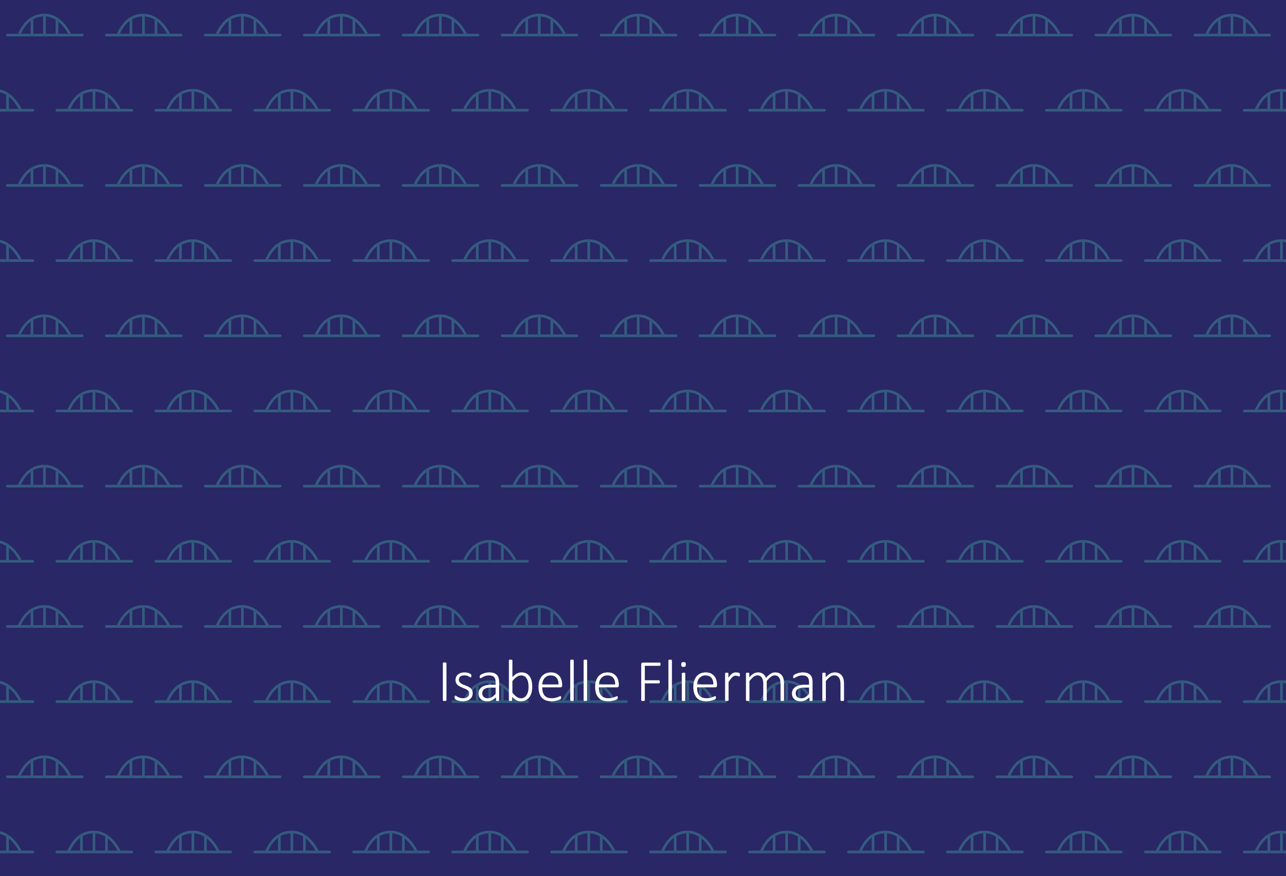
Timely palliative care for older patients

From early identification to better transmural collaboration



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Chapter 1

General introduction

Introduction

"Death is inevitable, a bad death is not" - the Economist

Mrs Smit is a 84-year-old widow and has a medical history of heart failure and diabetes type 2 and she has recently been admitted to the hospital with pneumonia. She is visually impaired and has difficulties in performing activities of daily living. She lives in an assisted living facility and community nurses aid her with bathing, compression stockings and medication. She has three involved children who see her on a weekly basis. Mrs. Smit prefers to spend as much of her time at home as possible and also die there. She experienced the last hospital admission as scary and the shortness of breath she frequently experiences reduces her quality of life. She has thus far not discussed this with her general practitioner and children.

On a Sunday afternoon, one of Mrs. Smits' daughters visits her and finds Mrs. Smit is not well at all, she is severely short of breath, tired and has abdominal pain. Mrs Smit's own general practitioner is not available on Sundays and her daughter does not know what to do other than call the ambulance. Mrs. Smit is admitted to the hospital for acute decompensated heart failure and treatment is started. Mrs. Smit is admitted for 6 days, during which her physical condition deteriorates and she experiences a lot of stress and fear. During the admission Mrs. Smit's needs and preferences are not identified, let alone discussed. Her general practitioner receives a short discharge letter describing the changes in medication and latest laboratory values. When he visits her a week later he sees she is delirious and suspects an infection. After a call with her daughter who is unaware of Mrs. Smits' preferences, Mrs. Smit is once again admitted to the hospital with both pneumonia and heart failure. Unfortunately, the treatment started is unsuccessful and Mrs. Smit dies during the admission.

In the case of Mrs. Smit, her palliative needs were not identified, no conversations about end of life preferences were held and care was not sufficiently coordinated. This led to a potential avoidable hospital admission, high symptom burden and Mrs. Smit not dying at her preferred place. The case of Mrs. Smit is unfortunately not an exception.

Palliative care in an aging population

With the aging population, and rising numbers of people living with and dying from (multiple) chronic conditions, there is an increased need for well-organized palliative care.[1] The European Association for Palliative Care (EAPC) found that in 2014 in Europe almost 4.5 million people died with serious health related suffering and who needed palliative care.[2] This number will increase further in the next decades.[1] In the Netherlands alone, the number of deaths each year is expected to increase from 150.000 in 2018 to 200.000 in 2040.[3]

The World Health Organization (WHO) defines palliative care as 'an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual.'[4] Palliative care can thus be seen as an approach that provides holistic care that is best fitting with wishes and needs of patients and their relatives.

Palliative care originated as care for the dying, and was started during the last weeks or days of life when no life-prolonging treatments were available anymore. This type of care is also referred to as 'Hospice care', 'End of life care' or 'Terminal care'. In the last decades it has however become clear that palliative care has many benefits when started much earlier in life-threatening disease trajectories and should thus be provided alongside disease modifying treatment.[5] This shift to initiating palliative care earlier in disease trajectories has led to difficulties in terminology and understanding of what palliative care entails for patients, care providers and researchers.[6] In all definitions, the clear goal is 'to improve the quality of life for patients', but when exactly this should be initiated varies.[6]

The shift to an earlier start of palliative care stems from cancer research. In 2010 Temel *et al*., published their seminal work on the benefits of early integration of palliative care for patients with lung cancer. In their study they found that palliative care improved quality of life and mood, lowered aggressive care at the end of life and prolonged survival.[7] Since then, prolonged survival has not been validated in other studies, but two reviews did show the other benefits and additionally found that early palliative care in patients with cancer reduced hospital admissions and length of stay, increased the number of advance directives, lowered caregiver burden, decreased medical costs and improved satisfaction with care.[8, 9] While palliative care is often associated with care for patients with cancer, it is now well known that patients dying from many other diseases can benefit from its holistic approach.[10, 11]

Palliative care in older patients

Almost four-fifths of people who die in Europe are older than 65 years and the causes of death differ between older and younger people. For older patients, the most common cause of death is circulatory disease (38.7%), followed by cancer (23.8%) and respiratory disease (8.9%). In people below 65 years, the most common cause of death is cancer (31.9%).[12] During the last years of life many older patients have multimorbidity, defined as two or more chronic conditions, functional and cognitive decline, and frailty.[13, 14] In a study by Hofstede *et al*., it was found that bereaved relatives of patients who died due to organ failure or frailty, in comparison to those with cancer, were more likely to negatively assess the palliative care provided to their relative and themselves.[15] Furthermore, in the study by Gardiner *et al*., hospital professionals described that palliative needs in older patients did not result in the same response from them in comparison to younger patients, because they thought older patients felt more at peace with a terminal diagnosis.[16] However, pain and emotional distress can be present to a similar extent among patients dying from cancer and frailty.[17] Furthermore, whereas younger patients often have a large network advocating for best possible care, older patients often have a smaller network.[16] This is especially worrisome knowing that many older patients lack the decision-making capacity to make decisions about the end of life.[18] The needs of older patients can thus differ from those of younger patients, however they are less likely to receive palliative care or be referred to specialist palliative care.[19]

During the last year of life, transitions between care settings are common in older patients.[20, 21] Most often these transitions are to and from the hospital and frequently result from insufficient symptom control or deterioration due to a chronic disease or vulnerability.[22] Not surprisingly, the number of older patients who die in the year following an acute hospitalization is high, up to 35%, most of whom during the first three months.[23, 24] During hospital admissions, the focus of professionals is nonetheless often on curation, and not on determining the presence of palliative needs.[16] Palliative care needs of the older patients remain unseen and unaddressed and the number of non-beneficial treatments is high.[25]

The high prevalence of hospital admissions can lead to patients dying in the hospital, while this is not often the preferred place of death.[26] While data on preferred place of death should be assessed with caution,[27] when the place of preference is known in older patients, this is most often home followed by hospice or a palliative care unit.[26] Compared to other countries, hospital deaths are low in the Netherlands.[28] In 2015 20% of non-acute deaths occurred in the hospital, whereas 33% died at home, 35% died in a nursing home or elderly home care facility and 12% died elsewhere including hospices and palliative care units.[29] Death did not occur at the preferred place of death for a third of patients in a study by Raijmakers *et al*., and was lower when the preferred place of death was at home.[30]

Organization of palliative care

To understand the barriers in palliative care provision, it is important to understand how palliative care is organized in the Netherlands. Palliative care can be provided in all care settings, including home, hospitals, nursing homes, hospices and palliative care units. Palliative care provision however varies widely between countries.[2] Generally, a division is made between generalist and specialist palliative care,[31] with a further division on how specialist care is provided. Based on the complexity of the needs of patients, three levels of care can be distinguished.[32] The first level is standard or generalist palliative care that is provided by all care professionals and spans all care settings. In the second level, multidisciplinary palliative care specialists with expert training can be consulted by the treating physicians and nurses in case of more complicated needs. In the third level, for the most complex cases, the palliative care specialist completely takes over care, for example in palliative care units. In the Netherlands, specialist palliative care is mainly provided on a consulting basis, both in hospitals and primary care. All Dutch hospitals that provide cancer care are required to have a specialist palliative care team. The number of these teams is increasing rapidly in the last years, however the number of consultations is often low.[33] The core team mostly consists of (specialist) nurses and medical specialists, often from the oncology, anaesthesiology or pulmonology departments, who themselves have varying degrees of additional training in palliative care.[34] Primary care physicians, often with a specific expertise in palliative care ('kaderartsen'), can also be part of these teams. During weekly multidisciplinary meetings additional medical and non-medical specialties, such as psychology, spiritual counsellors, dietician, physiotherapy and pharmacology may be present and can do additional consultations.

The majority of palliative care is provided at home and in nursing homes. In an average general practitioners practice, each year 5-6 out of 1000 patients are in the last phase of life.[35] In primary care, different specialist consultation options are in place. There is a national telephone service with palliative care specialists.[36] Furthermore, in recent years, PaTZ (palliative home care) teams have been formed that is a collaboration between general practitioners, community nurses and palliative care specialists and aim to identify patients early and asses their needs.[37] In recent years, over half of the hospital-based palliative care teams have also become available for consultation by primary care professionals.[34] Besides the role of the GP, nurses play an important role in care provision during the last weeks of life. This terminal home care can also be provided by advanced or technical nursing home care teams.

In addition to home care, palliative care can also be provided in hospices. There are two types of hospices in the Netherlands. High care hospices provide 24/7 medical care, whereas 'bijna-thuis-huizen' (almost-home-houses) are almost fully run by volunteers and community nurses and the patients' own GP provide the medical care. Besides hospices, many nursing homes also have palliative care beds or palliative care units with 24/7 medical care. Although the laws recently changed, to admit patients to a hospice, palliative care beds or to finance terminal home care (which allows for more hours or the advanced nursing teams), a declaration of a life expectancy of three months or less was needed from the treating physician.

Barriers to palliative care provision

Multiple barriers to palliative care provision exist and can lead to negative patient outcomes in older patients.

Late identification of palliative needs

One of the pillars of palliative care is early identification of needs and consequently treatment on the different palliative care domains.[4] However, timely identification is one of the main barriers to palliative care provision and identification often occurs late, or not at all.[23] Late identification of palliative needs can have different reasons. One of the reasons is the fact that diseases follow different trajectories with varying levels of predictability.[38] Whereas the trajectory of patients with cancer is somewhat predictable with a stable period followed by a rapid decline in functional status when the cancer spreads (metastases), the trajectory of patients who suffer from organ failure or frailty/dementia is much less predictable. In patients with organ failure repeated acute exacerbations lead to rapid decline followed by some recovery but lowering of overall functional status. It is difficult to predict which exacerbation will be the one leading to death, and hospitalizations and death during admission are especially frequent within this patient group. Frailty, a multicomponent condition that comes with old age, and dementia that is characterised by cognitive decline, follow a longer trajectory, wherein the overall condition is already highly reduced and declines slowly. Events such as a fall or infection often result in further decline or death. Besides the described trajectories, many older patients have multiple co-morbidities that influence their trajectories and functional status.

Thus, determining when a patient is nearing the end of life can be difficult. Moreover, physicians are often not very proficient at assessing prognosis and often overestimate the life expectancy.[39] Additionally, for many professionals defining the ‘palliative care patient’, in other words, when they declare that a patient is in the palliative phase, is difficult and unclear.[40, 41] While in cancer this terminology is more embedded because the word palliative is used for treatments that have no curative intent, in other trajectories the distinction between curation and palliation is not so clear. For example, heart failure itself cannot be cured, but the exacerbations and further deterioration can be delayed or stopped. If the professionals’ understanding of ‘palliative’ is care for the dying, palliative care will not be started.

Wishes and preferences are unknown

One of the main aspects of palliative care is talking with patients and their relatives about their wishes and needs for the end of life and how care can be organised to honour these preferences. This is especially important for older patients. Most older patients prefer care focused on quality of life instead of prolongation of life, while these preferences are not necessarily known to their health care professionals.[42] A study found that during the last days of life, treatment decisions had to be made in over 40% of older patients while 70% of the patients lacked decision-making capacity at that moment.[43] If preferences are not known in advance or no surrogate is assigned to make decisions, this could lead to undesired, and sometimes aggressive care.

In recent years, advance care planning (ACP) has been a much-studied subject within palliative care. In a recent consensus study, ACP was defined as “the ability to enable individuals to define goals and preferences for future medical treatment and care, to discuss these goals and preferences with family and health-care providers, and to record and review these preferences if appropriate".[44] These discussions thus allow health care providers to inform patients about their prognosis and the treatment options while at the same learning about patients' values and choices concerning future care. Most often this results in formulation of a written advance directive and when appropriate the nomination of a proxy who can make decisions when a patient is no longer able. Advance directives alone do not seem to influence patient outcomes.[45] However, when ACP conversations are held this can increase the quality of end of life care, and care is more fitting with patients' preferences.[46, 47] Furthermore, it can reduce stress, anxiety and depression in relatives.[48]

In clinical practice, advance care planning discussions occur infrequently.[49,50] Barriers to advance care planning occur on patient, professional and organisational level.[51] On the patient level, insufficient knowledge about health situation, hesitation to discuss treatment preference, and the insecurity about who should start these discussions can hinder the start of ACP. Professionals can also be hesitant to start the conversation because they are afraid to take away hope, even though studies have shown that speaking about the end of life lowers anxiety and patients do not lose hope.[52] But ACP is also hindered because professionals feel they do not have the skills or do not know what the right time is to initiate these conversations. On organisational level the focus on treatment, lack of coordination and uncertainty about responsibilities can hinder ACP.[51]

Insufficient collaboration between hospitals and primary care

The frequent hospital admissions of older patients in the last year of life increase the necessity for collaboration between hospitals and primary care. Continuity and coordination of care are also considered important quality indicators of palliative-care provision.[53] However, continuity of care is currently suboptimal. During transitions between hospital and primary care, insufficient collaboration between care professionals,[54, 55] incomplete handovers,[56] and unavailability or uncertainty about the expertise of follow-up care[57, 58] result in untimely follow-up by general practitioners[59] and increase the risk of adverse events such as medication errors and rehospitalization.[60, 61] Furthermore, insufficient communication with patients and their caregivers can result in patients not knowing how to manage symptoms, an increase in symptom burden, and uncertainty about whom to contact post-discharge.[62, 63]

To improve collaboration, transmural care interventions that follow patients throughout different care settings have shown promising results in older patients,[64, 65] and in oncological palliative patients.[66] However, transmural care is thus far not imbedded in palliative care.

Limited use of specialist palliative care

In recent years, the number of specialist palliative care teams in the Netherlands has increased rapidly.[33] Nonetheless, consultations are infrequent and if consultations occur, this is often during the last days of life. This can be the result of a lack of timely identification. But also the division between generalist and specialist palliative care and regional differences on how palliative care is organised contributes to a fragmented health care system where generalist do not always know who are available for consultations. Involvement of specialist palliative care is dependent on the underlying conditions; consultations are more frequent for patients with cancer. But also factors such as social economic status[67] and age[19] influence if patients are referred to specialist palliative care.

Development of a care pathway to overcome barriers

The aforementioned barriers have led to the development of the PalliSupport transitional care pathway. In 2014 the Netherlands Organisation for Health Research and Development (ZonMW) started the National Program Palliative Care (Nationaal Programma Palliatieve Zorg) to improve palliative care provision in the Netherlands. The *consortium Noord-Holland en Flevoland* received funding for a large project to develop a care pathway for older patients. The PalliSupport transitional care pathway aims to lower the number of unwanted hospital admissions at the end of life and facilitate death at place of preference for older patients. The PalliSupport transitional care pathway will consist of a number of interventions that span multiple settings, involving a large number of care professionals and also requires new behaviours from professionals. The extent of the goals, components of the intervention makes the PalliSupport transitional care pathway a complex intervention.[68] Multiple frameworks exist to guide researchers in designing and evaluating complex interventions. For the PalliSupport transitional care pathway, the MRC-framework was followed that consists of four phases.[68] In the first phase, interventions are developed based on existing evidence and theories. In phase 2, the feasibility of the intervention is assessed and adjusted if necessary. In phase 3, the intervention will be evaluated on effectiveness with a stepped wedge cluster randomised trial. If the intervention is found to be effective, the last phase is wider implementation of the intervention. These phases are not linear, and researchers can and should revisit phases when necessary.

Aim and content of the thesis

The overall aim of this thesis was to provide the evidence concerning timely identification, collaboration between hospitals and home and transmural palliative care that was needed for the development of building blocks for the PalliSupport intervention.

In part I of this thesis we assess how physicians and nurses identify the palliative phase in their patients and if identification instruments can aid in timely identification. In *chapter 2*, we assess how physicians and nurses determine if a patient is in the palliative phase and what they consider barriers to this process. In *chapter 3* and *chapter 4* we present the results of a multicentre observational cohort study wherein we assessed if nurses (*chapter 3*) and physicians (*chapter 4*) could predict which older hospitalised older patients were in the last year of life with the use of identification instruments and which instrument had the best predictive value.

In part II we focus on collaboration between hospitals and primary care for palliative patients. In *chapter 5*, we present the results of five focus groups that were held with nurses and physicians from primary and hospital care to assess how the handover between hospital and home currently occurs for palliative patients and what barriers exist. In *chapter 6*, we present the results of a systematic review and meta-analysis where we assessed if transmural palliative care team interventions reduces the number of hospitalizations for palliative patients. In *chapter 7*, we present the results of the feasibility study of a palliative transmural care intervention, the Pallisupport intervention, prior to a larger stepped wedge cluster randomized controlled trial. Based on the feasibility study, the study protocol for the Pallisupport trial was adjusted and this forms *chapter 8* of this thesis.

Chapter 9 is the general discussion and conclusion of this thesis and *chapter 10* the summary.

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Part I

Timely Identification

Chapter 2

How do hospital-based nurses and physicians identify the palliative phase in their patients and what difficulties exist? A qualitative interview study

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Abstract

Background: Early start of palliative care improves the quality of life of eligible patients and their relatives. However, in hospital, patients who could benefit from palliative care are often not identified timely. The aim of this study is to assess how hospital-based nurses and physicians define the palliative phase, how they identify the palliative phase and what difficulties they face.

Methods: Semi-structured interviews were held with ten nurses and 18 physicians working at seven hospitals in the Netherlands. Data was analysed using thematic analysis.

Results: Nurses and physicians feel insecure about how to define the palliative phase and differentiate between an acute and extended phase. Great variation existed in what life expectancy is attributed to each phase. A variety of ways to identify the palliative phase were described: 1) Prognostication. 2) Treatment trade-off. 3) Assessment of patients' preferences and needs. 4) Interprofessional collaboration. Professionals base prognostication on their experience but also search for clinical indicators. When benefits of treatment no longer outweigh the negatives, this was considered an, albeit late, identification point. To start a conversation on a patients' palliative care needs was found to be difficult. Therefore, some respondents wait for patients to vocalize preferences themselves. Many professionals rely on interprofessional collaboration for identification, however uncertainty exist about responsibilities. Difficulties in identification occurred because of variance in definitions, unpredictability of non-oncological diseases, focus on treatment and difficulties in communication and collaboration.

Conclusion: These results provide insight into the challenges and difficulties hospital-based professionals experience in timely identification of patients with palliative care needs.

Background

Historically, palliative care has been associated with patients that are dying. However, as stated in the WHO definition, palliative care should be integrated earlier in a patient's disease trajectory, because this can improve quality of life, reduce symptom burden, and leads to less aggressive treatments and fewer hospitalizations.[1-4] Yet, in daily practice, physicians and nurses often do not initiate palliative care until death is imminent—if they initiate it at all.[5-7] A challenge for timely initiation is the difficulty in identifying which patients are eligible for palliative care, especially because more people are now dying from chronic progressive diseases that often follow less predictable disease trajectories.[8, 9]

The majority of people with end-stage disease require acute hospital care, due to increased symptom burden, in the last years of life and many elderly in particular, die shortly after an acute hospitalization.[10-13] Hospital-based professionals are therefore well positioned to identify patients who could require palliative care.[14] However, thus far, most studies on identification of patients in the palliative phase have focused on general practitioners' (GP) perspectives and not hospital professionals, because patients often prefer home as the place of care and death.[15-17] Furthermore, nurses, who often work closer to patients, could be important in assessing which patients are in need of palliative care, although little is known about their role.

Dalgaard *et al.*,[18] described different methods for early identification within the hospital: prognostication, assessment of care needs and use of identification 'instruments', such as the 'Surprise Question' (would I be surprised if the patient were to die in the next year?)[19] and instruments that score on clinical and disease-related markers.[20, 21] The authors found that for none of the methods, there was sufficient evidence to recommend routine use in clinical practise.

In order to improve identification within the hospital setting and overcome existing barriers, we need to better understand what the current manners are for identification and what difficulties exist. Therefore, the aim of this study is threefold. 1) to explore how physicians and nurses working in the hospital define the palliative phase 2) how professionals identify the palliative phase in their patients in daily practice 3) what are perceived barriers to identifying the palliative phase in daily practice.

Methods

Study design

To provide an in-depth understanding of hospital-based physicians' and nurses' experiences with and perspectives on identification of the palliative phase within the hospital setting, a phenomenological approach was chosen,[22, 23] consisting of semi-structured interviews, which is a method particularly suitable to gain a comprehensive insight into experiences and perspectives.[22, 23] The interviews were held between September 2016 and 2017. We followed the consolidated criteria for reporting qualitative research (COREQ) guidelines[24] (appendix 1).

Study participants and recruitment

We recruited nurses, residents and medical specialists from the departments of internal medicine, oncology, geriatrics, cardiology, nephrology and pulmonology from one academic and six general hospitals. Professionals within these specialties often care for patients in the palliative phase and consequently were expected to have experience with identification. We recruited both nurses and physicians because of their different perspectives. We recruited residents, who provide most of the daily care for hospitalized patients, and specialists, who additionally see patients at the outpatient clinics. We recruited nurses with general training and those with additional specialty training, for example, in heart failure.

Participants were purposefully sampled based on specialization, hospital type, work experience and experience in palliative care. Six people declined participation because of time restraints. We recruited participants via email through the professional network of the researchers and through snowball sampling. The invitation mentioned the goal of the interview.

Data collection

The first author (IF), a physician and PhD student with training in qualitative research, conducted all interviews. Interviews were one-on-one and conducted in Dutch at participants' workplace, and in two cases at a library. Notes were made during each interview, which were used to make a summary of the interview which was sent to participants, and to provide context for the analysis. The interviews were guided by a topic list with open-ended questions and probing questions. The first and last authors (IF and DW) created the topic list based on previous research on this topic.[15, 16, 18] The other authors critically reviewed the topics. Two pilot interviews were held, after which the authors critically reviewed the topic list and adjusted the questions accordingly. The topic list can be found in appendix 2. We obtained written, informed consent, and audio recorded and transcribed verbatim all interviews.

Analysis

Data was analysed thematically, a method for identifying, analysing and reporting patterns, i.e. themes, within the data.[25] An initial 'open-coding' scheme was chosen because we aimed for data-driven analysis and an broader understanding of identification of the palliative phase in daily practice. IF read and reread all transcripts to become familiarized with the data. IF and IN coded the initial five transcripts independently with an 'open-coding' scheme (inductive coding), however some codes resulted specifically from the questions asked for example "Are there differences in identification for different diseases?" and were therefor the result of deductive coding. IF and IN discussed differences in coding until consensus was reached, if difference persisted a third researcher (DW) was consulted. After the initial open-coding scheme, IF and IN created an initial codebook, which IF used to code the remaining transcripts. This codebook was however not static, if necessary new codes emerged from the data these were added. After initial analysis, IF sorted the different codes into potential themes and subthemes. In the next phase, IF reread all the coded data and assessed the appropriateness of the formulated themes and, if necessary, adjusted, added or removed themes. During the analysis and writing process, the results were repeatedly discussed with all of the authors. Coding and analysis was done using the MAXQDA software program.[26] Data saturation was reached, because the last five interviews revealed no new concepts and themes.[27]

Results

We conducted 10 interviews with nurses, 12 with specialists, and six with residents. Table 1 presents a summary of their characteristics. The interviews lasted between 26 and 68 minutes with an average of 49 minutes.

Table 1. Participants characteristics

Respondent	Gender	Age	Department	Hospital (centre)	Years of work experience	(work) Experience/training in palliative care
N1	F	30-39	Nurse (internal medicine)	University hospital (1)	7	
N2	F	40-49	Nurse (internal medicine/ oncology)	University hospital (1)	19	
N3	F	20-29	Nurse (pulmonology)	University hospital (1)	4	
N4	F	20-29	Nurse (cardiology)	University hospital (1)	5	Extracurricular courses
N5	M	50-59	Nurse practitioner (cardiology)	University hospital (1)	37	Course on end of life communication
N6	F	30-39	Nurse (palliative care team)	General hospital (5)	22	Palliative care team member, specialist training
N7	F	40-49	Nurse (pulmonology)	General hospital (5)	17	Extracurricular course
N8	F	30-39	Nurse (internal medicine)	University hospital (1)	2	
N9	F	20-29	Nurse (internal medicine)	University hospital (1)	3	
N10	F	20-29	Nurse (internal medicine)	University hospital (1)	1.5	

Table 1. *Continued*

Respondent	Gender	Age	Department	Hospital (centre)	Years of work experience	(work) Experience/training in palliative care
R1	M	30-39	Resident (internal medicine)	University hospital (1)	2.5	
R2	F	30-39	Resident (internal medicine)	General hospital (2)	0.5	
R3	M	30-39	Resident (cardiology)	University hospital (1)	6	Extracurricular training
R4	F	30-39	Resident (nephrology)	University hospital (1)	6	
R5	M	20-29	Resident (cardiology)	General hospital (4)	0.5	
R6	F	20-29	Resident (geriatrician)	General hospital (6)	2	
P1	F	40-49	Oncologist	General hospital (2)	12	Palliative care team member
P2	M	50-59	Oncologist	General hospital (6)	14	Extracurricular courses
P3	M	40-49	Geriatrician	General hospital (6)	19	Worked in palliative care unit
P4	F	50-59	Nephrologist	University hospital (1)	30	
P5	M	40-49	Geriatrician	General hospital (5)	17	Palliative care team member, extracurricular courses
P6	M	60-70	Pulmonologist	General hospital (5)	31	Palliative care team member, specialist training
P7	M	60-70	Internist	General hospital (3)	31	
P8	F	40-49	Pulmonologist	General hospital (7)	11	Palliative care team member, specialist training
P9	F	40-49	Cardiologist	University hospital (1)	12	
P10	M	50-59	Nephrologist	General hospital (4)	25	
P11	F	40-49	Cardiologist	University hospital (1)	9	
P12	M	50-59	Internist/ Geriatrician	General hospital (3)	25	Educator in palliative care

The first main topic we addressed was ‘defining the palliative phase’. Respondents described a variety of often intertwining ways to identify the palliative phase in their daily practise, leading to four other main themes: (1) prognostication, (2) treatment trade-off and (3) patients’ preferences and needs (4) Interprofessional collaboration and responsibilities. Specific barriers and facilitators to identification emerged within each of these themes.

Defining the palliative phase

The majority of respondents have difficulty—and feel insecure about—defining which patients they consider to be in the palliative phase. Respondents often distinguished between an ‘acute’ palliative phase, in which death is imminent, and a more ‘extended’ phase, in which patients have a (potentially) life-threating disease but are not yet dying:

> *“You have of course the terminal phase, where you expect the patient to die within the foreseeable future. That is, then you are very active with providing palliative care. But palliation, in my opinion, can also mean you are not providing terminal care, but you are active with the end of life”* (P3 geriatrician).

Many considered the moment focus completely switches from curative care to symptom control and improving quality of life as the starting point of the palliative phase. Some believed thinking about the palliative phase was only useful when it had clear consequences such as withdrawal of treatment, discharging a patient to primary care or consulting the specialist palliative care team. The ‘acute’ palliative phase, also frequently described as the terminal phase or dying phase, was consequently clearer defined for respondents because the focus was fully on comfort and resulted in treatment withdrawal or palliative sedation. Respondents defined the extended phase differently. Descriptions frequently used were the moment when there were no curative options left, or when patients had a limited life expectancy. However, what was considered a limited life-expectancy ranged from weeks to years. Where many nurses, cardiologists and nephrologists spoke of a shorter life expectancy, geriatricians and oncologists more often spoke of a life expectancy of years.

> *“How long the foreseeable future is, that is complicated. When you know that death because of the underlying disease is certain, but yes that is difficult. Some patients will die somewhere between now and 30 years. That of course of is not really the palliative phase. Let’s say the last months. Yeah maybe shorter. I don’t know.”* (R5, resident cardiology)

Prognostication

Assessing the prognosis of a patient is an important step in identification for respondents. Respondents often found prognostication easiest in cancer patients, where metastasized disease means a clear transition point, and respondents can base their assessment on 'hard measurements' such as scans. On the other hand the unpredictable course of organ failure and dementia resulted in difficulty prognosticating:

> *"Look, the difference between, for example, the palliative phase in an oncological patient and the palliative phase in a heart failure patient ... if you have an untreatable metastasized lung carcinoma, then you'll die. That is, that is certain. And with heart failure, you know you'll die earlier, but you don't know when"* (N5, nurse practitioner cardiology).

For prognostication, respondents often rely heavily on their 'clinical glance', a term Dutch health care providers often use for an intuitive assessment of the severity of a patient's situation. Respondents had difficulty explaining this 'clinical glance' but said it was mainly based on previous experiences and physical or psychological signals from patients. Nurses often described it as a discomfort in following certain treatment orders:

> *"It is often nurses who already experience a sort of feeling in their stomach, a sort of feeling like 'what are we actually doing?' If you have the feeling like 'what are we actually doing' it is a sign that something is up"* (N8, nurse internal medicine department).

Inexperience with certain diseases resulted in insecurity in respondents to trust their gut feeling. Furthermore, when respondents had experiences with cases that did not follow the course they had expected, this could make respondents doubt their 'clinical glance':

> *"There are no good prediction models. It's more a like an individual clinical glance. What have you seen before? And you should always be careful with going with your own gut feeling and your own experience, because your own experience does not have to match with the patient that is sitting in front of you, or laying, or panting"* (R3, resident cardiology).

Respondents try to objectify their gut feeling, by looking for clinical indicators. Different clinical indicators were mentioned that could trigger identification: general, disease specific, physical, and psychological. One such general indicator was recurrent hospitalizations. Respondents describe that physical indicators can be very clear, such as weight loss or a change in functional status, but can also be subtle. Some respondents also mentioned psychological signals such as fear, depression and decline in cognitive functioning. Sometimes they observe resignation, as described here by a nurse practitioner:

> *"But in the end, people themselves see that there is no more hope. ... And then you eventually see somebody gives up. ... You see that the light in their eyes dampens, and you see that because you know the person so well. ... So the moment you see that, you know what the situation is, even though you don't have any numbers"* (N5, nurse practitioner cardiology).

Respondents view having a longer relationship with a patient as facilitating for prognostication, because it allows them to observe a decline over time. However, some felt having a bond with a patient could prevent them from seeing that a patient is nearing the end of life. A respondent described this situation in caring for a younger patient:

> *"I think, however, that that is a pitfall for especially experienced physicians ... that you get attached to a patient and don't want to acknowledge that it is going to end soon. And that is something I do think exists."* (P1 oncologist)

Some respondents were familiar with the 'Surprise Question' and use it as a trigger for identification. When asked specifically, respondents said they were unfamiliar with instruments that use lists of general indicators/signals. They felt identification instruments are helpful in creating awareness. However, they questioned the prognostic accuracy, and thought identification of the palliative phase is not as simple as 'checking off' certain indicators:

> *"But one of those checklists, I think you could use them in clinical practice, definitely. But I do think you need to keep in the back of your head that it is not black and white. So ... a checklist might not be applicable for each patient".* (R2, resident internal medicine department)

Treatment trade-off

Respondents considered lack of curative treatment options to be closely linked to limited prognoses; however, they also described this lack as a separate manner of identification and hence as a separate theme. The moment all curative options were exhausted was considered a clear transition point to the palliative phase. However, respondents thought this distinction was again less clear in patients with chronic diseases, such as organ failure or diabetes:

> *"Some people say that you can't cure COPD, so everything you do is per definition palliative, but I think that's nonsense. There is a group of people with COPD that are limited by their dyspnea or fear, and those are the people, if you ask me"* (P8, pulmonologist).

To decide if curative treatment options are viable, physicians described trying to weigh the benefits of treatment with the negatives and aim for an acceptable balance. They felt a shift to the negative marks the palliative phase, yet this shift often occurs late in the disease progression, especially in organ failure:

> *"Yes, but then it shouldn't be that ... at a certain moment you agree that, well, there are no treatment options left, … she (a patient with heart failure) dies within 24 hours. Then you can't do anything anymore. See, then you are a rather late"* (R6, resident geriatrics).

