Interventions

Identification

```
Records identified through database searching
(n=13001):

 MEDLINE (n=2219)
 EMBASE (n=7709)
 COHRANE Library (n=2080)
 CINAHL (n=993)
```

Screening

```
Records after duplicates removed
            (n=8092)
```

```
Records screened
   (n=8092)
```

```
Records excluded on title and
abstract (n=7982)

Main reason for exclusion:
Not related to transitional care
```

Eligibility

```
Full-text articles assessed
    for eligibility
      (n=110)
```

```
Full-text articles excluded,
with reasons (n=84):

No RCT (n=24)
Not related to transitional care (n=41)
Not original study (n=10)
Readmission no primary outcome (n=7)
Other (n=2)
```

Included

```
Studies included in
qualitative synthesis
      (n=26)
```

```
Studies included in
quantitative synthesis
(meta-analysis) (n=26):

   30 days (n=8)
 31-180 days (n=17)
  ≥181 days (n=7)
```

Source: Author's review process of retrieved articles. **Notes:** RCT indicates randomized clinical trial.

Appendix Exhibit A4 Summary of study characteristics of included studies

Study, Year, Reference	Country	Setting	Target group	Population	Multicenter yes/no	Intervention group, n
Atienza et al, 2004 [43]	SPAIN	University hospital	All patients with congestive HF	>18 years	YES	164
Casas et al, 2006 [51]	SPAIN/ BELGIUM	University hospital	Medical and surgical frail elderly patients	>18 years	YES	65
Castro et al, 2003 [26]	USA	University hospital	Patients with Asthma	18-65 years	NO	50
Cline et al, 1998 [45]	SWEDEN	University hospital	Older HF patients	65-84 years	NO	80
Coleman et al, 2006 [27]	USA	Large integrated delivery system	Elders at risk for requirement of extra health services after discharge	>65 years	NO	379
Courtney et al, 2009 [40]	AUSTRALIA	Tertiary referral metropolitan hospital	Older people with known risk factors for readmission	>65 years	NO	58
Daly et al, 2005 [28]	USA	General and psychiatric hospitals	Older frail patients	>18 years	NO	231
Forster et al, 2005 [44]	CANADA	University hospital	Chronically critically ill (CCI) patients	>18 years	NO	175
Huang et al, 2005 [50]	TAIWAN	University hospital	Patients admitted to a general medicine team	>65 years	NO	63
Kwok et al, 2004 [37]	HONG KONG	University hospital	COPD patients	>60 years	YES	70
Kwok et al, 2006 [38]	HONG KONG	Medical wards of a major teaching hospital	Older chronic HF patients	>60 years	YES	49
Laramee et al, 2003 [29]	USA	University hospital	All patients with CHF	>18 years	NO	141
Lim et al, 2003 [41]	AUSTRALIA	University hospital	Patients at an acute ward	>65 years	YES	340
McDonald et al, 2002 [47]	IRELAND	University hospital	High-risk elderly inpatients	>18 years	NO	51

Control group, n	Loss to follow-up (%) (I/C)	Died (%) (I/C)	Mean age (years) (I/C)	Sex (Female) (%) (I/C)	Outcome assessment on readmission (days)	Definition of readmission
174	0/0	0/0	69.0/67.0*	38.0/41.0	365	Any or all cause readmission
90	26/20**	19/16	70.0/72.0	23.0/12.0	365	Hospital readmission
46	†	†	35.0/38.0	80.0/85.0	360	Readmission due to asthma or total readmission
110	20/0	†	75.1/76.0	45.0/43.0	365	Readmission
371	5/5**	4/3	76.0/76.4	48.3/52.3	30;90;180	Non-elective rehospitalization (including the contracted hospital and any non-contracted hospitals)
64	16/9**	3/5	78.1/79.4	62.1/62.5	30;180	Hospital readmission
103	1/7	19/2	60.7/61.4	56.7/54.4	60	Hospital readmission (related to worsening of the original primary diagnosis, worsening secondary diagnosis, and/or development of a new problem)
186	10/8	16/6	65.4/66.6	57.7/51.0	30	Hospital readmission
63	0/0	0/0	75.9/78.1	63.5/74.6	90	All-cause hospital readmission
79	10/1	4/8	75.3/74.2	27.0/31.0	30;180	Unplanned hospital readmission
56	2/4	8/14	79.5/76.8	55.0/55.0	180	Readmission (exacerbation of existing disorder, new but related event, new unrelated event, elective, admission with no deterioration, social/psychological problems and dietary non-compliance)
146	4/6	9/9	70.6/70.8	42.0/50.0	90	All-cause readmission
314	4/4	†	76.5/76.8	60.0/57.0	180	Unplanned admissions
47	0/0	0/0	70.76/70.83	‡‡	90	Readmissions for HF

Study, Year, Reference	Country	Setting	Target group	Population	Multicenter yes/no	Intervention group, n
Naylor et al, 1999 [30]	USA	Urban, academically affiliated hospital	Elders with common medical and surgical reasons for admission	>65 years	YES	177
Naylor et al, 2004 [31]	USA	Academic and community hospitals	Elders with HF	>65 years	YES	118
Nikolaus et al, 1999 [42]	GERMANY	Geriatric center at university hospital	Elders with acute diseases, multiple chronic conditions, functional deterioration, risk for nursing home placement	>65 years	NO	140
Nucifora et al, 2006 [48]	ITALY	Internal medicine department	HF patients	≤85 years	NO	99
Parry, et al, 2009 [32]	USA	Major private hospital	Patients with COPD	>65 years	YES	49
Rich et al, 1995 [33]	USA	University hospital	Geriatric patients with congestive HF	>70 years	NO	142
Saleh et al, 2012 [34]	USA	General hospital	Elderly Medicare patients	>65 years	NO	175
Siu et al, 1996 [35]	USA	University hospital	HF patients	>65 years	NO	178
Smith et al, 1988 [36]	USA	General medical service at an urban academic hospital	High risk hospitalized adults	>18 years	NO	89
Townsend et al, 1988 [46]	UK	District general hospital and community	Elderly patients	>75 years	NO	464
Wong et al, 2011 [39]	HONG KONG	Acute general urban hospital	Frequent users of hospital services	>60 years	NO	339
Zhao et al, 2009 [49]	CHINA	Large comprehensive hospital	Older patients with coronary heart diseases	>60 years	NO	100

Source: Author's analysis of cited studies. **Notes**: N = number of subjects with evaluable outcome; COPD = Chronic Obstructive Pulmonary Diseases; HF = Heart Failure; CHF = Chronic Heart Failure; (I/C)= intervention : control; † Unclear percentage of loss to follow-up or deceased patients; ‡ Unclear mean or median age; ‡‡ Unclear percentage of female sex included; * Median age ; ** Deceased patients are included in number of loss to follow-up; *** YES = low risk of bias, NO = high risk of bias; UNCLEAR = not described in article.

Control group, n	Loss to follow-up (%) (I/C)	Died (%) (I/C)	Mean age (years) (I/C)	Sex (Female) (%) (I/C)	Outcome assessment on readmission (days)	Definition of readmission
186	27/28**	6/6	75.5 /75.3	46.0/54.0	15;180	Readmissions related to any cause (exacerbation, comorbid conditions and new health problems)
121	31/31	†	76.4/75.6	60.0/56.0	15;180	Rehospitalization
141	6/9	†	‡	‡‡	365	Rehospitalization
101	0/0	0/0	73.0/73.0	38.0/38.0	180	All-cause readmission
49	10/14**	2/2	80.5/82.8	75.5/61.2	30;90	Non-elective rehospitalization (inclusive of both the study and any non-study hospitals) and rehospita-lization for the same condition that prompted the index hospitalization
140	0/0	0/0	80.1/78.4	68.0/59.0	90	Readmission for any cause and HF
199	8/13**	2/2	‡	58.3/60.1	30;90;365	Readmission based on consequent admissions to the same hospital, with the readmission period determined according to proximity to the index admission
176	12/12	†	‡	68.0/52.3	240	Readmission
92	†	†	52.4/53.1	52.3/53.0	30	Non-elective readmission
439	†	†	82.0/81.8	63.0/66.0	90	Hospital readmission
347	20/18**	1/2	77.0/77.0	53.7/43.8	30	Readmission
100	0/0	0/0	72.86/71.58	49.0/53.0	90	Readmission related to CHF and other diseases

Appendix Exhibit A5 Methodological quality summary: review authors' judgment about each methodological quality item for each individual study

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Atienza 2004	+	+	?	?	+	+	+
Casas 2006	+	+	+	+	+	+	+
Castro 2003	+	+	−	+	+	+	+
Cline 1998	+	+	?	?	+	?	+
Coleman 2006	+	+	+	+	+	+	+
Courtney 2009	+	+	+	+	+	+	?
Daly 2005	+	+	?	?	+	+	+
Forster 2005	+	+	+	?	+	+	+
Huang 2005	+	?	+	?	−	?	?
Kwok 2004	+	+	+	+	+	+	+
Kwok 2006	+	?	+	+	−	+	+
Laramee 2003	+	+	+	+	+	−	+
Lim 2003	+	+	+	+	+	+	+
McDonald 2002	?	−	−	−	?	?	−
Naylor 1999	+	+	+	+	+	+	+
Naylor 2004	+	+	+	+	+	+	+
Nikolaus 1999	+	+	+	+	?	?	?
Nucifora 2006	+	?	?	?	+	+	+
Parry 2009	+	+	+	+	+	+	+
Rich 1995	+	+	+	+	+	+	+
Saleh 2012	+	−	?	+	+	+	+
Siu 1996	+	+	+	+	+	+	+
Smith 1988	+	+	?	?	+	+	+
Townsend 1988	+	?	?	?	+	+	+
Wong 2012	+	+	+	+	−	+	+
Zhao 2009	+	+	+	+	−	?	?

Source: Author's analysis of cited studies (see Appendix Exhibit 4). **Notes:** At the top of the table the quality assessment items are specified. A green dot with a + means that the quality assessment item was reported in the study and low risk of bias is present. A yellow dot with a ? means that it is unclear whether the researcher actually addressed or conducted the quality assessment item, representing possible bias. A red dot with a – means that the item was not reported in the study or the researchers did not address it in a methodological good way and it represents high risk of bias.