While patients' opinions on treatment continuation are considered an important part of assessing treatment trade-off, some physicians wait for patients themselves to mention they want to quit or not start treatment. Furthermore, physicians describe they need to have tried all treatment options before 'accepting' somebody is in the palliative phase. They described not wanting to have failed in exploring all diagnostic and treatment options that are possible:

> *"And you don't want to admit too quickly, so you want to first thoroughly have explored all different options you have before you say 'there is indeed really nothing we can do anymore'. So I think you should really have a complete picture and have discussed it with everyone before you say 'we really have considered it, but it's a bridge to far'"* (R5, resident cardiology).

Nurses frequently said they felt physicians often focus on treatment possibilities too long which they considered harmful for patients. An explanation given by respondents was that they were trained to focus on treatment and fixing the acute problem a patient presented with to the hospital. To overcome the continued focus on treatment, some physicians described setting a certain time limit in which a patient should have responded to treatment before withdrawal:

> *"Like, we are going to improve the nutritional status and we will do this and that and we are going to do everything optimally for two weeks. And if after two weeks it is still getting worse, then we quit"* (R4, resident nephrology).

Patients' preferences and needs

Respondents also base their assessments of the palliative phase on patients' needs and preferences. When the above-mentioned clinical indicators or treatments negatively influence the quality of life of a patient, the need for palliative care is clearer, according to respondents:

> *"I think that the moment they become very limited in their functioning, and especially when they, because of it, are not having any fun in their lives, that conversations are needed, like 'what is it you actually want, and how can I assist'. Yes, so how severe do they find their own suffering, and how much is it obstructing their quality of life"* (P12, geriatrician).

Respondents described the wishes and preferences of patients concerning their future as being important in their assessments. As stated before, some respondents felt that it was up to patients to vocalize wishes and preferences themselves. However, others actively engage in discussions to explore them when, based on other indicators, they believe a patient might be nearing the palliative phase:

> *"And she marked that phase herself because she herself indicated that she did not want any medical interventions anymore"* (P8, pulmonologist).

Respondents, however, described multiple barriers to initiating these conversations which often stem for the uncertainty they experience in prognostication but also because they didn't think patients wanted to discuss this or felt it was not their responsibility. Respondents also explained that patients can sometimes be inconsistent in expressing their preferences to other colleagues, which makes respondents reluctant to act on those preferences. Nurses often explained that patients tell them they want to discontinue treatment, but the patients withhold this wish from their physicians:

> *"And we as nurses are apparently more accessible, I think, because you have the function of nurse. But more accessible to share it with us than with a physician, because when the physician comes by and says, "Well, we are going to this and that and tomorrow we will test that', then they say, "Yes, off course". And we walk in half an hour later and then they say, "Yes, actually I don't want that, I don't want those tests anymore".* (N4, nurse cardiology department*)*

In patients with dementia and frailty, respondents believed conversations about future care are needed before patients become cognitively impaired, and consequently their focus shifts earlier to patients' preferences and needs. Respondents described searching for objective clinical indicators or relying on relatives to speak for patients who are already cognitively impaired. Relatives are, in general, considered an important source of information. However, some respondents find that relatives sometimes withhold information that could influence how respondents perceive patients' overall wellbeing:

> *"It lies a little in recognition because it is being obscured, because you are not getting all the information and you often see that the functioning is described better ... Yes, then you don't hear how bad somebody is functioning on their own"* (P12, geriatrician).

Interprofessional collaboration and responsibilities

Independent of their work experience, respondents mentioned they value discussions with direct colleagues while identifying patients in need of palliative care. Either to check if their assessment is right, and in cases of nurses to get more support before voicing their concerns to physicians.

> *"And of course consultation with a colleague, like: 'Well, this is what I see. Do you see that as well?"* (P11, cardiologist).

Consulting palliative care team members was mentioned as a consequence of identification but hardly as an aid in identification. Also, respondents did not often mention primary care physicians as colleagues with whom they would discuss identification. However physicians did describe coordinating care with the GP when the palliative phase was identified:

> *"Well then I tried to assess how this woman functioned at home. Well, the last years everything had become more difficult (…) And , yes her life had become increasingly more restricted. And then I consulted with her GP."* (P7, internist)

Many nurses said they are better at identification because they work more closely with the patients. However, some nurses mentioned being hesitant to tell physicians they consider a patient to be in the palliative phase. They do not want to be seen as 'giving up' on the patient or that they doubt physicians' expertise. Physicians, however, mentioned they consider nurses important in signalling and take their opinions seriously:

> *"Having the guts to say that you think the treatment or options that we are offering to the patient, well if they are in fact useful? Are we ... doing the right thing? Well then maybe you are not just undermining the physician's medical policy. But also, in my own eyes, I also have the feeling that when you say that, I don't want to help the patient anymore"* (N3, nurse at pulmonology department).

Many nurses and some residents believed identifying patients in the palliative phase is not their responsibility and is up to their superior. However, some specialists themselves, feel it is not their responsibility, for instance when they see patients for a specific problem or an emergency admission:

> *"I think that's a difficult issue. We see more and more that severely ill patients come to the ER, and then it's not just their acute illness, but everything that was already happening before. Heart failure, the chronic leg ulcer, everything together. And that makes you think 'yes, should I be the one that all of a sudden, I don't know you, be the one to say, well actually we are more in the palliative phase".* (P5, geriatrician)

Discussion

Main findings and comparison with other studies

This qualitative study explored how hospital-based physicians and nurses describe the palliative phase, what methods are used to identify the palliative phase and what difficulties exist in daily practise. Identification seems to be a non-structured process that occurs over a longer period of time that consists of prognostication, assessment of treatment trade-offs, assessment of preferences and needs and interprofessional collaboration. Barriers in identification occur because of the variance in definitions that are used, a persistent focus on treatment, the unpredictability of non-oncological diseases, difficulties in communication with patients, uncertainty in responsibility and insufficient interprofessional collaboration.

In 2002 the WHO stated that palliative care should be available for all patients and families facing the problems associated with life-threatening illness and should be initiated early on in disease trajectories.[4] Nonetheless, a first finding of our study was the difficulty and uncertainty our respondents experienced in defining the palliative phase. This finding agrees with previous studies in primary- and secondary-care settings,[28, 29] and despite the WHO definition, discussions are ongoing on how we, as researchers and practitioners, should define palliative patients.[30] The purpose of this study was to explore experiences and perspectives of professionals themselves. Therefore, we did not provide respondents with definitions, but instead acquired their own interpretation. Whereas some used definitions of the palliative phase similar to the ‘early palliative care model’, as proposed by Lynn *et al*., where palliative care starts before all curative options are exhausted,[5] many participants associated the palliative phase with the moment all curative options are exhausted or the prognosis is clearly limited. The misunderstanding that the palliative phase is synonymous with the terminal phase is persistent.[31] Consequently, identification will occur late within the hospital setting,[18] which prevents patients and their relatives to benefit from early integration of palliative care.[1-3]

When and whether identification occurs seems to be highly dependent on a patient’s diagnosis.[18] Whereas prognostication and the weighting of treatment options is a clear transition point to the palliative phase in cancer patients, in non-cancer patients, prognostication is considered more difficult which was also found within the primary care setting.[16, 17, 32, 33] In patients with organ failure, so-called ‘prognostic paralysis’ can occur, where, because of the uncertainty in prognosis, physicians do not tell patients they have reached the end stage of their disease and do not plan appropriate care.[34, 35] Furthermore, it is well established that physicians experience difficulties in determining prognosis and tend to overestimate life-expectancy.[36] Researchers have suggested that physicians should not wait for a specific prognostic transition point, but instead assess needs to identify the palliative phase.[18, 37]

One could argue that weighing of treatment options, another manner for identification described by our respondents, is in fact the consequence of identifying the palliative phase. However, we found that failure or success of treatment determines where professionals believe patients are in their trajectory. This continuous focus on treatment was thought to be stronger in physicians by our respondents, which could be explained by the differences in training. Whereas physicians' training traditionally focusses on understanding diseases and their cures, nurses are trained in a more holistic approach.[38] Nurses could therefore be considered better assessors of when a patient needs palliative care, which is further supported by the fact that nurses in our study think that patients can more easily open up to them (vs. physicians) about discontinuation of treatment. Yet, supporting previous findings,[39] nurses described feeling hesitant to disclose their observations to physicians.

Besides prognostication and treatment-trade-off, our respondents highlighted the importance of appraising patients' quality of life and holding open conversations with patients and relatives about wishes and preferences. However, not all respondents actively start these conversations and instead wait for initiation by patients. It also seems that the patients' voice within the assessment of treatment-trade-off is not always taken into account. This finding is not surprising, barriers to starting conversation about the end of life are numerous and divers.[31, 40] One specific barrier described by our respondents is that they did not believe to be the right person to discuss the end of life with patients. Although, one study found that patients think specialists should discuss disease-specific needs and care,[15] other studies do bring into question whether hospital-based physicians should be holding these conversations at all.[41, 42] GPs and community nurses, who often have a longer relationship with patients, focus less on a single disease/problem and are aware of functioning at home, might be better positioned to assess needs and consequently identifying the palliative phase. Collaboration between care settings to compare assessments and discuss how to respond to patients' needs and preferences seems logical. However, only a few physicians in our study described consulting with patients' GPs. GPs themselves experience this lack of collaboration as an important barrier to improving care for patients at the end of life.[33, 43]

Implications for research and practice

This study indicates that within the hospital setting there is little awareness of the early palliative care model. Both the WHO and the Dutch Quality Framework Palliative Care state that all health care professionals should be aware of the four dimensions of palliative care and early integration is an important aspect.[4, 44] With the raising number of patients in the palliative phase in general hospital wards, efforts should be made to further educate both nurses and physicians on the benefits of early integration of palliative care and how to provide holistic care. Palliative care experts could play an important role in this effort. Furthermore, team trainings have been shown to improve collaboration at hospital departments,[45] therefore a combined training on palliative care where both nurses and physicians attend, has the added bonus of improving collaboration on this subject. An important focus of training programs should be on how to initiate conversations with patients about their wishes and preferences, which could result in more patient-centred needs assessment instead of focussing on treatment options and prognosis. Furthermore, collaboration between hospital professionals and primary care professionals needs attention to improve coordination of tasks. What specific barriers exist and how to overcome them, needs further evaluation.

In recent years efforts have been made to provide professionals with instruments to identify patients in the palliative phase. Our respondents felt these identification instruments could potentially be helpful in identification, but doubted the prognostic accuracy. The prognostic accuracy of these instruments indeed varies widely amongst different populations.[46, 47] One could therefore argue whether prognostic value should be the primary objective or whether these instruments should work as a trigger to start conversations about patients' needs and preferences. Further studies regarding the usability of these identification instruments, and if this indeed leads to earlier integration of palliative care, is needed.

Strengths and limitations

One of the strengths of this study is that it sampled professionals from both medical and nursing staff, from different department and multiple hospitals. The qualitative approach of this study allowed us to get in-depth insight into each participant's experiences and helped us gain a better understanding of identification of the palliative phase in daily practise.

The results should be interpreted within their limitations. Although we sampled based on diversity in work backgrounds, we did not sample based on cultural and religious backgrounds—aspects that could influence perspectives on the palliative phase. Furthermore, especially within the sample of medical specialist, many had either training in palliative care or worked within the palliative care team. It might be possible that we therefore did not get the full scope of opinions of less experienced medical specialists. Additionally, IF is a physician herself, her interpretation of the results might carry some bias. We think we have overcome this possible limitation by thoroughly discussing data analysis within our research group.

Conclusion

Hospital-based physicians and nurses define palliative phase in a variety of ways. Methods used for identification are prognostication, assessment of treatment-trade-off, assessment of needs and preferences and interprofessional collaboration. Practitioners use these means alongside each other, and no structured approach to identification seems to exist. Efforts should be made to create awareness within the hospitals of the early palliative care model and the benefits of timely initiation of palliative care.

Ethical approval and consent to participate

According to Dutch law, our study did not need approval by a medical ethics committee[48]. Respondents received written and verbal information about participation. Before the interview started the respondents signed an informed consent form. Within this manuscript all identifiable data was removed.

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Appendix 1: COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/ facilitator	1	Which author/s conducted the interview or focus group?	Methods
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	Title page
Occupation	3	What was their occupation at the time of the study?	Methods: data collection
Gender	4	Was the researcher male or female?	Title page
Experience and training	5	What experience or training did the researcher have?	Methods: data collection
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Methods: participants and recruitment
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Methods: participants and recruitment
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Methods: data collection
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Methods: design & data analysis
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Methods: participants and recruitment

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Participant selection			
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	Methods: participants and recruitment
Sample size	12	How many participants were in the study?	Results
Non-participation	13	How many people refused to participate or dropped out? Reasons?	N/A
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	Methods: data collection
Presence of nonparticipants	15	Was anyone else present besides the participants and researchers?	Methods: data collection
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	Results, table 1
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Methods: data collection
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Methods: data collection
Field notes	20	Were field notes made during and/or after the interview or focus group?	Methods: data collection
Duration	21	What was the duration of the inter views or focus group?	Results
Data saturation	22	Was data saturation discussed?	Methods: data analysis
Transcripts returned	23	Were transcripts returned to participants for comment and/or	Methods: data collection
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	Methods: data analysis
Description of the coding tree	25	Did authors provide a description of the coding tree?	N/A
Derivation of themes	26	Were themes identified in advance or derived from the data?	Methods: data analysis

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Software	27	What software, if applicable, was used to manage the data?	Methods: data analysis
Participant checking	28	Did participants provide feedback on the findings?	N/A
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Results
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Results
Clarity of major themes	31	Were major themes clearly presented in the findings?	Results
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Results

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Appendix 2. Topic list

General

- Can you tell me about the last patient you thought was in the palliative phase?
- What made you think this patient was in the palliative phase?
- How do you define the palliative phase?
- Can you tell me about a patient where you doubt if he or she is in the palliative phase?
- What makes you doubt?
- Can you tell me about a case where you were to early/late in identifying the palliative phase?
- Are there consequences when u identify the palliative phase?

Difficulties

- What makes identification of the palliative phase easy/difficult?
- Are there differences in identification for different diseases?

Identification instruments

- Have you heard of instruments that can aid in identification of the palliative phase? If yes, do you use them?

Chapter 3

Usability of the Surprise Question by nurses to identify 12-month mortality in hospitalized older patients: a prospective cohort study

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Abstract

Background: Palliative needs in older patients are often not timely identified. The Surprise Question (SQ) ‘would I be surprised if this patient died in the next year?’ is a well-researched tool that could aid in this effort. Most studies thus far involved physicians or specialist nurses, however the predictive value of the SQ when used by general nurses caring for hospitalized older patients is unknown.

Objectives: To assess the predictive value of the SQ when used by general nurses and student nurses, in determining one year mortality in acutely hospitalized older patients.

Design: Observational cohort study with an one year follow-up.

Setting: One academic and one regional hospital in the Netherlands.

Participants: Patients ≥70 years acutely hospitalized for at least 48 hours.

Methods: Registered nurses and student nurses answered the SQ with ‘No’ (a positive SQ), ‘Yes’ or ‘Don’t know’. Data on student nurses was analysed separately. The sensitivity, specificity, negative- and positive predictive values were calculated. Furthermore, logistic regression was performed to determine the odds of death.

Results: 66 registered nurses answered the SQ for 252 patients of whom 77 (30.6%) died in the year after inclusion. Respectively, 44%, 14% and 22% died within the ‘No’, ‘Yes’ and ‘Don’t know’ group. 85% of patients who died during admission or in the first three months post-discharge were identified. The sensitivity and specificity were 76.7% and 56.6%. The positive and negative predictive values were 43.7% and 84.6 %. Compared to persons in whom the SQ was answered with yes, a no answer was associated with an 4.7 times increased odds of dying in the next 12 months (odds ratio 4.71 , 95% CI 2.43-9.12, $p<0.001$). Additionally, 20 student nurses answered the SQ about 73 patients; sensitivity and specificity were 46.7% and 72.1%, with a positive and negative predictive value of 53.8% and 66.0% respectively.

Conclusion: The usability of the Surprise Question in predicting 12-month mortality in older acutely admitted patients is limited, due to the high false positive rate. The SQ when used by non-specialized nurses identifies vulnerable patients with an increased mortality risk and can be used as a first step in assessing a patients’ palliative needs, but has limited use as a single criterion for referral to specialist palliative care.

Introduction

Up to 35% of older patients die within a year after an acute hospitalization, of which most during the first three months after discharge.[1, 2] Furthermore, hospitalizations in the last months of life are often the result of insufficient symptom control or deterioration.[3] Thus, many hospitalized older patients could therefore be seen as in need of palliative care. The WHO definition of palliative care emphasizes the importance of early identification of these needs and timely provision of holistic palliative care.[4] However, older patients who could benefit from palliative care are often identified late,[1] do not always engage in discussions about goals of care,[5] and are less often referred to palliative care services than younger patients.[6] This can result in inappropriate care and lower quality of life.[7]

In recent years, many efforts have been made to enhance early identification of palliative care needs and to increase timely start of palliative care. One of the best known and most researched methods for timely identification is the Surprise Question (SQ), 'Would I be surprised if this patient died in the next X months?'. In 2017, two meta-analyses showed that the predictive value of the Surprise Question varied from poor to reasonable.[8, 9] Most of the included studies posed the SQ to physicians, especially medical specialists. In a minority of studies nurses were asked to answer the SQ, and then mostly clinical nurse specialist or nurse practitioners. However, nurses working on the ward, who often see a patient intensively during hospital admissions and to whom patients might find it easier to open up to about their preferences and needs, could be good assessors of the Surprise Question.[10] Therefore, the aim of this study is to assess the predictive value of the SQ when used by nurses working on the ward, in determining one-year mortality in acutely hospitalized older patients.

Methods

Study design and setting

This was an observational cohort study in one academic and one regional hospital with a follow-up period of one year conducted between February 2017 and January 2019. In the regional hospital patients were recruited from the departments of cardiology, pulmonology, internal medicine, oncology and gastroenterology. In the academic hospital the department of internal medicine and oncology participated.

The STARD-guidelines checklist for reporting diagnostic accuracy studies was used for reporting in this paper.[11] No reference standard test was used in our reporting, because mortality was the outcome which does not require a gold standard test.

Study participants

Patients of 70 years or older with an acute hospitalization for at least 48 hours, were eligible for participation. Patients who were already in the dying phase were excluded (e.g. last days of life). This was determined by a treatment code that is given to dying patients during the hospitalization. These patients were excluded because the Surprise Question was of no use because the identification of the palliative phase had already been made. Further exclusion criteria were: 1) no proficiency in the Dutch language 2) no possibility for follow-up (for example patients who lived abroad for some time of the year or were homeless).

Data collection

Three days a week, researchers screened admission records for patients that met inclusion criteria. Exclusion criteria were checked with one of the nurses. The nurse caring for the patient that day was asked to answer the 'Surprise Question'. Answer options to the Surprise Question were 'Yes', 'No' and 'Don't know'. Age and work experience of each nurse who answered the surprise question, were obtained. Both registered nurses of level 4 (in Dutch MBO or secondary vocational education and those with) and level 5 (in Dutch HBO or higher professional education) were asked the SQ. We also asked student nurses the SQ, because they could also be the main carer for a patient during the day, although always under supervision.

Patient characteristics were obtained from the electronic patients record. Sociodemographic data consisted of age, gender, marital status and living arrangements. Details of the index admission contained the reason for admission, admission department and delirium during admission as stated in the medical file. Number of hospital admissions in the six months prior to the index hospitalization was also obtained. Furthermore, stay at ICU and presence of a do not resuscitate code (DNR code) was obtained. Co-morbidity was assessed using the Charlson co-morbidity index (CCI), a validated and reliable instrument that measures the amount and severity of co-morbidities.[12] The CCI is a scale ranging from 0-31 and higher scores have shown a positive association with mortality. Furthermore, we assessed polypharmacy determined as ≥5 different medications. In the Netherlands four different questionnaires are posed to each hospitalized patient over the age of 70 at admission.[13] These questionnaires are part of the Dutch Safety Management Program (*veiligheidsmanagmentsysteem VMS*) and are used to identify older patients at risk of frailty. The first questionnaire is the delirium risk assessment consisting of three questions: *Do you have memory problems? Did you need help in Activities of Daily Living (ADL) in the last 24 hours? and Have you experienced a delirium previously?* The second is fall risk, determined by the question *have you had a fall in the last six months?* The third is the Short Nutritional Assessment questionnaire (SNAQ) consistent of three questions: *Did you lose weight unintentionally? Did you experience a decreased appetite over the last month?* and *Did you use supplemental drinks or tube feeding during the last month?*.[14] And the last is the KATZ-ADL-score which assesses ADL functioning based on six questions about self-care.[15] These four validated instruments have been shown to be associated with mortality and other negative patient outcomes such as re-hospitalization.[13, 16]

At follow-up mortality data was obtained from the electronic patients file, or when not available through contact with the patients' General Practitioner.

Ethical considerations

The study protocol was assessed by the medical ethical board of the Amsterdam UMC, location AMC and found to not have to comply with the Medical research Involving Human Subject Act since the study only included observational patient data and because nurses had to answer the surprise question.[17] In consultation with the privacy officers of the participating hospitals it was determined that informed consent was not necessary because the collected data was solely observational. However, we did ask for consent when possible to be able to collect follow-up data in other settings than the hospital. Because excluding patients with cognitive impairment would create bias, in that case either referred consent through family members was obtained, or data was collected without consent if no family members were present. If we collected data on patients who were not able to consent, a note was made in patient record. The data we collected was made unidentifiable and will be kept for 15 years.

Statistical analysis

Descriptive statistics were used to summarize patient characteristics. For normally distributed data the mean and standard deviation are presented. For non-normally distributed data the median and interquartile rang were calculated. To determine the predictive value of the Surprise Question, sensitivity, specificity, positive predictive value and negative predictive value were calculated using 2x2 and 2x3 cross tables. Differences in patient characteristics between SQ answers groups were assessed using χ^2 test for categorical data and with the one-way anova for continuous variables. The Kruskal Wallis was performed for non-normally distributed continues data. The odds-ratio were calculated using univariate logistic regression. Survival analysis was done using the unadjusted Kaplan-Meier and difference in survival assessed with log-rank. Statistical differences were defined as a p-value of <0.05. All analysis were conducted using SPSS version 24.0.[18]

Results

Patient characteristics

A total of 479 patients were eligible for participation during the inclusion time, of which 135 were excluded. Of the 344 patients who were included, for six no Surprise Question was answered, and for seven it was unclear what the characteristics of nurse were that had answered the SQ, and an additional six were lost to follow-up (Figure 1), these were excluded from all analysis. Furthermore, for 73 patients the SQ was answered by student nurses. This data will be reported separately from the main analysis and baseline characteristics of these patients can be found in supplement 1. The mean age of the study population about whom registered nurses answered the SQ, was 81.2 (SD 6.6), 48.4 % was male, 35.5 % had a previous admission and 64.8% had a DNR code in place (table 1). The median Charlson comorbidity index was 2.0 (IQR 1.0-4.0), 47.6% had an increased delirium risk score, 41.4% had a score of ≥2 on the Katz-ADL and 30% had a score of ≥2 on the SNAQ score.

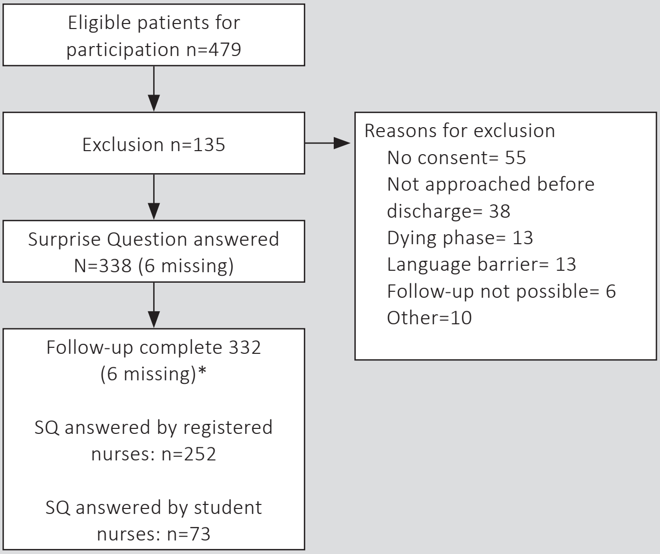

Figure 1. Flow-chart of participants inclusion
*For seven participants it was unclear what the characteristics of the nurse were that had answered the surprise question

Table 1. Patient characteristics and SQ responses

	Overall SQ answered by registered nurses n=252	**SQ 'No' n=135**	**SQ 'Yes' n=99**	**SQ 'Don't know' n=18**	**p-value**
Age in years, MEAN (SD)*	81.2 (6.56)	82.3 (6.59)	79.3 (6.14)	82.8 (6.53)	0.001
Male N (%)	122 (48.4)	64 (47.4)	51 (51.5)	7 (38.9)	0.580
Living arrangement prior to admission, N (%)					
Independent	138 (54.8)	54 (40.0)	73 (73.7)	11 (61.1)	n.a.
Independent with home care	81 (32.1)	54 (40.0)	24 (24.2)	3 (16.7)	
Nursing home	9 (3.6)	8 (5.9)	0 (0.0)	1 (5.6)	

Table 1. *Continued*

	Overall SQ answered by registered nurses n=252	**SQ 'No' n=135**	**SQ 'Yes' n=99**	**SQ 'Don't know' n=18**	**p-value**
Senior residence/ assisted living	20 (7.9)	16 (11.9)	1 (1.0)	3 (16.7)	
other	4 (1.6)	3 (2.2)	1 (1.0)	0 (0.0)	
Marital status, N (%)					
Married/living together	120 (47.6)	54 (40.0)	59 (59.6)	7 (38.9)	n.a.
Single/divorced	13 (5.2)	8 (5.9)	3 (3.0)	2 (11.1)	
Widow/widower	88 (34.9)	49 (36.3)	30 (30.3)	9 (50.0)	
Unknown	31 (12.3)	24 (17.8)	7 (7.1)	0 (0.0)	
Admission Department N (%)					
Internal medicine(-general)	87 (34.5)	42 (31.1)	35 (35.4)	10 (55.6)	n.a.
Oncology/ hematology	40 (15.9)	24 (17.8)	13 (13.1)	3 (16.7)	
Cardiology	72 (28.6)	38 (28.1)	29 (29.3)	5 (27.8)	
Pulmonology	41 (16.3)	24 (17.8)	17 (17.2)	0 (0.0)	
Gastro-enterology	12 (4.8)	7 (5.2)	5 (5.1)	0 (0.0)	
Admission Diagnosis, N (%)					
Cardiological	60 (23.8)	34 (25.2)	24 (24.2)	2 (11.1)	n.a.
Pneumonia	37 (14.7)	21 (15.6)	15 (15.2)	1 (5.6)	
Urinary tract infection/urosepsis	16 (6.3)	8 (5.9)	5 (5.1)	3 (16.7)	
Infection other	25 (9.9)	10 (7.4)	11 (11.1)	4 (22.2)	
Gastro-intestinal	13 (5.2)	6 (4.4)	7 (7.1)	0 (0.0)	
Oncological/hematological symptoms/ complications	20 (7.9)	14 (10.4)	4 (4.0)	2 (11.1)	
Exacerbation COPD	19 (7.5)	10 (7.4)	9 (9.1)	0 (0.0)	
Kidney insufficiency/ kidney fialure	6 (2.4)	4 (3.0)	2 (2.0)	0 (0.0)	
Other	56 (22.2)	28 (20.7)	22 (22.2)	6 (33.3)	
ICU stay during admission, N (%)	25 (9.9)	14 (10.4)	8 (8.1)	3 (16.7)	0.516

Table 1. *Continued*

	Overall SQ answered by registered nurses n=252	**SQ 'No' n=135**	**SQ 'Yes' n=99**	**SQ 'Don't know' n=18**	**p-value**
Hospitalization in past 6 months, N (%) (n=251)	89 (35.5)	50 (37.3)	32 (32.3)	7 (38.9)	0.698
number of hospitalizations, median [IQR[+]]	1.0 [1.0-2.0]	1.0 [1.0-2.0]	1.0 [1.0-2.0]	1.0 [1.0-1.0]	0.459
Polypharmacy, N (%) (n=250)	194 (77.6)	101 (74.8)	76 (78.4)	17 (94.4)	0.168
Delirium during admission, N (%)	38 (15.1)	27 (20.0)	7 (7.1)	4 (22.2)	0.016
Charlson Comorbity index, median [IQR][ϕ]	2.0 [1.0-4.0]	3.0 [1.0-4.0]	2.0 [1.0-4.0]	2.0 [1.0-3.0]	0.042
VMS criteria KATZ, N (%) (n=243)[β]	95 (39.1)	71 (53.0)	20 (21.1)	4 (28.6)	<0.001
VMS criteria SNAQ, N (%) (n=244)[⁎]	74 (30.3)	47 (35.3)	25 (26.3)	2 (12.5)	0.095
VMS Fall in previous six months, N (%) (n=239)	73 (30.5)	45 (35.2)	23 (24.0)	5 (33.3)	0.192
VMS delirium risk score, N (%) (n=237)[φ]	107 (41.1)	72 (53.3)	30 (30.3)	5 (35.7)	0.003
DNR code at admission (n=250)	162 (64.8)	103 (76.3)	48 (48.5)	11 (61.1)	<0.001
Palliative care team consultation during admission	7 (2.8)	6 (4.4)	1 (1.0)	0 (0.0)	0.218

* Standard deviation

[+] Interquartile range

[ϕ] Range of 0 to 31, with a higher score indicating more or more severe comorbidity.[8]

[β] Score based on six question on activities of daily living (ADL), if score is ≥2the KATZ score is positive.[10]

[⁎] Score based on three questions about weight loss and appetite. If score is ≥2 the SNAQ score is positive.[9]

[φ] Score based on three questions about delirium risk. If score is ≥1, the delirium risk score is positive.

n.a. = not applicable, due to the low number in each cells, a trustworthy p-value cannot be determined.

Nurses' characteristics

A total of 88 nurses answered the SQ for at least one patient, for two nurses baseline data were missing. 66 were registered nurses (band 4 or 5) and 20 were student nurses. The median age of registered nurses was 29 years (IQR 23.75-44.25), nurses in training were younger with a median age of 22 (IQR 20.0-25.0). Registered nurses had a median work experience of 6 years (IQR 2.5-15.5) (Table 2).

Table 2. Characteristics nurses

	Registered nurses n=66	**Student nurses n=20**
Age, median [IQR*]	29 [23.75-44.25]	22 [20-25]
Male (%)	5 (7.6)	2 (10.0)
Work experience, median [IQR]	6.0 [2.5-15.5]	
Working department (%)⁺		
Internal medicine/oncology	26 (39.4)	12 (60.0)
Internal medicine/oncology/gastroenterology	17 (25.8)	5 (25.0)
Cardiology/pulmonology	23 (34.8)	3 (15.0)
Extra education in palliative care$^{\beta}$ (%)	20 (30.3)	3 (15.0)

* Interquartile range

⁺ In one hospital the internal medicine and oncology department was combined. In the other hospital gastro-enterology patients also were admitted to the same department.

$^{\beta}$ extra education could be any extracurricular palliative care schooling (for example courses and conferences)

Performance Surprise Question

Out of 252 patients, registered nurses answered the Surprise question with 'No' (i.e. nurses would not be surprised if the patient died within a year) for 135 (53.6%), 'yes' for 99 (39.3%) patients, and with 'Don't Know' for 18 (7.1 %). Patients for whom nurses answered 'No' were older than the 'yes' group (82.3 years vs 79.3 p=0.001), had delirium during admission (20% vs 7.1%, p=0.016) and had a higher Charlson comorbidity score (median 3.0 vs 2.0, p=0.042). Additionally, they more often scored positive on the KATZ-ADL score (53% vs 21.1%, p<0.001), delirium risk score (53.3% vs 30.3, p=0.003) and had a DNR code in place (76.3% vs 48.5%, p<0.001) (table 1). Formal statistical analysis was not possible for living arrangements due to low numbers in each group, however in the 'No' group patients seem to have more care prior to the index admission.

Overall 77 patients died about whom the registered nurses answered the SQ (table 3). Respectively, 44%, 14% and 22% died within the 'No', 'Yes' and 'Don't know' groups. In 61.5% of cases the nurses correctly predicted the outcome of a patient with the 'No' and 'Yes' response. Respectively 83.3% and 85.3% of patients who died during admission and in the first month post-discharge

Table 3. Mortality and SQ response

	Overall n=252 (%)	**Patients identified (SQ 'No') n=135 (%)**	**Patients not identified (SQ 'yes') n=99 (%)**	**Patients not identified (SQ 'Don't Know') n= 18 (%)**
Mortality within one year	77 (30.6) *	59 (43.7)*	14 (14.1)*	4 (22.2)*
	Deceased patients overall n=77 (%)	*Deceased patients identified (SQ 'No') n=59*	*Deceased patients not identified (SQ 'yes') n=14*	*Deceased patients not identified (SQ 'Don't Know') n=4*
Treatment code changed to 'fully supportive' during hospital admission (%)	15 (19.5)*	*14 (93.3)*$^{+}$	*1 (6.7)*$^{+}$	*0 (0.0)*$^{+}$
Time until death (%)				
Death during admission	6 (7.8)*	*5 (83.3)*$^{+}$	*1 (16.7)*$^{+}$	*0 (0.0)*$^{+}$
Death one month post discharge	34 (44.1)	*29 (85.3)*	*3 (8.8)*	*2 (5.9)*
Death between one and three months post discharge	15 (19.5)	*13 (86.7)*	*2 (13.3)*	*0 (0.0)*
Death between three and six months	7 (9.1)	*3 (42.9)*	*4 (57.1)*	*0 (0.0)*
Death between six months and one year	15 (19.5)	*9 (60.0)*	*4 (26.7)*	*2 (13.3)*

* Percentages of the overall population (column percentages).
$^{+}$ Row percentages.

were identified with the 'No' answer of the SQ. Furthermore, 93.3% of patients whose treatment status later changed to 'fully supportive' during the hospital admission were identified.

Of the three-answer Surprise Question (n=252), e.g. when the answers 'No' (positive SQ), 'Yes' and 'Don't know' (negative SQ) were included, the sensitivity was 76.7% with a specificity of 56.6%. The positive predictive value (i.e. when the answer 'No' was given, patients indeed died within a year) and negative predictive values respectively were 43.7% and 84.6 %. Limiting the analysis to just 'Yes' and 'No' response led to a sensitivity of 80.8% and specificity of 52.8%. When considering the 'Don't know' response equal to a 'No' response, the sensitivity increased to 81.8% with specificity of 52.8%. In that scenario the PPV increased to 46.7%. The sensitivity and negative predictive values were higher for level 4 nurses, while for level 5 nurses the specificity and positive predictive value increased. (table 4).