Appendix Exhibit A6 Elements of transitional care interventions in included randomized clinical trials

Study, Year, Reference	Assessment at admission	Self-management education	Caregiver involvement	Discharge Planning	Care Coordination by nurse	General Practitioner Communication	Home visit within three days	Number of home visits	Telephone Follow-up	Number of telephone follow-ups	Total duration of the intervention **	Total score of intervention intensity ***	Short-term RR (I : C) ****	Intermediate-term RR (I : C) ****	Long-term RR (I : C) ****
Intensive interventions															
Atienza et al, 2004 [43] *	Y	Y	Y	Y		Y			Y	#	3	10			24/45
Coleman et al, 2006 [27] *		Y	Y	Y	Y2		Y	1	Y	3	1	10	8/12	17/22	
Courtney et al, 2009 [40] *	Y	Y		Y	Y1	Y	Y	1	Y	9	2	14	5/16	22/50	
Daly et al, 2005 [28]	Y		Y	Y	Y2		Y	9	Y		2	12		40/38	
Huang et al, 2005 [50] *		Y	Y	Y	Y1			1	Y	1	2	13		6/21	
Kwok et al, 2004 [37]		Y	Y		Y1			10		#	2	10	47/37	76/62	
Kwok et al, 2006 [38]		Y			Y1			11		#	2	9		39/43	
Laramee et al, 2003 [29]		Y	Y	Y	Y1	Y			Y	9	2	13		35/32	
Mc Donald et al, 2002 [47] *		Y			Y3	Y	Y	3	Y	13	2	12		2/23	
Naylor et al, 1999 [30] *	Y	Y	Y	Y	Y2	Y	Y		Y	4	1	14	3/12	6/15	
Naylor et al, 2004 [31] *	Y	Y	Y	Y	Y2	Y	Y	12			2	13	6/12	36/48	47/61
Nikolaus et al, 1999 [42]	Y†	Y	Y				Y	2			2	9			42/46

Parry et al, 2009 [32]		Y	Y	Y	Y		Y	Y1	1	Y	Y	3	1	10	6/16	10/31	
Rich et al, 1995 [33] *	Y	Y			Y		Y	Y1	3	Y	Y	1	2	12		29/42	
Siu et al, 1996 [35]	Y†					Y			4	Y	Y		2	9		24/21	
Wong et al, 2011 [39]	Y	Y		Y	Y		Y	Y1	2		Y	2	1	10	12/15		
Zhao et al, 2009 [49]	Y	Y	Y		Y	Y	Y	Y1	2	Y	Y	2	1	11		19/20	
Mean percentage of individual components	59	88	65	65	41	65	82	65	4††	Y	71	3††	2††				
Non-intensive interventions																	
Casas et al, 2006 [51] *		Y	Y	Y	Y		Y	Y1	1‡	Y	Y		1	6			45/67
Castro et al, 2003 [26]			Y				Y	Y3	##		Y	##	2	7			40/54
Cline et al, 1998 [45]		Y	Y	Y	Y		Y		1				3	7			28/39
Forster et al, 2005 [44]	Y	Y		Y			Y	Y1			Y	1	1	5	17/12		
Lim et al, 2003 [41]	Y							Y1	##		Y	##	2	7		22/25	
Nucifora et al, 2006 [48]		Y					Y		1		Y	1	2	6		49/43	
Saleh et al, 2012 [34]	Y	Y	Y						3				2	8	9/6	10/12	38/45
Smith et al, 1988 [36]	Y					Y			1		Y		2	6	18/20		
Townsend et al, 1988 [46]	Y			Y				Y4	3	Y		3	2	8		23/23	
Mean percentage of individual components	44	67	33	44	0	22	44		1††	Y	67	0.2††	2††				
Overall mean percentage of individual components	54	81	54	58	27	50	69	69	3††	Y	69	2††	2††				

Source: Author's analysis of cited studies (see Appendix Exhibit 4). **Notes**: * effective interventions; ** calculation of the duration of interventions (1= ≤30 days, 2= 31-180 days, and 3= 181-365 days); ; ***calculation of the total intensity of interventions (in-hospital component (assessment at admission=1, self-management education=1, caregiver involvement=1, discharge planning=1, provider continuity (coordination by assigned nurse or other professional=1, general practitioner communication=1), post-discharge component (home visit within three days of discharge=1, telephone follow up=1, number of scheduled home visits and/or telephone follow-up (1=1, 2-3=2, 4-5=3, 6 or more=4), and total duration of the interventions (30 days=1, 30-60 days=2, 61-180 days=3). To create comparison groups with similar numbers, interventions with scores of 1-8 were categorized as low-intensive and those with scores of 9-16 were categorized as high-intensive). **** (RR) rate of readmission in percentage; (I/C)= intervention : control; Y=yes; † geriatric assessment; ‡ different logistic approach in 2 study sites, ## performed when necessary; †† mean; 1 registered nurse (RN); 2 advanced practice nurse (APN); 3 clinical nurse specialist (CNS); 4 unclear

Appendix Exhibit A7 Effect of transitional care interventions on short term (<30 days), inter-mediate term (31-180 days) and long term (181-365 days) on rate of readmission

Study or Subgroup	Experimental Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Effects at ≤ 30 days follow-up						
Coleman 2006	31	379	44	371	3.6%	0.66 [0.41, 1.07]
Courtney 2009	3	58	10	64	1.1%	0.29 [0.08, 1.13]
Forster 2005	30	175	22	186	3.1%	1.54 [0.85, 2.79]
Kwok 2004	33	70	29	79	2.8%	1.54 [0.80, 2.96]
Naylor 1999	6	177	23	186	1.9%	0.25 [0.10, 0.63]
Naylor 2004	7	118	15	121	1.9%	0.45 [0.17, 1.14]
Parry 2009	3	49	8	49	1.1%	0.33 [0.08, 1.34]
Saleh 2012	15	175	12	199	2.3%	1.46 [0.66, 3.21]
Smith 1988	16	89	18	92	2.5%	0.90 [0.43, 1.90]
Wong 2012	39	339	51	347	3.8%	0.75 [0.48, 1.18]
Subtotal (95% CI)		1629		1694	24.2%	0.76 [0.52, 1.10]
Total events	183		232			
Heterogeneity: Tau² = 0.20; Chi² = 22.81, df = 9 (P = 0.007); I² = 61%						
Test for overall effect: Z = 1.46 (P = 0.15)						
Effects at 31-180 days follow-up						
Coleman 2006	63	379	83	371	4.2%	0.69 [0.48, 1.00]
Courtney 2009	13	58	32	64	2.3%	0.29 [0.13, 0.64]
Daly 2005	93	231	39	103	3.7%	1.11 [0.69, 1.78]
Huang 2005	4	63	13	63	1.4%	0.26 [0.08, 0.85]
Kwok 2004	53	70	49	79	2.6%	1.91 [0.94, 3.88]
Kwok 2006	19	49	24	56	2.4%	0.84 [0.39, 1.84]
Laramee 2003	49	141	46	146	3.6%	1.16 [0.71, 1.89]
Lim 2003	75	340	79	314	4.3%	0.84 [0.59, 1.21]
McDonald 2002	1	51	11	47	0.5%	0.07 [0.01, 0.53]
Naylor 1999	11	177	27	186	2.5%	0.39 [0.19, 0.81]
Naylor 2004	42	118	58	121	3.5%	0.60 [0.36, 1.01]
Nucifora 2006	48	99	43	101	3.3%	1.27 [0.73, 2.22]
Parry 2009	5	49	15	49	1.5%	0.26 [0.09, 0.78]
Rich 1995	41	142	59	140	3.6%	0.56 [0.34, 0.91]
Saleh 2012	17	175	23	199	2.8%	0.82 [0.42, 1.60]
Siu 1996	43	178	37	176	3.6%	1.20 [0.73, 1.97]
Townsend 1988	105	464	102	439	4.5%	0.97 [0.71, 1.32]
Zhao 2009	19	100	20	100	2.7%	0.94 [0.47, 1.89]
Subtotal (95% CI)		2884		2754	52.8%	0.77 [0.62, 0.96]
Total events	701		760			
Heterogeneity: Tau² = 0.12; Chi² = 43.37, df = 17 (P = 0.0004); I² = 61%						
Test for overall effect: Z = 2.37 (P = 0.02)						
Effects at ≥ 181 days follow-up						
Atienza 2004	39	164	79	174	3.7%	0.38 [0.24, 0.60]
Casas 2006	29	65	60	90	2.8%	0.40 [0.21, 0.78]
Castro 2003	20	50	25	46	2.3%	0.56 [0.25, 1.26]
Cline 1998	22	80	43	110	3.0%	0.59 [0.32, 1.10]
Naylor 2004	56	118	74	121	3.5%	0.57 [0.34, 0.96]
Nikolaus 1999	59	140	65	141	3.7%	0.85 [0.53, 1.36]
Saleh 2012	67	175	89	199	4.0%	0.77 [0.51, 1.16]
Subtotal (95% CI)		792		881	22.9%	0.58 [0.46, 0.75]
Total events	292		435			
Heterogeneity: Tau² = 0.03; Chi² = 8.80, df = 6 (P = 0.18); I² = 32%						
Test for overall effect: Z = 4.29 (P < 0.0001)						

Odds Ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
Favours experimental   Favours control

Source: Author's analysis of cited studies (see Appendix Exhibit 4). **Notes:** CI indicates confidence interval. Odds ratios lower than 1 indicate decreased risk of readmission.

Appendix Exhibit A8 Random effects meta-analysis for outcomes stratified by study characteristics in 26 trials of transitional care interventions

Characteristics	Studies	Number I/C	OR (95% CI)[a]	I^2, %[b]	p value[c]	ARR (95% CI)	I^2, %[b]	p value[c]	NNT
All studies	10	1629/1694	0.76 (0.52, 1.10)	61	0.007	-0.03 (-0.06,0.01)	58	0.01	33
Intensity of the intervention									
High	7	1190/1217	0.59 (0.38,0.92)	57	0.03	-0.05 (-0.09,-0.02)	33	0.18	20
Low	3	439/477	1.30 (0.87,1.95)	0	0.51	0.03 (-0.01,0.07)	0	0.49	33
Mean age of study population (years)									
>60	8	1365/1416	0.66 (0.43,1.01)	60	0.01	-0.04 (-0.08,-0.01)	54	0.03	25
≥18	2	264/278	1.24 (0.74,2.08)	18	0.27	0.03 (-0.03,0.09)	1	0.31	33
Type of primary disease									
Heart failure, COPD, asthma	3	237/249	0.68 (0.25,1.88)	70	0.04	-0.03 (-0.14,0.08)	64	0.06	33
Conditions treated by general internal or surgical medicine	7	1392/1445	0.77 (0.50,1.17)	62	0.01	-0.03 (-0.07,0.01)	62	0.01	33
Region									
Europe	0	_[d]	_[d]	_[d]	_[d]	_[d]	_[d]	_[d]	_[d]
North America and Australia	8	1220/1268	0.67 (0.42,1.07)	63	0.009	-0.04 (-0.08,0.00)	61	0.01	25
Asia	2	409/426	1.03 (0.52,2.07)	68	0.08	0.02 (-0.12,0.15)	65	0.09	50
Date of publication									
2002 or before	2	266/278	0.49 (0.14,1.72)	78	0.03	-0.07 (-0.14,0.00)	34	0.22	14
After 2002	8	1363/1416	0.84 (0.57,1.24)	56	0.02	-0.02 (-0.06,0.02)	55	0.03	50

Number of patients									
Fewer than 100	4	266/284	0.74 (0.35,1.55)	58	0.07	-0.04 (-0.13,0.05)	55	0.08	25
100-200	4	645/692	0.74 (0.31,1.77)	79	0.002	-0.02 (-0.09,0.05)	80	0.002	50
More than 200	2	718/718	0.71 (0.51,0.99)	0	0.70	-0.03 (-0.07,-0.00)	0	0.88	33

Source: Author's analysis of cited studies (see Appendix Exhibit 4). **Notes:** Figures are odds ratios and absolute risk reduction (for rate of readmission) with 95% confidence intervals. Abbreviations: OR, odds ratios; ARR, absolute risk reduction; CI, confidence interval; I2, heterogeneity statistics; NNT, numbers needed to treat. [a] The ORs that are lower than 1 indicate decreased risk of readmission. [b] Values of 25%, 50%, and 75% were considered to represent low, medium, and high heterogeneity. [c] Statistical significance for heterogeneity was defined as P < .10. [d] Not applicable.