The answer to the SQ with 'No' response was associated with mortality (figure 2). The odds of death between the 'No' response compared to a 'Yes'

Table 4. predictive values Surprise Question

	Registered nurses (n=66)			**nurses in training (n=20)**			**Level 4 nurses (n=41)**			**Level 5 nurses (n=25)**		
Predictive value	**Three-answer SQ (n=252)**	**Binary SQ (n=234)**	**Binary where ‘don’t know’ is counted as No (n=252)**	**Three-answer SQ (n=73)**	**Binary SQ (n=65)**	**Binary where ‘don’t know’ is counted as No (n=73)**	**Three-answer SQ (n=147)**	**Binary SQ (n=134)**	**Binary where ‘don’t know’ is counted as No (n=147)**	**Three-answer SQ (n=105)**	**Binary SQ (n=100)**	**Binary where ‘don’t know’ is counted as No (n=105)**
Sensitivity	76.7%	80.8%	81.8%	46.7%	60.9%	70.0%	79.5%	85.4%	86.4%	72.7%	75.0%	75.7%
Specificity	56.6%	52.8%	52.8%	72.1%	71.4%	69.8%	54.4%	49.5%	44.7%	59.7%	57.4%	57.4%
Postive predictive value	43.7%	43.7%	46.7%	53.8%	53.8%	61.7%	42.7%	42.7%	40.0%	45.3%	45.3%	43.8%
Negative predictive value	84.6%	85.9%	85.9%	66.0%	77.0%	77.0%	86.1%	88.5%	88.5%	82.7%	83.0%	83.0%
	Death n=77 (30.6%)			Death n=30 (41.1%)			Death n=44 (30.0%)			Death n=33 (31.4%)		

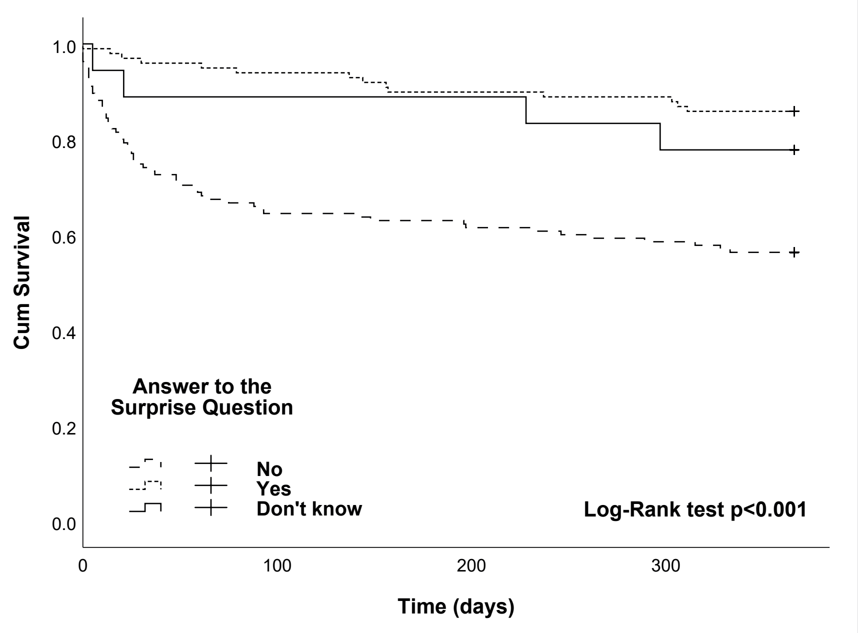

Figure 2. Kaplan-Meier curve displaying the nurses assessment of the Surprise Question and survival. There is a significant difference between the SQ-question answer and survival.

response was 4.7 times as high (odds ratio [OR] 4.71, 95% CI 2.43-9.12, p<0.001). The odds of death between the 'Don't know' response compared to a 'Yes' response was 1.7 times as high though not significant (odds ratio [OR]1.73 , 95% CI 0.50-6.03 p=0.39 , p=0.002).

Student nurses

20 students nurses answered the SQ about 73 separate patients (baseline characteristics can be found in supplement 1). The student nurses answered with 'No' for 26 patients (35.6%), with 'Yes' for 39 (53.4%) patients and with 'Don't Know' for 8 (11.0%) patients. The mortality rate was higher in these patients (40.1%) compared to the patients about whom the registered nurses answered the SQ, although not significantly (p=0.092). Respectively, 53.8%, 23.1% and 87.5% died in the 'No', 'Yes' and 'Don't Know' group. In 67.7% the student nurses correctly identified patients with the 'No' and 'Yes' response. The sensitivity was 46.7% with a specificity of 72.1% and a positive and negative predictive value of 53.8% and 66.0% respectively (table 4.). The sensitivity was influenced by the mortality rate in the 'Don't know group' removing the 'Don't know' response from the analysis improved the sensitivity to 60.9%. When considering the 'Don't know' response equal to 'No' the sensitivity further increased to 70.0%. The odds of death between the 'No' and 'Yes' response was 3.89 (95%CI 1.33-11.36, p=0.013).

Discussion

This was an observational cohort study to assess the predictive value of the Surprise Question (SQ) when used by general nursing staff, in determining one-year mortality in acutely hospitalized older patients. The positive predictive value of the Surprise Question in this setting is low while the sensitivity and negative predictive value are moderate. There is a significant association between the answer of the SQ and mortality and most patients with short prognoses were identified. Furthermore, the patients that were identified by the SQ were older, and scored higher on vulnerability criteria.

Comparison to literature

The predictive value of the Surprise Question has been studied in different patient populations and with different respondents. The outcomes range widely with the sensitivity between 11.6% and 95.6% and the specificity between 13.8% and 98.2%.[9] The predictive value of the 'No' answer to the SQ (positive SQ) in our study was on the lower end of the spectrum, especially the specificity and positive predictive value.[8, 9] However, 85% of patients who died during and in the three months after hospitalization were identified using the SQ. To our knowledge non-specialist nurses were included in five previous studies about the SQ out of approximately fifty publications.[19-23] In three studies separate analyses were available for the assessment by nurses in a heart failure population,[23] a dialysis population[19] and a general in hospital population.[21] In these studies, the sensitivity ranged between 35.6% and 80%, with higher specificities between 68% and 85%. Da Silva *et al*., found that nurses of a lower band were less accurate in their SQ prediction.[19] In our study we found that for band 4 nurses the sensitivity was higher, while for band 5 nurses the specificity increased. In the subset of student nurses we found they, underestimated the number of patients that would die, although this was influenced by the fact they chose the 'Don't Know' response more often. Interestingly the number of false positives was also the lowest for student nurses and they overall identified more patients correctly. In all, the registered nurses (both level 4 and 5) had limited years of work experience, median of six years, which could have influenced our results. Furthermore, it has been shown that the SQ performs better in patients with cancer, while in our study we included patients with a wide range of illnesses.[8] The low specificity could be a result of the high age of our population, and similar prognostic values were previously found in studies including older patients.[24, 25] The SQ asks to make an assessment if it is possible that someone could die and not if you are certain. While age alone is not a sole predictor of mortality, the possibility of death does increase with higher age and thus can result in the 'No' answer of the SQ and consequently a high false positive rate.

In this study 'Don't know' was a third option for the SQ, by adding a third option the sensitivity and specificity will automatically be altered. This three-answer option is in concordance with the SQ in the *Gold Standard Framework*

Proactive Identification Guidance (GSF-PIG), an identification instrument widely used in the UK.[26] Surprisingly, the 'Don't know' option was chosen by only 7.1% of the registered nurses , and 11% of the student nurses. In comparison, in a study by Javier *et al*, the option 'neutral' was chosen 21% of the time, which was the third response in that study,[27] suggesting that nurses in our study felt comfortable making an assessment.

The mortality rate in our study is comparable to previous studies concerning acutely hospitalized older adults, and shows that the number of patients who die during and shortly after admission is high.[2] In the Netherlands palliative care is provided in as similar manner as the generalist plus specialist palliative care model described by Quill *et al*.[28] Palliative care in the Netherlands is thus mainly provided by non-palliative care specialists and only in complex cases specialist teams are consulted. This could explain the low number, 2.8% of consultations with the palliative care team in our study. While this number is comparable with a previous study by Gardiner *et al*., the number of patients with a DNR in place was much higher in our study, 64.8 % compared to 28.6% in Gardiner's study.[20] In the Netherlands, for all patients admitted to the hospital resuscitation has to be discussed. While a solely 'do not resuscitate' order is not necessarily associated with palliative care, when the code changes to 'fully supportive' this does emphasize that the treatment is palliative. For 15 patients the treatment code changed to fully supportive during admission and thus they were identified during the admission.

Implications for practice and research

Discussions have been ongoing on the clinical use of the SQ.[8, 29-31] Our study confirms the low predictive value, and that nurses highly overestimate patients who are going to die when using the SQ. One could argue that this overestimation is not necessarily negative, because in this particular setting we should strive for a high as possible negative predictive value, so we do not miss patients that are dying. And indeed in our study most patients that died during and shortly after admission were identified. Acceptability of these prognostic values depends on the consequence that is given to a positive SQ. As it was originally intended, clinicians can use the SQ as a trigger for a holistic assessment and exploration of palliative care needs. In that case high false-positive rates could be seen as acceptable because clinicians would as a next step explore through clinical assessments and through conversations with patients and relatives if interventions on palliative needs are necessary (without disclosing prognosis). In care settings where instead of generalist, palliative care specialist are the main providers of palliative care such as the USA and UK, the SQ can also be used as a criterion for referral to these services. With the high false positive numbers using the SQ for referral to a palliative care specialist or hospice care could result in overburdening of these systems. However, as stated by Romo and Lynn., patients about whom clinicians would not be surprised if they died in the following year should have an in-depth assessment and availability of services independent of how long they live.[30] This is further emphasized by the consensus that palliative care is considered appropriate throughout the care continuum independent of prognosis, and timely consideration is the responsibility of all clinicians caring for the seriously ill.[32] Studies are needed that not solely focus on the predictive value of the SQ but how its use influences needs assessment and consideration for palliative care. Especially, because the patients identified in our study do seem to be more vulnerable based on higher comorbidity and frailty assessments scores.

The role of nurses in assessing palliative needs deserves more attention. This study and the study by Da Silva *et al*., suggest that the SQ has moderate prognostic value when used by nurses, especially compared to physicians.[19] This does not suggest nurses' role in assessing palliative needs should be limited. Their more holistic training and often closer relationship to patients during an hospital admission allows for a broader assessment of needs instead of solely prognosis and treatment options which is often the focus of physicians.[10] Closer collaboration with physicians could further enhance these assessments.

Strengths and limitations

To our knowledge this was the first study to assess the predictive value of the SQ in an older patient population when used by nurses during hospitalization. By asking non-specialist nurses we strived to ask the SQ in a setting most comparable with daily practice. The results should however be interpreted within their limitations. First, the included population might be more vulnerable than the general patients population because we had to exclude a proportion that was already discharged before we could approach them which thus had short admission and might therefore be less ill. Furthermore, the SQ was asked only once on the day of inclusion. As shown by the fact that patients treatment code changed during the admission, the answer to the SQ might also have changed during the admission. Retrospectively, asking multiple nurses about the same patients during the admission would have allowed for assessment of interuser reliability and would have allowed the nurses to adjust their answer when a patients' situation changed during admission.

Conclusion

The surprise question has a significant association with mortality and moderate negative predictive value when used by registered nurses in older acutely admitted patients in determining one year mortality. The specificity and positive predictive value are low when used by registered nurses and the sensitivity is low when answered by student nurses. These results limit the usability of the SQ as a single criterion for referral to specialist palliative care. However, the SQ could be used as a first step in assessing patients' palliative needs for it does identify vulnerable older patients with increased mortality risk. The role of nurses in assessing palliative needs is underrepresented in research and needs further attention.

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Supplement 1. Patient characteristics and SQ responses from student nurses

	Overall SQ answered student nurses n=73	**SQ 'No' n=26**	**SQ 'Yes' n=39**	**SQ 'Don't-know' n=8**
Ageinyears, MEAN (SD)*	80.5 (6.41)	82.7 (6.0)	77.97 (5.8)	85.5 (5.3)
Male N (%)	40 (54.8)	14 (53.8)	20 (51.3)	6 (75.0)
Living arrangement prior to admission, N (%)				
Independent	43 (58.9)	11 (42.3)	27 (69.2)	5 (62.5)
Independent with home care	20 (27.4)	10 (38.5)	8 (20.5)	2 (25.0)
Nursing home	1 (1.4)	1 (3.8)	0 (0.0)	0 (0.0)
Senior residence/assisted living	5 (6.8)	1 (3.8)	4 (10.3)	0 (0.0)
other	5 (5.5)	3 (11.5)	0 (0.0)	1 (12.5)
Marital status, N (%)				
Married/living together	44 (60.3)	12 (46.2)	26 (66.7)	6 (75.0)
Single/divorced	3 (4.1)	1 (3.8)	2 (5.1)	0 (0.0)
Widow/widower	19 (26.0)	10 (18.5)	8 (20.5)	1 (12.5)
Unknown	7 (9.6)	3 (11.5)	3 (7.7)	1 (12.5)
Admission Department N (%)				
Internal medicine (general)	43 (58.9)	12 (46.2)	27 (69.2)	4 (50.0)
Oncology/hematology	8 (11.0)	2 (7.7)	4 (10.3)	2 (25.0)
Cardiology	13 (17.8)	5 (19.2)	6 (15.4)	2 (25.0)
Pulmonology	4 (5.5)	4 (15.4)	0 (0.0)	0 (0.0)
Gastro-enterology	5 (6.8)	3 (11.5)	2 (5.1)	0 (0.0)
Admission Diagnosis, N (%)				
Cardiological	8 (11.0)	3 (11.5)	3 (7.7)	2 (25.0)
Pneumonia	11 (15.1)	5 (19.2)	5 (12.8)	1 (12.5)
Urinary tract infection/ urosepsis	5 (6.8)	2 (7.7)	2 (5.1)	1 (12.5)
Infection other	13 (17.8)	1 (3.8)	11 (28.2)	1 (12.5)
Gastro-intestinal	14 (19.2)	6 (23.1)	7 (17.9)	1 (12.5)
Oncological/hematological symptoms/complications	3 (4.1)	1 (3.8)	2 (5.1)	0 (0.0)
Exacerbation COPD	1 (1.4)	1 (3.8)	0 (0.0)	0 (0.0)
Kidney insufficiency/kidney fialure	7 (9.6)	2 (7.7)	4 (10.3)	1 (12.5)
Other	11 (15.1)	5 (19.2)	5 (12.8)	1 (12.5)

Supplement 1. *Continued*

	Overall SQ answered student nurses n=73	**SQ ‘No’ n=26**	**SQ ’Yes’ n=39**	**SQ ‘Don’t-know’ n=8**
ICU stay during admission, N (%)	9 (12.3)	2 (7.7)	6 (15.4)	1 (12.5)
Hospitalization in past 6 months, N (%)	27 (37.0)	11 (42.3)	12 (30.8)	4 (50.0)
number of hospitalizations, median [IQR[+]]	1.0 [1.0-2.75]	1.5 [1.0-3.0]	1.5 [1.0-2.75]	1.0 [1.0-1.75]
Polypharmacy, N (%) (n=72)	60 (83.3)	23 (88.5)	29 (76.3)	8 (100)
Delirium during admission, N (%)	14 (19.2)	7 (26.9)	4 (10.3)	3 (37.5)
Charlson Comorbity index, median [IQR][Φ]	3.0 [2.0-4.0]	3.5 [2.0-5.0]	2.0 [1.0-3.0]	2.50 [1.25-4.50]
VMS criteria KATZ, N (%) (n=71)[β]	32 (45.1)	14 (53.8)	14 (37.8)	4 (50.0)
VMS criteria SNAQ, N (%) (n=69)[⁎]	19 (27.5)	6 (24.0)	9 (23.1)	4 (50.0)
VMS Fall in previous sixmonths, N (%) (n=70)	23 (32.9)	11 (42.3)	10 (27.0)	2 (25.0)
VMS delirium risk score, N (%) (n=69)[φ]	37 (53.6)	18 (72.0)	15 (41.7)	4 (50.0)
DNR code at admission (n=72)	42 (58.3)	21 (84.0)	25 (64.1)	1 (12.5)
Palliative care team consultation during admission	1 (1.4)	1 (3.8)	0 (0.0)	0 (0.0)

* Standard deviation

[+] Interquartile range

[Φ] Range of 0 to 31, with a higher score indicating more or more severe comorbidity[8]

[β] Score based on six question on activities of daily living (ADL), if score is ≥2the KATZ score is positive.[10]

[⁎] Score based on three questions about weight loss and appetite. If score is ≥2 the SNAQ score is positive[9]

[φ] Score based on three questions about delirium risk. If score is ≥1, the delirium risk score is positive.

n.a. = not applicable, due to the low number in each cells, a trustworthy p-value cannot be determined.

Chapter 4

Prognostic accuracy of the Surprise Question, SPICT, GSF-PIG and PPS in determining one-year mortality in acutely hospitalized older patients

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Submitted

Abstract

Context and objectives: Hospitalized older patients who need palliative care are not always identified in a timely manner, while multiple instruments exists to aid in identification. The objective of this study was to determine the prognostic accuracy and usability of the Surprise Question (SQ), Supportive Palliative Care Indicators Tool (SPICT™), Gold Standard Framework - proactive identification guidance (GSF-PIG), and Palliative Performance Scale (PPS), in determining one-year mortality in an acute hospital setting.

Methods: An observational cohort study with a one-year follow-up in three hospitals in the Netherlands. 57 medical professionals filled in the instruments for 278 acutely admitted older patients ≥70 years. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), likelihood ratios, diagnostic odds, and area under the curve (AUC) were determined. A questionnaire helped assess usability.

Results: The one-year mortality rate was 36.4%. The SPICT™ was positive for the lowest number of patients (34.2%) and the SQ, the highest (65.1%). The sensitivity and specificity for one-year mortality, respectively, was 81.5% and 41.1% for the SQ, 51.0% and 75.7% for the SPICT, 56.9% and 75.6% for the GSF-PIG, and 55% and 66.7% for the PPS. The diagnostic odds were low and ranged between 2.4 (95% CI 1.5-4.1) for the PPS to 5.2 (95% CI 2.4-11.5) for the GSF-PIG. Usability ratings were moderate for all instruments.

Conclusion: None of the instruments can predict one-year mortality in older hospitalized patients. The instruments can create awareness about the presence of palliative needs.

Introduction

One of the pillars of palliative care is timely identification and assessment of palliative needs and consequently treatment.[1] Older patients often suffer from multiple chronic illnesses and complex needs, with high symptom burden and frequent hospitalizations in the last months of life.[2, 3] However, hospital professionals do not identify older patients who could benefit from palliative assessments, or do so late in the disease trajectory.[4, 5]

In the last decade, researchers have developed multiple instruments to identify patients with palliative care needs and assess prognosis. The Surprise Question (SQ) asks physicians whether they would be surprised if the patient died within X months.[6] The Supportive Palliative Care Indicators Tool (SPICT)[7] and the Gold Standard Framework proactive identification guidance (GSF-PIG)[8] use general indicators of decline, for example, functional status, and disease-specific indicators. The Palliative Performance Scale (PPS) measures the physical status in palliative care patients and has shown an association with prognosis.[9,10]

These instruments are mostly intended to assess palliative needs and to aid professionals in starting conversations regarding care goals, referrals to specialist palliative care, or study participation. However, no “gold standard” is available for assessing these outcomes. Therefore, often a 12-month life expectancy is used as a surrogate for “timely identification”. The prognostic accuracy of these instruments has been studied in different settings and patient populations; however, not in acutely hospitalized older patients.

To determine the prognostic accuracy of SQ, SPICT, GSF-PIG, and PPS in this population, we performed an observational cohort study. We asked professionals responsible for daily medical patient care to fill in the instruments. Our aim was, first, to assess which of four identification instruments has the best prognostic accuracy for one-year mortality in acutely admitted older patients. Secondly, we assessed the usability of the instruments in daily practice.

Design and Methods

Study design and setting

Our observational cohort study was conducted between February 2017 and June 2019 in one academic and two regional hospitals. In the first (academic) hospital, the department of internal medicine and oncology participated; in the second hospital, the departments of cardiology, pulmonology, internal medicine, gastroenterology, and oncology; and in the third hospital, the departments of geriatrics, internal medicine, and pulmonology.

In the Netherlands, generalists (in primary and hospital setting) are the main providers of palliative care, whereas specialists can provide consultation in complex cases.[11] On Dutch hospital wards, different professionals provide daily medical care under the supervision of medical specialists: Physicians (whether or not in specialty training), physician assistants (specialist nurses), and medical interns during their last rotation. To enhance readability, we use the term “professionals” for all sub-groups.

Study participants

Patients of 70 years or older who were acutely hospitalized for at least 48 hours were eligible for participation. We excluded patients in the dying phase, as mentioned in the records, because the instruments would be redundant. Further exclusion criteria were (1) no proficiency in the Dutch language and (2) no possibility of follow-up.

Ethical considerations

The study protocol did not have to comply with the Medical Research Involving Human Subject Act by the medical ethical committee of Amsterdam UMC, location AMC, because we obtained only observational data. Although the privacy officers of the participating hospitals determined informed consent was unnecessary, we did ask for written informed consent from patients or relatives to enable follow-up data collection outside of the hospitals. If no relatives were available, we included patients without consent in order to prevent bias. In those particular cases, we made a note in patients’ records about participation. Participating patients were at no risk of harm. Professionals could be alerted to palliative care needs. If professionals were to act on the observed needs, by current standards, this action would be considered best care. To assure anonymity, we removed any personal identifiers from the collected data.

Data collection

Researchers screened admission records three days a week for eligible patients, and asked department nurses for exclusion criteria. We asked the treating professional to fill in the instruments before patients were discharged and to document the date. The SQ was always asked first because of the intuitive nature of the question, the order in which the other instruments were presented was randomized After professionals had filled in the instruments for three patients, we asked them to assess the instrument’s usability, using a 5-point Likert scale. We obtained age and work experience for each professional as well.

Instruments

For the SQ, the answer options were yes, no, and don’t know. A ”no” answer was considered a “positive SQ,” and a “yes” and “don’t know” are negative.
The SPICT starts with a list of general indicators followed by a checklist for disease-specific clinical indicators.[7] For the SPICT, if a patient has two or more general markers or one of the clinical indicators, they are considered to be in need of palliative care.[7]

The GSF-PIG contains a modified SQ: “Would you be surprised if the patient were to die in the coming months, weeks, or days?” If the answer is “don’t know,” professionals should check for general indicators of decline, followed by disease-specific clinical indicators.[12] Patient are considered to be in need of palliative care if the professional answered “no” to the modified SQ or if general or specific clinical indicators are present.

The Palliative Performance Scale (PPS) is a modification of the Karnofsky Performance Scale to assess the functional status of palliative patients with cancer.[9] Studies have found it has prognostic value in determining short prognoses.[10, 13] Its use in determining one-year mortality is novel and was recommended in a recent review.[14] In this study, we aimed to examine if the PPS can be used for this purpose, and if so, what cut-off value to use.

Validated Dutch translations were available for the SQ, SPICT and PPS. We used forward and backward translation to translate the GSF-PIG (version 2011) for this study. We pilot-tested the translation with physicians and nurses, and checked the final backward translation with one of the creators of the GSF-PIG.[8]

Patient characteristics

We obtained patient characteristics from their electronic files. Characteristics included sociodemographic data (age, gender, marital status, and living arrangements) and data about admission, including reason and duration of admission.

Furthermore, we included data which are also present in the instruments. This included previous hospitalizations, poly-pharmacy defined as five or more different medications, and the presence of a do not resuscitate code (DNR). We used the Charlson comorbidity index, a scale ranging from 0-3,1 with higher scores indicating more severe comorbidities.[15] In all Dutch hospitals, frailty of admitted patients older than 70 is assessed with questionnaires on four domains: (1) the risk for delirium, (2) the presence of a fall in the last six months, (3) activities of daily-living (ADL) functioning (KATZ-ADL),[16] and (4) malnutrition, assessed with the Short Nutritional Assessment questionnaire (SNAQ)[17] or with the Malnutrition Universal Screening Tool (MUST).[18]

Follow-up

At follow-up, we obtained data on mortality through the electronic patient file or through contact with the general practitioner.

Statistical analysis

To summarize patient characteristics, we used descriptive statistics. For normally distributed data, we present the mean and standard deviation, and present the median and interquartile range for non-normally distributed data. To assess differences between groups, we used the χ^2 test and Student T-test for categorical and continuous variables, respectively. We performed the Mann-Whitney U and Kruskal Wallis test for non-normally distributed continuous data. We calculated the sensitivity, specificity, and positive and negative predictive value using 2x2 cross tables, and calculated the diagnostic odds ratio using univariate logistic regression.[19] The diagnostic odds ratio is the ratio of the odds of positivity in the case of patients who died relative to the odds of positivity in the patients still alive, and ranges from 0 to infinity, with higher scores indicating better test performance.

To determine the optimal cut-off value for the PPS, we built a receiver operating characteristic curve and calculated the area under the curve (AUC). We used the Youden J statistics, which range from 0 to 1, with 1 being a perfect test, to determine the optimal cut-off value. Furthermore, we calculated the AUC for the general and disease-specific indicators of both the SPICT and GSF-PIG. Because of the binary nature of the SQ, we did not calculate the AUC for these measures. Statistical differences were defined as a p-value of <0.05, and all analyses were conducted using SPSS version 24.0.[20]

Results

Overall, 606 patients were eligible for participation, 157 were excluded. At least one of the instruments was filled in (Figure 1) for 238 patients, for four no follow-up data was available. The instruments were filled in on average 1.5 days (SD 2.3) after inclusion and 4.8 days before discharge (SD 6.0).

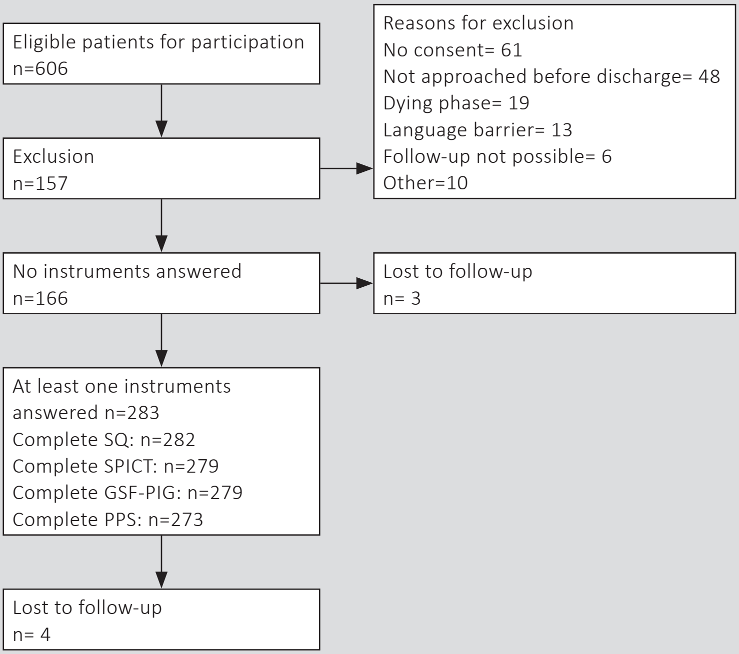

Figure 1. Flow-chart of participants inclusion

Included patients were, on average, 81.2 years old and 49% was male (Table 1). In total, 55% lived at home without home care and 30% with home care. Overall, 34% had a hospital admission in the last six months, and the median Charlson comorbidity index was 2.0 (IQR 1.0-4.0). Patients with completed instruments had a longer admission duration (8.7 vs. 5.3 days), had more incidents of delirium during admission (20% vs 12%), and more often had high frailty scores.

Table 1. Baseline Characteristics

	Overall n=449	At least one questionnaire n=283	No questionnaire n=166	p-value
Age in years, mean (SD)*	81.2 (6.7)	81.5 (6.5)	80.6 (6.9)	0.17
Male N (%)	220 (49.0)	137 (48.4)	84 (50.0)	0.75
Living arrangement prior to admission, N (%)				
Independent	246 (54.8)	150 (53.0)	96 (57.8)	0.70
Independent with home care	133 (29.6)	84 (29.7)	49 (29.5)	
Nursing home	13 (2.9)	9 (3.2)	4 (2.4)	
Senior residence/assisted living	37 (8.2)	25 (8.8)	12 (7.2)	
other	20 (4.5)	15 (5.3)	5 (3.0)	
Marital status, N (%)				
Married/living together	218 (48.6)	131 (46.3)	87 (52.4)	0.36
Single/divorced	23 (5.1)	17 (6.0)	6 (3.6)	
Widow/widower	145 (32.3)	91 (32.2)	54 (32.5)	
Unknown	63 (14.0)	44 (15.5)	19 (11.4)	
Admission Department N (%)				
Internal medicine(general)	183 (40.8)	122 (43.1)	61 (36.7)	0.23
Oncology/hematology	51 (11.3)	31 (11.0)	20 (12.0)	
Geriatrics	46 (10.2)	34 (12.0)	12 (7.2)	
Cardiology	86 (19.2)	47 (16.6)	39 (23.5)	
Pulmonology	66 (14.7)	38 (13.4)	28 (16.9)	
Gastro-enterology	17 (3.8)	11 (3.9)	6 (3.6)	
Admission Diagnosis, N (%)				
Cardiological	73 (16.3)	37 (13.1)	36 (21.7)	0.18
Pneumonia/pneumosepsis	68 (15.1)	45 (15.9)	23 (13.9)	
Urinary tarct infection/urosepsis	44 (9.8)	29 (10.2)	15 (9.0)	
Infection other	55 (12.2)	43 (15.2)	12 (7.2)	
Gastro-intestinal	29 (6.5)	16 (5.7)	13 (7.8)	

Table 1. *Continued*

	Overall n=449	**At least one questionnaire n=283**	**No questionnaire n=166**	**p-value**
Oncological/hematological symptoms/complications	29 (6.5)	18 (6.4)	11 (6.6)	
Exacerbation COPD	26 (5.8)	16 (5.7)	10 (6.0)	
Kidney insufficiency/kidney fialure	16 (3.6)	10 (3.5)	6 (3.6)	
Other	109 (24.3)	69 (24.4)	40 (24.1)	
ICU stay during admission, N (%)	41 (9.1)	22 (7.8)	19 (11.4)	0.19
Hospitalization in past 6 months, N (%) (*n=448*)	153 (34.2)	98 (34.8)	55 (33.1)	0.73
number of hospitalizations, median [IQR[+]]	1.0 [1.0-2.0]	1.0 [1.0-2.0]	1.0 [1.0-2.0]	0.95
Polypharmacy, N (%) (*n=446*)	349 (78.3)	225 (80.4)	124 (74.7)	0.16
Delirium during admission, N (%)	77 (17.1)	57 (20.1)	20 (12.0)	0.03
Charlson Comorbity index, median [IQR][Φ] (n=449)	2.0 [1.0-4.0]	2.0 [1.0-4.0]	2.0 [1.0-4.0]	0.55
KATZ-score, N (%) (n=425)[β]	190 (44.7)	130 (49.8)	60 (36.6)	0.01
SNAQ/MUST-score, N (%) (n=435)[⁎]	197 (45.3)	135 (49.6)	62 (38.0)	0.02
Fall in previous six months, N (%) (n=420)	142 (33.8)	90 (34.9)	52 (32.1)	0.56
Delirium risk score, N (%) (n=424)[φ]	217 (51.2)	150 (56.8)	67 (41.9)	<0.01
DNR code at admission (n=446)	292 (65.5)	187 (66.3)	105 (64.0)	0.62
Palliative care team consultation during admission (%)	10 (2.2)	5 (1.8)	5 (3.0)	0.51
Admission duration in days, median [IQR]	6.9 [4.8-11.7]	8.7 [5.7-13.7]	5.3 [3.9-8.1]	<0.01
Mortality, N (%) (n=442)	152 (34.3)	103 (36.4)	49 (29.5)	0.12

* Standard deviation

[+] Interquartile range

[Φ] Range of 0 to 31, with a higher score indicating more or more severe comorbidity.

[β] Score based on six question on activities of daily living (ADL), if score is ≥2the KATZ score is positive.

[⁎] Score based on two separate scores. The SNAQ is positive when score is ≥2. The MUST is positive when score is ≥1.

[φ] Score based on three questions about delirium risk. If score is≥1, the delirium risk score is positive

Baseline characteristics of professionals

Fifty-seven professionals filled in at least one instrument, and baseline data was collected for 53. Seventeen professionals (32.1%) were male and the median age was 28 years [IQR 26.0-31.0]. Additionally, 37.7% were in specialty training, 49.1% were not in training, two were physician assistants (3.8%), and five were residents (9.4%). The number of patients about whom the professionals filled in the instruments ranged from 1 to 27 (median 4.0 IQR 2.0-6.0).

Mortality

Overall, 152 patients died (34.3%)—15 while admitted (9.9%) and 53 (34.9%) in the first month post discharge. In the group with completed instruments, one-year mortality was slightly higher, with 103 deaths (36.4%).

Predictive value identification instruments

Table 2 shows the number of patients with positive scores, predictive values, and diagnostic odds of the different identification instruments. The percentages of patients with positive scores (thus marked as at risk for mortality) varied between 41.3 % (PPS) and 70.8% (GSF-PIG combination of SQ and indicators).

The sensitivity of the SQ, the percentage of patients who had died and had a positive score, was 81.6%. The specificity, the percentage of patients who were alive at one year and had a negative score, was 44.6%.

The presence of two or more general indicators of the SPICT resulted in sensitivity and specificity of 57.8% and 66.5%, respectively; in combination with the disease-specific indicators, the sensitivity increased to 80.4% and specificity decreased to 42.4%.

The first step of the GSF-PIG, the modified SQ, had a sensitivity of 70.6% and specificity of 59.9%. Combining the modified SQ with general (second step) and disease specific indicators (third step) led to a sensitivity of 92.2% and specificity of 30.8%.

For the PPS, the ROC-curve showed an area under the curve of 0.64, suggesting a poor test. The Youden J statistic was the highest, with 0.22 for the cut-off of <60, and was thus determined as the optimal cut-off. With this cut-off, the sensitivity was 55.0% with a specificity of 66.7%.

For all combinations of instruments, the negative predictive values were above 72%, indicating the rate of false negatives was acceptable. The diagnostic odds ranged from 2.4 (95% CI 1.5-4.1) for the PPS to 5.2 (95% CI 2.4-11.5) for the combination of steps of the GSF-PIG.

Usability identification instruments

Thirty-four professionals filled in a usability evaluation. Table 2 shows the results. We found no significant differences between any of the usability questions and professionals slightly agreed on how easy and usable they scored the instruments in identifying patients with palliative needs. Not all answers by professionals in the instruments concurred with data from the electronic

Table 2. predictive values instruments

	Percentage with a positive test	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Diagnostic odds ratio	p=value	AOC
SQ* n=278	65.1	81.6 (72.7-88.5)	44.6 (37.1-52.3)	46.4 (42.6-50.2)	80.4 (72.6-86.4)	3.56 (1.99-6.35)	<0.01	
SPICT ≥2 general indicators n=275	42.5	57.8 (47.6-67.6)	66.5 (58.9-73.5)	50.4 (43.8-57.1)	72.8 (67.6-77.5)	2.72 (1.64-4.50)	<0.01	0.62
SPICT ≥ 1 disease specific indicators n=275	57.8	73.5 (63.9-81.8)	51.4 (43.7-59.1)	47.2 (42.4-52.0)	76.7 (69.8-82.5)	2.94 (1.73-5.01)	<0.01	0.65
SPICT ≥2 general indicators and/or ≥ 1 disease indicators n=275	66.2	80.4 (71.4-87.6)	42.2 (34.7-49.9)	45.1 (41.2-49.0)	78.5 (70.4-84.9)	2.99 (1.69-5.32)	<0.01	
GSF-PIG SQ* n=274	51.5	70.6 (60.8-79.2)	59.9 (52.2-67.3)	51.1 (45.6-56.5)	77.4 (71.3-82.6)	3.58 (2.12-6.05)	<0.01	
GSF-PIG ≥2 general indicators n=275	60.7	76.5 (67.0-84.3)	48.6 (40.9-56.3)	46.7 (42.3-51.2)	77.8 (70.5-83.7)	3.07 (1.78-5.30)	<0.01	0.63
GSF-PIG ≥1 disease specific n=275	62.5	80.4 (71.4-87.6)	48.0 (40.3-55.7)	47.7 (43.4-52.0)	80.6 (73.1-86.4)	3.78 (2.13-6.70)	<0.01	0.66
GSF-PIG ≥2 general indicators and/or ≥ 1 disease indicators n=275	74.2	87.3 (79.2-93.0)	33.5 (26.5-41.1)	43.6 (40.5-46.8)	81.7 (72.0-88.5)	3.45 (1.78-6.69)	<0.01	
GSF-PIG SQ* OR ≥2 general indicators and/or ≥1 disease n=274	70.8	92.2 (85.1-96.6)	30.8 (24-38.3)	44.1 (41.3-47.0)	86.9 (76.7-93.0)	5.23 (2.37-11.54)	<0.01	
PPS cut-off <60 n=271	41.3	55.0 (44.7-65.0)	66.7 (59.1-73.7)	49.1 (42.3-60.0)	71.7 (66.6-76.3)	2.44 (1.47-4.06)	<0.01	0.64
PPS cut-off <70 n=271	62.7	71.0 (61.1-79.6)	42.1 (34.6-50.0)	41.8 (37.5-46.2)	71.3 (63.6-78.0)	1.78 (1.05-3.02)	0.03	

SQ=Surprise Question, SPICT= Supportive and Palliative Care Indicators Tool, GSF-PIG= Gold Standard Framework- Proactive Identification Guidance, PPS= Palliative Performance Scale, *the ‘don’t know’ answer of the SQ was counted as a negative SQ.

medical record. For example, in the GSF-PIG and SPICT, for 24% and 28% of patients, respectively, professionals inaccurately reported a hospital admission. We observed similar numbers for reports of weight loss.

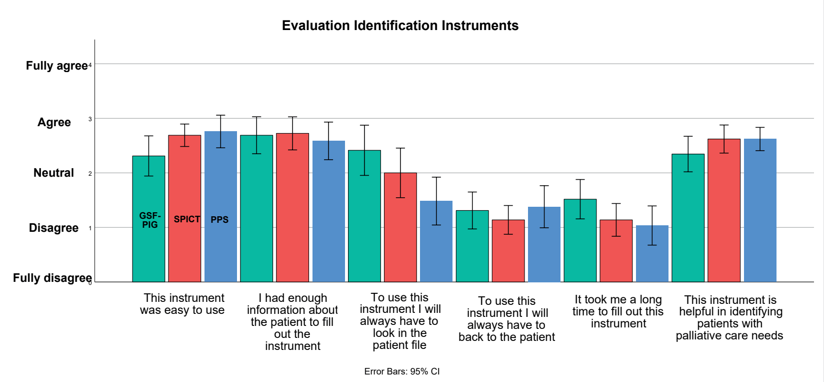

Figure 2. Usability of identification instruments as scored by professionals
GSF-PIG= Gold Standard Framework- Proactive Identification Guidance
SPICT= Supportive and Palliative Care Indicators Tool
PPS= Palliative Performance Scale

Discussion

To our knowledge, this study is the first to compare the prognostic accuracy of multiple identification instruments for palliative care needs, when used by generalists in an older hospitalized population. The results show that none of the researched instruments provide good prognostic accuracy for one-year mortality. For the SQ and GSF-PIG, the sensitivity was acceptable, with values above 80%. However, false positives were high, with specificities below 50%, so many patients were identified wrongly of having a one year prognosis. The negative predictive value was moderate for all instruments, with values above 70%. The evaluations by professionals showed no conclusive differences in preference for one of the instruments.

Comparison with literature

In 2017, two reviews were published about the predictive value of the SQ.[21, 22] Both found a wide range of predictive values and concluded an overall moderate predictive value. In our study, the specificity was low compared with earlier studies. The SQ asks professionals whether they would be surprised if someone were to die, and not if they expect that person to die. The old age of participants in our study might have led to more professionals not being surprised that a patient could die. Additionally, in our study, patients did not suffer from a specific disease with a short prognosis, such as end-stage cancer, which might make use of the SQ more difficult.

The SPICT and GSF-PIG have been studied less than the SQ. The two instruments have similarities in that they both look for “general disease characteristics” and “disease/clinical specific characteristics.” De Bock *et al*. evaluated the SPICT in a geriatric hospitalized population and concluded the SPICT could be a valuable instrument for identifying geriatric patients in need of palliative care, with a sensitivity of 84.1% and specificity of 57.9%. However, they also found that geriatricians, could identify patients with a limited prognosis, based on experience and clinical knowledge, and thus doubted the usefulness of the SPICT on a geriatric ward.[23] Nonetheless, geriatric patients do not reside only in geriatric wards, and geriatricians might be more aware of this clinical knowledge than non-specialized professionals who participated in our study.

O’Callaghan *et al*., assessed the GSF-PIG in hospitalized patients and found a sensitivity and specificity of 62.6% and 91.9%, respectively.[24] In their study palliative care specialist filled in the instruments instead of generalist which could explain the overall lower score of the instruments in our study. However, in a review by White *et al*., the authors found no difference between type of physicians in prognostic accuracy.[25] Nonetheless, the professionals in our study were at the start of their career and not yet specialized, which could have negatively influenced performance of the instruments.

In our study the PPS had poor predictive value. The PPS is based on functional status, and acutely admitted patients often have low functional status due to acute illness, which could result in lower scoring on the PPS and thus explain the low predictive value.

Implications for practice

In a previous study, physicians and nurses described needing prognostic accuracy in order to determine if someone is “palliative”,[26] which the instruments we studied did not provide. Even so, the instruments could possibly aid in palliative needs assessment, mark the start of goals-of-care conversations, or help decide about referrals to specialist palliative care. Which instrument to use in clinical practice, if at all, depends on the purpose. The SQ “identified” 65% of patients at risk of mortality and had a high rate of false positives. If used for referral, this instrument would lead to overburdening palliative care specialists. However, the SQ did not miss many patients and is a short and intuitive question that could create awareness among hospital-based professionals to think and act beyond curative treatment.

The presence of indicators in the SPICT and GSF-PIG signals patients are either deteriorating, are experiencing high symptom burden, or need high levels of care. Although these instruments did not provide high prognostic accuracy, they did identify the more vulnerable patients who needed additional assessment and possibly treatment, and thus could be useful in the acute hospital setting.

We found no conclusive differences between professionals’ judgment on usability of the instruments. However, we also found the instruments were not always filled in accurately, which could be because professionals had to fill in all instruments at once, which could be time consuming and lead to inaccuracy. Furthermore, in the present study, there were no consequences when an instrument scored positive or negative. The accuracy could increase if the professionals knew they had to act on the findings.

Strengths and limitations

In this study, we assessed different instruments at the same time to create a fair comparison. Therefore, the answers to each instrument could have influenced each other. However, in an attempt to overcome this possibility, we randomized the order in which we had professionals fill in the instruments. The number of times professionals filled in the instruments varied widely, and so the learning curve might have influenced the results. Additionally, because professionals filled in the instrument only once for each patient, we could not take into account changes during the admission. The patients for whom the instruments were filled in had longer admissions and were more vulnerable, and thus were not fully comparable to all hospitalized older patients. This fact could have influenced the predictive value of the instruments.

Conclusion

In an acute hospital setting, none of the researched instruments, the SQ, SPICT, GSF-PIG, and PPS, when used by generalists, have both high sensitivity and specificity for determining one-year mortality in older hospitalized patients. Therefore, we cannot recommend any of the studied instruments for this purpose. The SQ could be useful as a trigger for medical professionals to start assessments. However, the SPICT and GSF-PIG seem to better identify those patients with higher care needs. The PPS does not seem to provide additional benefits in determining one-year mortality in this setting. Further research is needed to determine the use of the instruments as a first step in assessing palliative needs and not solely prognostic accuracy.

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Part II

Transmural collaboration

Chapter 5

Healthcare providers' views on the transition between hospital and primary care in patients in the palliative phase: a qualitative description study

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Abstract

Context: Inadequate handovers between hospital and home can lead to adverse health outcomes. A group particularly at risk are patients at the end of life because of complex health problems, frequent care transitions and involvement of many professionals.

Objectives: To investigate healthcare providers' views and experiences with regard to the transition from hospital to primary care in palliative care.
Methods: This was a descriptive qualitative study. Three focus group discussions were held with 28 nurses and two focus groups with nine physicians. Participants were recruited from primary and hospital care. The focus groups were audio-recorded, transcribed verbatim and analysed thematically.

Results: The following themes emerged from the data: (1) lack of identification of and communication about the last phase of life; (2) incomplete and insufficient handover; and (3) uncertainty about responsibilities. Professionals emphasize the importance of proper handovers and transitional processes in these vulnerable patients. The transition between hospital to primary care is hindered by a lack of identification of the palliative phase and uncertainties about patient awareness. Direct communication between professionals is needed but lacking. The handover itself is currently primarily focussed on physical aspects where psychosocial aspects were also found necessary. Furthermore, uncertainties with regard to physicians' responsibility for the patient seem to further hinder professionals in the transitional process.

Conclusion: Efforts should be made to enhance knowledge and skills around identification of palliative needs and communication with patients about the end of life, especially in the hospital setting.

Introduction

Care transitions, most often to and from the hospital, are frequent among patients in their last months of life.[1, 2] During this time, patients may suffer from multiple and complex health problems that often require care from both hospital and primary-care professionals.[3] Continuity and coordination of care are thus important aspects of palliative-care provision.[4]

Currently, the transition from the hospital to primary-care setting for patients with palliative-care needs is hindered by insufficient collaboration between care professionals,[5, 6] incomplete handovers,[7] and unavailability or uncertainty about the expertise of follow-up care,[8, 9] which results in untimely follow-up by general practitioners[10] and increases the risk of adverse events such as medication errors and rehospitalization.[11, 12] Furthermore, insufficient communication with patients and their caregivers can result in patients not knowing how to manage symptoms, an increase in symptom burden, and uncertainty about whom to contact post-discharge.[13, 14]

In a recent review, Saunders *et al*. assessed the impact of specialist palliative-care involvement during hospitalization on the care transition to the community. The authors were unable to draw conclusions, due to the heterogeneity of studies and varying quality.[15] Specialist palliative care is not available in all care settings, either due to the organization of care or the scarcity of resources. In the Netherlands, palliative care is provided in a similar fashion as the generalist-plus-specialist-care model described by Quill *et al*.[16] The Netherlands does not consider palliative care a separate specialty, and generalist health care professionals from both the hospital and primary care provide palliative care. Specialist palliative-care teams are available for consultation in complex cases. The European Association for Palliative Care (EAPC) also recommends a palliative care approach provided by generalists with availability of specialist palliative care for complex cases and is used in different countries around the world.[17] The specialist palliative-care teams can be hospital or primary-care based and sometimes follow patients in both settings. The composition of these teams varies and the number of consultations is low.[18] In the Netherlands, after hospital admissions, patients with palliative needs can be discharged home with community or terminal health care, or can be discharged to a hospice or palliative-care unit within a nursing home. To become eligible for terminal-care, hospice, or palliative-care units, the treating physician needs to make a declaration that the prognosis is less than three months.

With the ever-growing number of patients in need of palliative care, the role of generalists in the transition of patients with palliative-care needs might also become larger in care settings where, traditionally, only specialists provide palliative care. To improve continuity of care in settings where generalists provide (some of the) palliative care, insight is needed into factors that negatively affect the transitional-care process and into how these factors can be targeted. Therefore, the aim of this study is to investigate both nurses' and physicians' views and experiences with regard to the transition from hospital to primary care for patients with palliative-care needs.

Methods

Study design

To provide a description of physicians' and nurses' experiences with regard to the transition from hospital to primary care for patients with palliative care needs, a qualitative description study was performed.[19, 20] This approach is founded in existing knowledge on this topic, instead of other qualitative approaches that are theory-driven.[19, 20] Qualitative description allows for a rich description of professionals experiences with the topic and the issues surrounding it.[20] Focus group discussions here held to gain a wide range of experiences and perspectives.[21] Focus groups were deemed appropriate because they allow for interactive discussion. Not only do we thus gain participant's' own experiences, perspectives and work methods but also get an understanding how their experience relate to those of the other professionals in the "health care chain".

Context: the handover process from hospital to primary care in the Netherlands

A liaison nurse visits patients who will receive either community care or are transferred to a nursing home or hospice. A nursing handover, written by a department nurse, containing nursing diagnosis and care plans, is either printed and given to the patient, or sent digitally (or both).

The medical handover, written by the physician, contains a summary of medical history, physical examination, medical tests, summary of admission and treatment, a medication overview and follow-up appointments and tests. The aim is to send medical handovers within 24 hours of discharge,[22] in practise the median time is between four and seven days post-discharge.[23, 24]

Participants and recruitment

We held focus groups with physicians and nurses separately, because handovers rarely cross over between professions. Participants from both primary and secondary care took part, and some participants in each group had additional education in palliative care. We recruited participants through a region-wide invitational email, from the northwest region of the Netherlands from four different hospitals with aligned primary-care facilities. The invitation described the purpose of the focus groups. Personal contacts from the researchers helped in spreading the invitations among hospital and primary-care professionals through their networks

Data collection

For this study, the Dutch Medical Research Involving Human Subject Act did not apply.[25] We obtained written informed consent from participants. The focus groups took place within four hospitals. IF, a physician and PhD student, guided the discussion using a protocol with open questions that we formulated based on a literature search. The topic list is available in supplement 1. MP, a post-doctoral researcher, observed, took notes, and intervened when necessary. The researchers reflected on the sessions afterwards and compared observations. We audio recorded the focus groups and transcribed them verbatim. The original audiotapes were password protected, and we removed identifiable data from transcripts. As a member check, after each focus group, we sent a summary, based on notes taken by the observer, to participants. None of the participants commented on the summary of the findings.

Data analysis

To identify the key content areas, IF and RvS analyzed the data using the thematic analysis framework,[26] which allows for the identification and analysis of patterns within the data and for the formulation of themes. Both researchers coded the first two transcripts independently using open, that is, inductive coding. We used the initial patterns and themes to create a coding frame to code all five transcripts. The coding frame was not static; that is, codes could be added, removed, or changed if necessary. IF and RvS discussed differences in coding until consensus was reached. We sorted the codes into themes and subthemes and used them to analyze all transcripts again. Throughout the further interpretation and writing process, we revisited the data and held discussions within the research group to assess the appropriateness of the formulated themes and, if necessary, adjusted them. (Sub)themes are illustrated with extracts from the transcripts. We used MAXQDA software for data extraction and analysis (version 12.0.2 VERBI GmbH, Berlin, Germany). During the last focus groups we did gain new perspectives. However, we cannot fully claim data saturation as we divided the focus groups between physicians and nurses. We followed the consolidated criteria for reporting qualitative research (COREQ) guidelines.[27]

Results

We held three focus groups with nurses and two with physicians between May and October 2017, lasting between 80 and 92 minutes. Table 1 provides an overview of participants.

Three essential themes emerged: (1) lack of identification of and communication about the last phase of life, (2) incomplete and insufficient handover, and (3) uncertainty about responsibilities.

1. Lack of identification of and communication about the last phase of life

Recognition of patients in the palliative phase

A first hurdle to the handover process is the lack of clarity about which patients are considered "palliative." Participants mentioned doubting which patients should be considered in the palliative phase, and used a variety of definitions.

Table 1. participants in each focus group

	Participants	Setting	Experts in Palliative care
FG1	Five community nurses	Home	One with specialization palliative care
	Three oncology nurses	Hospital	
FG2	Four community nurses	Home	
	Hospice nurse	Hospice	Specialization palliative care
	Liaison nurse	Hospital	
	Oncology nurse	Hospital	
	Cardiology nurse	Hospital	
FG3	Two community nurses from technical home care	Home	
	Five community nurses	Home	
	Liaison nurse	Hospital	
	Pulmonolgy nurse	Hospital	Member Palliative care team
	Oncology nurse	Hospital	
	Two oncology nurses	Home	
FG4	Two general practitioners	Home/Hospice	Both provide care within Hospice
	General Practitioner	Home	
	Nursing home physician	Nursing home	Palliative care bed in nursing home
	Pulmonologist	Hospital	Member Palliative care team
FG5	Two general practitioners	Home	
	Anaesthesiologist	Hospital	Member Palliative care team
	Geriatrician	Hospital	

This uncertainty results in respondents and their colleagues not signaling or marking the palliative phase. Respondents described frustration when they believed a patient was indeed palliative but a colleague, often the treating physicians, disagreed. Primary-care professionals experience difficulties in communication with and provision of care for their patients if, during hospitalization, the palliative status is not identified and consequently not communicated during the handover. Nurses explained they sometimes have to push physicians to give a statement about an anticipated life expectancy of less than three months so insurance companies cover intensive home or hospice care:

> *"Very difficult, because someone comes home when they actually need palliative care. You can tell during the intake: we are not going to make it with four visits a day. But the patient is not yet given the stamp [of being palliative]. So, 9 out of 10 times it comes down to us calling the GP the same day, and 7 out of 10 times, the GP does give that statement."* (community

> nurse)

Primary-care professionals found the extent to which information about palliative care and prognosis was communicated was highly dependent on the clinical department. They attributed this dependency to the extent of awareness of palliative care, but also on predictability of the disease course:

> *"In the case of cardiology, people have end-stage heart failure, and those people are in the palliative phase. But each time, a little diuretic is added or removed, even though life expectancy is less than three months, and it's not communicated in that way to the GP."* (geriatrician)

Communication with patients about their palliative status
Participants described cases in which patients were not necessarily aware of their palliative status when discharged home. Participants thought that sometimes patients were told this information but did not comprehend it; however, they also believed patients were not always informed about their palliative status:

> *"If the handoff says the patient has a short life expectancy and the patient says, 'I'm not ill at all,' you end up in a sort of conflict situation. If it is not written down that a patient has heard 'bad news' and reacted as such and such, well, then you don't know what to do with that. You are at a loss. What can I do to respectfully care for this patient?"* (community nurse)

In addition, participants noted that not only patients but also their relatives should be made aware of their loved ones' palliative status as well as what the patients' preferences are in order to prevent unwanted interventions in crises. Nurses felt physicians should have the initial conversation with their patients about the end of life. General practitioners also described first needing medical specialists to be clear about their patients' prognoses, so they could start a dialogue about future care when patients were discharged home:

> *"As long as a physician doesn't tell the patients and their family that things are moving toward the end, you can't mention it as a nurse."* (hospital-based nurse)

> *"It really needs to be said that someone will die in the near future. I believe, that is very important for people to know. Otherwise, it's really hard to start the conversation [as a GP]. They are not ready in that case, because their mindset is not right at that moment. If they hear it from a specialist, it becomes a fact."* (general practitioner)

2. Incomplete and insufficient handover

Content: More than just physical

Participants said the written hospital discharge letter often focused primarily on physical aspects and omitted information about other palliative domains, such as spiritual, psychological, and social. They felt including psychosocial information or a patient's coping strategies within the general handover improves follow-up within the primary-care setting. However, not all participants felt certain "sensitive" information belonged in a written handover because patients could potentially access this, but also because participants have difficulty writing down such information:

> *"Actually, I have more need for the information that has not been written down—the social aspects, how someone is dealing with things now that he knows he's terminal and there are no treatment options left. How is someone experiencing that? You don't hear about that—is someone angry or resigned?"* (hospice nurse)

> *P1: "Those sort of 'soft' things or context things are also very important for the handover, because you sometimes need to anticipate them. For example, concerning a euthanasia and an angry son that arrives from another country. If you'd known that up front. Those sort of things."*
> *P2: "But thinking about it, I would find that hard to write down clearly. Then I'd call."*
> (P1: general practitioner, P2: geriatrician)

Participants were not in agreement concerning the usefulness of anticipatory plans in the handover. Some general practitioners mentioned they felt capable of making these plans themselves as long as the palliative status was communicated, whereas most nurses thought anticipatory plans could help them understand what to expect and what treatment plans to follow:

> *"What is the plan when someone goes home? What has been agreed upon? If someone becomes dyspneic, does he have medication that he can try first? And if that doesn't work, what can be done? Does his wife call the GP or can she call the hospital ward? Those are pre-emptive agreements you could make, so you know in the community which steps to follow."* (community nurse)

Differences between handovers

Handovers between physicians and between nurses are separate and can contain different types of information, which frustrated some nurses, who felt privacy laws prohibited them from copying physicians' reports into their own handover. One community nurse described trying to get hold of the medical handover because she wants to know more about treatment limitations that are not described in handovers she receives:

> *"The patient does get the letter (medical handover) and they have to give it to the GP. So, I intercept it. That's why I would like to receive it with the nursing handover. ... Then you have everything you need to know—a bigger picture, treatment limitations, and how far someone is willing to go."* (community nurse)

Patient wishes

Respondents said the handover generally did not include patients' wishes and preferences for future care. Hospital-based professionals described not having time to have conversations about preferences during hospital admissions. Additionally, treatment limitations such as "do not resuscitate" were not added, because they felt they were not legally valid in the home situation. In all, participants said patients unnecessarily needed to have these conversations repeatedly with different professionals, at an often-stressful time:

> *"What I experience is that I advise the patient: 'why don't you discuss this with your pulmonologist?' It is then discussed with the pulmonologist and is written down in the file, but it's not in the GP's file. Then, we have to say, 'Please also discuss this with your GP, so it's written down there as well.'"* (hospital-based nurse)

However, regarding patients' wishes and preferences, community nurses also explained they do not blindly follow what is written in the handover. They feel that whatever wishes the patient indicates at the moment they talk to them is leading:

> *"You start your own intake conversation with a patient after discharge. If they said something different during hospitalization than what they say at home or during the intake conversation, then what has been said in the hospital is not leading. In general, we say that the wishes and needs of a patients are key and leading."* (community nurse)

A handover for the patient

Currently, the patient receives the written nurse handover to give to the community nurse. Although patients can read these handovers, they do not seem to do so. A handover written in "layman's" language, which one of the participants used, was thought to benefit patients and their relatives, providing them a summary of the admission and their medication. However, participants did not agree on whether expected future symptoms should be mentioned

> *"Only when you see a benefit to a patient knowing all the symptoms he could develop. Someone is sick and goes home or to a hospice to die and knows things are not well. To what extent should they be burdened with this sort of perhaps useless information? As long as everyone else knows what to look out for."* (community nurse)

Warm handover
A warm handover, which our respondents defined as either a face-to-face handover or a handover through telephone calls, is important for discussing essential information for continuity of care or resolving a lack of clarity in the written handover. However, participants noted that phone contact in general does not occur often. Reasons mentioned were that not all hospital-based professionals are aware of the importance, time constraints, shift work, and strict privacy laws. Some primary-care professionals had experience visiting patients at the hospital prior to discharge or having a conversation with the hospital professional and patient. Participants described this type of "warm handover" as beneficial for the transition and said it could also aid in determining whether a patient is suitable for terminal care. However, participants doubted if wider implementation was time and cost efficient. They thought multidisciplinary palliative-care team meetings were a good opportunity to invite primary-care professionals, in person or by phone, to get on the same page:

> *"I once had a specialist ask me, 'Could we possibly have a conversation together with the patient, because he is here with a euthanasia request and I don't know how to deal with that. And you know him a lot better.' We ended up having the conversation together."* (general practitioner)

3. Uncertainty about responsibilities

Community and ward nurses described the handover process as a clear transition of tasks and responsibilities. In cases where a patient goes home to die, specialists leave care completely to GPs. However, in the pre-terminal stage, which physician is "in charge" of a patient is not always clear to the GPs, which could also result in patients and nurses not knowing whom to call. GPs were frustrated because they felt this lack of clarity could result in unnecessary hospital admissions and hinder their role:

> *"Which physician is in charge? ... You have to be clear in this, because also when, like me, you have an out-of-hour shift [as a GP] and I visit a patient in the palliative phase, I sometimes notice it is not clear at all that responsibility is handed over to the GP. And then you are more likely to send the patient to that 'revolving door' in the hospital."* (general practitioner)

GPs advocated for earlier involvement and collaboration in decision making during hospitalizations. Hospital physicians also felt this involvement could be beneficial. GPs could then provide information about how a patient is functioning at home and, if known, what the patient's wishes are. Furthermore, this information would allow for discussion about role division:

> *"I hardly ever get called by a hospital specialist: this lady is quickly deteriorating. What should she have wanted? Have you had any conversations about this? What are the wishes? What can you do? We often know a patient very well. But, no, that does not happen."* (general practitioner)

With the introduction of the specialist palliative-care teams and multidisciplinary meetings, participants saw an improvement in the content of handover. However, some GPs worry that responsibility, even in the terminal stage, will not be handed over to them, hindering their relationship with and care for patients:

> *"Because there are palliative teams, it is rare that the hospital is done [treating a patient] and the GP starts. And that bothers me a little, because the team claims to be available for patients until the end, which hinders our role."* (general practitioner)

Although responsibility might not always be clear, professionals do emphasize they go the extra mile for patients with palliative-care needs. Community nurses explained that some care can be declined because of their workload, but that a tacit rule exists to never turn down patients with palliative needs. Hospital nurses also mentioned that if a patient in the terminal phase wants to go home, they do all they can to facilitate a transition within a day:

> *"I have experienced that on Saturday morning, it is decided: we are starting a terminal trajectory and the patients has said, 'I would like to die at home'. […] But then it was said, 'The liaison nurses are out, it has to wait until Monday.' When I heard that, I thought, 'That's not going to happen, I am making it work today.' It takes three or four hours, but I told my colleagues, 'No matter what, I am going to arrange this and that patient will go home at the end of my shift.' And it happened."* (hospital nurse)

Discussion

Main findings and comparison to literature

This qualitative study explored the views and experiences of physicians and nurses with regard to the transition from the hospital to the primary-care setting for patients with palliative-care needs. A lack of identification, exclusive focus on physical aspects, insufficient interprofessional communication, and uncertainty in medical responsibility form important barriers to a sufficient handover process.

When patients transition between care settings, all who are involved must know if the patients' care goals are curative or palliative. In their review, Cotogni *et al*. suggest hospitals should play a bigger role in identifying patients needing a palliative approach.[28] Our participants confirmed that currently, when patients transfer to the primary-care setting, the focus of care is often not specified or remains curative, both of which might not be appropriate. However, primary-care professionals in our study seem to wait for the hospital-based physicians to determine if patients are palliative. Gott *et al*. found that structured transition to a palliative-care approach seldom happens in the acute hospital setting, and the authors indicated lack of clarity about prognosis as an important reason.[29] The Netherlands requires a "three-month life-expectancy declaration" for financing 24/7 terminal home care, which might result in professionals considering this late time frame the criterion for defining the palliative phase.

Insufficient communication between professionals was previously described as negatively affecting patient care in the end-of-life setting[6] and can lead to patients having to work as the mediator between settings.[30] However, primary-care providers are often uncertain of whether patients are aware of their palliative status. Benzar *et al*. found patients and relatives do indeed miss information about prognoses and disease progression after discharge.[14] And Ewing *et al*. found caregivers are not always aware of patients' end-of-life situation, which formed a significant barrier in the discharge process.[31]

The primary focus on the physical aspects in the handover further emphasize that goals and preferences are not yet discussed with patients and caregivers during hospitalization. Advance Care Planning (ACP) has been advocated as a means of discussing goals and preferences and formulating anticipatory care plans.[32, 33] However, whether ACP is realistic in the hospital setting is debatable, given that, on average, a hospital admission duration is only five to seven days.[34] Furthermore, hospital professionals do not always feel confident about having these conversations.[35] Hence, ACP and a subsequent complete advance care plan at discharge might not be realistic or even desired. However, from our results, we can derive a minimum of information that primary-care professionals need in the handover: a clear declaration of a palliative approach, if and how this approach is communicated with patients, and a description of psychosocial problems (if any).

In our study, physicians' roles and responsibilities were unclear, which can result in nobody taking the lead in decision making or starting conversations with patients about the end of life.[36, 37] This uncertainty not only exists between primary and hospital care, but is also highlighted in our study by the fact that nurses do not start a conversation about the end of life when physicians have not addressed this uncertainty, whereas nurses could play a bigger role in patient transition to palliative care.[38, 39] Our participants suggested a "warm handover," where professionals have direct contact with each other, for improvement of continuity of care. Direct communication was previously found to be infrequent, but appropriate in complex cases.[40, 41] However, the benefits at the patient level need further assessment.[42]

Implications for practice and research

In our study, we found late identification and insufficient communication with patients about their palliative status is an important barrier within the transitional care process. Researchers have developed multiple instruments in recent years to aid in identification, although with varying levels of success.[43, 44] However, these instruments often focus on prognostication, although clinicians also advocate to instead assess needs.[45, 46]

Studies have shown the involvement of palliative-care teams positively influences patients' quality of life.[47, 48] Although some palliative-care teams follow up with patients after discharge, most teams either work within the hospital or within primary care, leading to a gap in follow-up.[49, 50] In the last decade, transitional care interventions, where primary-care nurses visit a patient at the hospital and follow up at home, show positive results in complex-care patients such as frail elderly or those with heart failure.[51, 52] Within transitional palliative-care programs, the specialist palliative-care teams play an important role.[53, 54] However, our study showed that when hospital teams follow up with patients in the primary-care setting discussions can arise between generalists and specialist palliative care. Partnership between generalists and specialist palliative care is therefore necessary for these interventions to be successful,[55] and future studies should determine what model is most effective in improving the continuity of care for patients with palliative-care needs.

Limitations

The results of this study must be considered within their limitations. The study was set in the Netherlands and might not be directly translatable to other care settings. However, multiple European countries have similar generalist-plus-specialist-care models. Furthermore, our results can also benefit settings where specialists are the sole providers of palliative care, because their involvement is often late, and the lack of resources will intensify the role of generalists. The number of participants from the hospital were limited, so we may not have gotten the full scope of hospital-based perspectives. Furthermore, recruiting physicians proved difficult, which also could have resulted in missed perspectives. By dividing the focus groups between physicians and nurses, interdisciplinary discussions were not possible; therefore, we may have missed findings on interdisciplinary communication and collaboration. During the last focus groups, we did not feel we gained many new perspectives. However, we cannot claim data saturation, because we divided the focus groups into physicians and nurses.

Conclusion

From a professional's perspective, the transition between hospital and primary care for patients with palliative care needs is hindered by lack of identification, focus on the physical aspects, insufficient interprofessional communication, and unclear distribution of responsibilities. For the transitions to improve, efforts should be made to enhance knowledge and skills in the hospital setting about identifying and communicating with patients about the end of life. Moreover, transitional care interventions for these patients in which primary, hospital, and specialist palliative care closely collaborate could potentially benefit this patient group but needs further research.

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Supplement 1. Topic List

- How does the handover between hospital and primary care currently occur for patients in the palliative phase?

- What are experiences with the written handover?

- What are experience with the verbal handover?

- Which information do you consider crucial for the continuity of care for these specific patients?

- What are important barriers in current practice?

- How could the transitional handover be organized best for patients in the palliative phase?

- What information should be included within the transitional handover?

Chapter 6

Effectiveness of transmural team-based palliative care in prevention of hospitalizations in patients at the end-of-life. A systematic review and meta-analysis

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Abstract

Importance and objective: Patients at the end-of-life are frequently admitted to the hospital. Team-based palliative care team interventions have shown positive results in both hospital and community settings. However, whether transmural team-based palliative care interventions that span both hospital and community, also known as transmural care, can prevent hospital admissions and increase death at home is unknown.

Data source: In this systematic review and meta-analysis, MEDLINE (Ovid), Embase (Ovid), CINAHL (Ebsco), PsychINFO (Ovid), and Cochrane Library (Wiley) were systematically searched.

Study selection: We included randomized controlled trials and observational studies with a control group. Studies incorporating collaborative teams in which hospital and community professionals co-managed patients, hospital-based teams that followed patients in the community, and case-management interventions led by palliative care teams were included.

Data extraction and synthesis: Data was extracted by two researchers independently. Data was pooled using random-effect modeling.
Main outcomes: Outcomes were hospital admissions and place of death. We performed a meta-analysis on events of patients with hospital admissions and home deaths.

Results: In total, 19 studies met the inclusion criteria, involving 6,614 patients, of whom 2,202 received an intervention. Most studies were of low or moderate quality. Studies had high heterogeneity on the type of intervention, study population, control group, and follow-up time in addition to effects. Twelve studies were included in the meta-analysis on hospital admissions and eight on home deaths. The overall pooled odds ratio of at least one hospital (re) admissions was 0.46 (95% confidence interval (CI) 0.34-0.68) in favor of the intervention group. The highest reduction in admission was in the hospital-based teams with community follow-up: OR 0.21 (95% CI 0.07-0.66). The pooled effect on home deaths was 2.19 (95%CI 1.26-3.79), favoring the intervention, with also the highest in the hospital-based teams: OR 4.77 (95% CI 1.23-18.47).

Conclusion: Transmural team-based palliative care interventions show an overall effect on lowering hospital admissions and increasing the number of patients dying at home. Hospital-based teams that follow up patients at home seem to have the largest impact on these outcomes. However, broad clinical and statistical heterogeneity of included studies results in uncertainty about the effect size.

Introduction

Palliative care is an approach to improving the quality of life for patients and their relatives facing life-threatening illness.[1] Palliative care traditionally focused on patients with an oncological diagnosis; however, the number of patients living with and dying from multiple chronic conditions is increasing, emphasizing the need for well-organized palliative care.[2] Although most patients at the end-of-life wish to be cared for and die at home, care transitions to the hospital, and consequently hospital deaths, are common in the last phase of life.[3-6] Continuity of care, collaboration, and information sharing between care settings are important aspects of palliative care.[7, 8] However, collaboration between professionals from different care settings is suboptimal and can lead to negative patient outcomes.[9, 10]

The organization of palliative care is highly dependent on country and setting. Whereas in some countries, palliative care specialists provide most of the palliative care, in many European countries, generalists such as the general practitioner provide most of the palliative care, and specialists have a consulting function. Studies have shown interventions incorporating multidisciplinary care teams are the most effective in improving patient outcomes.[11] These multidisciplinary care teams function either within the hospital or in the community setting and do not follow patients while they move from one setting to another. For continuity of care, structured collaboration between home and hospital, information sharing, and providing care at the desired place are important. Whereas research has found both home-based and hospital-based palliative care interventions reduce hospital readmissions and increase home deaths,[12-14] evidence on the effectiveness of structured transmural team-based palliative care collaborations is limited. Hence, whether transmural team-based collaborations in which patients are followed throughout care settings reduce hospital admissions and increase home deaths is unknown.