Appendix Exhibit A9 Random effects meta-analysis for outcomes stratified by study characteristics in 26 trials of transitional care interventions, intermediate-term readmission rate

Characteristics	Studies	Number I/C	OR (95% CI)[a]	I^2, %[b]	p value[c]	ARR (95% CI)	I^2, %[b]	p value[c]	NNT
All studies	18	2884/2754	0.77 (0.62,0.96)	61	0.0004	-0.05 (-0.09,-0.01)	62	0.0003	20
Intensity of the intervention									
High	14	1806/1701	0.69 (0.51,0.92)	67	0.0002	-0.07 (-0.12,-0.02)	66	0.0003	14
Low	4	1078/1053	0.94 (0.77,1.16)	0	0.65	-0.01 (-0.05,0.02)	0	0.61	100
Mean age of study population (years)									
>60	15	2461/2434	0.74 (0.59,0.93)	59	0.002	-0.05 (-0.09,-0.02)	59	0.002	20
≥18	3	423/296	0.83 (0.38,1.80)	72	0.03	-0.05 (-0.21,0.11)	82	0.004	20
Type of primary disease									
Heart failure, COPD, asthma	9	946/968	0.90 (0.66,1.23)	58	0.02	-0.03 (-0.09,0.04)	60	0.01	33
Conditions treated by general internal or surgical medicine	9	1938/1786	0.65 (0.47,0.89)	65	0.004	-0.07 (-0.11,-0.02)	65	0.003	14
Region									
Europe	3	614/587	0.82 (0.39,1.72)	73	0.02	-0.05 (-0.19,0.09)	82	0.004	20
North America and Australia	11	1988/1869	0.74 (0.56,0.97)	64	0.002	-0.05 (-0.10,-0.01)	69	0.0003	20
Asia	4	282/298	0.88 (0.45,1.74)	64	0.04	-0.02 (-0.14,0.10)	67	0.03	50
Date of publication									
2002 or before	5	1012/988	0.66 (0.39,1.09)	74	0.004	-0.07 (-0.14,0.00)	75	0.003	14
After 2002	13	1872/1766	0.80 (0.62,1.03)	57	0.005	-0.04 (-0.09,0.00)	58	0.004	25

Number of patients									
Fewer than 100	6	340/358	0.43 (0.18,1.01)	78	0.0004	-0.13 (-0.24,-0.01)	75	0.001	8
100-200	8	1130/1169	0.82 (0.62,1.10)	51	0.05	-0.03 (-0.08,0.01)	47	0.07	33
More than 200	4	1414/1227	0.87 (0.73,1.05)	0	0.40	-0.03 (-0.06,0.01)	0	0.48	33

Source: Author's analysis of cited studies (see Appendix Exhibit 4). **Notes:** Figures are odds ratios and absolute risk reduction (for rate of readmission) with 95% confidence intervals. Abbreviations: OR, odds ratios; ARR, absolute risk reduction; CI, confidence interval; I^2, heterogeneity statistics; NNT, numbers needed to treat. [a] The ORs that are lower than 1 indicate decreased risk of readmission. [b] Values of 25%, 50%, and 75% were considered to represent low, medium, and high heterogeneity. [c] Statistical significance for heterogeneity was defined as P < .10.

Appendix Exhibit A10 Random effects meta-analysis for outcomes stratified by study characteristics in 26 trials of transitional care interventions, long-term readmission rate

Characteristics	Studies	Number I/C	OR (95% CI)[a]	I², %[b]	p value[c]	ARR (95% CI)	I², %[b]	p value[c]	NNT
All studies	7	792/881	0.58 (0.46,0.75)	32	0.18	-0.13 (-0.19,-0.07)	28	0.22	8
Intensity of the intervention									
High	3	422/436	0.57 (0.35,0.92)	66	0.05	-0.13 (-0.24,-0.03)	62	0.07	8
Low	4	370/445	0.62 (0.46,0.82)	0	0.43	-0.12 (-0.18,-0.05)	0	0.63	8
Mean age of study population (years)									
>60	4	513/571	0.71 (0.56,0.91)	0	0.64	-0.08 (-0.14 to -0.03)	0	0.65	13
≥18	3	279/310	0.41 (0.29,0.58)	0	0.70	-0.21 (-0.28,-0.13)	0	0.79	5
Type of primary disease									
Heart failure, COPD, asthma	4	412/451	0.49 (0.37,0.65)	0	0.56	-0.17 (-0.23,-0.10)	0	0.62	6
Conditions treated by general internal or surgical medicine	3	380/430	0.68 (0.46,1.01)	44	0.17	-0.09 (-0.19,0.00)	46	0.16	11
Region									
Europe	4	449/515	0.53 (0.35,0.80)	56	0.08	-0.15 (-0.24,-0.06)	52	0.10	7
North America and Australia	3	343/366	0.67 (0.49,0.90)	0	0.62	-0.10 (-0.17,-0.03)	0	0.60	10
Asia	0	_[d]	_[d]	_[d]	_[d]	_[d]	_[d]	_[d]	_[d]
Date of publication									
2002 or before	2	220/251	0.75 (0.51,1.09)	0	0.36	-0.07 (-0.16,0.02)	0	0.40	14
After 2002	5	572/630	0.53 (0.39,0.71)	32	0.21	-0.15 (-0.22,-0.09)	26	0.25	7

Number of patients								
Fewer than 100	2	115/136	0.46 (0.28,0.76)	0	0.54	-0.19 (-0.31,-0.07)	0	0.55	5
100-200	5	677/745	0.61 (0.46,0.82)	45	0.12	-0.12 (-0.18,-0.05)	41	0.15	8
More than 200	0	-d	-d	-d	-d	-d	-d	-d	-d

Source: Author's analysis of cited studies (see Appendix Exhibit 4). **Notes:** Figures are odds ratios and absolute risk reduction (for rate of readmission) with 95% confidence intervals. Abbreviations: OR, odds ratios; ARR, absolute risk reduction; CI, confidence interval; I2, heterogeneity statistics; NNT, numbers needed to treat. [a] The ORs that are lower than 1 indicate decreased risk of readmission. [b] Values of 25%, 50%, and 75% were considered to represent low, medium, and high heterogeneity. [c] Statistical significance for heterogeneity was defined as P < .10. [d] Not applicable.

Appendix Exhibit A11 Univariable meta-regression on intervention components associated with readmission

Intervention component	Short-term readmission [a]		Intermediate-term readmission [b]		Long-term readmission [c]	
	≤30 days rate of readmission		31-180 days rate of readmission		181-365 days rate of readmission	
	OR (95%CI)	P Value[d]	OR (95%CI)	P Value[d]	OR (95%CI)	P Value[d]
Assessment at admission						
Present in study	0.62 (0.33 to 1.17)	0.12	0.74 (0.51 to 1.08)	0.11	0.73 (0.52 to 1.04)	0.07
Not present in study	0.97 (0.47 to 2.01)	0.93	0.79 (0.48 to 1.28)	0.32	0.45 (0.30 to 0.67)	0.00
Self-management education						
Present in study	0.73 (0.42 to 1.25)	0.21	0.68 (0.49 to 0.95)	0.03	-[e]	-[e]
Not present in study	0.90 (0.19 to 4.34)	0.88	1.01 (0.62 to 1.64)	0.98	-[e]	-[e]
Caregiver involvement						
Present in study	0.68 (0.35 to 1.31)	0.22	0.76 (0.50 to 1.13)	0.16	0.58 (0.40 to 0.84)	0.01
Not present in study	0.85 (0.39 to 1.84)	0.64	0.76 (0.49 to 1.18)	0.21	0.56 (0.17 to 1.89)	0.28
Care Coordination by nurse						
Present in study	0.60 (0.37 to 0.98)	0.04	0.71 (0.52 to 0.96)	0.03	0.51 (0.28 to 0.92)	0.03
Not present in study	1.28 (0.64 to 2.58)	0.44	1.10 (0.58 to 2.08)	0.77	0.62 (0.41 to 0.96)	0.62
General Practitioner Communication						
Present in study	0.33 (0.12 to 0.87)	0.03	0.78 (0.46 to 1.31)	0.33	0.57 (0.23 to 1.45)	0.19
Not present in study	0.92 (0.61 to 1.38)	0.64	0.75 (0.52 to 1.07)	0.11	0.58 (0.39 to 0.86)	0.02
Home visit within three days						
Present in study	0.44 (0.26 to 0.76)	0.00	0.67 (0.47 to 0.94)	0.02	0.61 (0.35 to 1.05)	0.07
Not present in study	1.14 (0.75 to 1.74)	0.49	0.98 (0.63 to 1.51)	0.91	0.56 (0.35 to 0.90)	0.03
Telephone Follow-up						
Present in study	0.72 (0.41 to 1.27)	0.22	0.72 (0.51 to 1.01)	0.06	0.46 (0.21 to 1.00)	0.05
Not present in study	0.84 (0.26 to 2.70)	0.74	0.88 (0.50 to 1.55)	0.64	0.61 (0.42 to 0.89)	0.02

Source: Author's analysis of cited studies (see Appendix Exhibit 4). **Notes:** Abbreviations: OR, odds ratios; CI, confidence interval, NA= not applicable (lack of contrast in the available data to properly analyze the variable). [a] 10 studies are included into analysis. [b] 18 studies are included into analysis. [c] 7 studies are included into analysis. [d] P value for the meta-regression. [e] Not applicable.