The aim of this study is thus to systematically review and summarize all evidence on effectiveness of transmural team-based collaborations between hospital and primary care professionals in palliative care on hospital admissions and home deaths. We include three models of care: (1) collaborative teams in which hospital and community-based professionals closely collaborate, (2) hospital-based teams that follow patients in the community setting, and (3) case management coordinated by a hospital-based team.

Methods

Eligible interventions

The interventions in the studies consisted of team-based collaboration between primary and secondary care. We defined transmural team-based palliative care as teams that provide continuous care for patients at the end-of-life while the patient moves between settings. Teams had to provide at least face-to-face consultations at home or in the hospital. We defined three organizational models for the teams:

1. Collaborative teams: These teams involve structural collaboration between professionals from both the hospital and community. They follow patients transitioning between care settings. They can provide medical care and symptom control at home.
2. Hospital-based teams: These teams provide care for patients in the hospital and community setting (through home visits), without structural collaboration with primary care professionals. These teams are mostly responsible for all care and can treat patients at home.
3. Case management: Case managers collaborate with hospital-based multidisciplinary teams. The main focus is on advance care planning and not on providing treatment at home.

We did not consider interventions to be transmural team based when teams were solely hospital based, for example, when they followed patients in the outpatient setting or were community/hospice based with referrals from the hospital but no further or unclear collaboration with the hospital.

Inclusion criteria

We used the following inclusion criteria for studies:

1. Study participants were 18 years or older.
2. Studies defined their participants as being in need of palliative care.
3. Studies used an independent control group: randomized controlled trials (RCTs), non-RCTs (e.g., before-and-after study, interrupted time series), and observational studies (e.g., cohort study and case-control study). Control groups were (historical) care as usual, which could either be palliative care provided in one setting, or no palliative care.
4. Studies used one of the following outcomes: (re)-hospitalizations and/or days of hospital admissions or home death and/or (preferred) place of death. These outcomes can be seen as synonyms for good symptom control by reducing the need for unplanned hospitalizations and reflect organization of care to fulfil a patient’s wish to spend time and die at home.
5. Studies had to be in English or Dutch.

Search strategy

MEDLINE (Ovid), Embase (Ovid), CINAHL (Ebsco), PsychINFO (Ovid), and Cochrane Library (Wiley) were systematically searched from onset until January 2021. We drafted a customized search strategy with the help of a clinical librarian (FJ). To validate the search strategy, we formulated a reference set of articles through a scoping search (IF). The search contained the following key concepts: “palliative care,” “transmural care,” “hospitalization,” and “place of death.” The full search strategy is displayed in supplement 1.

Study selection and quality assessment

All titles and abstracts were screened independently by two of four researchers

(IF, EG, MP, and SB) for eligibility for full-text assessment. The researchers discussed discrepancies between selection, which occurred in 3.9% of the abstracts, until reaching consensus, and, if necessary, consulted a third researcher (BB). Covidence software was used throughout the screening process.[15] References were screened for additional articles. IF and EG read the selected full text and assessed eligibility for data extraction independently. BB was consulted for the final selection of studies for this review.

The Cochrane risk-of-bias tool was used for quality assessment of RCTs and the Robins-I tool was used for non-RCTs. Because the blinding of transmural team-based palliative care interventions is essentially impossible, studies where participants and professionals were not blinded were not automatically assessed as high risk. Furthermore, the outcomes for hospitalization and place of death are unlikely to be influenced by a lack of blinding and will therefore be treated as "low risk-of-bias" even if blinding was unsuccessful.

Data extraction

Two researchers (IF and EG) independently used a standardized data-extraction form for data extraction. Data were collected on study characteristics (author, publication year, country, type of study), intervention characteristics (aim of study, description and components of intervention, recruitment place, comparator, team members), patient characteristics (mean age, gender, disease characteristics) and outcomes (hospitalization, place of death, preferred place of death).

Data analysis

Studies were synthesized in a descriptive summary. Odds ratios and 95% confidence intervals were constructed per study and for each outcome. If these data were not available from the main manuscript, authors were contacted to provide these data. We used the Mantel-Haenszel estimator to perform a random-effects meta-analysis with studies that reported event data on the outcomes for hospital admissions and/or home deaths. If studies reported different endpoints for hospital admissions, for example, admissions one month before death and six months before death, we included data from the longest timeframe. In the analysis of home deaths, we additionally used the Peto odds method because one of the studies had zero events. Pooled odds ratios were converted to absolute risk reduction and number needed to treat.

We used the chi-square test and I^2 statistic to assess the statistical heterogeneity. We defined several sources of clinical and methodological heterogeneity and used subgroup analyses to explore their influence on the pooled effect estimates. First, we hypothesized that the effect would be different for the three types of interventions. Second, we investigated whether risk-of-bias influenced the effect estimates. We did not construct funnel plots, because the sample of included studies per outcome was less than 10.

Results

The database searches yielded 11,217 records, and manual searches identified an additional 35 records (Figure 1). We screened 8,566 abstracts for inclusion and exclusion criteria, after which we assessed 275 full texts for eligibility. Nineteen articles were included in this review. For two studies, three separate articles were published that looked at different outcomes, and these studies will be described as one study by Rogers *et al.*,[16-18] and by Benthien *et al.*,[19-21]

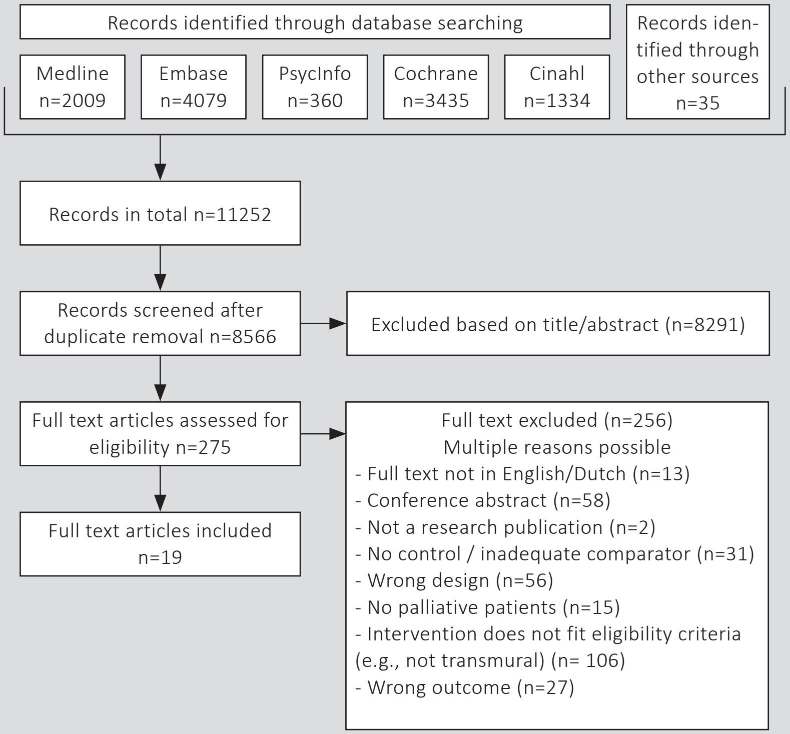


Figure 1. Flow-diagram inclusion and exclusion

Description of studies

Table 1 and supplement 2 summarizes the included studies and outcomes. Seven studies were RCTs[16, 17, 19-26] or a cluster RCT,[27] two were prospective non-randomized studies,[28, 29] one was a prospective quasi-experimental study,[30] four were retrospective before–after studies,[31-34] and one was clustered, partially controlled before–after study.[35] Of these, three studies were pilot studies.[25, 29, 33]

Overall, the studies included 6,614 patients, 2,202 of whom were in the intervention groups. Eight studies assessed collaborative teams with hospital and primary care professionals, though none of the interventions were exactly

Table 1. Study characteristics

Collaborative team hospital and primary care								
Study	**Aim of study**	**Study type**	**Population**	**Recruitment place**	**Control group**	**Follow-up time**	**Mortality**	**Outcomes hospital admissions and place of death (intervention vs. control)**
Brumley *et al.*, 2007, USA	To determine whether an in-home palliative care intervention for terminally ill patients can improve patient satisfaction, reduce medical care costs, and increase the proportion of patients dying at home.	Randomized controlled trial (RCT)	• N: I: 155/ C: 155 • Diagnosis: heart failure (HF), COPD or Cancer • Anticipated Prognosis: <1 year • Age: I: 74 / C: 74 • Gender (male): I: 55% / C: 47%	From community or hospital	Standard care to meet the needs of the patients; home health services, acute care services, primary care services, and hospice care	Until death or the end of the study period	I: 73% C: 73%	• Lower number of patients with at least one hospital admission. 36% vs. 59% (p <0.001). • Hospital days reduced by 4.36 (p=0.001) determined by linear regression. • Higher number of home deaths: 71% vs. 51% (p <0.001), OR to die at home 2.2.
Jordhoy *et al.*, 2000, Norway	To evaluate if a palliative care intervention increased the rate of home deaths.	Cluster RCT	• N: I: 235/ C: 199 • Diagnosis: Cancer • Anticipated Prognosis: 2-9 months • Age: I: 70 (38-90) / C: 69 (37-93) • Gender (male): I: 56% / C: 49%	NM	Conventional care	2 years	I: 93% C: 88%	• NSD in number of patients with at least one hospital admission (93% vs. 94%). • No reduction in length of stay (10.5 ± 7.3 vs. 11.5 ± 8.9 days). • Higher number of home deaths (25% vs. 15% (p=0.02)).

Table 1. *Continued*

Study	Aim of study	Study type	Population	Recruitment place	Control group	Follow-up time	Mortality	Outcomes hospital admissions and place of death (intervention vs. control)
Groenewoud *et al.*, 2020, Netherlands	To evaluate the effect of an integrated, proactive palliative care pathways covering the complete cycle of care.	A clustered, partially controlled before–after study	• N: I: 99/ C: 71 • Diagnosis: not specified • Anticipated Prognosis: 12 months • Age: I: 74 / C: NM • Gender (male): I: 44%/ C: NM	NM	Standard care	Until death or end of study (maximum two years)	I: 59%	• Higher number of deaths nearly at home (including nursing home, home care, hospice, palliative unit) 97.3% vs 77.5% p=0.006. • NSD between Risk Ratio's between intervention and control for number of hospitalizations in last six months of life. • Lower number of patient with at least one admission after start intervention (54% vs. 76%)
Kalluri *et al.*, 2018, Canada	Explorative analysis of a multidisciplinary collaborative care model with emphasis on community-based care.	Retrospective before–after study of diseased patients	• N: I: 22/ C: 10 • Diagnosis: Idiopathic pulmonary fibrosis • Anticipated Prognosis: NA • Age: I: 73/ C: 66 • Gender (male): I: 64% / C: 60%	During clinic visit	Non-multidisciplinary collaborative (MDC) care	mortality follow-back	100%	• NSD in patients with respiratory-related hospital admission (50% vs. 70%). • Authors concluded clinical-relevant reduction in hospital admissions (IRR= 2.32; 95% CI: 0.95-5.6; p=0.064), though not significant. • Higher number of home deaths (55% vs. 0%). • Higher number of hospice death (23% vs. 0%). • 85% achieved preferred place of death in intervention group.

Lawson *et al.*, 2009, Canada	To examine temporal trends in ED visits among palliative care services' patients and to examine the effects of the implementation of an integrated service model.	Retrospective before–after study of diseased patients	• N: I: 606 / C: 2615 • Diagnosis: not specified 'palliative care service patients' • Anticipated Prognosis: NM • Age: I: 71 / C: 70 • Gender (male): I: 54% / C: 62%	From palliative care services	A multidisciplinary team follows patients across care settings, including the home, an outpatient clinic, an inpatient palliative care unit, and throughout the QEII HSC hospital sites.	Mortality follow-back	100%	• NSD for mean number of days in hospital (16.2 ± 33.8 vs. 13.9 ± 24.4). • NSD for home deaths (45.0% vs. 43.6%).
Smeenk *et al.*, 1998, Netherlands	To investigate the effect of a transmural home care program on re-hospitalization, quality of life, and place of death.	Quasi-experimental intervention	• N: I: 79 / C: 37 • Diagnosis: Cancer • Anticipated Prognosis: <6 months • Age: I: 65 / C: 64 • Gender (male): I: 60 / C: 62%	During hospital admission	Standard community care.	Until death	I: 100% C: 100%	• Lower number of days in the hospital (5.8 ± 12.8 vs. 11.5 ± 17.1 (p<0.01)). • NSD for home death (81% vs. 65% (p=0.06)).
Benthien *et al.*, 2018/ Nordly *et al.*, 2019 / Benthien *et al.*, 2020 Denmark	To investigate if a systematic fast-track transition from oncological treatment to specialized palliative care at home could result in more time spent at home and death at home.	RCT	• N: I: 170 / C: 170 • Diagnosis: Cancer "end stage" • Anticipated Prognosis: NM • Age: I: 66/ C: 65 • Gender (male): I: 49% / C: 49%	Inpatient and outpatient clinics	Standard cancer care plus on-demand specialized palliative care. Standard care includes in- and out-hospital treatment, access to a general practitioner, general practitioner out-of-hours service, psychological counselling, and access to 24 h nursing home care.	6 and 30* months after last inclusion	I: 41% C: 37% after 6 months I: 96% C: 94% After 30 months	• NSD in mean number of hospital admissions (2.14 SD 2.22 vs 2.02 SD2.05 (p=0.63)) • NSD in number of days in hospital (14.33 SD 16.55 vs. 15.84 SD 19.31 (p=0.58)). • NSD in-home deaths (22.7 % vs. 17.6% (p=0.46)) after 6 months. • NSD in-home deaths (23.0 % vs. 25.0% (p=0.69)) after 30 months.

Table 1. *Continued*

Study	Aim of study	Study type	Population	Recruitment place	Control group	Follow-up time	Mortality	Outcomes hospital admissions and place of death (intervention vs. control)
Tan *et al.*, 2016, Singapore	To evaluate the impact of the integrated hospice home care program on acute-care-service usage and on the share of home deaths.	retrospective before-after study of deceased patients	• N: I: 321/ C: 593 • Diagnosis: Cancer • Anticipated Prognosis: <1 year • Age: I: 71 / C: 69 • Gender (male): I: 58% / C: 59%	During hospital admission	Patients discharged to home hospice services.	Mortality follow-back	100%	• Lower number of hospital admissions at one months (38.9% vs. 72.0% p<0.001), three months (74.1 vs. 90.6% (p<0.001)), and six months before death (88.5% vs. 95.6% (p<0.001)). • Higher number of home deaths (59.6% vs. 40.0% (p<0.001)).
Hospital-based team that follows patient at home								
Ahlner-Elmqvist *et al.*, 2004, Sweden	To compare outcomes for patients receiving either hospital-based advanced home care, including 24-hour service by a multidisciplinary palliative care team or conventional hospital care.	prospective non-randomized study	• N: I: 119/ C: 178 • Diagnosis: Cancer • Anticipated Prognosis: 2-12months • Age: I: 67/ C: 68 • Gender (male): I: 52%/ C: 46%	During hospital admission	Conventional hospital and terminal care	at least 1,5 years	I: 98%, C: 92%	• Reduced overall time spent in hospital 18% vs. 31% (p<0.005)). • Number of patients with at least one hospital admission (79% vs. 99%). • Higher number of home deaths 45% vs. 10% (p<0.001).

Brännström *et al.*, 2014, Sweden	To evaluate the effects of an integrated Palliative advanced home care and heart failure (PREFER) intervention.	RCT	• N: I: 36 / C:3 • Diagnosis: H • Anticipated Prognosis: <1 year • Age: I: 82 / C: 77 • Gender (male): I 72% / C: 69%	From department of Medicine-Geriatrics or primary healthcare centre	Usual care was provided by general practitioners or doctors and/or the nurse-led heart failure clinic at the Medicine-Geriatrics department	6 months	17% in total, NSD between groups.	• Lower mean number of hospitalizations (0.42 ± 0.60 vs. 1.47 ± 1.81, (p=0.009)). • Lower number of total hospital admissions (15 vs. 53) • Lower number of patients with at least one hospital admission (36.1% vs. 58.3%) • Lower mean number of hospital days 2.9 ± 8.3 days vs. 8.5±12.4 (p=0.011)
Cross et. al., 2019, Australia	To document the effect of an innovative community palliative care program on home death rate, hospital death rate and achieving preferred place of death.	Prospective, comparative cohort study	• N: I: 130 / C:120 • Diagnosis: not specified • Anticipated Prognosis: <6 months • Age: I: 75 / C: 72 • Gender (male): I: 45% / C: 47%	Referred and admitted to community specialist palliative care service	Standard level of care	Until death or discharge from palliative care program	I:59%, C:58% (1 year)	• Higher number of home deaths: 46% vs. 26% (p=0.036). • No significant higher odds for death at preferred place: OR 1.17, 95% CI: 0.38, 3.54, (p=0.79).

Table 1. *Continued*

Study	Aim of study	Study type	Population	Recruitment place	Control group	Follow-up time	Mortality	Outcomes hospital admissions and place of death (intervention vs. control)
Pace *et al.*, 2012, Italy	Assess the role of palliative home-care services and impact on quality of care and cost-effectiveness	Retrospective pilot study	• N: I: 72/ C:72 (subgroup of overall study) • Diagnosis: Brain tumour Glioblastoma (GBM) • Anticipated Prognosis: NM • Age: I: 62 / C: 65 • Gender (male): I: 58% / C: 55%	During hospital admission for surgical intervention	GBM patients from different neurosurgical ward without palliative home-care	NM	In total 98% (NSD survival time between groups)	• Reduced hospitalization in last month of life 8.3% vs 26.8% (Poisson regression age- and sex-adjusted Incidence Rate Ratio (IRR) 0.20 (95% CI: 0.12-0.74, p=0.009)) and in last two months of life 16.7% vs. 38.0% (IRR 0.35 (95%CI 0.18-0.65) p=0.001). • Lower mean hospitalization duration month before death: 0.8 days (95%CI 0.6-1.0) vs. 2.5 days (95%CI 2.1-2.9)
Case management coordinated by (hospital based) team/palliative care specialist(s)								
Radwany *et al.*, 2014, USA	To describe the feasibility and present the outcomes of the PEACE pilot study	Randomized pilot study	• N: I: 40 / C: 40 • Diagnosis: End stage chronic disease (organ failure, cancer, neurological disease) > 60 years • Anticipated Prognosis: NM • Age: I: 70 / C: 69 • Gender (male): I: 25% / C: 22%	Community-based long term care	Usual PASSPORT care, which follows more of a psychosocial rather than a biopsychosocial model. Consumers also received mailed palliative care educational information every month in an attempt to mask group assignment	12 months	18% in both groups	• NSD in hospital admission 50% vs. 55%, p=0.65)

Rogers *et al.*, 2017/ Mentz *et al.*, 2018/ Warraich *et al.*,2020 USA	To investigate whether an interdisciplinary palliative care intervention in addition to evidence-based heart failure care improves outcomes	RCT	• N: I: 75/ C: 75 • Diagnosis: HF • Anticipated Prognosis: >50% predicted 6 month mortality • Age: I: 72 / C: 70 • Gender (male): I: 66% / C: 49%	During or shortly after hospital admission	Patients managed by a cardiologist--directed team with heart failure expertise.	Intervention 6 months, followed for 24 months.	I: 31%, C: 27% (at 6 mo)	• NSD for all-cause readmission 47% vs.51%, p>0.05 • NSD for hospital admission for heart failure (30.7% vs. 29.3%), non-heart failure cardio vascular (16.0% vs. 13.0%) and non-cardiovascular (10.7% vs. 24.0%). • NSD between death at home or inpatient hospice 55% vs 45%, or hospital or killed nursing home death 41% vs 59% p=0.30
Wong *et al.*, 2016, Hong Kong	To examine the effect of home--based transitional palliative care for patients with end-stage HF after hospital discharge.	RCT	• N: I: 43 / C: 41 • Diagnosis: HF • Anticipated Prognosis: <1 year • Age: I: 78 / C: 78 • Gender (male): 44% / C: 61%	During hospital admission	Both groups received usual care, which consisted of PC medical clinic consultation, discharge advice on symptom management and medication and referrals if appropriate (home visits).	12 weeks	I: 14%, C: 24%	• Reduction in hospital admissions 34% vs. 61% (p =0.009). • Lower mean number of hospital admission group (0.42 ± 0.10 vs. 1.10 ± 0.16 (p=0.001)).

I=Intervention. C=control. RCT=randomised controlled trial. HF= heart failure. COPD= chronic obstructive pulmonary disease. ED= Emergency Department, PC=palliative care. GBM=glioblastoma multiforma. NSD=no significant difference. NM=not mentioned. NA=not applicable. CI=confidence interval.

the same.[17, 23, 27, 30-32, 34, 35] The effect of hospital-based teams that followed patients in the community setting was assessed in four studies.[22, 28, 29, 33] In three studies, case management was the primary focus of intervention.[20, 25, 26]

In four studies, the intervention was compared with non-transmural palliative care,[26, 31, 32, 34] whereas in the other studies, the usual care did not include palliative care, although in some cases, usual-care patients did receive hospice or terminal care on demand.

For eight studies, hospital admissions were (one of) the primary outcomes,[23, 26-28, 30, 31, 33, 34] whereas it was a secondary outcome for other studies. Cross *et al*. solely looked at place of death.[29]

Risk assessment

Table 2 shows the risk-of-bias scores. Out of the seven RCTs, none received a low risk for all five bias points. All studies either received some concern or high risk-of-bias score due to deviations from intended interventions, because information on adherence to the intervention was missing. Jordhoy *et al*., received a high risk-of-bias score on the randomization process because it was a cluster RCT.[27]

For the non-RCTs, all studies received at least moderate risk in the confounding section. Also, moderate to serious risk-of-bias was found due to deviations from intended interventions or insufficient information to fully judge this section.

Meta-analysis

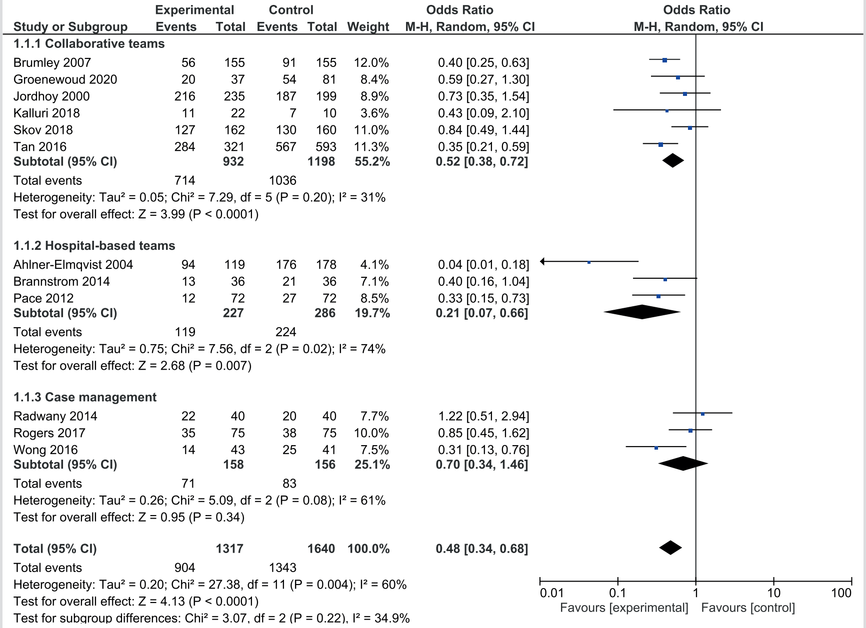
Twelve studies were included in the analysis on hospital admission (see figure 2). Overall, the odds of hospital admission was significantly reduced. The pooled odds ratio was 0.48 (95%CI 0.34-0.68). The overall absolute risk difference was -0.13 (95%CI-0.16,-0.10), and equals a number needed to treat of 7.55 (95%CI 6.11-9.87). However, considerable heterogeneity exists ($I^2 = 60\%$), and relevant subgroup differences were detected. Interventions with collaborative teams and hospital-based teams resulted in fewer hospital admissions, but this effect was not observed in case-management interventions. For collaborative teams, the absolute risk difference was-0.10 (95%CI-0.13—0.07) with a NNT of 10.13 (95%CI 7.57-15.31). For the hospital-based teams the absolute risk difference was-0.26 (95%CI-0.34,-0.18), with a NNT of 3.86 (95% CI 2.94– 5.61). However, the residual heterogeneity for outcome was high within the three subgroups (I^2 31%-74%), suggesting the differences in outcomes cannot be fully explained by the differences in intervention. For the sensitivity analysis for risk-of-bias, we selected studies that received a moderate risk-of-bias score on no more than two domains as the “higher”-quality studies, because none of the studies received an low risk-of-bias on all domains. These analyses could not be performed for the subgroups, due to the low number of studies. Looking at the pooled effect, the decreased odds for hospital admission remained (OR 0.52, 95%CI 0.33-0.81) (supplement 3).

Table 2. Risk of Bias

Cochane Risk of Bias	**Bias arising from the randomisation process**	**Bias due to deviations from intended interventions**	**Bias due to missing outcome data**	**Bias in measurement of the outcome**	**Bias in selection of the reported result**
Brannström 2014	low	moderate	low	low	low
Brumley 2007	low	moderate	low	low	low
Jordhoy 2000	serious	moderate	low	low	low
Radwany 2014	moderate	serious	moderate	moderate	moderate
Rogers 2017/Mentz 2018/Warraich 2019	moderate	moderate	moderate	low	low
Benthien 2018/Nordly 2019/Benthien 2020	low	moderate	low	low	low
Wong 2016	low	serious	low	low	low

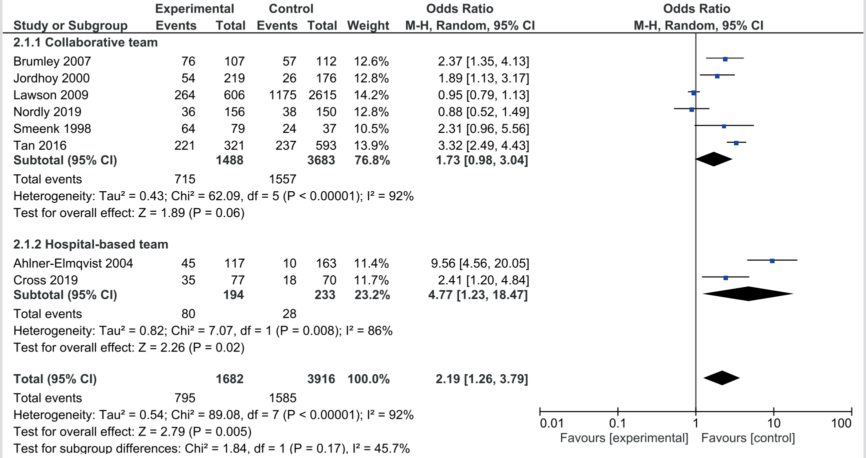
Robins Tool	**Bias due to confounding**	**Bias in selection of participants into study**	**Bias in classification of interventions**	**Bias due to deviations from intended interventions**	**Bias due to missings**	**Bias in measurements of outcomes**	**Bias in selection of the reported results**
Ahlner-Elmqvist 2004	serious	low	low	NI/low*	low	low	low
Cross 2019	serious	low	low	serious	low	low	low
Groenewoud 2020	serious	low	low	NI	serious	low	low
Kalluri 2016	moderate	moderate	low	NI/low	low	low	low
Lawson 2009	moderate	moderate	low	NI	low	low	low
Pace 2012	serious	low	low	NI/low	low	low	low
Smeenk 1998	moderate	low	low	moderate	low	low	low
Tan 2016	moderate	serious	low	NI	low	low	low

NI = no information, * in studies with NI/low risk, the information that was available suggested low risk



Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds Ratio M-H, Random, 95% CI
1.1.1 Collaborative teams						
Brumley 2007	56	155	91	155	12.0%	0.40 [0.25, 0.63]
Groenewoud 2020	20	37	54	81	8.4%	0.59 [0.27, 1.30]
Jordhoy 2000	216	235	187	199	8.9%	0.73 [0.35, 1.54]
Kalluri 2018	11	22	7	10	3.6%	0.43 [0.09, 2.10]
Skov 2018	127	162	130	160	11.0%	0.84 [0.49, 1.44]
Tan 2016	284	321	567	593	11.3%	0.35 [0.21, 0.59]
Subtotal (95% CI)		**932**		**1198**	**55.2%**	**0.52 [0.38, 0.72]**
Total events	714		1036			
Heterogeneity: Tau² = 0.05; Chi² = 7.29, df = 5 (P = 0.20); I² = 31%						
Test for overall effect: Z = 3.99 (P < 0.0001)						
1.1.2 Hospital-based teams						
Ahlner-Elmqvist 2004	94	119	176	178	4.1%	0.04 [0.01, 0.18]
Brannstrom 2014	13	36	21	36	7.1%	0.40 [0.16, 1.04]
Pace 2012	12	72	27	72	8.5%	0.33 [0.15, 0.73]
Subtotal (95% CI)		**227**		**286**	**19.7%**	**0.21 [0.07, 0.66]**
Total events	119		224			
Heterogeneity: Tau² = 0.75; Chi² = 7.56, df = 2 (P = 0.02); I² = 74%						
Test for overall effect: Z = 2.68 (P = 0.007)						
1.1.3 Case management						
Radwany 2014	22	40	20	40	7.7%	1.22 [0.51, 2.94]
Rogers 2017	35	75	38	75	10.0%	0.85 [0.45, 1.62]
Wong 2016	14	43	25	41	7.5%	0.31 [0.13, 0.76]
Subtotal (95% CI)		**158**		**156**	**25.1%**	**0.70 [0.34, 1.46]**
Total events	71		83			
Heterogeneity: Tau² = 0.26; Chi² = 5.09, df = 2 (P = 0.08); I² = 61%						
Test for overall effect: Z = 0.95 (P = 0.34)						
Total (95% CI)		**1317**		**1640**	**100.0%**	**0.48 [0.34, 0.68]**
Total events	904		1343			
Heterogeneity: Tau² = 0.20; Chi² = 27.38, df = 11 (P = 0.004); I² = 60%						
Test for overall effect: Z = 4.13 (P < 0.0001)						
Test for subgroup differences: Chi² = 3.07, df = 2 (P = 0.22), I² = 34.9%						

Figure 2. Meta-analysis on hospital admission forest plot



Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds Ratio M-H, Random, 95% CI
2.1.1 Collaborative team						
Brumley 2007	76	107	57	112	12.6%	2.37 [1.35, 4.13]
Jordhoy 2000	54	219	26	176	12.8%	1.89 [1.13, 3.17]
Lawson 2009	264	606	1175	2615	14.2%	0.95 [0.79, 1.13]
Nordly 2019	36	156	38	150	12.8%	0.88 [0.52, 1.49]
Smeenk 1998	64	79	24	37	10.5%	2.31 [0.96, 5.56]
Tan 2016	221	321	237	593	13.9%	3.32 [2.49, 4.43]
Subtotal (95% CI)		**1488**		**3683**	**76.8%**	**1.73 [0.98, 3.04]**
Total events	715		1557			
Heterogeneity: Tau² = 0.43; Chi² = 62.09, df = 5 (P < 0.00001); I² = 92%						
Test for overall effect: Z = 1.89 (P = 0.06)						
2.1.2 Hospital-based team						
Ahlner-Elmqvist 2004	45	117	10	163	11.4%	9.56 [4.56, 20.05]
Cross 2019	35	77	18	70	11.7%	2.41 [1.20, 4.84]
Subtotal (95% CI)		**194**		**233**	**23.2%**	**4.77 [1.23, 18.47]**
Total events	80		28			
Heterogeneity: Tau² = 0.82; Chi² = 7.07, df = 1 (P = 0.008); I² = 86%						
Test for overall effect: Z = 2.26 (P = 0.02)						
Total (95% CI)		**1682**		**3916**	**100.0%**	**2.19 [1.26, 3.79]**
Total events	795		1585			
Heterogeneity: Tau² = 0.54; Chi² = 89.08, df = 7 (P < 0.00001); I² = 92%						
Test for overall effect: Z = 2.79 (P = 0.005)						
Test for subgroup differences: Chi² = 1.84, df = 1 (P = 0.17), I² = 45.7%						

Figure 3. Meta-analysis on home death forest plot

Nine studies reported the percentage of patients with home deaths. We excluded one study from the random-effects modelling, because in the control group, zero events occurred.[31] The pooled effect indicate more home deaths (OR 2.19, 95% CI 1.26-3.79) with an absolute risk difference of 0.07 (95%CI 0.04-0.10) and an NNT of 14.7 (95% CI 10.4-25.3). The effect was larger in hospital-based teams (OR 4.77, 95% CI 1.23-18.47) than in collaborative teams (OR 1.73, 95% CI 0.98-3.04). However, the residual heterogeneity for outcome was very high within the two subgroups (I^2 86%-92%).

We found similar effects toward more home deaths in the sensitivity analysis with Peto odds, including the study with zero events (OR 1.57 95%CI 1.38-1.78), as well as within the sensitivity analysis for risk-of-bias (OR 1.63, 95%CI 0.81-3.31); see supplement 3.

Additional outcomes

Two studies provided the mean number of admissions days. Lawson *et al*. found no significant differences between intervention and control (16.2 ± 33.8 vs. 13.9 ± 24.4).[32] Smeenk *et al*. did find a lower mean number of admissions days in the intervention group (5.8 ± 12.8 vs. 11.5 ± 17.1 ($P<0.01$)).[30]

In two studies, the percentage of home deaths was combined with inpatient hospice deaths. Whereas Groenewoud *et al*. found a significantly higher number of patients dying at home/hospice,[35] Warraich *et al*. did not find a significant difference.[21] Two studies mentioned the preferred place of death: Kalluri *et al*. reported that 85% of patients in the intervention group died at their preferred place of death; however, no number for the control group was mentioned.[31] Cross *et al*. found no increase in death at place of preference (odd ratio 1.17, 95% CI: 0.38, 3.54, ($p=0.79$)).[29]

Discussion

This systematic review and meta-analysis assessed the effect of transmural team-based collaborations between hospital and primary care professionals on hospital admissions and home deaths. We included 19 studies that incorporated collaborative teams, hospital-based teams, or case management. Meta-analysis demonstrated overall a lower number of patients with hospital admissions, and more home deaths. However, observing a precise effect estimate was impossible because of the heterogeneity. Subgroup analysis only partially explained the between-study variance but indicated hospital-based teams were the most effective. Furthermore, not all studies were of high quality; however, when we only included higher-quality studies, the overall reduction in hospital admissions and increase in home deaths remained.

Comparison with literature

Previous reviews have focussed on palliative care interventions in either the hospital setting or home care settings, with some positive results in reducing hospital admissions and increasing the rate of home deaths.[13, 14] Our review is novel in that it specifically focused on studies that span both the hospital and home setting. Overall, hospital-based teams that follow patients at home seem to have the largest effect on reducing hospital admissions and increasing the rate of home deaths, whereas case-management interventions showed limited effects. One explanation could be that in the included studies, the hospital-based teams were often fully in charge of the patient, and thus, continuity of care was achieved. However, patients might also wish to continue curative treatment in addition to palliative care, or patients want to continue treatment with their general practitioners. In these countries, collaborative teams in which palliative care specialists and generalists work together might be more desirable. This preference is also in line with the generalist-plus-specialist care model first described by Quill *et al.*,[36] and fits well with the early palliative care model whereby palliative care is provided alongside disease-modifying treatment. Another explanation for the large effect of the hospital-based intervention could be that care as usual was non-palliative care in these interventions, whereas in the collaborative-team interventions, the usual care of the control group often already contained palliative care components.