8

General discussion

Introduction

Hospital readmissions occur frequently and have a large impact on the lives of patients and their informal caregivers and the healthcare system. Avoiding or reducing unplanned hospital readmission for chronically ill patients is a complicated process and not easy to prevent. Some readmissions are necessary due to complications, but there are a lot of unnecessary readmissions that could have been prevented if some preventive measures had been taken (1). In order to know how to reduce unplanned hospital readmissions, we need to know what causes them and what specific programs work best. The overall aim of this thesis was to improve patient-centered care for acutely admitted chronically ill patients in the transition from hospital to home to prevent unplanned hospital readmission. Specific aims were to provide insight into organizational, behavioral, and social factors associated with unplanned hospital readmission. We assessed the effectiveness of a comprehensive discharge bundle to improve the transition from hospital to home for chronically ill patients, explored patients' perspective on care transitions, and tried to summarize the impact of transitional care interventions to prevent unplanned hospital readmission.

Reflection on the main findings

Part I Managing hospital discharge for chronically ill patients

This thesis started with the development, implementation and evaluation of a comprehensive discharge bundle for chronically ill acutely hospitalized patients to reduce unplanned hospital readmissions (**chapter 2 and 3**). As introduced in **chapter 1** of this thesis, the majority of chronic care patients (70-80%) receive basic discharge interventions.

Preparation for discharge planning should begin at the start of admission, by effective history taking, discussing expectations, goal setting, and assert who plays a critical role in preparing for home. However, preparation for discharge is time-consuming and often seems rushed (4). To improve discharge preparation, we evaluated the effects of a comprehensive discharge bundle in a quasi-experimental study (**chapter 2**). The comprehensive discharge bundle consisted of several discharge interventions: (1) planning the date of discharge, (2) a discharge checklist for residents and nurses, (3) a personalized patient discharge letter and (4) patient education. Furthermore, preparation of hospital discharge is an essential element of the daily clinical round. The daily clinical round is a strategy for improving care coordination and enables patients and their informal caregivers to be involved in care planning (5). We explored how decision-making about individual patient care during the daily medical round could be improved (chapter 4).

After implementation of the comprehensive discharge bundle, medical discharge summaries were sent faster to the GP and a trend to a longer time to readmission was present in the post-test group after implementing the intervention (**chapter 2 and 3**). In addition, the personalized patient discharge letter improved discharge communication between patients and healthcare professionals in acute situations (**chapter 3 and 5**). Patients were able to understand and use the information written in the personalized patient discharge letter. Before, patients had difficulty understanding written health
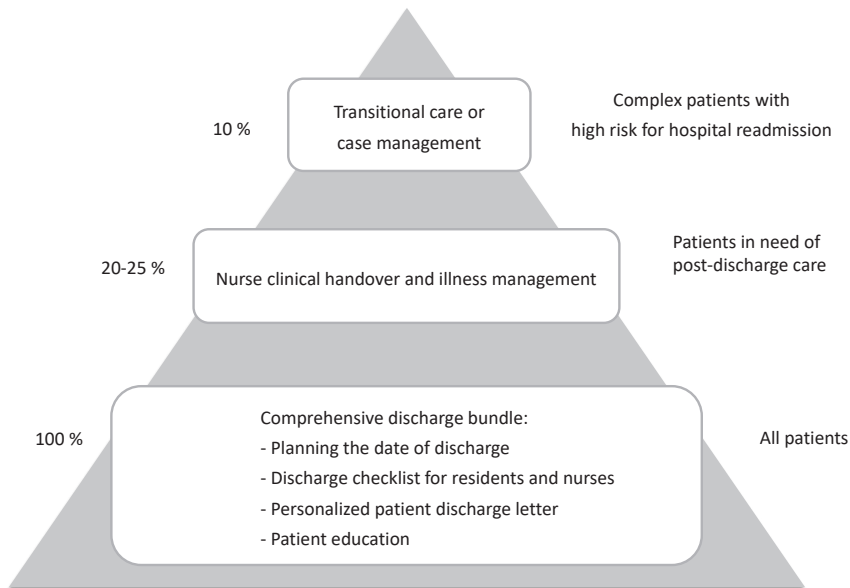
Figure 1: Adapted from the Kaiser Permanente model (2) and Seben et al. (3). Illustrating different levels of care coordination from hospital to home. Higher risk for hospital readmission indicates more intensive care coordination. The population of chronically ill people is stratified into three groups and supply of different type of services according to needs.

information in the discharge letter because of the medical terminology and jargon.

Health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (6). Low health literacy is associated with poor health outcomes, such as more unplanned hospital readmissions and higher mortality, and impacts on the effectiveness of chronic disease self-management interventions (7-9). Also, lower levels of health literacy is more common among patients who are older, have a low education, a lower income, suffer from multimorbidity, or experience moderate to severe functional limitations (10). When healthcare professionals communicate with patients it is important to recognize if patients have low health literacy. Approximately 29% of the Dutch population has limited health literacy skills (11).

Unfortunately, we found no evidence that the comprehensive discharge bundle resulted in reducing unplanned 30-days hospital readmissions in chronically ill patients. Additionally, the intervention was not more effective than current hospital discharge care for the duration of the readmission, time to readmission, length of stay, total number of general practitioner and emergency department visits, mortality, and patient satisfaction on the overall discharge process. Our results are in contrast with other studies, which have shown positive results after implementation of a bundle of discharge interventions. For instance, the Project RED (RE-Engineered Discharge), developed by Jack and colleagues (12, 13), is a standardized hospital discharge program that lowers hospital readmissions and improves patient experience.

An important explanation for the lack of effect on unplanned hospital readmission is that several contextual factors and processes might have played a role in measuring effectiveness of the comprehensive discharge bundle. We conducted a process

evaluation and ethnographic research to understand more about the mechanisms through which the intervention produced its effect (14). We collected data about program impacts, and the process of program implementation, but also about the specific aspects of program context that might have impact on program and about the specific barriers and facilitators. For example, we observed that after integrating the personalized patient discharge letter in the electronic medical file, writing the letter was still time consuming. Furthermore, the personalized patient discharge letter was integrated in the master's program of medical students but was not part of hospital wide discharge policies and procedures according to the Joint Commission on Accreditation of Healthcare Organizations performance standards (15). These difficulties possibly resulted in a low adherence rate and support from healthcare professionals.

Another possible explanation for the lack of effect of the comprehensive discharge bundle is that patient and family engagement in healthcare was not widely adopted by healthcare professionals (**chapter 4**). For example, during the daily medical round decisions about goals for the next 24 hours till hospital discharge were often made without patients. Healthcare professionals were hesitant to include patients in the decision-making process, because they thought patients lacked resources and skills enabling them to make decisions about their own health. However, poor communication between healthcare professionals and patients can lead to various negative outcomes, such as discontinuity of care, compromise patient safety, and gaps in unmet expectations about recovery after acute hospitalization (16, 17). The model of patient-centered care promotes engagement of patients and families in the management of their care. Healthcare professional could set realistic goals together with patients about the impact of the diagnosis, length of stay and recovery during clinical rounds. Also, with regard to living with a chronic illness, healthcare professionals could address patients fear associated with the uncertainty, progression, and suffering of their disease, and their expectations about overcoming or replacing losses (18). Nonetheless, we recommend that healthcare professionals should attempt to improve care transitions, because standardized discharge interventions and better integration of patient-centered care principles are crucial to provide patient safety and quality of care.

Part II Improving the patient journey from hospital to home

In the second part of this thesis we focused on the importance of patient and family engagement in the management of healthcare. In **chapter 5** we conducted an in-depth interview study with chronically ill patients who were readmitted to the hospital. We found that not being ready for hospital discharge was hindering patients of experiencing a safe journey from hospital to home that ultimately resulted in an unplanned hospital readmission. Readiness for hospital discharge was influenced on the one hand by the organization of hospital discharge management and on the other hand by coping skills and the availability of social support during the recovery period after hospital discharge.

Our results are in line with other studies (19, 20) on the association of discharge readiness with unplanned hospital readmissions. Therefore, we recommend that healthcare professionals question patient's readiness to go home. However, additional questions could be added to the assessment of discharge readiness. Patients may be unable or unwilling to share their true feelings (21). For example, in **chapter 5** patients explained that they expected to go into the hospital to get better. They knew something was still wrong, but ignored their intuition or experience of previous exacerbations of the chronic illness. More in-depth assessment of patient readiness is a necessary part

of the discharge process. Discharge readiness is a multifaceted, multistage concept that provides an estimate of patients' and their informal caregivers' ability or preparedness to leave the hospital (22, 23). As a concept, discharge readiness assessment can evaluate strength and needs in several areas: (1) personal status (how the person is feeling on the day of discharge); (2) knowledge (how much the patient knows about self-management at home); (3) perceived coping ability (how well the patient will be able to manage self-care at home); (4) expected support (how much emotional support and help will be available at home); and (5) access to healthcare system and community resources (19, 24, 25).

Not only the state of being ready and prepared for hospital discharge is important to assess but also the context of leaving the hospital (26). The access to resources, such as the social support system might influence hospital readmissions. Therefore, we evaluated the role of social determinants of health on unplanned hospital readmissions within six months (**chapter 6**). We found no evidence that social determinants of health were positively associated with reduced unplanned hospital readmissions within six months.

We conducted our research in a time that the Dutch healthcare system was changing. Health policy changes were implemented in 2015 to restrain long-term care spending (27, 28). Before, long-term care spending was seen as a collective responsibility with a high supply of residential care. After long-term care reform, local governments became responsible for social care with a reduced budget and independent insurers took responsibility over for home nursing (29). Care at home was thus given greater priority. For older adults this meant that they were encouraged to draw on their own network and resources for support. In the Netherlands, 17% of people 65 and older receive informal care support (30). Considering the growing elderly population and fiscal strains on public budgets, it is expected that this number will increase in the near future. However, not all older adults with complex care needs have a social support network they can rely upon (31). In **chapter 6** we demonstrated that 35% of the elderly patients did not have an informal caregiver. Also, they may not want to be a burden to their family or friends (**chapter 5**). This may impact the recovery period after hospitalization (32). Therefore, healthcare professionals need to assess the available support before hospital discharge and involve them in patient care. For example, during admission, healthcare professionals should not only do an assessment of patients, but they also need to assess the needs for improved health literacy and the willingness and capacity of informal caregivers to take on a complex roles of care after hospital discharge (18). In addition, informal care is often provided over a long period of time and the caregiver role can be stressful. On average, informal caregivers provide care 24 hours a week (**chapter 6**). We recommend screening and monitoring the level of caregiver burden (33). This may not decrease unplanned hospital readmissions, but might prevent caregiver burden, which enables informal caregivers providing long-term care. Also, in the Netherlands, 10% more women than men provide care (30). Gender specific interventions, such as emotional support, focusing on enabling older partners to be better prepared for long-term partner care (34).