Within the subgroup of case-management studies, the studies with longer follow-up showed no differences in readmissions, whereas the study by Wong *et al*. did find positive effects of the intervention during the 12-week follow-up.[26] Case management alone, even if in collaboration by a palliative team, might not be sufficient in the last months of life, when needs increase and more hands-on medical care is needed at home, to prevent hospital admissions. Furthermore, two of the case-management studies included patients with heart failure, and although the studies inclusion criteria stated end-stage heart failure, mortality rates were low, which could result from the difficulty in assessing prognosis in organ failure.[37] Case management's limited effect on the reduction in hospital admissions in palliative settings is disappointing, especially compared with non-palliative settings.[38]

Our meta-analysis also showed, on average, more home deaths in the intervention groups. The more intensive collaboration with primary care and the provision of medical and nursing care at home could have resulted in both patients and care professionals feeling confident that a "comfortable" death could be achieved at home. Furthermore, in many studies, advance care planning was part of the intervention, and open discussions about the preference to die at home could have increased home deaths.[39, 40] By choosing home deaths as an outcome, we did not incorporate patients who died in hospice, which is the second-most reported preferred place of death.[41] Preferably, the outcome measured would have been the preferred place of death; however, this outcome was only reported in two studies.[29, 31] This finding is not surprising, because the preferred place of death is often not known for all patients and is subject to change over time.[42] In the study with the largest effect on home deaths (Ahlner-Elmqvist), patients in the intervention group explicitly chose home care, whereas the control group did not, and the incentive to continue care at home until death might therefore be high compared with other studies.[28]

Limitations

The heterogeneity of the included studies was high, which is an important shortcoming in many reviews on palliative care. We aimed to improve the comparability of the effects in the included studies by using two outcome measures that were available for all patients, instead of more frequently used outcomes, such as quality of life, that can be measured with a wide variety of scales. Nonetheless, the interpretation of our findings, and especially the meta-analysis, should be considered within these limitations. Furthermore, the quality of the included studies varied as well. Most studies were of moderate quality or showed at least some potential bias. Interestingly, although all interventions studied could be described as complex interventions,[43] almost none of the studies included adherence to protocol or reported on it in a separate study.[44] Jordhoy *et al*. did describe failing implementations as important limitations in their study.[27] Failures in implementation are not necessarily limitations if clearly reported. Understanding why implementation failed and how such failure could have affected the results is important so others can learn how to improve future studies and care programs.

Conclusion

This review and meta-analysis of transmural team-based collaborations between hospital and primary care professionals in palliative care showed the interventions lowered hospital admissions and increased the number of patients dying at home. Hospital-based teams that follow patients at home seem to have the largest impact on these outcomes; however, the heterogeneity of the included studies limited strong overall conclusions.

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Supplement 1 searches

MEDLINE (Ovid)
Database(s): **Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R)** Daily and Ovid MEDLINE(R) 1946 to Present
Search Strategy:

#	Searches
1	palliative care/ or exp terminal care/ or Hospice Care/ or Terminally Ill/ or Palliative Medicine/ or (palliat* or terminal care or terminally ill* or terminal ill* or end of life or last year of life or LYOL or hospice care or advanced disease* or end stage ill* or end stage disease*).ti,ab,kw.
2	exp Patient Care Team/ or Community Health Services/ or Home Care Services/ or Transitional Care/ or (Cooperative Behavior/ and Palliative Care/) or ((speciali?ed or specialist or integrated or integrating or combine* or collaborati*) adj2 (palliative or terminal* or care or team*)).ti,ab,kw. or ((palliative care or interdisciplin* or inter-disciplin* or multidisciplin* or multi-disciplin* or multiprofessional or multi-professional or hospital or shared care or sharing care or collaborat* or transitional or transmural) adj3 (team* or service* or serving or healthcare or model* or program* or management or palliative care intervention* or PC intervention*)).ti,ab,kw.
3	mortality/ or hospital mortality/ or death/ or exp Hospitalization/ or hospitali?ation*.ti,ab,kw. or (hospital* adj3 (admiss* or readmiss* or discharg*)).ti,ab,kw. or death*.ti. or (death rate* or mortality rate*).ti,ab,kw. or ((death* or die or died or dying or mortalit*) adj12 (place* or home* or hospital*)).ti,ab,kw.
4	exp clinical trial/ or exp controlled clinical trial/ or observational study/ or comparative study/ or validation studies/ or exp case-control studies/ or exp cohort studies/ or evaluation studies/ or meta-analysis/ or follow-up studies/ or longitudinal studies/ or cross-sectional studies/ or multicenter study/ or controlled before-after studies/ or interrupted time series analysis/ or (evaluat* or random* or case-control or compar* or cohort or retrospective* or prospective* or valid* or predict* or systematic review).ti,ab,kw. or ((before adj10 (after or during)) or (time series adj2 interrupt*)).ti,ab,kw. or (analys* or trial).ti.
5	1 and 2 and 3 and 4
6	(exp child/ or exp Pediatrics/ or (child* or p?ediatr* or adolescen* or infan* or neonat* or newborn*).ti,ab,kw.) not (exp adult/ or adult*.ti,ab,kw.)
7	comment/ or letter/ or editorial/ or (letter or comment).ti.
8	(1 and 2 and 3 and 4) not 6 not 7

EMBASE (Ovid)
Database(s): **Embase Classic+Embase** 1947 to January 16 2020
Search Strategy:

#	Searches
1	exp *palliative therapy/ or exp *terminal care/ or *hospice care/ or exp *terminally ill patient/ or (palliat* or terminal care or terminally ill* or terminal ill* or end of life or last year of life or LYOL or hospice care or advanced disease* or end stage ill* or end stage disease*).ti,ab,kw.
2	(*patient care/ and team*.ti,ab,kw.) or community care/ or home care/ or ((speciali?ed or specialist or integrated or integrating or combine* or collaborati*) adj2 (palliative or terminal* or care or team*)).ti,ab,kw. or ((palliative care or interdisciplin* or inter-disciplin* or multidisciplin* or multi-disciplin* or multiprofessional or multi-professional or hospital or shared care or sharing care or collaborat* or transitional or transmural) adj3 (team* or service* or serving or healthcare or model* or program* or management or palliative care intervention* or PC intervention*)).ti,ab,kw.
3	death/ or mortality/ or hospital admission/ or hospital readmission/ or hospitalization/ or standardized mortality ratio/ or hospitali?ation*.ti,ab,kw. or (hospital* adj3 (admiss* or readmiss* or discharg*)).ti,ab,kw. or death*.ti. or (death rate* or mortality rate*).ti,ab,kw. or ((death* or die or died or dying or mortalit*) adj12 (place* or home* or hospital*)).ti,ab,kw.
4	clinical trial/ or controlled clinical trial/ or randomized controlled trial/ or exp comparative study/ or observational study/ or validation study/ or major clinical study/ or priority journal/ or exp case control study/ or cohort analysis/ or exp evaluation study/ or multicenter study/ or pretest posttest design/ or (evaluat* or random* or case-control or compar* or cohort or retrospective* or prospective* or valid* or predict* or systematic review).ti,ab,kw. or ((before adj10 (after or during)) or (time series adj2 interrupt*)).ti,ab,kw. or (analys* or trial).ti.
5	1 and 2 and 3 and 4
6	(child/ or exp pediatrics/ or (child* or p?ediatr* or adolescen* or infan* or neonat* or newborn*).ti,ab,kw.) not (exp adult/ or adult*.ti,ab,kw.)
7	letter/ or editorial/ or (letter or comment).ti.
8	(1 and 2 and 3 and 4) not 6 not 7

PSYCINFO (Ovid)
Database(s): **PsycINFO** 1806 to January 16 2020
Search Strategy:

#	Searches
1	palliative care/ or hospice/ or terminally ill patients/ or (palliat* or terminal care or terminally ill* or terminal ill* or end of life or last year of life or LYOL or hospice care or advanced disease* or end stage ill* or end stage disease*).ti,ab,id.
2	(exp *Palliative Care/ and exp *Teams/) or interdisciplinary treatment approach/ or integrated services/ or community services/ or partial hospitalization/ or ((speciali?ed or specialist or integrated or integrating or combine* or collaborati*) adj2 (palliative or terminal* or care or team*)).ti,ab,id. or ((palliative care or interdisciplin* or inter-disciplin* or multidisciplin* or multi-disciplin* or multiprofessional or multi-professional or hospital or shared care or sharing care or collaborat* or transitional or transmural) adj3 (team* or service* or serving or healthcare or model* or program* or management or palliative care intervention* or PC intervention*)).ti,ab,id.
3	exp "death and dying"/ or hospitalization/ or exp hospital admission/ or exp hospital discharge/ or mortality rate/ or hospitali?ation*.ti,ab,id. or (hospital* adj3 (admiss* or readmiss* or discharg*)).ti,ab,id. or death*.ti. or (death rate* or mortality rate*).ti,ab,id. or ((death* or die or died or dying or mortalit*) adj12 (place* or home* or hospital*)).ti,ab,id.
4	clinical trials/ or prospective studies/ or longitudinal studies/ or retrospective studies/ or cohort analysis/ or meta analysis/ or "literature review"/ or (evaluat* or random* or case-control or compar* or cohort or retrospective* or prospective* or valid* or predict* or systematic review).ti,ab,id. or ((before adj10 (after or during)) or (time series adj2 interrupt*)).ti,ab,id. or (analys* or trial).ti.
5	exp pediatrics/ or (p?ediatric* or child*).ti.
6	1 and 2 and 3 and 4
7	6 not 5

COCHRANE LIBRARY

#	Searches
#1	MeSH descriptor: [Palliative Care] explode all trees
#2	MeSH descriptor: [Terminal Care] explode all trees
#3	MeSH descriptor: [Terminally Ill] explode all trees
#4	palliat* or terminal care or terminally ill* or terminal ill* or end of life or last year of life or LYOL or hospice care or advanced disease* or end stage ill* or end stage disease*:ti,ab,kw (Word variations have been searched)
#5	#1 or #2 or #3 or #4
#6	MeSH descriptor: [Mortality] explode all trees
#7	MeSH descriptor: [Death] explode all trees
#8	MeSH descriptor: [Hospitalization] explode all trees
#9	hospitali?ation*:ti,ab,kw (Word variations have been searched)
#10	hospital* near/3 (admiss* or readmiss* or discharg*):ti,ab,kw (Word variations have been searched)
#11	death*:ti,ab,kw (Word variations have been searched)
#12	death rate* or mortality rate*:ti,ab,kw (Word variations have been searched)
#13	(death* or die or died or dying or mortalit*) near/12 (place* or home* or hospital*):ti,ab,kw (Word variations have been searched)
#14	#6 or #7 or #8 or #9 or #10 or #11 or #12 or #13
#15	MeSH descriptor: [Patient Care Team] explode all trees
#16	MeSH descriptor: [Community Health Services] explode all trees
#17	MeSH descriptor: [Home Care Services] explode all trees
#18	(speciali?ed or specialist or integrated or integrating or combine* or collaborati*) near/2 (palliative or terminal* or care or team*):ti,ab,kw (Word variations have been searched)
#19	(palliative care or interdisciplin* or inter-disciplin* or multidisciplin* or multi-disciplin* or multiprofessional or multi-professional or hospital or shared care or sharing care or collaborat* or transitional or transmural) near/3 (team* or service* or serving or healthcare or model* or program* or management or palliative care intervention* or PC intervention*):ti,ab,kw (Word variations have been searched)
#20	#15 or #16 or #17 or #18 or #19
#21	#5 and #14 and #20

CINAHL (Ebsco)

#	Searches
#1	((MH “Palliative Care”) OR (MH “Terminal Care+”) OR (MH “Hospice Care”)) OR ((MH “Hospice and Palliative Nursing”)) OR (MH “Terminally Ill Patients+”) OR (TI (palliat* or terminal care or terminally ill* or terminal ill* or end of life or last year of life or LYOL or hospice care or advanced disease* or end stage ill* or end stage disease*) OR AB (palliat* or terminal care or terminally ill* or terminal ill* or end of life or last year of life or LYOL or hospice care or advanced disease* or end stage ill* or end stage disease*))
#2	MH “Multidisciplinary Care Team+” OR (MH “Community Health Services”) OR (MH “Home Health Care”) OR (MH “Transitional Programs”) OR (TI ((speciali?ed or specialist or integrated or integrating or combine* or collaborati*) N2 (palliative or terminal* or care or team*)) OR AB ((speciali?ed or specialist or integrated or integrating or combine* or collaborati*) N2 (palliative or terminal* or care or team*))) OR (TI ((palliative care or interdisciplin* or inter-disciplin* or multidisciplin* or multi-disciplin* or multiprofessional or multi-professional or hospital or shared care or sharing care or collaborat* or transitional or transmural) N3 (team* or service* or serving or healthcare or model* or program* or management or palliative care intervention* or PC intervention*)) OR AB ((palliative care or interdisciplin* or inter-disciplin* or multidisciplin* or multi-disciplin* or multiprofessional or multi-professional or hospital or shared care or sharing care or collaborat* or transitional or transmural) N3 (team* or service* or serving or healthcare or model* or program* or management or palliative care intervention* or PC intervention*)))
#3	((MH “Mortality+”) OR (MH “Hospital Mortality”)) OR (MH “Death”) OR ((MH “Hospitalization+”) OR (MH “Patient Admission”) OR (MH “Patient Discharge+”) OR (MH “Readmission”)) OR (TI hospitali?ation* OR AB hospitali?ation*) OR (TI (hospital* N3 (admiss* or readmiss* or discharg*)) OR AB (hospital* N3 (admiss* or readmiss* or discharg*))) OR TI death* OR (TI (death rate* or mortality rate*) OR AB (death rate* or mortality rate*)) OR (TI ((death* or die or died or dying or mortalit*) N12 (place* or home* or hospital*)) OR AB ((death* or die or died or dying or mortalit*) N12 (place* or home* or hospital*)))
#4	(MH “Clinical Trials+”) OR ((MH “Case Control Studies+”) OR (MH “Prospective Studies+”)) OR (MH “Systematic Review”) OR (MH “Meta Analysis”) OR ((MH “Utilization Review+”) OR (MH “Quality Assessment+”)) OR MH “Quasi-Experimental Studies” OR MH “Control Group” OR (TI (evaluat* or random* or case-control or compar* or cohort or retrospective* or prospective* or valid* or predict* or systematic review or trial*) OR AB (evaluat* or random* or case-control or compar* or cohort or retrospective* or prospective* or valid* or systematic review or trial*))
#5	#1 AND #2 AND #3 AND #4

Supplement 2. Intervention components

Study	Description of intervention	Palliative care alongside disease modifying treatment +/-/ P(ossible)	Core team	Collaboration/ Consultations	Multidisciplinary Meeting	Coordination of care/ case- management	Palliative (Physical, Psychological, Social, Spiritual) assessment.	ACP/ End of life preparation	Patient Education (disease trajectories)	Symptom control	'Home care' (ADL)
Collaborative team hospital and primary care											
Brumley *et al.*, 2007, USA	- Palliative care physician coordinates care from a variety of healthcare providers. -All patients received initial assessments from physicians, nurses, and social workers.	+	Palliative care specialist, Palliative care nurse, Nurse (non--palliative), community nurse	GP, medical specialist. Social worker, spiritual counsellor or chaplain, bereavement coordinator, home health aide, pharmacist, dietitian, volunteer, physical therapist, occupational therapist, and speech therapist	No	+	+	+	+	+	+

Groenewoud *et al.*, 2020, the Netherlands	-multidisciplinary palliative care pathway consisting of eight steps: 1) early identification 2) assessment of needs at intake 3) weekly multidisciplinary meeting 4) medication review 5) timely conversation about wishes and needs at the end of life 6) good coordination between intra and extramural professionals 7) interview with caregiver(s) post-mortem 8) continuous monitoring of outcomes	+	GP or medical specialist, "chain' coordinator	GP, geriatrician, oncologist, pharmacist, spiritual caretakers	weekly	+	+	+	-	+	-
Jordhoy *et al.*, 2000, Norway	- All inpatient and out-patient hospital services were provided at the Palliative Medicine Unit (unless for medical reasons care was required elsewhere) - The team at the Palliative Medicine Unit served as a link to the community. - Predefined guidelines to keep optimum interaction between services. - Community professionals were offered an educational programme.	+ , on request	Palliative care specialist, Palliative care nurse, Nurse (non-palliative), GP, community nurse	Social worker, priest, nutritionist, physiotherapist	Once, after entry with patient, staff meetings weekly	+	+	+	-	+	C

Supplement 2. *Continued*

Study	Description of intervention	Palliative care alongside disease modifying treatment +/-/ P(ossible)	Core team	Collaboration/ Consultations	Multidisciplinary Meeting	Coordination of care/ case- management	Palliative (Physical, Psychological, Social, Spiritual) assessment.	ACP/ End of life preparation	Patient Education (disease trajectories)	Symptom control	'Home care' (ADL)
Kalluri *et al.*, 2018, Canada	- Multidisciplinary collaborative care. - Disease assessment and management with early integrated palliative care approach for interstitial pulmonary fibrosis - Patient-centred assessment, collaborative goal setting and shared decision making, practical advices on symptom self-management - Periodic reassessment needed.	+	Palliative care specialist, medical specialist, nurse practitioner	GP, community nurse, physiotherapist, occupational therapist, dietician	NM	+	+	+	+	+	C
Lawson *et al.*, 2009, Canada	- Creation of geographic community care teams composed of family physicians, home care coordinators, home visiting nurses, and hospital-based palliative care home consult physicians and nurses.	NM	Palliative care specialist, Palliative care nurse, GP, community nurse		No	+	NM	+	+	+	+

Smeenk *et al.*, 1998, Netherlands	- Transmural home care intervention programme -A specialist nurse coordinator - A 24 hour telephone service in the hospital with access to a transmural home team - A collaborative home care dossier - Protocols designed for specific care	+	Oncologist, Specialist oncology nurse	GP, community nurse	No	+	NM	+	NM	+	-
Benthien *et al.*, 2018/ Nordly *et al.*, 2019 / Benthien *et al.*, 2020 Denmark	- A systematic fast-track transition from oncological treatment to home-based specialized palliative care reinforced with a dyadic psychological intervention plus standard cancer care. - Five weekdays after randomization, a conference took place in the patient's home. The informal caregiver, representatives of the specialized palliative care team, a district nurse, the patient's general practitioner, and a project psychologist were invited.	+ (limited)	Palliative care specialist, Palliative care nurse	GP, community nurse, psychologist	Once after inclusion	+	+	-	-	+	+

Supplement 2. *Continued*

Study	**Description of intervention**	**Palliative care alongside disease modifying treatment +/-/ P(ossible)**	**Core team**	**Collaboration/ Consultations**	**Multidisciplinary Meeting**	**Coordination of care/ case- management**	**Palliative (Physical, Psychological, Social, Spiritual) assessment.**	**ACP/ End of life preparation**	**Patient Education (disease trajectories)**	**Symptom control**	**'Home care' (ADL)**
Tan *et al.*, 2016, Singapore	-Multidisciplinary team comprised of physicians, nurses and medical social workers with an oversight of care provided by a specialist palliative care physician. -24/7 hospice home services. -Clinical collaboration between the home care team and the department of palliative medicine. -Clinical decision followed-up by the hospital doctors. -Direct admissions rights.	P (minority)	Palliative care specialist, nurse (non-palliative) community nurse	Medical social worker	NM	+	+	+	-	+	+

Hospital-based team that follows patient at home

Ahlner--Elmqvist *et al.*, 2004, Sweden	-Hospital-based seven-days-a-week advanced home-care (AHC) complementary to existing inpatients care. -AHC visits' in accordance with needs, emergency services available 24/7. -Symptom treatment, counselling, emotional, social and family support.	+	Oncologist, nurse (non--palliative), community nurse	Physiotherapist, social worker, priest	Weekly	-	+	-	-	+	+
Bränn-ström *et al.*, 2014, Sweden	- Collaboration specialists palliative care and heart failure care. - Physical and palliative assessment - Nurse led person-centred palliative care. - Continuation through home visits and phone calls. - Diuretic administration, blood sampling and ECG possible at home.	+	Palliative care specialist, Palliative care nurse, Cardiologist, heart failure nurse	Physiotherapist, occupational therapist	bi-weekly	NM	+	+	+	+	+

Supplement 2. *Continued*

Study	**Description of intervention**	**Palliative care alongside disease modifying treatment +/-/ P(ossible)**	**Core team**	**Collaboration/ Consultations**	**Multidisciplinary Meeting**	**Coordination of care/ case- management**	**Palliative (Physical, Psychological, Social, Spiritual) assessment.**	**ACP/ End of life preparation**	**Patient Education (disease trajectories)**	**Symptom control**	**'Home care' (ADL)**
Cross et. Al., 2019, Australia	Case management by a dedicated doctor-nurse team; initial allied health assessment by a physiotherapist, occupational therapist and counsellor; access to further allied health input at home when required; and eligibility for 'intensive' specialist palliative care support (increased frequency of nursing, medical, and allied health visits, as well as access to up to 12-hours per day of in-home personal care by an Assistant in Nursing)	- (dis--charged when active treatment goal)	Palliative care specialist, Palliative care nurse	GP, Medical specialist. physiotherapist, occupational therapist, counsellors, community nurse	No	+	+	+	-	+	+

Pace *et al.*, 2012, Italy	-Palliative home-care for neuro-oncological patients. -Multidisciplinary team. -Home-visits every two days during terminal phase.	+	Neurologist, nurse (non--palliative)	GP, psychologists, rehabilitation therapists, social worker, health district services	Weekly	+	+	+	+	+	C
Case management coordinated by (hospital based) team/palliative care specialist(s)											
Radwany *et al.*, 2014, USA	-Within 3 weeks of enrolment first of 2 in-home geriatric/ palliative care visits to assess biopsychosocial needs, check of treatment options and wishes with GP. -The second visit: consumer goal setting. -Interdisciplinary team meeting to review the findings of the care manager's assessment and making of personalized care plan. -implementation of plan and to teaching, activation, and coaching of the consumer and/or care- giver. -24/7 access to the care manager or a hospital-based team member	+	Case-manager, Palliative care specialist, Palliative care nurse, Geriatrician	GP, geriatric nurse, social worker, spiritual adviser, dietitian, psychologist, pharmacist	After assessment	+	+	+	+	+	-

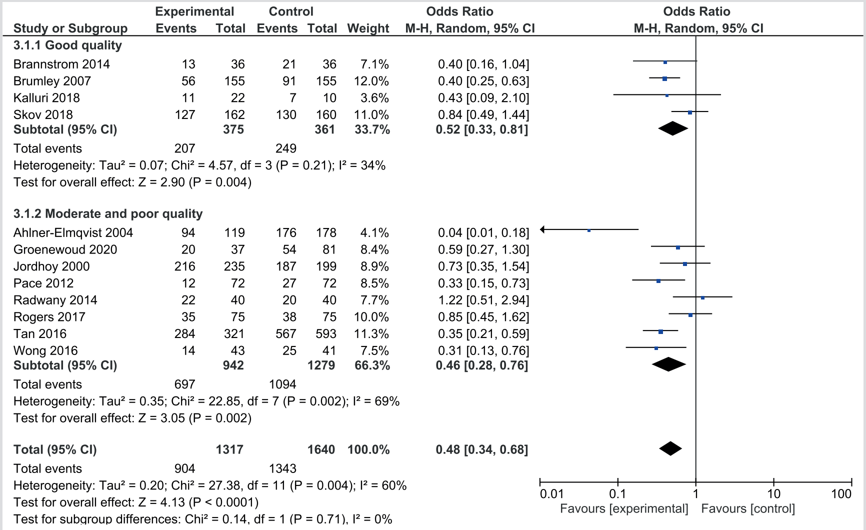
Supplement 2. *Continued*

Study	**Description of intervention**	**Palliative care alongside disease modifying treatment +/-/ P(ossible)**	**Core team**	**Collaboration/ Consultations**	**Multidisciplinary Meeting**	**Coordination of care/ case- management**	**Palliative (Physical, Psychological, Social, Spiritual) assessment.**	**ACP/ End of life preparation**	**Patient Education (disease trajectories)**	**Symptom control**	**'Home care' (ADL)**
Rogers *et al.*, 2017/ Mentz *et al.*, 2018/ Warraich *et al.*,2020 USA	-The study team assessed and managed the multiple domains of quality of life for patients with advanced heart failure, including physical symptoms, psychosocial and spiritual concerns, and advance care planning. -A certified palliative care nurse practitioner coordinated the aspects of the patient's care in collaboration with a hospice and palliative medicine board-certified physician. -Collaboration with each patient's clinical cardiology team and focused on shared goal-setting to combine HF symptom amelioration with palliative care goals	+	Case-manager (=palliative care nurse), Palliative care specialist.	Cardiologist, Heart failure nurse, Mental health provider	No	+	+	+	+	+	-

Wong *et al.*, 2016, Hong Kong	-Weekly home visits/ telephone calls in the first 4 weeks then monthly follow-up, provided by a nurse case manager Intervention. -The intervention was based on six principles: (i) case management with periodic review; (ii) discussion of end-of-life issues; (iii) multidisciplinary approach; (iv) staff development for communication, cardiovascular and PC; (v) discussion of treatment preferences and (vi) integrated model of care.	+	Case-manager (palliative home care nurse), Palliative care specialist	Social worker, trained volunteers	No	+	+	+	-	+	-

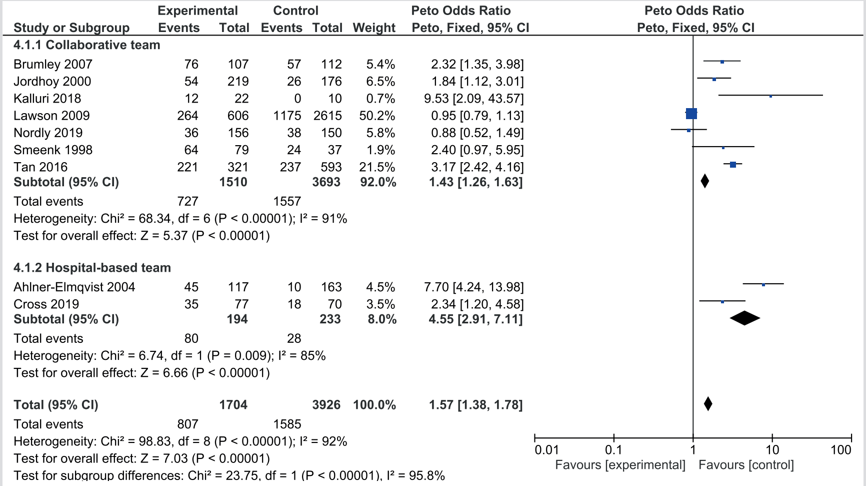
+= present. -=not present. NM=not mentioned. GP=general practitioner. PC=palliative care. HF: heart failure. C=in collaboration with.

Supplement 3. Sensitivity analysis



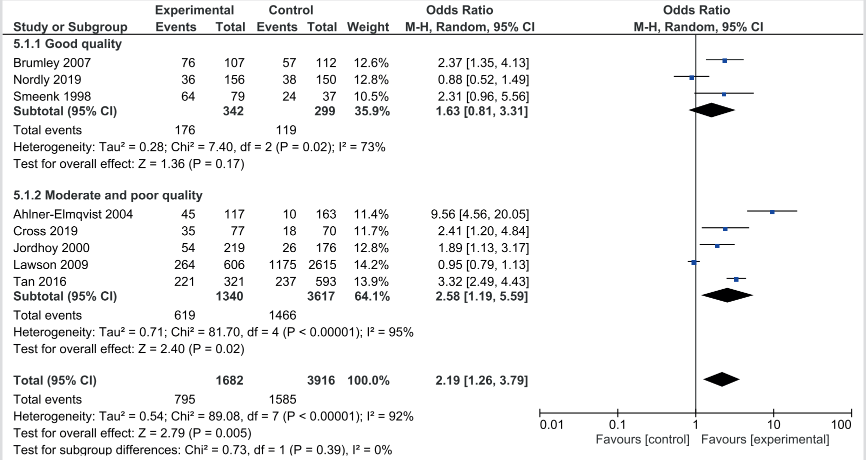
Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds Ratio M-H, Random, 95% CI
3.1.1 Good quality						
Brannstrom 2014	13	36	21	36	7.1%	0.40 [0.16, 1.04]
Brumley 2007	56	155	91	155	12.0%	0.40 [0.25, 0.63]
Kalluri 2018	11	22	7	10	3.6%	0.43 [0.09, 2.10]
Skov 2018	127	162	130	160	11.0%	0.84 [0.49, 1.44]
Subtotal (95% CI)		**375**		**361**	**33.7%**	**0.52 [0.33, 0.81]**
Total events	207		249			
Heterogeneity: Tau² = 0.07; Chi² = 4.57, df = 3 (P = 0.21); I² = 34%						
Test for overall effect: Z = 2.90 (P = 0.004)						
3.1.2 Moderate and poor quality						
Ahlner-Elmqvist 2004	94	119	176	178	4.1%	0.04 [0.01, 0.18]
Groenewoud 2020	20	37	54	81	8.4%	0.59 [0.27, 1.30]
Jordhoy 2000	216	235	187	199	8.9%	0.73 [0.35, 1.54]
Pace 2012	12	72	27	72	8.5%	0.33 [0.15, 0.73]
Radwany 2014	22	40	20	40	7.7%	1.22 [0.51, 2.94]
Rogers 2017	35	75	38	75	10.0%	0.85 [0.45, 1.62]
Tan 2016	284	321	567	593	11.3%	0.35 [0.21, 0.59]
Wong 2016	14	43	25	41	7.5%	0.31 [0.13, 0.76]
Subtotal (95% CI)		**942**		**1279**	**66.3%**	**0.46 [0.28, 0.76]**
Total events	697		1094			
Heterogeneity: Tau² = 0.35; Chi² = 22.85, df = 7 (P = 0.002); I² = 69%						
Test for overall effect: Z = 3.05 (P = 0.002)						
Total (95% CI)		**1317**		**1640**	**100.0%**	**0.48 [0.34, 0.68]**
Total events	904		1343			
Heterogeneity: Tau² = 0.20; Chi² = 27.38, df = 11 (P = 0.004); I² = 60%						
Test for overall effect: Z = 4.13 (P < 0.0001)						
Test for subgroup differences: Chi² = 0.14, df = 1 (P = 0.71), I² = 0%						

Figure 4. Meta-analysis: sensitivity analysis risk of bias on hospital admissions forest plot



Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
4.1.1 Collaborative team						
Brumley 2007	76	107	57	112	5.4%	2.32 [1.35, 3.98]
Jordhoy 2000	54	219	26	176	6.5%	1.84 [1.12, 3.01]
Kalluri 2018	12	22	0	10	0.7%	9.53 [2.09, 43.57]
Lawson 2009	264	606	1175	2615	50.2%	0.95 [0.79, 1.13]
Nordly 2019	36	156	38	150	5.8%	0.88 [0.52, 1.49]
Smeenk 1998	64	79	24	37	1.9%	2.40 [0.97, 5.95]
Tan 2016	221	321	237	593	21.5%	3.17 [2.42, 4.16]
Subtotal (95% CI)		**1510**		**3693**	**92.0%**	**1.43 [1.26, 1.63]**
Total events	727		1557			
Heterogeneity: Chi² = 68.34, df = 6 (P < 0.00001); I² = 91%						
Test for overall effect: Z = 5.37 (P < 0.00001)						
4.1.2 Hospital-based team						
Ahlner-Elmqvist 2004	45	117	10	163	4.5%	7.70 [4.24, 13.98]
Cross 2019	35	77	18	70	3.5%	2.34 [1.20, 4.58]
Subtotal (95% CI)		**194**		**233**	**8.0%**	**4.55 [2.91, 7.11]**
Total events	80		28			
Heterogeneity: Chi² = 6.74, df = 1 (P = 0.009); I² = 85%						
Test for overall effect: Z = 6.66 (P < 0.00001)						
Total (95% CI)		**1704**		**3926**	**100.0%**	**1.57 [1.38, 1.78]**
Total events	807		1585			
Heterogeneity: Chi² = 98.83, df = 8 (P < 0.00001); I² = 92%						
Test for overall effect: Z = 7.03 (P < 0.00001)						
Test for subgroup differences: Chi² = 23.75, df = 1 (P < 0.00001), I² = 95.8%						

Figure 5. Meta-analysis: peto-odds of home deaths forest plot



Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds Ratio M-H, Random, 95% CI
5.1.1 Good quality						
Brumley 2007	76	107	57	112	12.6%	2.37 [1.35, 4.13]
Nordly 2019	36	156	38	150	12.8%	0.88 [0.52, 1.49]
Smeenk 1998	64	79	24	37	10.5%	2.31 [0.96, 5.56]
Subtotal (95% CI)		**342**		**299**	**35.9%**	**1.63 [0.81, 3.31]**
Total events	176		119			
Heterogeneity: Tau² = 0.28; Chi² = 7.40, df = 2 (P = 0.02); I² = 73%						
Test for overall effect: Z = 1.36 (P = 0.17)						
5.1.2 Moderate and poor quality						
Ahlner-Elmqvist 2004	45	117	10	163	11.4%	9.56 [4.56, 20.05]
Cross 2019	35	77	18	70	11.7%	2.41 [1.20, 4.84]
Jordhoy 2000	54	219	26	176	12.8%	1.89 [1.13, 3.17]
Lawson 2009	264	606	1175	2615	14.2%	0.95 [0.79, 1.13]
Tan 2016	221	321	237	593	13.9%	3.32 [2.49, 4.43]
Subtotal (95% CI)		**1340**		**3617**	**64.1%**	**2.58 [1.19, 5.59]**
Total events	619		1466			
Heterogeneity: Tau² = 0.71; Chi² = 81.70, df = 4 (P < 0.00001); I² = 95%						
Test for overall effect: Z = 2.40 (P = 0.02)						
Total (95% CI)		**1682**		**3916**	**100.0%**	**2.19 [1.26, 3.79]**
Total events	795		1585			
Heterogeneity: Tau² = 0.54; Chi² = 89.08, df = 7 (P < 0.00001); I² = 92%						
Test for overall effect: Z = 2.79 (P = 0.005)						
Test for subgroup differences: Chi² = 0.73, df = 1 (P = 0.39), I² = 0%						

Figure 6. Meta-analysis: sensitivity analysis risk of bias on home deaths forest plot

Chapter 7

Feasibility of the PalliSupport care pathway; results from a mixed-method study in acutely hospitalized older patients at the end of life

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Abstract

Background: A transitional care pathway (TCP) could improve care for older patients in the last months of life. However, barriers exist such as un-identified palliative care needs and suboptimal collaboration between care settings. The aim of this study was to determine the feasibility of a TCP, named PalliSupport, for older patients at the end of life, prior to a stepped-wedge randomized controlled trial.