Part III Moving towards patient-centered transitional care management

In part III of this thesis we aimed to gain a better understanding about patient-centered care transitions for patients at high risk for unplanned hospital readmissions. Chronically

ill patients might benefit from transitional care interventions, because they often leave the hospital in a state of physiologic, psychological and functional vulnerability, which can have a negative effect on their capacity of enacting self-care (35). Transitional care interventions are a broad range of services designed to promote the safe and timely passage of patients between levels of health care across care settings (36, 37). We therefore evaluated the effect of transitional care interventions on unplanned hospital readmissions on the short (30 days or less), intermediate (31-180 days) and long term (181-365 days) (**chapter 7**).

Transitional care interventions are fairly resource intensive. Therefore, early identification of hospitalized patients at high risk for unplanned hospital readmission is an essential requirement of prioritizing the allocation of transitional care interventions. Our study showed that patients older than age sixty, intermediate (OR: 0.74; 95% CI: 0.59, 0.93) and long terms (OR: 0.71; 95% CI: 0.56, 0.91), had fewer unplanned hospital readmissions when transitional care interventions were applied. Other research shows that older adults are more susceptible to unplanned hospital readmissions because of living with frailty and the prevalence of chronic diseases (38). Screening for frailty syndromes, such as falling, incontinence and confusion, during acute hospitalization could indicate the need for further comprehensive geriatric assessment in order to develop a coordinated integrated plan for treatment and follow-up (39). In addition, assessment of discharge readiness could be integrated in the transitional care model to complete the care plan for treatment and follow-up.

Different approaches might be needed to prevent unplanned hospital readmission on the short, intermediate, and long term. We found that transitional care interventions are associated with reduced hospital readmissions in the intermediate (OR: 0.77; 95% CI: 0.62, 0.96) and long terms (OR: 0.58; 95% CI: 0.46, 0.75). However, patients who are readmitted on the short term after hospital discharge might benefit from high-intensity transitional care interventions, (OR: 0.59; 95% CI: 0.38, 0.92). Three individual components of transitional care interventions were of special importance to patients at high risk for readmission on the short term, namely: (1) care coordination by a nurse; (2) communication between the hospital and the primary care provider; and (3) a home visit within three days. Subsequently, twenty patients need to receive high-intensive transitional care interventions to prevent one unplanned hospital readmission within 30 days. These insights might stimulate hospitals to forge collaborative relationships, within hospitals, between healthcare institutions, and in surrounding communities, that focus on improving the journey of patients from hospital to home and beyond (40).

Implementation and methodological considerations

Implementation strategies for discharge interventions (part I)

We used the Medical Research Council framework to develop, implement and evaluate the comprehensive discharge bundle (41). During the course of this study we worked closely with decision-makers and healthcare professionals. These stakeholders were involved early in designing the intervention and helped to assemble an infrastructure to support the implementation of the intervention. The researchers adopted an active role in feeding back information to the different stakeholders. Also, healthcare professionals

were educated regularly about how the comprehensive discharge bundle works.

Although the stakeholders in our study were involved early in the design of the intervention study, we observed some difficulties during the implementation of the comprehensive discharge bundle. One difficulty was that the effects of the interventions were not always readily visible for healthcare professionals. Hospitalized patients are discharged to home or other care settings. Hospital personnel do not observe if the interventions they provide are effective. Also, healthcare professionals treated the hospital discharge as an ending of their care delivery. Possibly, it takes more time to change healthcare professionals' view on the context of care and address hospital discharge as a reintegration to home life (42). We used storytelling as an educational tool to show healthcare professionals what is important to patients and informal caregivers in the discharge process. Using real-life stories of patients and their informal caregivers could provide with more insight into how care affects patients' experiences, and to reflect and learn from this (43). As such, storytelling is a mechanism that could engage healthcare professionals in clinical improvement.

Another difficulty was that the comprehensive discharge bundle was implemented during organizational changes. The Amsterdam Medical Center was striving to achieve the Joint Commission International (JCI) accreditation and an electronic health record was introduced (15). The intervention was related to the JCI goals on care transitions and elements of the intervention (personalized patient discharge letter and discharge checklist) were integrated in the electronic health record. However, these major organizational changes might have influenced the commitment and support for implementation of the comprehensive discharge bundle. Healthcare professionals are already busy and the additional workload required by the implementation of system improvements may lead to insufficient 'headspace' to manage change and limit motivation for change (44, 45). In addition, the process indicators showed that adherence with the comprehensive discharge bundle declined when a new team of physicians and their supervisors started on the medical wards. These regular "cohort turnovers", also referred to as the "July phenomenon" in teaching hospitals, might have influenced the sense of ownership and accountability. It is known that when many experienced trainees exit at the same time that a new group of trainees enter this could lead to increased mortality and decreased efficiency in hospitals (46). We recommend that future research on implementation of complex interventions should include process evaluations to understand how local context and environment might influence outcomes (41).

Finally, we observed differences in adherence with the intervention between physicians and nurses. In more detail, we observed that physicians showed resistance to using the checklist. This resistance to change was in large due to time constraints and effectiveness concerns. It has been previously reported that implementation of checklists in healthcare settings can be difficult, because it pushes against the traditional culture of medicine (47). Physicians often rely on their own expert competence and autonomy, and the use of checklists could place responsibility elsewhere and interfere with their professional autonomy (48). However, checklists seem to improve patient outcomes complex environments (49). A more comprehensive understanding about the receptive cultural environment and facilitation is needed to establish successful implementation of clinical interventions (50). Furthermore, implementation of interventions needs constant supervision and instruction until it becomes self-evident and accepted. Complex interventions, and consequently complex change processes, should be thought of as a mix of bottom-up activity with top-down guidance (51).

Use of mixed methods (part I, II and III)

The strength of this thesis is that we have used different sources of evidence. The mix of quantitative and qualitative perspectives gave us the opportunity to address the research questions, regarding improving the complex process of transitions in care. Furthermore, we used a mixture of qualitative and quantitative research techniques to understand barriers to participation. For example, we used ethnographic research techniques, such as participant observation, in addition to quantitative methods to evaluate implementation activities. We used a quasi-experimental study design because it was better suited for the evaluation of our interventions. This design gave attention to the challenges associated with the dynamic nature of improvement interventions and their interactions with contextual factors (52). This thesis also included two qualitative studies (chapter 4 and 5). We conducted these small studies at a single university teaching hospital, which could limit the transferability and generalizability of the findings from these studies to other settings. However, the sample sizes of both qualitative studies were sufficient for its purposes.

Implications for clinical practice

Patient-centered hospital discharge management (part I and II)

Healthcare professionals who are looking for ways to improve hospital discharge management and patient engagement need to learn how to effectively communicate with patients and their informal caregivers (53). There are several basic communication and interpersonal skills that patients value most in healthcare professionals: empathy, careful listening, compassion, and investing time and effort to educate patients and make sure they understand the illness (54). Patient-centered communication between healthcare professionals, patients, and informal caregivers is a key element of discharge planning and transitional care. Effective discharge communication will result in a patient and/or informal caregiver who can recall their main diagnosis and understand their medication treatment regimen. For example, during care transitions prescription medications are commonly altered. Patients who understand their medication regimen have fewer adverse drug events after hospital discharge (55, 56). Written materials and teach-back techniques can be used to reinforce verbal instructions and ensure that patients comprehend key points (57, 58). In our study, teach-back technique was used to confirm whether a patient understood what was being explained to them (chapter 2 and 3). For example, patients were asked: 'In your own words, what are some possible side effects of the medicine?' or 'Can you tell me in your own words how you understand the plan?' Teach-back is a simple and an effective way to communicate with patients and their caregivers to improve learning outcomes and has been linked to more effective and safe care transitions (59, 60). However, it is important to mention that discharge education is not about persuasion in the medical encounter, in the sense that it is patients' job to follow doctors' orders. We recommend to treat communication and understanding as a formative, multi-directional process of negotiation and exchange (42). Hereby, biomedical knowledge is not treated as self-evident and fixed but patients' knowledge and motivation are treated as important and used to craft more convincing messages (42, 61).

Healthcare professionals could engage patients further by adopting the model of shared-decision making. Most patients today appear to prefer a partnership with their healthcare provider and want to share the responsibility for their care (62). Integrating the model of shared-decision making into the management of hospital discharge may improve patient communication. Shared-decision making is a process by which a healthcare choice is made jointly by healthcare professionals and the patient (63). Healthcare professionals could actively involve patients in the decision-making process during hospital admission during the multidisciplinary rounds (chapter 4) and discuss discharge readiness. This could implicate that healthcare professionals and patients need to be aware of their own positions. Both parties probably need to take on different roles than they are used to. To achieve this, healthcare professionals need to be prepared and take on a proactive role in guiding patients through these changes of becoming an informed and actively involved patient (64, 65). Furthermore, it is important to respect patient perspectives and build relationships (42). Healthcare professional training may be important to support them in changing current healthcare practices. Implementing educational meetings, giving healthcare professionals feedback, giving healthcare professionals learning materials and using patient decision aids might be helpful (63, 66).

Although most patients want to be actively involved in the management of their chronic disease, our results suggest that the group of patients in our study (chapter 5) was very ill and therefore not always able to participate in decision-making. We suggest that healthcare professionals involve informal caregivers in decision-making when patients themselves cannot actively participate in decision-making. Healthcare professionals should explain that most decisions are value-laden and that their input is needed to select the treatment option that is best for the individual patients (61). Also, the decisions should align to the values, goals and preferences previously stated by competent adult patients if applicable and contemporary. Informal caregivers could participate in the daily medical round which supports trust, understanding and empowerment (61).

Transitional care for patients with complex care needs (part III)

The transitional care model captures all the dimensions of patient-centered care and patient outcomes might improve when transitional care is targeted at the right population. Our results indicate that nurses play an important role in transitional care (**chapter 7**). Possibly, nurses could take care of patients in the hospital as well as in the home to provide care continuity and enhance patient safety. This means that nurses work within a network of healthcare professionals involved in individual the care for patients without the boundaries of organizations or institutions (67). Investments should be made to prepare and support nurses and other healthcare professionals in the care for the growing population of older chronically ill patients. It is necessary that healthcare professionals are even more equipped with competencies and skills to be able to collaborate in the coordination of care for patients with complex care needs in- and outside the hospital. The development of these competencies and skills can come through interprofessional education. Research shows that interprofessional education improves patient-centered care because there is a better mutual understanding and coordinated cooperation (68, 69). Nursing and medical students can learn during their bachelor studies how to work with individuals from other professions and maintain a climate of mutual respect and shared values. Furthermore, they can learn of one's own

role and those of other professions to appropriately assess and address the healthcare needs of patients.

Furthermore, timely exchange of information between all healthcare professionals caring for the same patient is essential in establishing care continuity and improving patient outcomes (37). One example of facilitating communication between different healthcare providers and improving the provision of continuity of care is using one electronic patient record, that integrates all health data (70). Furthermore, we previously demonstrated that discharge communication (informational continuity) improved between physicians in the hospital and primary care physicians after implementation of the personalized patient discharge letter (chapter 2 and 3). Ultimately, the personalized patient discharge letter could be used to complete the entire hospital stay and used as a formal handover to the patient and the primary care physicians. This means that primary care physicians have direct access to important medical information the same day patients leave the hospital and could play an important role patient safety in the first critical period after hospital discharge (71, 72).

Last, transitional care services are time-limited services provided before, during and after hospital discharge to patients at high risk for unplanned hospital readmissions. The consequence of the time-limited nature of services is that home visits are often scheduled within seven to fourteen days (73). However, research has shown that patients are at highest risk for unplanned hospital readmission within the first week after hospital discharge (74). We recommend that patients at high risk for unplanned hospital readmission receive a home visit from a registered nurse within three days after hospital discharge. During the home visit nurses can provide a range of services, such as medication reconciliation, patient and informal caregiver education, and identification of social and environmental barriers, to assist patients and their informal caregivers in transitioning after hospital discharge (75).

Future perspectives

Facilitating integrated care

In chapter 6 we demonstrated that an increase of comorbidities was associated with unplanned hospital readmission and mortality within 180 days after discharge. It is estimated that over the next 20 years there will be an expansion of morbidity, particularly complex multi-morbidity (4 + diseases) (76). This growth of increasing complex multimorbidity in the older population asks for a different approach of healthcare delivery. Organizing healthcare around chronic conditions and care cycles is important to patients (**chapter 5**). Acutely hospitalized patients with multiple chronic diseases might benefit from an integrative patient-centered approach (77). This approach abandons the single-disease paradigm that does not include the needs of patients with multiple chronic diseases (78). Instead, integrated and patient-centered care is an approach to enhance quality of care and quality of life, consumer satisfaction and system efficiency for patients through the delivery of health services cutting across multiple services, providers and settings (79). Integrated care for patients with multimorbidity consists of multiple key elements, such as supporting behaviors to improve adherence to care plans and coordination of care across the integrated care team (80). Further research is needed to investigate how cost-effective integrated care for chronic conditions is (81).

Establishing an organizational learning culture

Healthcare professionals need the skills and flexibilities to cope with the ongoing changes in their work and to continue learning (82). Therefore, we recommend establishing an organizational learning culture where healthcare professionals are able to innovate healthcare practices and hospital discharge procedures (83). Within this organizational learning culture it is important to embed complete learning cycles and infrastructure in routine clinical practice to improve care for individual patients, also called a Learning Healthcare System (84). The Learning Healthcare System is defined as a system in which "science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience (85)." Within a Learning Healthcare System, healthcare professionals could learn as they go about the best medical care for each individual patient and try out the newly arisen ideas and practical solutions immediately in collaboration with patients (86). For instance, CERTAIN (87) and PEDSnet (88) are networks of patients, clinicians, researchers, and health system leaders that use the principles of a learning healthcare system. These networks integrate and evaluate data across care delivery sites, perform research, and design and implement interventions to increase evidence-based practice and continuously improve quality of healthcare. The combination of research and quality improvement in these networks can considerably shorten the time from obtaining knowledge to patient impact. Another example is, that routinely used data can be used to develop predictive models to identify patients at high risk for unplanned hospital readmissions (44). In addition, the Learning Healthcare System paradigm entails a shift in thinking and cultural change, both for individuals and their organizations. Recent Dutch healthcare policy supports this cultural change and calls for a shift from suspicion to trust (89). This means that the current experience of suspicion, with its systems of inspection, quality measures and performance indicators, makes place for individuals and organizations that can earn trust by demonstrating trustworthiness, constancy, and openness (90).

Final conclusions

In conclusion, this thesis shows how care transitions for acutely hospitalized chronically ill patients can be improved. Putting the perspective of patients and their informal caregivers at the center of care delivery might reduce unplanned hospital readmissions. Patient engagement can be reinforced by assessment of discharge readiness, patient-centered communication and implementation of shared decision-making. Strategies for promoting patient education and engagement should focus on self-management and health-literacy. Although the personalized patient discharge letter showed improved discharge communication, we did not show significant positive results after implementation of the comprehensive discharge bundle. Several barriers, such as extensive organizational changes, might have influenced the lack of effect of the comprehensive discharge bundle. These insights are useful for future implementation studies in the health setting. We recommended that health care services provide integrative care that relates to the complex care needs of an increasing older population and their informal caregivers. Furthermore, we recommend that acute care organizations invest in transitional care interventions because it supports patients at high risk for unplanned hospital readmission in disease management and self-management during and after

acute hospitalization. Implementing complete learning cycles and infrastructure in routine clinical practice and health evaluation could support healthcare professionals in the care for patients with complex care needs.

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9

Summary

Chapter 1 is the general introduction of this thesis. With an aging population and changing lifestyle of people, the incidence and prevalence of chronic diseases have grown steadily worldwide. The care for patients with multiple coexisting diseases is complex and requires care coordination across multiple providers and settings. However, care for acutely hospitalized patients is often fragmented and communication between healthcare providers and patients is ineffective. As a result, patients have an increased risk for unplanned hospital readmissions. Furthermore, due to healthcare policy changes and budget cuts people with complex care needs are forced to be cared for at home with the support of their informal caregivers. In this thesis, we investigated if discharge interventions can be used to improve care transitions for acutely hospitalized chronically ill patients in general. A more integrative approach of chronic care management might help patients at high risk for unplanned hospital readmission to have a safe patient journey through care cycles and to actively participate in decision-making about their own care.

The overall aim of this thesis is to improve patient-centered care for acutely admitted chronically ill patients in the transition from hospital to home to prevent unplanned hospital readmission. Specific aims were to provide insight into organizational, behavioral and social factors associated with unplanned hospital readmission. We assessed the effectiveness of a comprehensive discharge bundle to improve the transition from hospital to home for chronically ill patients, explored patients' perspective on care transitions, and tried to summarize the impact of transitional care interventions to prevent unplanned hospital readmissions.

The results of the comprehensive discharge bundle on unplanned hospital readmission within 30 days of hospital discharge are presented in the first part of this thesis. In **chapter 2** a pre-post-test design was used to investigate the effect of the comprehensive discharge bundle. The comprehensive discharge bundle consisted of (1) planning the date of discharge, (2) a discharge checklist for residents and nurses, (3) a personalized patient discharge letter and (4) patient education. Participants in the post-test group (n = 204) did not have a lower rate of unplanned hospital readmission than those receiving usual care (n = 224) (12.9 vs. 13.2%, p = 0.93). Also, patient satisfaction was high in both groups (pre-test 7.5 and post-test 7.4 points, (p = 0.49). However, medical discharge summaries were sent faster to the general practitioner (median of 14 days pre-test vs. 5 days post-test, p < 0.001) and a trend to a longer time to readmission was present (pre-test 14 vs. post-test10 days, p = 0.06).

Chapter 3 evaluates the development, implementation, and evaluation of a personalized patient discharge letter to improve the quality of handoff communication from the hospital to home. A quality improvement project, consisting of a before-after evaluation design, and a process evaluation was conducted. The personalized patient discharge letter is a plain language handoff communication tool provided to the patient at hospital discharge. The results from the first phase of quality improvement showed that providing patient with a personalized patient discharge letter increased the number of patients receiving verbal and written information at discharge. Patient satisfaction with the personalized patient discharge letter was 7.3. The level of implementation was low (30%). In the second phase, the level of implementation improved because of incorporating the personalized patient discharge letter into the electronic patient record and professional education. An average of 57% of the discharged patients received the personalized patient discharge letter upon discharge. The number of discharge

conversations also increased.

Chapter 4 presents a focus group study that explores health care professionals' perceptions of interprofessional communication and collaboration during the medical rounds. We conducted three focus groups with residents, registered nurses, medical specialists and quality improvement officers. We used a descriptive method of content analysis. Our study shows that it is important for healthcare professionals to consider how team members and patients are involved in the decision-making process during the clinical round and how current social and spatial structures can affect communication and collaboration between the healthcare team and the patient. Specific aspects of communication and collaboration were identified for improving effective interprofessional communication and collaboration during rounds.

Chapter 5 reports on a qualitative study exploring chronically ill patients' perceptions and experiences of being discharged to home and then acutely readmitted to the hospital to identify the potential impact on future care transition interventions. We conducted semi-structured interviews with 23 chronically ill patients who had an unplanned 30-day hospital readmission at a university teaching hospital in the Netherlands. A constructive grounded theory approach was used for data analysis. Our study shows that patients' readiness for hospital discharge was influenced by the organization of hospital care, patients' involvement in decision-making and preparation for discharge. This might have affected patients' feelings of trust, recognition, self-confidence and power. Furthermore, the experienced difficulties during care transitions might have influenced patients' ability to cope with challenges of recovery and dependency on others. Healthcare professionals are recommended to assess patients' readiness for hospital discharge, recognize patients and guide them through transitions of care. In addition, employing specifically designated strategies that encourage patient-centered communication and shared decision-making can be vital in improving care transitions and reduce hospital readmissions. We suggest that healthcare professionals pay attention to the role and capacity of informal caregivers during care transitions and the recovery period after hospital discharge to prevent possible post-discharge problems.

Chapter 6 presents the results of a secondary analysis of acutely hospitalized patients (65+) who were (1) re-admitted at 180 days, (2) not-readmitted, or (3) died with no readmission to identify if social determinants of health, like social support and social network, are associated with unplanned readmissions within 180 days after hospital discharge. Social determinants of health were operationalized to social network (e.g. paid and unpaid help), social support (e.g. informal caregiver), socio-economic status (SES), living situation, educational level, and country of birth. Odds ratios and 95% confidence intervals were estimated using a multinomial logistic regression model accounting for death. The results of our study show that of the 674 participants, 194 (28.7%) older adults experienced an unplanned readmission within 180 days. After adjustment, there was no association between unplanned hospital readmission and social determinants of health. After backward selection, only a higher Charlson Comorbidity Index score was associated with an increased risk of unplanned hospital readmission (OR 1.13; 95% CI 1.04-1.22).