Methods: A mixed-method feasibility study was conducted at one hospital with affiliated primary care. Patients were ≥60 years and acutely hospitalized. The intervention consisted of 1) training on early identification of the palliative phase and end of life conversations; 2) involvement of a transitional palliative care team during admission and post-discharge; 3) intensified collaboration between care settings. Outcomes were feasibility of recruitment, data collection, patient burden and protocol adherence. Experiences of 14 professionals were assessed through qualitative interviews.

Results: Only 16% of anticipated participants were included which resulted in difficulty assessing other feasibility criteria. The qualitative analysis identified misunderstandings about palliative care, uncertainty about professionals' roles and difficulties in initiating end-of-life conversations as barriers. The training program was well received and professionals found the intensified collaboration beneficial for patient care. The patients that participated experienced low burden and data collection on primary outcomes and protocol adherence seems feasible.

Discussion: This study highlights the importance of performing a feasibility study prior to embarking on effectiveness studies. Moving forward, the Pallisupport care pathway will be adjusted to incorporate a more active recruitment approach, additional training on identification and palliative care, and further improvement on data collection.

Background

With the aging population and growing number of people living with, and dying from, chronic diseases, the need for well-organized palliative care is increasingly urgent.[1] Currently, palliative care for older patients is hindered because of multiple barriers: lack of timely identification of palliative needs,[2] infrequent conversation about goals of care,[3, 4] insufficient collaboration between care professionals[5, 6] and little caregiver support.[7, 8] These barriers can result in unwanted care transitions, mainly acute hospitalizations, and patients not dying at their preferred place.[9-13] A transitional palliative care intervention could overcome these barriers through early identification of needs, advance care planning, symptom management and coordination of care.[14]

For this purpose, the PalliSupport care pathway was developed that aims to provide patient centred, goal-oriented care throughout different care settings for older patients and their relatives in the last year of life. The starting point of the pathway is an acute hospitalization, because up to 35% of older patients die in the following year,[15] and hospitalizations can often result from unidentified palliative care needs.[15-17] The PalliSupport care pathway was developed according to the MRC-framework.[18] During phase one, the development stage of the intervention, we performed qualitative studies to assess barriers to timely identification of palliative care needs[19] and barriers leading to transitions between community care and the hospital for patients with palliative care needs.[20] Furthermore, in as of yet unpublished studies we assessed instruments that could aid care professionals in identifying patients in the last year of life, and explored the effectiveness of collaborative palliative care teams. In collaboration with experts and after studying best practises, we developed the training modules and established the steps of the pathway. This led to the Pallisupport transitional care pathway consisting of training modules on early identification, advance care planning, protocols on interprofessional and transitional collaboration and establishment of a transitional palliative care team.

Currently, the effectiveness of the pathway is being studied in an ongoing stepped-wedge Randomized Controlled Trial (RCT). In order to assess the effectiveness of the pathway two outcomes were chosen: (1) hospital admissions and (2) number of patients dying at their preferred place of death. These outcomes can be seen as indicators of good symptom control by reducing the need for unplanned hospitalizations and organization of care in such a manner that patients' wish to die at their preferred place can be fulfilled. Prior to the stepped-wedge RCT we performed a mixed-method feasibility study, which we present here.[21] The specific objectives of this study were:

1. To determine feasibility of the study protocol on
    a. Patient and informal caregiver recruitment
    b. Data collection

   c. Patient burden
   d. Implementation of study components and protocol adherence
2. To assess the experiences of professionals with the training module and the care pathway to determine acceptability of the intervention.

Methods

Study design

This was a mixed-method feasibility study set in the Netherlands in one urban hospital and affiliated primary care facilities, such as general practitioners offices, community care organizations and care homes. Patients were recruited between February and July 2018 and followed for six months after discharge. During the same period, care professionals who were involved in the intervention were interviewed. For the qualitative data a qualitative description approach was used,[22] for this allowed us to acquire firsthand knowledge of professionals' experience with the intervention.[23] The CONSORT checklist for extension for randomized pilot and feasibility trials was followed for reporting this study.[24] However, this was not a randomized feasibility study, thus not all criteria applied.

Participants and recruitment

We aimed to include 50 patients in the pre-set duration of this study (6 months) for this meant one inclusion per week per department. Eligible patients were ≥60 years and acutely hospitalized for at least 48 hours at the department of pulmonology or gastroenterology. We selected these departments because we aimed to include patients with a variety of diagnoses and not solely cancer. However, due to the low inclusion rates, we decided also to recruit from the oncology department during the last two months of the study. Presence of palliative care needs was defined as a positive Surprise Question, "Would I be surprised if the patient died in the next 12 months?", and the presence of two or more *Supportive and Palliative Care Indicators Tool*™ (SPICT™) criteria, which include amongst others decline in functional status, repeated unplanned hospital admissions and significant weight loss in the last three to six months.[25, 26] Patients who lived outside a set postal code area, who were cognitive impaired (Mini-Mental State Examination <15) or did not speak Dutch were excluded. Furthermore, if patients had an informal caregiver, the caregiver was asked to participate in the study to assess caregiver burden. Only informal caregivers that provided more than 8 hours of care per week, were 18 years or older, and were able to answer Dutch questionnaires could participate. Participation of an informal caregiver was not a prerequisite for patient participation.

Department-based residents and nurses informed the transitional palliative care team (TPCT) if they identified patients with palliative needs and a TPCT member then approached each eligible patient for participation. There was no active recruitment from the researchers. Due to privacy laws in the participating hospital we were not allowed to assess data on eligible patients and only on those approached by the palliative care team.

Interventions

Interventions were done on A) department level and B) palliative care team level. Table 1. shows the different steps of the pathway and who performs them. Because the aim of the study was to assess feasibility, no control group was used. In the ongoing RCT, the care pathway is being compared to usual care. Usual care entails generalist care with on demand specialist palliative care services in the hospital without follow-up in home-setting and without intensified collaboration between care settings.

A) Intervention on department level

We gave presentations about early identification for nurses and physicians at the participating departments. In addition, we hosted a practical and interactive training module, spread out over two afternoons and aimed at both nurses and physicians, on how to initiate end of life conversations (in Dutch: STEM-training). The training incorporated discussions about the participants' personal values regarding the end of life but also addressed how different types of patients tend to have different preferences when it comes to talking about the end of life.

B) Intervention on palliative care team level

Prior to the study, a palliative care team consisting of two clinical nurse specialists, a specialized general practitioner (GP), an oncologist and GPs in training, worked on a consultation basis within the hospital. Patients for whom they were consulted were mostly patients with cancer and on average they were consulted 17 days prior to death. Team members performed palliative assessments and advance care planning conversations and patients were discussed within multidisciplinary team meetings (MDTs) where other medical specialists and non-medical specialists were present. The team was available for patients during office hours and did not follow-up in the home-setting.

To enable the team to work transitionally, changes were made to the working method of the team. Two community care nurses joined the team. Individual care plans were formulated with the patient and discussed during the MDT. The GP of participating patients and if involved, community nurse, were invited to the MDT. If the GP could not be present, a handover was done by phone. The patient, GP and community nurse received a copy of the individualised care plan whereas informal caregivers received information about caregiver support. The TPCT provided at least one home visit. A new colour code, ranging from green to red, was introduced to decide if the TPCT should stay involved. This was based on severity of symptoms and needs, and (im)possibilities of generalists to provide the necessary care, with green suggesting low needs and no further involvement unless requested by other professionals, and red meaning high needs and frequent involvement of the team. MDTs were

Table 1. Components of the intervention

Intervention	Components	Intervention conducted by
Identification of palliative care needs during admission	- Identification of palliative needs based on Surprise Question and ≥ 2 SPICT criteria* - Palliative Care team is consulted	Department nurses and physicians
Palliative care assessment & Advance care planning.	- Assessment of needs, preferences and symptoms on 1) physical, 2) psychological 3) social and 4) spiritual level - Discussion of treatment limitations+ - Discussion of preferred place of death+ - Formulating individualised care plan+	Palliative care team and/or department physician
Multidisciplinary team meeting	- Weekly discussions about patients with the palliative core team, hospital specialists and non-medical specialist - Invitation GP and community nurse (either in person or by phone)* - Discussing individualised care plan* - The complexity of the patient's palliative care situation is assessed using the new working methods (colour coding indicating the stability and severity of the problems) *	Palliative care team, department physician, GP, community nurse
Discharge	- Patient receives individualised care plan* - Informal caregiver receives information sheet about support*	Palliative care team or department physician/nurse
Handover	- Contact with GP at least once prior to discharge/during MDT meeting+ - MDT summary is sent to GP and/or community nurse within 24 hours of discharge+ - Medial handover is send to GP within 24 hours of discharge+	Palliative care team and/or Department physician/nurse
Home visit and follow-up	- Home visits at place of care* If applicable - Follow-up discussion at MDT* - Adjustment of individualised care plan* - Adjustment of colour coding*	Palliative care team

*Components that were completely new within the intervention

+Components that were already performed for some patients but should be done for all patients during the study continued for patients as long as the TPCT stayed involved. It is important to note that the team retained a consulting function and was never 'in-charge' of the patients. The team was available 24/7 for other professionals during the study period. During the study, the palliative care team received funding to compensate for the extra hours they made. GPs did not receive funding from the study itself, but there are financial constructions in place in the Netherlands where GPs can get additional payment for a so called 'palliative care consult' when participating in a MDT.

Data collection

Feasibility criteria with regard to recruitment, data collection, patient burden and protocol adherence were set prior to the study (table 2.) These criteria were assessed through quantitative data collected from the electronic medical record and through questionnaires at baseline, two weeks, one month, three months, and six months post discharge. The questionnaires included the EuroQol-5D+C,[27] the Palliative outcome scale[28] the Edmonton Symptom Assessment System[29] and for caregivers the CarerQol-7D and CarerQol-VAS.[30] Furthermore, self-reported use of primary care services, which entailed hours of home care and number of (out of hour) GP visits, were reported using the questionnaires. The burden of answering the questionnaires was reported using a 10 point likert scale, with one meaning no burden at all, and 10 meaning very high burden. Hospital-based health care utilization (number and days of hospital admissions, ER visits, palliative care team consultations) was obtained from the electronic medical record (EMR). If applicable, place of death was

Table 2. Feasibility criteria

Feasibility criteria	Criteria met
50 patients are included during six months	8 were included (16%)
60% of patients who meet the inclusion criteria consent to participate in the study	61% consented (8/13)
50% of patients assign an informal caregiver	62.5% assigned informal caregiver
90% completes baseline demographics and questionnaires by participants at baseline	100% complete questionnaires at baseline
80% completed primary outcome (readmission) 80% complete questionnaires by alive participants at the follow-up measure points (two weeks and one, three and six months post-discharge)	75% completed questionnaires, primary outcomes known for all
Burden for patients and informal caregivers to complete the questionnaires is low, median score lower than 4 on a 10 point likert scale	Patients scored the burden of answering the questionnaires as low with a median score of 1.6 (IQR 1-3) on a ten point Likert scale.
Patients complete all the steps of the intervention (specified in table 1) or meet the primary end-point (death)	Not all steps of the interventions were followed for all patients

obtained from the EMR. Adherence to the intervention protocol was assessed through records kept by the palliative care team. This included number and content of consultations, attendance records of the MDTs, use of color code, if care plans were handed over, and the time at which handovers were sent. All quantitative data was collected in CASTOR Electronic Data Capture for safe and valid data collection.[31]

To assess professionals' experiences and opinions about the interventions in the PalliSupport pathway, semi-structured interviews were conducted. Participants were recruited based on their involvement in the trial components. To this end we recruited members of the palliative care team, physicians and nurses that cared for study participants at the departments, and participants' GPs. Interview questions were adjusted to the professionals' role in relation to the study components. For example, department professionals were asked about their experience with identifying patients for the study, whereas GPs were asked about their experience on collaboration with the palliative care team. The interviews were audio-recorded. Furthermore, a survey was conducted among the training participants.

Data analysis

Quantitative data was analyzed through descriptive statistics using SPSS version 24.0.[32] The semi-structured interviews were transcribed verbatim and were thematically analyzed to explore the experiences and perspectives of professionals on the feasibility of the Pallisupport care pathway.[33, 34] Two researchers, IF and DN, independently analyzed the data by reading and rereading the transcripts and coding relevant passages. Initially an open coding scheme (inductive coding), was used. However some codes arose from specific interview questions and thus from deductive coding. The relevant passages were structured into different themes that related to the acceptability and feasibility of the transitional care pathway. Data saturation was not sought, because the number of professionals from each setting was too limited. MAXQDA software (version 12.02) was used to extract and analyse the data.[35]

Results

Patient baseline and outcomes

Eight patients were included. Baseline characteristics are presented in table 3. One patient died during the index admission; a further five patients died in the following six-months. Time between inclusion and death ranged between 2-79 days (mean 44.6). Three patients died at home, one in a hospice and two in the hospital. Two out of five patients died at their preferred place. Three patients had a at least one readmission.

Table 3. Baseline characteristics

Baseline characteristics	**n=8**
Male (%)	5 (62.5)
Age, median (IQR)	73 (66-76)
Marital status (%)	
Married	5 (62.5)
Widowed	2 (25)
Single	1 (12.5)
Living arrangement (%)	
independent at home	5 (62.5)
at home with help	3 (37.5)
Hospitalization in past 6 months (%)	5 (62.5)
Charlson comorbidity index, median (IQR)	6.5 (6-7.75)
Polypharmacy (n=7) (%)	87.5
Prior consultation palliative care team	none

IQR= Interquartile range

Feasibility criteria outcomes

The feasibility criterion on recruitment was not met, only 16% (n=8) of anticipated patients were included. Because of this low participation number the interpretation of the other criteria is difficult (table 2). The number of eligible patients is unknown. A total of 23 patients, for whom the palliative care team was consulted, were excluded because these patients were already dying (7), there was a language barrier (2), no consent (5), or cognitive impairment (2), they were living outside of postal code area (5), or discharged before consent could be asked (2).

All baseline questionnaires were completed, 75% of follow-up questionnaires were completed until death or end of study. One participant did not want to continue with the questionnaires, while one patient could not answer the questionnaire because he was in the dying stage. The intended primary outcome (readmissions) and data on place of death, health care usage and palliative care team consultations were known for all patients. Protocol adherence was not met for all patients. For all discharged patients, palliative assessments, MDT meetings, colour code assignment, care plan formulation and home visits were completed. However, the MDT was not always held prior to discharge because the meetings could only be held once a week and admissions were often short. Furthermore, the GPs could not always be present during the MDT due to time restraints, however all but one were contacted by the TPCT during the hospital admission. The medical handover was not always sent within 24 hours and two patients and one caregiver did not receive a their care plan or information sheet.

Experiences and opinions of professionals

Overall, 34 professionals participated in the training modules and answered the survey. Furthermore, 14 professionals were interviewed (table 4). Here we present the findings on 1) Training module 2) Inclusion/identification 3) Transitional palliative care team 4) Responsibility. Quotes were added to illustrate the findings.

Table 4. characteristics interview participants

Organisation Division Respondent	**Gender**	**Age, ranged**	**Experience in current role, years**
Hospital			
Pulmonary department			
1. Nurse-in-training	F	20-29	3.0
2. Nurse	F	40-49	3.0
3. Resident	M	30-39	2.5
Gasteroenterology department			
4. Nurse-in-training	F	30-39	1.0
5. Nurse	F	30-39	2.5
6. Physician in training	M	20-29	3.0
7. Nurse team leader	F	40-49	1.0
Hospital and Primary care			
Transitional palliative care team			
8. Specialist nurse	F	30-39	6.0
9. Specialist nurse	F	30-39	4.0
10. General practitioner in training	F	30-39	2.0
11. General practitioner	F	40-49	6.0
12. Community nurse	F	40-49	unknown
Primary care			
13. General practitioner	M	50-59	20.0
14. General practitioner	F	40-49	unknown

M=male F=Female

1) Training module

The participants rated the training a 7.9 out of 10. The fact that the training was combined for both nurses and physicians was evaluated positively, as contributing to collaboration on this subject. Most participants also felt the training addressed an important subject and that the training contributed to their skills. When asked for ways to improve the module, the participants suggested incorporating training on how to improve communication with patients of different cultural and religious backgrounds, allotting more training time to conversation practice and offering the training module more often to ensure maximum participation.

2) Inclusion/identification

The exclusion criteria were found to be strict, which resulted in patients who could have benefitted from palliative care not being approached. Two physicians described that identification of patients for the study was not high on their priority list due to other more pressing matters during their workday. Despite the training, many physicians continued to associate palliative care with the terminal or dying stage. Nurses described being frustrated that physicians often did not agree patients were suitable for palliative care, and thus not eligible for the study, and were afraid to be turned down if they suggested otherwise.

> *"But then you say, well I think that the patient does not have a year to live. Shouldn't we be thinking about PalliSupport? By which, yes, to me it still feels a bit like I am devaluing the physician. They are still busy trying to fix the problem. To treat." (department nurse)*

Other barriers to inclusion were respondents' hesitation to introduce the transitional palliative care team to patients because they feared patients would react negatively. Furthermore, some respondents felt the hospital was not the best setting to hold conversations about palliative care because of short admission time, focus on cure and lack of privacy in hospital rooms. Working in shifts also made it difficult to bond with patients, which many considered a precondition for starting end of life conversations. Furthermore, nurses felt they needed approval of physicians to start end of life conversations.

> *"That they (physicians) just find it scary to address the subject, I think. And as a nurse it can sometimes be very difficult to start a conversation about the end of their life when the physician says everything will be alright".* (department nurse)

All in all, respondents felt that, despite the training, they were still late to initiate palliative care. Suggested improvements for inclusion were: appointing a dedicated professional at each department that would be responsible for assessing potential participants and taking a moment each day to assess patients for potential participation.

3) Transitional palliative care team

The specialist nurses and community nurse found the home visits to be very informative, yet time-intensive. The protocol stated all patient should have one home visit, however some felt this was not necessary in all cases and should be based on the colour code assigned during the first MDT.

> *"Well it's just fun (laughter), to get on your bike and go somewhere. That's very different from when you see someone in their (hospital) bed here. Because you really enter someone's world. And then you walk in and you think, I see a stair lift here. Then it turns out that this man already has a stair lift. Well the stair lift is from the neighbour but he can use it himself as well. And those are the relevant things you don't pick up on as quickly if you see someone in their (hospital) bed."* (specialist nurse, TPCT)

Participation in the MDT by the GP was thought to improve collaboration and clarification of responsibility, but was difficult to achieve logistically. Being available after hours constituted a major time investment for the small team while the benefit was unknown and they were consulted only once by the professionals. The TPCT was also open for telephone consultation with patients and relatives. Although this was not stated in the protocol, respondents felt the phone calls increased because of the home visits.

> *"But I have experienced regularly that a GP is present at the MDT. That we discuss together what would be good for a patient and that the GP is very happy with it. He (the GP) receives tailored advise from specialist. (…) So some GPs are very happy about it. And other GPs, yeah, it's difficult, you don't see them or hear from them.* (GP in training, TPCT)

4) Responsibility

The specialist nurses of the TPCT felt a continued responsibility for patients in the study. They continued to check-up on them, even though this was not stated in the protocol. This was thought to lead to increased expectations of patients and the GPs.

> *"At the same time it creates expectations, because I cannot solve everything myself and not everything belongs on my plate. So it immediately raises new questions. Like, is this my responsibility? So yes, it could have a negative side, that it creates to much expectations for a patient."* (specialist nurse, TPCT)

One of the GPs had the expectation that the TPCT would become the main contact in the hospital for the patient. Both the GPs and the TPCT members felt the GP was primarily responsible for a patient after discharge and the home visits were perceived to be somewhat interfering with the GP's responsibility. Therefore, discussing with the GP when and why home visits were performed was well received. The protocol however did not include how the TPCT should report back to GPs after each home visit, which was also thought to be necessary.

Discussion

This was a mixed-method feasibility study to assess the PalliSupport care pathway prior to a stepped-wedge RCT. The protocol in its current form proved to be unfeasible because of the low recruitment rate. Additionally, protocol adherence and data collection of secondary outcomes need improvement. The training module was found to add to the professionals' communication skills and was thought to improve patient care. Continued misunderstanding of when palliative care can be initiated, hindered the study, as well as time restraint.

Findings and comparison to literature

Within the Medical Research Council Framework a feasibility study is an important step in the development of a complex intervention after the developing stage.[18] Feasibility studies in palliative care are rare. While many studies are described as feasibility studies, such studies do not always include criteria to judge success or failure.[21, 36] In our study we did formulate feasibility criteria on recruitment, data collection, patient burden and protocol adherence. The biggest setback in our study was the low recruitment rate which also influenced how we could interpret the other criteria. Low recruitment is not uncommon in palliative care studies.[37] A review on cancer studies by Grand *et al.*, determined that obstacles for accrual can be found in three different categories: clinician, patient and system.[38] In our study clinicians seem to have formed the biggest barrier to recruitment because the number of times the TPCT was called was considerably lower than anticipated and if they were called, many patients were already dying. Unfortunately, because of strict privacy laws in this particular hospital, researchers could not access patients records to assess potential participants themselves. Clinicians are often hesitant to approach patients and informal caregivers with a request for study participation in such a vulnerable time in the patients' lives, and some doubt it is even ethical to do so.[39, 40] However, patients and caregivers in our study did not report their participation to be a heavy burden. Although inclusion criteria were set for participation, clinicians' own assessment of the need for palliative care seemed to overrule these set criteria. Physicians, in particular, still associate palliative care with the terminal or dying stage and in our study therefore did not suggest patients for participation.[41] Furthermore, while nurses seem to identify patients earlier in their trajectories, they can be hesitant to disclose these findings to physicians.[42] We therefore have to conclude that solely relying on department clinicians to enrol patients for participation is not feasible.

Baseline data collection and data on the RCT's primary outcome (re-hospitalization) were achieved for all patients. Our secondary outcomes depended on the completion of follow-up questionnaires. However, these were not always completed. This is not surprising. When patients are nearing death, answering questionnaires becomes more difficult. Assessing quality of life through questionnaires with relatives, such as the Quality of Dying and Death Questionnaire, could overcome this data gap.[43] However, when choosing primary outcomes measures in palliative care, more practical measures, such as hospitalization or place of death, increase the success rate of follow-up.

Protocol adherence was based on previous formulated steps that had to be met for each patient. The different steps of the intervention were not always followed according to our intended sequence and in the intended manner, although this conclusion is based on limited data. In some cases this was limited to the MDT being post-discharge. In another case the GP was not contacted, and in yet other cases the care plan was not provided to patients which both could potentially influence the effectiveness outcomes. Care pathways are by definition complex interventions and need to be adjusted to the structures already in place.[44] Complete adherence to all parts of the protocol might therefore not be achievable. When evaluating the effectiveness of care pathways, a process evaluation can contribute to the understanding of what is implemented and to what extent this influences effectiveness outcomes.[44-46]

Our qualitative data yielded insight into another aspect that could hinder our RCT: difficulty in transitional collaboration and division of roles. Lack of collaboration between specialists and generalists in palliative care has been a frequent occurrence.[47, 48] In the Netherlands the GP is the gatekeeper and most often the primary physician during the last phase of life. This responsibility is temporarily transferred to medical specialists when patients enter the hospital. The transitional palliative care team aimed to act as a bridge between the two settings and to provide transmural consultation. However, both the transitional palliative care team and GPs feared that, because of the home visits, the team would take over the care for the patient at home. This could lead to an unnecessary power struggle between the two which could be an important barrier to the success of the intervention.

Implications for the effectiveness trial

Based on the findings of this feasibility study the protocol for the ongoing stepped-wedge RCT has been adjusted. First, to improve inclusion rates during the RCT, instead of waiting for clinicians, researchers are now actively screening the admission records for potential participants and asking the Surprise Question within the daily rounds.[49] Second, an e-learning on timely identification and starting conversation about the end-of-life has been added to the training program. Third, a questionnaire for relatives on quality of dying and death, has been included.

Fourth, to improve collaboration between primary and secondary care, the set-up of the transitional care pathway has been adjusted so that GPs, medical specialists, nurses and the palliative care team are now all involved from the start. We have also started identifying existing regional structures for palliative care building upon these structures. In addition, prior to the intervention phase of the study, meetings are being held between the study coordinators, palliative care teams and primary care organisations to make collaboration agreements and to enhance familiarity with the project.

Fifth, to lower the burden for the TPCT's the 24/7 availability has been removed from the trial. Finally, we have adopted a rigorous mixed-method process evaluation according to the MRC framework alongside the stepped wedge RCT.[18]

Strengths and limitations

This feasibility study was designed to identify potential shortcoming in a study protocol for a stepped-wedge RCT in correspondence with the tutorial by Thabane *et al*.,[21] This led to valuable adjustments in the research protocol. However the design of the feasibility study itself could also have been improved. Including experiences and perspectives of patients on the project could have given a different perspective. Furthermore, we could not collect data on all eligible patients but only on those for whom the TPCT was called. Therefore, we do not known the actual number of potential participants. Additionally, this was a feasibility study with one study site. We do not expect major differences in feasibility in other sites. However, we cannot be certain that all results can be generalized to other geographical settings. Regional implementation barriers and facilitators will be investigated as part of a comprehensive process evaluation of the stepped wedge RCT.

Conclusion

The PalliSupport care pathway protocol outlined in this paper, needs to be adjusted to improve recruitment, protocol adherence and data collection at follow-up. When developing a complex intervention in a palliative care setting, such as a care pathway, it is advised to perform a thorough feasibility study before embarking on larger trials. Special attention should be given within the study protocol to recruitment and how to involve clinicians in this process. Data collection can be challenging during follow-up because of the fragile condition of the participants and outcome measures should be chosen deliberately. Process evaluations should be a part of your trial to determine which aspects of an intervention work within the existing structures and how implementation will affect the effectiveness outcomes.

Ethical considerations

The study protocol was judged by the medical ethical board of the Amsterdam UMC, location AMC and exempted from assessment according to the Medical research Involving Human Subjects Act. Reasons being that the focus of this study was to see if components of the intervention were feasible, mainly on organisation of care level. Furthermore, there was no randomization and patients were aware of the care they would receive. This study has been registered at the ISRCTN registry with reference number ISRCTN14361072.

All participants provided written informed consent before participation. Data was made irreducible and will be kept for 15 years after study closure.

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Chapter 8

Effectiveness of transmural team-based palliative care for older patients at the end of life, PalliSupport: protocol of a stepped-wedge cluster randomized trial

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Abstract

Background: Acutely hospitalized older patients at the end of life are often not identified as in need of palliative care. Therefore these patients do not receive optimal palliative care, leading to reduced quality of life, unplanned readmissions and not dying at place of preference. The aim of this paper is to describe the protocol of a study to investigate whether transmural team-based palliative care for older patients at the end of life can reduce unplanned readmissions at the end of life and facilitate death at the place of preference (The PalliSupport care pathway).

Methods: In a stepped wedge cluster randomized controlled trial, 380 eligible patients, ≥ 65 years with a life expectancy of ≤ 1 year will be enrolled from internal medicine, cardiology, pulmonology, oncology or geriatric medicine wards in five hospitals in the Netherlands. Patients included in the care as usual phase will receive standard care. Five clusters will switch to the intervention phase. A cluster is a hospital and surrounding healthcare organizations .The PalliSupport care pathway consists of five components: 1) identification of palliative care needs during admission, 2) palliative care assessment and advance care planning by a transitional palliative care team, 3) multidisciplinary team meetings, 4) discharge and comprehensive handover, 5) home visits and follow up. The primary outcome for this study is the number of patients with an unplanned readmission in the six months after inclusion. Secondary outcomes are death at preferred place, quality of life, symptom burden, health care utilization and caregiver burden. Follow up takes place at baseline and two weeks, three, six and twelve months after discharge.

Discussion: This study will provide new knowledge on the effectiveness, cost-effectiveness and fidelity and reach of transmural team-based palliative care in acutely hospitalized older patients.

Background

Older patients at the end of life are often not timely identified as being in need of palliative care.[1] Consequently, end-of-life preferences are not discussed and palliative care is not initiated, which can result in multiple care transitions at the end of life,[2] a high symptom burden,[3] reduced quality of life and not dying at the preferred place of death.[4, 5]

The early integration of palliative care has been the focus of much research and the benefits become increasingly known.[6, 7] Early palliative care has the potential to increase quality of life and decrease symptom burden.[8] Early proactive palliative care has become an integral part of nursing home care and is increasingly implemented in general practices in the Netherlands.[9-11]

However, long-term implementation in daily practice has not yet fully succeeded, particularly not in older acutely hospitalized patients with end-stage organ failure.[12] This can be attributed to several causes, such as the difficulty of prognostication, especially in patients with non-oncological diseases, and the continuing focus on curative treatment by care professionals and the belief that palliative care is only needed when all disease modifying options are exhausted.[13] These barriers hinder the early integration of palliative care and can result in inappropriate treatment.[14, 15]

Furthermore, in the Netherlands palliative care is provided in different care settings, both by generalists and specialists in palliative care.[16] This can cause fragmentation, suboptimal collaboration and communication, late and incomplete handovers, resulting in unplanned hospital readmissions at the end of life.[17]

Specialist palliative care in the Netherlands is mainly provided on consulting basis, both in hospitals and primary care. Timely specialist palliative care can have a positive effect on symptom management, reduce unplanned hospital admissions and improve the overall quality of life for older patients at the end-of-life, as well as their relatives.[18] However, the number of consultations is low and often in the last days of life.[19] Additionally, patients and informal caregivers caring for patients at the end-of-life lack the awareness that death is near and often informal caregivers become overburdened.[20]

To overcome these barriers and to improve transitions in palliative care we developed the The PalliSupport care pathway, a complex intervention that consists of five components: 1) identification of palliative care needs during admission, 2) palliative care assessment and advance care planning by a transitional palliative care team, 3) multidisciplinary team meetings, 4) discharge and comprehensive handover, 5) home visits and follow up.

The aim of this paper is to describe the study investigating whether the implementation of transmural team-based palliative care for acutely hospitalized older patients at the end of life can reduce readmissions in the last six months of life and facilitate death at the place of preference. We report on the design of the PalliSupport care pathway for older patients at the end of life and on the methods that we will use for its evaluation.

Methods

This study follows the Standard Protocol Items for Interventional Trials (SPIRIT) checklist (Additional file 1).[21]

Methodological framework

We used the Medical Research Council (MRC) framework for the development, feasibility testing implementation and evaluation of complex interventions as the methodological basis of the study.[22] The MRC framework includes four phases in which an intervention strategy is developed, piloted, evaluated and implemented:

- Phase I: development and adaption of components of the intervention.
- Phase II: feasibility testing.
- Phase III: a rigorous effect evaluation, combined with an additional cost-effectiveness analysis and process evaluation.
- Phase IV: large-scale implementation of the intervention.

Ethical approval

The study has been approved by the Institutional Review board of the Amsterdam UMC, location AMC in the Netherlands (Protocol ID: METC2018_216). All participating hospitals have assessed the protocol for local feasibility. The recruitment procedures are conducted in accordance with the Dutch Medical Research Involving Human Subjects Act and the WMA declaration of Helsinki. All collected data will be entered into a database (Castor, http://castoredc.com) with an identification code for each patient. Data will be stored for 15 years and archived according to the regulations of the Netherlands Federation of University Medical Centers (NFU) (http://www.nfu.nl). Data processing will be performed according to the General Data Protection Regulation (Algemene Verordening Gegevensbescherming (AVG) in Dutch). The study has been registered in Netherlands Trial Register (NL7425).

Design and setting

Figure 1 shows the design of the trial. The study is a pragmatic multicenter stepped-wedge randomized controlled trial (SW-RCT) and will be conducted in five hospitals and surrounding regions in the northwestern part of the Netherlands. A cluster is a hospital and healthcare organizations such as home care, nursing home and hospices in the surrounding region of the hospital. In all clusters (n=5) a care as usual phase will be followed by a transition phase of three months where the different components of the PalliSupport care pathway are implemented. The transition phase is followed by the intervention phase wherein participants follow the PalliSupport care pathway. All participating hospitals choose two internal medicine wards to participate in the study. Possible internal medicine wards to participate were cardiology, geriatrics, oncology, pulmonology, gastroenterology and general internal medicine.

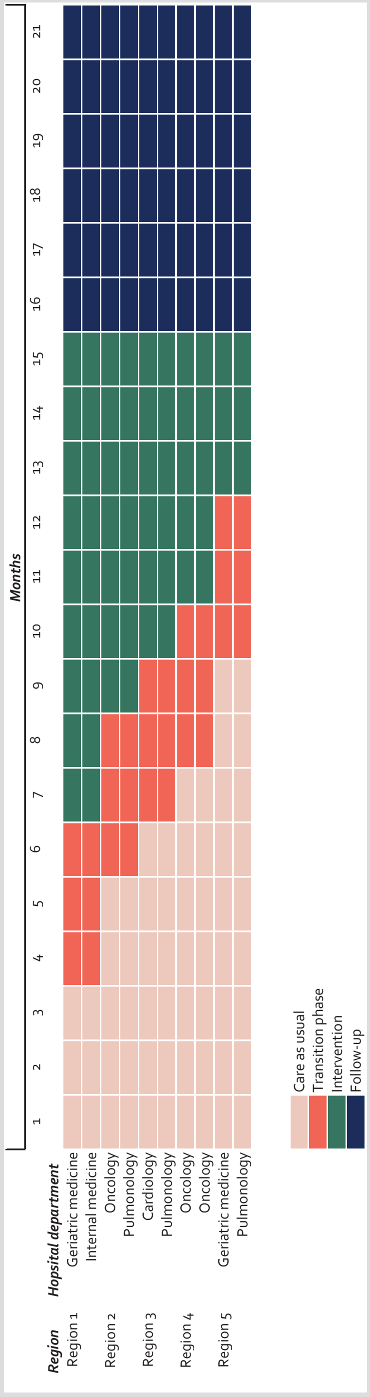

Figure 1. Design of the stepped wedge cluster randomized trial

Study population

All acutely hospitalized patients aged 65 years and over who are admitted to an internal medicine ward for ≥48 hours are selected from the electronic medical records by a research assistant. Patients are excluded for participation in case of: 1) severe cognitive impairment, due to diagnosis of dementia or active delirium during the entire admission (Mini-Mental State Examination < 15), and 2) inability to communicate in Dutch.

Older patients with palliative care needs

As part of the development phase of the PalliSupport care pathway we conducted a prospective cohort study with 282 patients to investigate the best applicable instrument to identify acutely hospitalized older patients with palliative care needs (Flierman *et al*, submitted). Multiple identification instruments were assessed to determine which had the best predictive value and usability in determining which patients were in the last year of life, however none of these instruments had acceptable predictive values. Because none of the instruments were considered applicable for selection of older patients with palliative care needs, we adapted the criteria for selection of patients and tested those criteria with the data of our prospective cohort study. Taking into account feasibility, and also to facilitate physicians in the inclusion process, we selected three criteria that are included in the ‘Supportive and Palliative Care Indicator Tools^{tm}’ (SPICT^{tm})[23] and the

'Gold Standard Framework Proactive Indicator Guidance (GSF-PIG)[24] and are possible to extract from the electronic medical record. Those criteria are 1) a hospital admission in six months prior to admission 2) functional status and 3) malnutrition (table 1). The cut off score for inclusion based on these criteria will depend on the age of the patient. Patients are eligible if aged 65–79 years and score ≥ 2 or aged ≥ 80 years and score ≥ 1 (table 1). Using these criteria the predictive value resulted in a sensitivity of 72% and a specificity of 51.2%.