Chapter 7 presents the results of a systematic review and meta-analysis to study the effectiveness of transitional care interventions on all-cause hospital readmission rates within the short-term (30 days or less), the intermediate-term (31-180 days), and the

long-term (181-365 days) in chronically ill patients. Twenty-six randomized controlled trials were finally included. The results of our study suggest that transitional care is effective in reducing all-cause intermediate-term and long-term readmissions. Only high-intensity interventions seemed to be effective in reducing short-term readmissions. Our findings suggest that to reduce short-term readmissions, transitional care should consist of high-intensity interventions that include care coordination by a nurse, communication between the primary care provider and the hospital, and a home visit within three days after discharge.

Chapter 8 presents a general discussion of the main findings of this thesis as well as future directions for clinical practise and education. In conclusion, this thesis shows how care transitions for acutely hospitalized chronically ill patients can be improved. Putting the perspective of patients and their informal caregivers at the center of care delivery might reduce unplanned hospital readmissions. We recommend that acute care hospitals educate patients on discharge instructions and self-management. Although the personalized patient discharge letter showed improved discharge communication, we did not show significant positive results after implementation of the comprehensive discharge bundle. Several barriers, such as extensive organizational changes, might have influenced the lack of effect of the comprehensive discharge bundle. These insights are useful for future implementation studies in the healthcare setting. Furthermore, we recommend that acute care organizations invest in transitional care interventions because it supports patients at high risk for unplanned hospital readmission in disease management and self-management during and after acute hospitalization. We recommended that healthcare services provide integrative care that relates to the complex care needs of an increasing older population and their informal caregivers. Patient engagement can be reinforced by assessment of discharge readiness, patient-centered communication and implementation of shared decision-making. Implementing complete learning cycles and infrastructure in routine clinical practice and health evaluation could support healthcare professionals in the care for patients with complex care needs.

Samenvatting

Hoofdstuk 1 vormt de algemene inleiding van dit proefschrift. Vanwege de vergrijzing van de bevolking en een andere levensstijl van mensen is het aantal chronisch zieken met acute zorgvragen toegenomen. De zorg voor patiënten met meerdere naast elkaar bestaande chronische aandoeningen is complex en vereist een zorgvuldige coördinatie en continuïteit van zorg. Maar de zorg voor patiënten die acuut in het ziekenhuis worden opgenomen, is vaak gefragmenteerd. En de communicatie tussen zorgverleners en patiënten is vaak is ineffectief. Daardoor hebben patiënten een verhoogd risico op een ongeplande heropname in het ziekenhuis. Bovendien worden mensen met complexe zorgbehoeften als gevolg van bezuinigingen en veranderingen in het zorgbeleid, gedwongen om langer thuis te blijven wonen en gebruik te maken van mantelzorgers.

In dit proefschrift hebben we onderzocht of het verbeteren van de overgang van zorg van ziekenhuis naar huis voor acuut opgenomen chronisch zieke patiënten het aantal heropnames vermindert. Om een veilige overgang van ziekenhuis naar huis te waarborgen, is voor patiënten met een hoog risico op een ongeplande heropname in het ziekenhuis een integratieve benadering van zorg (transmurale zorg interventies) gewenst. Door onder andere actief deel te nemen aan de besluitvorming over hun eigen zorg, kunnen deze patiënten zich beter voorbereiden op het ontslag uit het ziekenhuizen.

Het doel van dit proefschrift is het voorkomen van een ongeplande heropname in het ziekenhuis bij acuut opgenomen chronisch zieke patiënten. Het proefschrift geeft inzicht in organisatorische, gedrags- en sociale factoren die van invloed zijn op een heropname.

Als eerste trachtten we om de ontslagprocedure te verbeteren zodat er een veilige overgang van ziekenhuis naar huis voor chronisch zieke patiënten kan plaatsvinden. Daarna hebben we inzicht verkregen in de periode rondom het ontslag uit het ziekenhuis. Het perspectief van patiënten op de overgang zorg van ziekenhuis naar huis stelden we daarbij centraal. Vervolgens onderzochten we de associatie tussen sociale determinanten van gezondheid en ongeplande heropnames. Tot slot, hebben we het effect van transmurale zorg interventies op een ongeplande heropname in het ziekenhuis geïnventariseerd.

Hoofdstuk 2 presenteert de resultaten van een pre-test / post-test studie. Deze studie had tot doel om ongeplande heropnames in het ziekenhuis binnen dertig dagen te reduceren. We implementeerden een set van ontslaginterventies ter verbetering van de ontslagprocedure. Deze set van ontslaginterventies bestond uit: (1) het plannen van een ontslagdatum, (2) een ontslagchecklist voor artsen en verpleegkundigen, (3) een patiëntenbrief (ontslagbrief in lekentaal) en (4) patiënteneducatie. Er was geen significant verschil aantoonbaar tussen de post-testgroep (n = 204) en pre-test groep (n = 224) (12,9 versus 13,2%, p = 0,93) ten aanzien van het aantal ongeplande heropnames. Ook bleek de patiënttevredenheid in beide groepen hoog (pre-test 7,5 en post-test 7,4 punten (p = 0,49).) Echter, de medische ontslagbrieven werden sneller verstuurd naar de huisarts (mediaan van 14 dagen vóór de test vs. dagen na de test, p <0,001) en er was een trend zichtbaar in een langere duur tot heropname (pre-test 14 versus post-test 10 dagen, p = 0,06).

Hoofdstuk 3 presenteert de resultaten van een kwaliteitsverbeterproject waarin

we de ontwikkeling, implementatie en evaluatie van de patiëntbrief (ontslagbrief in lekentaal) evalueren. De patiëntbrief is een communicatiehulpmiddel, welke aan de patiënt wordt verstrekt vóór ontslag uit het ziekenhuis. De resultaten van de eerste fase van het kwaliteitsverbeteringsproject toonden aan dat de mondelinge en schriftelijke ontslaginformatie was toegenomen. De patiënttevredenheid over de patiëntbrief was 7.3. Echter, het implementatieniveau was laag (30%). In de tweede fase verbeterde het implementatieniveau doordat de patiëntbrief was opgenomen in het elektronische patiëntendossier en het master onderwijsprogramma van geneeskunde. Gemiddeld werd de patiëntbrief aan 57% van de deelnemende patiënten verstrekt.

Hoofdstuk 4 beschrijft een focusgroepstudie naar de percepties van zorgprofessionals over interprofessionele communicatie en samenwerking tijdens de dagelijkse visite. Drie focusgroepen werden geleid met artsen in opleiding, verpleegkundigen, medisch specialisten en kwaliteitsfunctionarissen. Uit de focusgroepen bleek dat het belangrijk is om na te gaan hoe zorgprofessionals en patiënten betrokken zijn bij het besluit-vormingsproces tijdens de visite. Daarnaast kwam naar voren dat huidige sociale en ruimtelijke structuren van invloed kunnen zijn op de communicatie en samenwerking tussen de zorgprofessionals onderling en met patiënten. Specifieke kenmerken van interprofessionele communicatie en samenwerking werden geïdentificeerd ter verbetering de dagelijkse visite.

Hoofdstuk 5 presenteert de resultaten van een kwalitatieve studie waarvan het doel was om het patiëntenperspectief op de overgang van ziekenhuis naar huis en vervolgens weer terug naar het ziekenhuis te omschrijven. Drieëntwintig chronisch zieke patiënten die binnen dertig dagen waren heropgenomen in het ziekenhuis werden geïnterviewd. Middels een gefundeerde theoriebenadering werden de data constructief geanalyseerd. Ons onderzoek laat zien dat de mate waarin patiënten 'klaar' waren voor ontslag uit het ziekenhuis, werd beïnvloed door de organisatie van de zorg, de betrokkenheid van patiënten bij het besluitvormingsproces en de voorbereiding op ontslag uit het ziekenhuis. Dit kan gevoelens van vertrouwen in zorgprofessionals, zelfvertrouwen en de regie van patiënten hebben beïnvloed. Bovendien hadden de problemen van patiënten tijdens de overgangen van zorg invloed op hun coping skills en bereidheid om hulp te vragen aan anderen. Om patiënten beter voor te bereiden op ontslag zou het kunnen helpen om de mate van 'klaar' zijn voor ontslag te screenen en om patiënten te herkennen en begeleiden bij overgangen van zorg. Daarnaast kunnen door patiëntgerichte communicatie en gedeelde besluitvorming, zorgover-gangen verbeterd worden en heropnames wellicht gereduceerd worden. Om mogelijke problemen na ontslag te voorkomen bevelen wij aan dat zorgprofessionals aandacht besteden aan de rol en het vermogen van mantelzorgers tijdens zorgovergangen en de herstelperiode na ontslag uit het ziekenhuis.

Hoofdstuk 6 presenteert de resultaten van een secundaire analyse van acuut opgenomen patiënten (65+) met als doel om te onderzoeken of sociale determinanten van gezondheid, zoals informele zorg en een sociaal netwerk, worden geassocieerd met een ongeplande heropname binnen honderdtachtig dagen na ontslag uit het ziekenhuis. Patiënten werden opgedeeld in drie groepen, namelijk: (1) heropgenomen na honderd-tachtig dagen, (2) niet-heropgenomen, of (3) overleden zonder heropname. Sociale determinanten van gezondheid werden geoperationaliseerd middels het hebben van een sociaal netwerk (bijvoorbeeld betaalde en onbetaalde hulp), sociale ondersteuning (bijvoorbeeld mantelzorger), sociaaleconomische status (SES), leefsituatie, opleiding-

sniveau en geboorteland. Odds ratio's en 95% betrouwbaarheidsintervallen werden geschat met behulp van een multinomiaal logistisch regressiemodel. Honderdvierenne- gentig (28,7%) van de 674 oudere volwassenen had een ongeplande heropname binnen honderdtachtig dagen. Na correctie zagen we geen verband tussen een ongeplande ziekenhuisopname en sociale determinanten van gezondheid. Na *backward selection* was enkel het hebben van een hogere Charlson-score geassocieerd met een verhoogd risico op een ongeplande heropname in het ziekenhuis (OR 1,13; 95% CI 1,04-1,22).

Hoofdstuk 7 presenteert de resultaten van een systematische literatuurstudie en meta-analyse met als doel om het effect van transmurale zorginterventies op heropname in het ziekenhuis binnen korte termijn (30 dagen of minder), middellange termijn (31-180 dagen) en lange termijn (181-365 dagen) bij chronisch zieke patiënten te onderzoeken. Zesentwintig gerandomiseerde studies werden uiteindelijk opgenomen. De resultaten suggereren dat transmurale zorg interventies effectief zijn in het verminderen van middellange en lange termijn heropnames. Alleen intensieve transmurale zorg interventies leken effectief te zijn in het verminderen van korte termijn heropnames. Onze bevindingen suggereren dat transmurale zorg interventies tenminste de volgende elementen moet bevatten om heropnames op de korte termijn te kunnen voorkomen: zorgcoördinatie door een verpleegkundige, communicatie tussen de primaire zorgverlener in de eerste lijn en in het ziekenhuis en een huisbezoek binnen drie dagen na ontslag uit het ziekenhuis.

Hoofdstuk 8 sluit het proefschrift af met een algemene discussie over de belangrijkste bevindingen van dit proefschrift en de implicaties voor de klinische praktijk en het onderwijs. Concluderend laat dit proefschrift zien hoe zorgovergangen voor acuut opgenomen chronisch zieke patiënten kunnen worden verbeterd. Door het perspectief van patiënten en hun mantelzorgers centraal te stellen, kunnen ongeplande heropnames in het ziekenhuis worden gereduceerd. Wij adviseren dat acute zorgorganisaties patiënten voorbereiden op het ontslag en ondersteunen in zelfmanagement. Hoewel de patiëntbrief de communicatie en educatie rondom het ontslag uit het ziekenhuis verbeterde was er geen interventie-effect zichtbaar na implementatie van de set aan ontslaginterventies. Verschillende belemmeringen, zoals uitgebreide organisatorische veranderingen, kunnen van invloed zijn geweest op het ontbreken van een interven- tie-effect. Deze inzichten zijn nuttig voor toekomstige implementatiestudies in de gezondheidszorg. Wij adviseren dat acute zorgorganisaties investeren in transmurale zorg, omdat deze interventies patiënten met een hoog risico op een heropname tijdens en na een acute ziekenhuisopname ondersteunen bij het management van hun ziekte of aandoening. Daarnaast sluit het integrale zorgmodel aan op de complexe zorgbehoeften van een toenemende oudere bevolking en hun mantelzorgers. Patiënt- betrokkenheid kan worden versterkt door het 'klaar' zijn voor ontslag te screenen en door implementatie van patiëntgerichte communicatie en gedeelde besluitvorming is het mogelijk om patiënten te stimuleren actief betrokken te zijn bij hun eigen zorg. Het implementeren van complete leercycli en de daarbij behorende infrastructuur kan zorgprofessionals ondersteunen in de zorg voor patiënten met complexe zorgbehoeften.

10

PhD Portfolio
Scientific publications
Dankwoord
Curriculum Vitae

PhD Portfolio

Name PhD student: **Kim Verhaegh**
PhD period: **2013 - 2019**
Supervisor: **Prof. dr. B.M. Buurman and Prof. dr. S.E. Geerlings**

PhD training	Year	Workload (ECTS)
Courses		
Het schrijven van onderzoeksvoorstellen (NIVEL)	2016	1.60
Kwaliteitssysteem NIVEL en het verrichten van interne audits (NIVEL)	2016	0.50
Practical Biostatistics (AMC Graduate school)	2016	1.14
Oral Presentation in English (AMC Graduate school)	2015	0.78
Didactische introductie, Summercourse voor nieuwe docenten van Domein gezondheid (HvA)	2014	1.14
Clinical Epidemiology (AMC Graduate school)	2014	0.64
Scientific Writing in English for publication (AMC Graduate school)	2014	1.50
Qualitative Health Research (AMC Graduate school)	2014	1.92
Seminars, workshops and master classes		
Masterclass Transitional care by prof. Dr. Mary Naylor (AMC)	2017	0.20
Workshop HBO-Nursing of the Future: Hoe daag ik mijn student uit tot EBP in de praktijk? (HvA)	2015	0.57
Weekly Geriatric Meetings (AMC)	2013-2014	3.28
Monthly Geriatrics research meetings (AMC)	2013-2014	0.85
Conferences		
International Forum on Quality and Safety in Health Care. Londen, United Kingdom.	2015	0.50
Symposium: Op weg naar excellent verplegen: Je rolmodel (leren) (h)(er)kennen, Sigma Theta Tau International, Honor Society of Nursing, Rhi Chi-at-Large Chapter en V&VN Wetenschap in Praktijk. Utrecht, the Netherlands	2015	0.50
Geriatriedagen. Den Bosch, the Netherlands	2013	0.50
Oral presentations		
De relatie tussen transitional care interventies en heropnames in het ziekenhuis van chronisch zieke patiënten: een meta-analyse. Geriatriedagen. Den Bosch, the Netherlands	2013	0.50

Handover at the time of hospital discharge. Interdisciplinary presentation. Amsterdam Medical Center, the Netherlands	2014	0.50
Poster presentations		
The ideal medical round: a focus group study. International Forum on Quality and Safety in Health Care. Londen, United Kingdom	2015	0.50
The ideal medical round: a focus group study. Symposium: Op weg naar excellent verplegen: Je rolmodel (leren) (h)(er)kennen, Sigma Theta Tau International, Honor Society of Nursing, Rhi Chi-at-Large Chapter en V&VN Wetenschap in Praktijk. Utrecht, the Netherlands	2015	0.50
Other		
JCI accreditation board, Patient handover, consultant (AMC)	2013-2014	30.00
Development of blueprint for the medical round (AMC)	2013-2014	3.00
Development of a discharge checklist, discharge policy and protocol (AMC)	2013-2014	6.00
Development and implementation of PPDL (AMC)	2013-2014	30.00

Teaching	Year	Workload (ECTS)
Lecturing		
Bachelor Nursing studies (HvA)	2013-2016	60.00
Master course: Discharge communication, pre-IHK (AMC)	2013-2014	2.00
Supervising		
Supervision bachelor thesis: Improving hospital discharge from the perspective of patients, Floor Molenaar and Rosa Gonggrijp (AMC)	2013	1.00
Supervision bachelor thesis: Shared decision-making in planning hospital discharge, Jamila Kluvers and Nairouz Badawi (HvA)	2011	1.00

ECTS European Credit Transfer System (1 ECTS = 28 hours)

Abbreviations

AMC	Academic Medical Center, Amsterdam
HvA	Hogeschool van Amsterdam
PPDL	Personal Patient Discharge Letter
V&VN	Verpleegkundigen & Verzorgenden Nederland

Scientific publications

1. **Kim J. Verhaegh**, Marjon van Rijn, Janet L. MacNeil-Vroomen, Suzanne E. Geerlings, Sophia E. de Rooij en Bianca M. Buurman. Social determinants of health do not play a role in unplanned hospital readmissions in the Netherlands. *Submitted 2019*.
2. Ellen J.M. Bakker, Jos Kox, **Kim J. Verhaegh**, Anneke L. Francke, Cecile R.L. Boot, Pepijn D.D.M. Roelofs, Allard J. van der Beek. Late drop-out from nursing education: an interview study of nursing students' experiences and reasons. *Accepted for publication in Nursing Education in Practice.*
3. Karin den Boer, Anke J.E. de Veer, Linda J. Schoonmade, **Kim J. Verhaegh,** Berno van Meijel, Anneke L. Francke. A systematic review of palliative care tools and interventions for people with severe mental illness. *BMC Psychiatry. 2019 Apr, 19(1): https://doi.org/10.1186/s12888-019-2078-7*
4. **Kim J. Verhaegh**, Patricia Jepma, Suzanne E. Geerlings, Sophia E. de Rooij en Bianca M. Buurman. Not feeling ready to go home: a qualitative analysis of chronically ill patients' perceptions on care transitions. *International Journal for Quality in Health Care. 2019 Mar;31(2):125-132.*
5. **Kim J. Verhaegh**, Annamarike Seller-Boersma, Robert Simons, Jeanet Steenbrugge, Suzanne E. Geerlings, Sophia E. de Rooij en Bianca M. Buurman. An exploratory study of healthcare professionals' perceptions of interprofessional communication and collaboration. *Journal of Interprofessional Care. 2017 Mar;31(3):397-400.*
6. Rosanne van Seben, Suzanne E. Geerlings, **Kim J. Verhaegh**, Carina G.J.M. Hilders, Bianca M. Buurman. Implementation of a Transfer Intervention Procedure (TIP) to improve handovers from hospital to home: interrupted time series analysis. *BMC Health Services Research. 2016 Sept;16:479.*
7. Bianca M. Buurman, **Kim J. Verhaegh**, Marian Smeulers, Hester Vermeulen, Suzanne E. Geerlings, Suzanne Smorenburg and Sophia E. de Rooij. Improving handoff communication from hospital to home: the development, implementation and evaluation of a personalized patient discharge letter. *International Journal for Quality in Health Care. 2016 May;28(3):384-90.*
8. **Kim J. Verhaegh**, Janet L. MacNeil-Vroomen, Saeid Eslami, Suzanne E. Geerlings, Sophia E. De Rooij and Bianca M. Buurman. Transitional care interventions prevent hospital readmissions for adults with chronic illnesses. *Health Affairs. 2014 Sept;33(9):1531-1539.*
9. **Kim J. Verhaegh**, Bianca M. Buurman, Gwenda C. Veenboer, Sophia E. de Rooij, and Suzanne E. Geerlings. The implementation of a comprehensive discharge bundle to improve the discharge process: a quasi-experimental study. *Netherlands Journal of Internal Medicine. 2014 Jul;72(6):318-25.*
10. **Kim J. Verhaegh**, Annamarike Seller-Boersma, Robert Simons, Jeanet Steenbrugge, en Bianca M. Buurman. Multidisciplinaire visite: ontwikkeling en implementatie van een blauwdruk. *TVZ Tijdschrift voor verpleegkundigen. 2012 Oct;122 (5):51-55.*

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Curriculum Vitae

Kim Verhaegh was born on 7 November 1979 in Tegelen, the Netherlands. After graduating from high school she continued her studies in nursing. She completed a Bachelor's degree in Nursing at the Fontys University of Applied Sciences in 2004. She did her nursing internship in a leprosy clinic in Kathmandu, Nepal. She obtained her Master of Science in Cultural Anthropology at Utrecht University in 2007. For her master thesis, she conducted ethnographic fieldwork on the impact of globalization on the construction of identity of urban middle class women in Nepal. After various jobs in nursing and finance she started this PhD project in the Amsterdam Medical Center, where she combined research and lecturing Nursing at the Amsterdam University of Applied Sciences.