Including the Surprise Question (SQ) ('would you be surprised if the patient would die within the next 12 months') in the inclusion criteria further improves sensitivity. However, asking the treating physician to answer the SQ in the care as usual phase of the study might contribute to more awareness of palliative care needs and consequently might influence the care as usual that is provided during the care as usual phase. Therefore we decided not to ask the treating physicians to answer the SQ during the care as usual phase, instead, research assistants, who all have a medical or nursing background, will answer the SQ during the care as usual phase. In the intervention phase the treating physician will be asked to answer the SQ as a last step in the inclusion process.

Table 1. Inclusion criteria

Risk domain	Instrument	Questions	Cut off	Score	Source
Hospital admission in six months prior to admission	Single question	Have you been previously admitted to the hospital in the past 6 months?	Yes = 1	1	EMR
Functional status	KATZ-6[25]	Assessing whether the patient needs help with: 1) bathing, 2) dressing, 3) toileting, 3) transferring from bed to a chair, 5) eating and 6) whether patient uses incontinence material.	≥ 2 points = 1	1	EMR
Malnutrition	SNAQ[26]	Assessing whether the patient: 1) lost weight unintentionally in the last 36 months and/or 2) experiences a decreased appetite and 3) used supplemental drinks or tube feeding	≥ 1 point = 1	1	EMR

Abbreviations: SNAQ Short nutritional assessment questionnaire, ADL Functioning activities of daily living-functioning, KATZ-6 Modified KATZ-6 index

a. Patients are eligible if aged 65–79 years and score ≥ 2 or aged ≥ 80 years and score ≥ 1
b. EMR=electronic medical record

Recruitment

Research assistants recruit patients three days a week from participating wards in each of the five hospitals by screening hospital records for eligible patients according the indicators as described in table 1. Patients who are eligible are approached for participation. Before they give written consent, patients will be given oral and written information about the study, explaining the aim and duration of the study, potential risks and burdens, and the possibility to reconsider participation during the study.

A patient who is willing to participate will be asked whether they have a close relative over 18 years of age who can, but not necessarily does provide informal care. If so, the research assistant will ask the patient whether the close relative may be approached for participation. The eligible close relative will also be provided with oral and written study information and will be asked to give written informed consent.

Randomization and blinding

Randomization will be performed two weeks before the start of the study by an independent epidemiologist who is not further involved in the study. The clusters are the units of randomization. Five clusters will switch one by one to the next phase. The result of this randomization are five trajectories that were fixed in advance (see Figure 1). For the randomization, a program will be written using the sample command in Stata version 13.1 (Stata Corp LP, College Station, TX) applying the following terms: (i) clusters were ranked as to their size and likely patient recruitment potential; (ii) two strata were formed, two clusters which preferred to start early and two clusters which preferred to start later, including one cluster with no preference; (iii) these were allocated in a way that would enhance the likelihood of collecting similar amounts of information the two strata. Health care providers cannot be blinded. Patients are informed about the procedures of the phase in which they participate, however patients are not informed about the procedures of the other phases of the study.

Care as usual

Patients included in the care as usual phase will receive standard care as provided by their involved health care professional(s).

In the Netherlands, palliative care is provided in all care settings, including home, nursing home, hospices and hospitals, but it is mainly provided by generalists.[16] Most often the GP is the primary physician at the end of life and is, together with community care nurses, the main provider of palliative care. Early proactive palliative care has become an integral part of nursing home care and is increasingly implemented in Dutch general practices.[9-11]

However, in the last three months of life, 55% of the patients are transferred between care settings, the most frequently occurring final transition being from home to hospital (42%).[27]

When complex problems occur, specialist palliative care is available on a consulting base. All Dutch hospitals that provide cancer care are required to have a specialist palliative care team. These teams in general consist of nurse specialists and physicians with special training in palliative care, typically oncologists, anesthesiologists or pulmonologists (the core team).[12] During multidisciplinary team meetings (MDT) other physicians and non-medical specialists such as dieticians, pharmacists and spiritual counsellors may be present to advise or consult when necessary. This team can also contain professionals from primary care but this is not the norm. Currently, most of the hospital based teams are not available for consultation outside of the hospital. When palliative care teams in the hospital are consulted, this is often late in the disease trajectory.[12]

When patients are discharged home, a discharge letter is sent to the GP and if necessary a nurse handover to the community care nurse.[28] No specific handovers are in place for palliative care patients (besides the report on the multidisciplinary team meeting). Follow up at home is not part of standard care, sometimes personal contact by phone does occur. The discharge letters are often sent late, with an average of seven days after discharge.[28]

Specialist palliative care in primary care is available as a national telephone consultation service and can be contacted by general practitioners for specialist palliative questions concerning an individual patient. These consultants are often GP’s specialized in palliative care who generally do not know the individual patients they advise on.

Transition phase

After the care as usual phase (but on different moments) all clusters switch to the transition phase of three months. The transition phase gives all involved stakeholders the possibility to prepare for the intervention phase. Training of involved health care professionals, transformation to a transitional palliative care team and regional agreement on the working methods will be required preconditions before the start of the intervention.

Training of health care professionals

To provide the professionals with the expertise to perform the study interventions, different educational programs were developed. All health care professionals involved in this study will be asked to complete an e-learning on timely identification and starting conversation about the end-of-life.[29] Both physicians and nurses from the participating departments follow a practical interactive 8-hour training module, split into two sessions on the initiation of end of life conversations with regard to the dying in your own way (in Dutch: STEM).[30, 31] The training highlights the importance of awareness of patient’s views regarding death and dying and aims to improve communication between patient en health care professional in the last phase of life. Additionally, presentations about early identification are held for nurses and physicians at the participating departments.

Transitional palliative care team

The palliative care team in the hospital and the GP's with a specialization in palliative care and a community care nurse in the surrounding region of the hospital will be transformed to one transitional palliative care team. The composition of the palliative care teams in the hospital, which were already present before the start of the study, differs between hospitals but they generally consist of specialist nurses and physicians with special training in palliative care, typically oncologists, anesthesiologists or pulmonologists (the core team).[12] During the intervention phase each team is expanded to include community nurses and general practitioners with expertise in palliative care to aid the team in working in both the hospital and primary care. To create and guide the newly formed team, a series of meetings and trainings were organized. These meetings facilitated on the new working method, the exchange standard working procedures and meetings to discuss cases. The teams were offered a standardized consultation format, however teams were allowed to use or expand their own format, as long as the four dimensions of palliative care (physical, social, psychological and spiritual) are part of the structured consultation format.

The intervention

The PalliSupport care pathway consists of five components: 1) identification of palliative care needs during admission, 2) palliative care assessment and advance care planning, 3) multidisciplinary team meetings, 4) discharge and handover, 5) home visits and follow up (table 2).

Patients will be included during the acute hospital admission based on the inclusion criteria and a positive answer to the Surprise Question. Patients do not have to forego disease modifying/curative treatment to participate in the study. After inclusion, the transitional palliative care team (TCPT), in collaboration with the treating physician from the admission department, will contact the patients' own general practitioner (GP) to inform whether preferences and goals of care are discussed with the GP. In agreement with the GP, the palliative care team in collaboration with the physicians from the admission department, will perform a bed-side consultation where a palliative care assessment is performed and preferences and goals of care are discussed. The discussions do not need to be completed during the hospital admission but can continue after discharge.

Weekly multidisciplinary meeting (MDT) will be held. During the meeting other physicians and non-medical specialists such as dieticians, pharmacists and spiritual counsellors are present to advise or consult when necessary. Furthermore, during the intervention patients own GP and community nurse are invited to participate in the MDT, either in person or by phone. If the GP cannot be present (s)he is called either before the MDT or after. During the MDT, a care plan is formulated that contains the goals of care and treatment

Table 2. Components of the PalliSupport care pathway

Intervention	Components	Intervention conducted by
Identification of palliative care needs during admission	- Identification of palliative needs based on ≥ 2 SPICT criteria and Surprise Question - Department physician introduces the Transitional Palliative Care team (TPCT) - TPCT is consulted	Department physician
Palliative care assessment & Advance care planning.	- Assessment of needs, preferences and symptoms on 1) physical, 2) psychological 3) social and 4) spiritual level - Discussion of goals of care and treatment limitations - Discussion of preferred place of death - Formulating individualised care plan	TPCT / department physician
Multidisciplinary team (MDT) meeting	- Weekly discussions about patients with the TPCT, hospital specialists and non-medical specialist - Invitation GP and community nurse (either in person or by phone) - Discussing individualised care plan - The complexity of the patient’s palliative care situation is assessed using the new working methods (colour coding)	TPCT, department physician, general practitioner , community nurse
Discharge	- Patient takes home the individualised care plan - Informal caregiver receives information sheet about support	TPCT, department physician/nurse
Handover	- Contact with GP at least once prior to discharge/during MDT meeting - MDT summary is sent to GP and/or community nurse within 24 hours of discharge - Medial handover is send to GP within 24 hours of discharge	TPCT and/or department physician/ nurse
Home visit and follow-up	- Home visitation at place of care If applicable - Follow-up discussion at MDT - Adjustment of individualised care plan - Adjustment of colour coding	TPCT / general practitioner / community care nurse

Abbreviations: TPCT: Transitional Palliative Care team, GP: General Practitioner, MDT: Multidisciplinary team

options, which is discussed with the patient, and if present relatives.

Furthermore, during the MDT meeting a color code, ranging from green to red, will be registered, based on severity of symptoms and needs, and (im)possibilities of generalists to provide the necessary care, with green suggesting low needs and no further involvement unless requested by other professionals and red meaning high needs and frequent involvement of the team. MDTs will be continued for patients as long as the TPCT stays involved. The TPCT retain a consulting function and are not the ‘in-charge’ of the patients. At discharge, the care plan is handed over to the patient, the patients' GP, community nurse and if involved hospital-based medical specialist. Post-discharge the patient is visited at least once at home by the TCPT and discussed once more in the MDT and if necessary the care plan is adjusted. Follow-up at home continues for as long as necessary and is determined by the severity of needs and to what extent the generalists are able to provide the necessary care.

Use of co-interventions

Patients are allowed to participate in concurrent trials during the study period, for examples in studies concerning medication or diagnostics. Details of these trials will be registered. However, patients are not allowed to participate in other palliative care related interventions.

Outcome and measurements

Baseline characteristics

At baseline; sociodemographic data, data on admission, health care usage in six months prior to admission, medical data and geriatric risk assessments (functional status,[25] malnutrition,[26] delirium risk,[32] decubitus[33] and fall risk[34]) will be collected through electronic patient medical record.

Primary outcomes

The primary outcome for this study is the number of patients with an unplanned hospitalization in the six months after inclusion and will be collected through electronic patient medical record (table 3).

Secondary outcome measures

Secondary outcomes will be measured at baseline, two weeks, three, six months after discharge. Data on health care utilization will be collected from electronic patients records. All other data will be obtained through questionnaires. Questionnaires at baseline will during the intervention phase be collected prior to the first consultation of palliative care team. The follow-up measures will be collected by telephone.

- Preferred place of death.
- Palliative symptoms and needs (Palliative care Outcome Scale).[35]
- Frequency and severity of palliative symptoms (Utrechtse Symptoom Dagboek (Dutch version of the Edmonton Symptom Assessment Scale)).[36, 37]
- Quality of life (McGill Quality of Life Questionnaire).[38]
- Health related quality of life (EuroQol-5D-5L).[39]
- The burden of informal caregiver and the caregiver's wellbeing (CarerQoL-7D (burden) and CarerQoL-VAS (wellbeing)).[40]
- Health care utilization, including total number of (un)planned hospitalizations per patient, length of admissions (days), number of planned day admissions, ER visits (number), GP visits (number), contact with GP out of hour visits (number), hours per week of home care (both household and community

care), number of days admitted to a nursing home or hospice.

If patients is deceased:

- Death at place of (first) preference.
- Quality of death and dying (QoDD).[41]

Table 3. Baseline, outcome measures and time points of assessment in PalliSupport study

Measures	T0 (baseline)	T1 (2 weeks)	T2 (1 month)	T3 (3 months)	T4 (6 months)	T5 (12 months)
Baseline assessment						
Demographic data	X					
Geriatric assessment						
- Functional status (KATZ ADL)	X					
- Malnutrition (SNAQ)	X					
- Falls	X					
- Decubitus (Braden)	X					
- Delirium risk	X					
Surprise Question	X					
Primary outcome						
Readmission						
Date of readmission Length in days	X	X	X	X	X	X
Secondary outcomes						
Preferred place of death	X	X	X	X	X	X
Quality of life						
- EuroQol-5D+C	X	X	X	X	X	X
- McGill Quality of Life Questionnaire	X	X	X	X	X	X
Symptom burden						
- Palliative Outcome Scale	X	X	X	X	X	X
- ESAS	X	X	X	X	X	X
Health care utilization						
- Readmission	X	X	X	X	X	X
- Emergency dep. visits	X	X	X	X	X	X
- Nursing home /hospice admission	X	X	X	X	X	X
- GP consult	X	X	X	X	X	X
- GP out of hours	X	X	X	X	X	X
- Home care	X	X	X	X	X	X
Informal caregiver						
- CarerQol-7D	X	X	X	X	X	X
- CarerQol-VAS	X	X	X	X	X	X
Mortality						
- Date of death	X	X	X	X	X	X
- Place of death	X	X	X	X	X	X
- QODD	X	X	X	X	X	X

Process evaluation

Besides the primary and secondary outcomes, a comprehensive process evaluation will be performed to further assess the feasibility of the PalliSupport care pathway. For each patient in the intervention phase health care professionals and research assistants will register which steps of the care pathway were followed. Furthermore, qualitative data will be collected from patients, relatives and health care professionals during both the care as usual phase as the intervention phase. For patients and relatives individualized semi-structured interviews will be held to assess their experience with either care as usual or the PalliSupport care pathway. For professionals, focus group meeting will be held to evaluate their experience with the different components of the PalliSupport care pathway. The findings will be summarized with the barriers and facilitators for implementation and can be used to develop a guideline for implementation.[42]

Cost effectiveness analysis

To assess cost-effectiveness the EQ-5D will be used to calculate Quality Adjusted Life Years (QALYs) in both groups. Because cost data have a highly skewed distribution due to many patients with low costs and a few patients with (very) high costs and no possibility of negative values, bootstrapping will be performed with 5000 replications to estimate Approximate Bootstrap Confidence (ABC) intervals around cost differences. Incremental cost-effectiveness ratios (ICERs) will be calculated by dividing the difference in total costs between the intervention group and the care as usual group by difference in QALYs. The uncertainty surrounding the ICERS will be estimated with non-parametric bootstrapping (5000 replications).

Feasibility study

Between February 2018 and July 2018 a feasibility study was conducted in the OLVG hospital in Amsterdam.[43] Within this feasibility study 8 patients and 5 informal caregivers participated. Including patients and informal caregivers in this feasibility study appeared to be a challenge. The low number of participants included in the feasibility study has led to adjustments to some of the procedures for this stepped wedge cluster RCT. Adjustments were made to the protocol to further structure the steps. We changed the inclusion procedure to an opt out system to facilitate physicians in the inclusion process. Based on feedback from professionals the protocol was made to be more adjustable to daily practice. For example, the advance care planning conversation will nog longer have to be completed during the hospital admission, but can be continued at home. Both patients and caregivers experienced low burden from answering the questionnaires.

Sample size calculation

The proportion of patients with at least one unplanned readmission is the primary outcome in this trial. Currently 50% of patients have at least one readmission to the hospital during their last six months of life. We expect a reduction to 30% in the number of patients with a hospital readmission through the implementation of the transitional palliative care pathway.

Our original power analysis was based on the expectation that there were five clusters (hospital + surrounding region) including about as many patients in the control and in the intervention periods. We assumed that the 5 hospitals would include 10 patients per month for 12 months for a total of 600 patients. In addition we assumed that the correlation of outcomes of patients from the same hospital and the same control/intervention period was 0.025, and that the correlation of outcomes of patients from the same hospital but different control/intervention periods was zero. Using a two-sided alpha level of 0.05, this design, expectations and numbers would achieve 85% power (stepped wedge command Stata 13.1).

Given the difficulties with the original design we had to change the expectation of how many patients each hospital is going to include in the trial. In collaboration with the statistical department of our university we made new calculations. With three clusters for the intervention phase, we now expect to include 490 patients in total (300 in the control period, 190 in the intervention period). With this new calculation we also changed the assumption that there is zero correlation between outcomes of patients from the same hospital but from different control/intervention periods to 0.025 correlation: thus, we now assume that this correlation is as large as the correlation between outcomes of patients from the same hospital and the same control/intervention period. Using a two-sided alpha level of 0.05, this updated design with slightly changed expectations and numbers would achieve over 85% power.

Statistical analysis

An adapted CONSORT flow diagram will detail the flow of clusters and patients through the trial figure 2). Baseline comparability at the level of clusters (immediately after randomization) and patients (at recruitment) will be assessed. Descriptive data will be used to assess any time trends of patient characteristics at recruitment since patient selection bias is a threat in cluster trials that cannot be blinded for allocation. The treatment effects on the various outcomes will be estimated with mixed (generalized) linear models using dummy variables, random intercepts for the clusters, and time as a fixed effect. Where appropriate , for each outcome, the baseline values of that outcome will be used as a covariable. The trial will have limited power to explore treatment by time or treatment by cluster interactions. If feasible, we will explore these. Two sided 95% confidence intervals will be calculated. An intention-to-treat analysis will be the primary analysis. Per-protocol analyses based on degree of compliance with the study protocol will be used in an exploratory fashion.

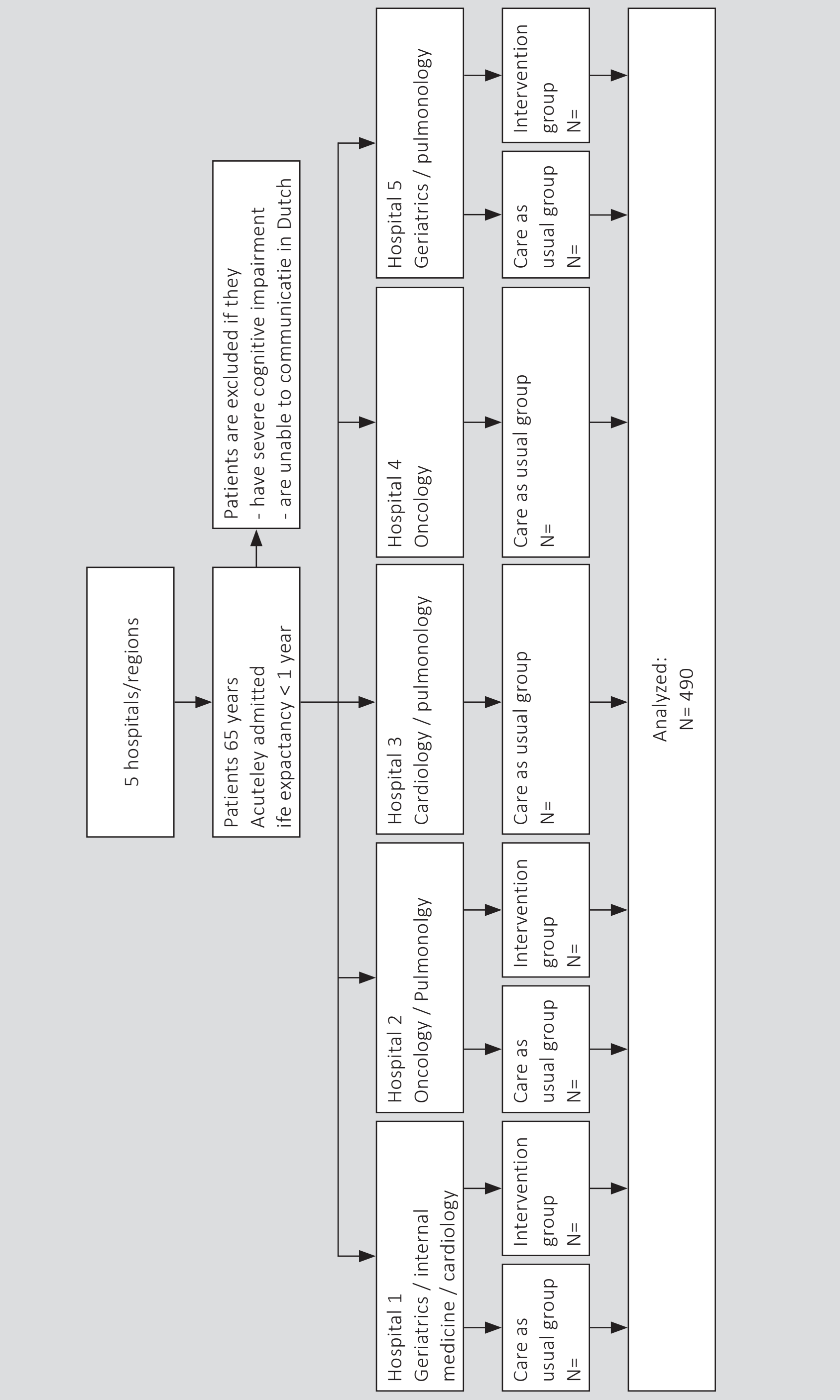

Figure 2. Flow diagram with clusters and patients through the trial

Preliminary results

Because of the results of our pilot study we determined a go/no go moment three months after the start of the SWD trial in each center to evaluate inclusion rates. The trial started on January 1st 2019 in the first center. During the go/no phase we included 69 patients. Of 656 patients 65 years or older, 242 met the inclusion criteria, 138 patients were excluded and 35 patients gave no consent (figure 3). The inclusion rates of the first three months of our study resulted in a go for the SWD trial, however based on these findings we expected a potential risk of inclusion difficulties in the intervention phase. Therefore we changed the expectation of how many patients each hospital is going to include in the trial, as described in sample size calculation section.

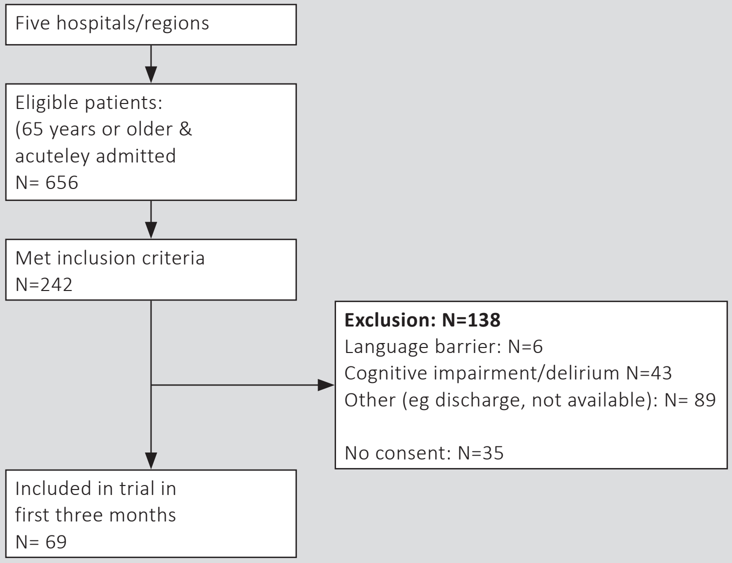

Figure 3. Flow of patients included during the first three months of the trial

Discussion

This protocol for a stepped wedge cluster randomized controlled trial is designed to reduce readmissions in older patients acutely admitted at the end of life. Older patients acutely hospitalized are at high risk for adverse outcomes, in particular for readmission and mortality.

In this paper we describe the study protocol of the PalliSupport care pathway, which consist of five components.

Strengths and limitations

The first strength of this study is that the intervention has been designed in interprofessional collaboration between hospital physicians and nurses, GP's, community care nurses, older patients, informal caregivers and a mental health worker. This increases likeliness to structurally imbed the transitional care pathway in the participating regions. Second, this study includes a wide variety of older patients, including oncological and non-oncological patients. This is because we select patients based on their risk of dying within one year, instead of diagnoses. Furthermore, patients are selected from five regions, in both an urban and rural area, which incorporates potential differences in palliative care provision between regions.

A third strength of this study is the focus on patients' goals, needs and wishes. These needs and wishes will be used to develop an individualized care plan including geriatric and palliative care, that is transferrable across settings and healthcare providers. This facilitates the implementation and improves patient relevant outcomes.

Fourth, we will collect data on process indicators to evaluate the execution of the components of the intervention and the performance of the involved healthcare providers. This will support the interpretation of the study results.

Finally, a pragmatic stepped wedge design has multiple methodological and practical advantages. The possibility for all clusters to switch to the intervention phase is a first advantage and increases the willingness to participate. Furthermore, the intervention effect can be estimated using between and within cluster comparisons and the professionals are their own controls in the interventions. In addition, the staggered start allows for a controlled focus on training and implementation in each region separately and because of the crossover from control to intervention and each participant receives only one condition, we may assume that there are no carryover effects.

This study also has some limitations. First, we exclude patients with delirium and dementia. These patients are at risk for readmission and mortality and therefore could potentially benefit from this intervention. However, it is not possible to include these patients in this study because of ethical considerations. Second, we expect a variety of level of implementation, which will be influenced by regional differences and the involvement of many stakeholders in each region. To potentially overcome this limitation we choose a pragmatic design of a stepped wedge cluster randomizes trial. Third; the COVID-19 pandemic leads to uncertainties for our trial, such as the possibility to include patients within the given time frame. A potential limitation might be that we will not be able to complete inclusion rates as planned.

In summary; this study has the potential to effectively improve palliative care for older patients and at the end life and their informal caregivers. Furthermore this study will provide new knowledge regarding the effectiveness, cost effectiveness and fidelity and reach of a transitional care pathway for older patients at the end life.

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Chapter 9

General discussion

General discussion

The overall aim of this thesis was to provide evidence concerning timely identification, collaboration between hospital and home, and transmural palliative care in older patients with palliative care needs to develop building blocks for the PalliSupport transmural care pathway intervention. In part I we assessed how physicians and nurses identify patients in need of palliative care and if identification instruments can aid in this effort. In part II we assessed how the handover between hospital and primary care in palliative care currently occurs and if transmural palliative care can reduce the number of hospital admissions and improve the number of patients dying at home. Additionally, we performed a feasibility study of the transmural PalliSupport intervention which led to the design of a stepped wedge trial to evaluate the effectiveness of the PalliSupport intervention.

In this general discussion we first reflect on the main findings of this thesis. This will be followed by discussions on methodological issues, the implications for clinical practice and research and for future perspectives.

Reflection on the main findings

Identifying patients that could benefit from palliative care (part I)

The first step in initiating palliative care is identifying who may benefit. However, identification does not always occur in a timely manner, especially during hospital admissions.[1] In chapter two we conducted a qualitative study to explore the views and experiences of hospital-based nurses and physicians on identifying the palliative phase in their patients. In the white paper from 2003 by Lynn *et al.*, the idea that palliative care should be provided alongside disease modifying care was first introduced and that with time, palliative needs further increase while disease modifying care decreases.[2] Thus the clear distinction between a curative and palliative phase was abandoned. However, for the purpose of this study we did use the terminology ‘palliative phase’. We did so because in pilot interviews, other terminology, such as palliative needs, led to confusion for our participants and thus not to in-depth insights into the subject.

We found that identification is a not very structured process that consists of prognostication, weighing of treatment options and evaluation of patients’ needs and preferences. We found several barriers to timely identification. A first barrier that was found was the range of definitions of palliative care that were used by our participants and that, for many of them, palliative care was still associated with terminal care or with situations in which no curative treatment options are left. The difficulty in defining the palliative phase is not new[3, 4] and even though there is a WHO definition for palliative care, both researchers and clinicians are struggling with how to best identify patients in need of palliative care.[5, 6] Our study confirmed that making this distinction for patients with oncological diseases was thought to be easier. This could be the result of the terminology ‘palliative’ being clearly imbedded in oncology and synonymous with inoperable or metastatic disease, though in recent years because of scientific advances some forms of metastatic cancer have become a chronic disease making the distinction less clear.[7] In non-oncological diseases, the distinction was found to be less clear based on a short prognosis and a lack of curative options remaining. This can lead to 'prognostic paralysis',[8, 9] where patients are not told they have reached the end stage of their disease and consequently appropriate care is not planned because of prognostic uncertainty on the part of the physician.

Besides prognosis, professionals in our study engage in a treatment trade-off, where they weigh the potential benefits of treatment with the potential harm and mark the beginning of the palliative phase when negatives prevail. But some professionals said that they want to have tried all possible diagnostic and treatment options before 'accepting' patients are in the palliative phase. And even though professionals also find patients' own preferences and needs important in their assessments, they find it difficult to start conversation about the end of life and often wait for patients to start the conversation themselves.

Another finding in this study was that for identification to occur, collaboration with other professionals, such as nurses and general practitioners, is important. However, nurses may feel insecure about addressing palliative care issues with physicians out of fear of being seen as giving up on a patient or disagreeing with the physician, which further hinders the identification process.

In all, the confusion in terminology, the difficulty in prognostication, the continued focus on treatment and the difficulty in starting conversations about the end of life can lead to late initiation of palliative care in the hospital setting. These barriers to timely identification were found in chapter five, a qualitative study on collaboration between hospital and primary care in palliative care, and chapter seven, our feasibility study. In both studies we found that the barriers to timely identification in turn hindered handovers. In addition it hindered inclusion of patients in our feasibility study.

One of the methods to improve timely identification is the use of 'instruments' or 'tools'. In chapter three and four we assessed the prognostic accuracy of multiple identification instruments in determining one-year mortality in older patients. It is up for debate if we should look for manners of prognostication instead of focusing on needs independent of life expectancy.[10, 11] However, we chose one-year mortality as a surrogate for palliative needs because during the last year of life disease burden often increases and this time frame also allows for changes in goals of care to become more fitting with patients' preferences. We conducted both studies in the same patient population of acutely admitted patients of 70 years or older and confirmed previous findings of the high percentage of 35% of one-year mortality after admission.[12]

In the chapter three we assessed the prognostic accuracy of the Surprise Question when used by nurses. The Surprise Question, 'would I be surprised if the patients died in the next 12 months?' was first discussed by Murray *et al*.,[13] and has since been the most studied instrument for identification of palliative needs. Two systematic reviews assessing its prognostic accuracy were published in recent years and found it to have low to mediocre predictive value.[14, 15] However, the use of the Surprise Question by nurses has been hardly studied. We hypothesized that nurses might be better at answering the SQ because they are often seeing patients intensively during a hospital admission and patients might find it easier to open up to nurses about needs in comparison to physicians. In our study, we found low predictive values with a sensitivity and specificity of 77% and 57% and positive and negative predictive values of 44% and 85%. These predictive values where not much better for physicians (chapter 4) with a sensitivity and specificity of 82% and 41%. One of the explanations could be that we included older patients in our study. Age alone is not a sole predictor of mortality. However, because we ask if professionals would be surprised if a patients died, age could influence this. This could have led to a high number of false positives.

In chapter 4 we studied three additional instruments which we presented to physicians: the Supportive Palliative Care Indicators Tool (SPICT™),[16] the Gold Standard Framework proactive identification guidance (GSF-PIG),[17] and Palliative Performance Scale (PPS).[18, 19] Unfortunately, none of these instruments had both good sensitivity and specificity and diagnostic odds were low. Usability of these instruments was judged similarly by participating physicians and the instruments were judged as moderately helpful in aiding the professional in identifying palliative needs. In addition, we found that when scoring the instruments physicians did not always correctly fill-out parts of the instrument, for example if patients experienced previous hospital admissions or weight loss, so the assessment might not be accurate enough. Based on the findings in this study we had to conclude that none of the instruments studied had good prognostic value in determining one-year mortality. However, the negative predictive value of around 80%, in other words the fact that the percentage of patients that died and were not identified was low, could be seen as acceptable depending on the consequence attached to it. If we use the instruments as a starting point to further explore palliative needs and start conversations about future care the high number of ‘false positives’ might not be seen as a drawback. This is not acceptable however if it would lead to telling a patient about an uncertain prognosis or forgoing potentially curative treatment. A recent study showed that formally identifying patients as potentially benefitting from palliative care led to an increased use of palliative care services.[20] The high rate of false positives would currently lead to overburdening of these systems.

Based on our three studies, the use of identification instruments is debatable, in addition to the prognostic inaccuracy, in our qualitative study professionals were also hesitant about use of instruments. Professionals felt determining palliative needs is not as black and white as scoring on a certain set of criteria. Use of the instruments is further hindered by professionals’ uncertainty and inexperience with starting conversations about the end of life if an instrument score is positive. The barriers to starting conversations about the end of life or addressing palliative care are well known and encompass fear of scaring the patients and starting conversations to soon, but also the fact that professionals feel incompetent about having these conversations or feel it is not their job.[21, 22] For timely identification to occur, these barriers should also be addressed, and should feel comfortable with discussions about the end of life and have enough skills and knowledge regarding palliative care. However, because these barriers exist, instruments could potentially be helpful to determine a starting point. Interestingly in our studies, the rate of do not resuscitate orders at admission were high (65.5%), especially in comparison with other countries.[23] In addition, a further 33.2% had a notification in their record to not go to intensive care. In the Netherlands discussing resuscitation and ICU admission before hospital admission is a requirement. Nonetheless, these number suggests that in this older population both professionals and patients are not afraid to put limitations on what life prolongation treatment is medically useful or desirable. However, the referral to specialist palliative care in our study population was still very low, only 2.2%, which is consistent with previous findings in Dutch hospitals.[24]

Transmural palliative care (part II)

If patients are identified as needing palliative care, barriers in transitions between care settings and collaboration between professionals can hinder palliative care. In the Netherlands, palliative care is organised in a generalist plus specialist manner, meaning palliative care is mainly provided by generalists in both hospital and primary care. In complex cases, specialist palliative care teams can be consulted.[25, 26] Palliative care teams in hospitals in the Netherlands are a fairly recent development, as professionals standards stated that all hospitals were to have a palliative care team by 2017.[27] The current low number of consultations with specialist palliative care is thus not surprising,[24] even though benefits on patient outcomes such as quality of life and satisfaction with care have been well established.[28, 29] With the formation of specialist palliative care teams, the number of care professionals involved in patients care at the end of life is further increasing. This high number of professionals involved lead to difficulties in provision of continuity of care because of difficulties in communication and handovers. In addition, patients at the end of life frequently move between care settings while having complex symptoms and needs, making continuity of care especially important. In Dutch, transmural care is used as the term to describe care that bridges between care settings and thus ‘goes through the walls’. Transmural care has shown promising results in older frail patients and could potentially benefit patients at the end of life as well.[30, 31] To first understand how transitions between hospital and community care in palliative patients occur and which barriers exist, we performed a focus group study (chapter 5). We included both nurses and physicians from primary care and hospitals and performed five focus groups. We found that while most professionals emphasize the importance of the transition between hospital and community going well and they are willing to put in extra effort, multiple barriers exist. Good transitions are hindered by lack of timely identification of palliative needs, the handover focuses on solely physical aspects, there is insufficient interprofessional communication and professionals do experience uncertainty about medical responsibilities. It was found that within the handover between hospital and primary care, the focus of care was often non-specified or still on curation while this was found to be inappropriate. In our study the primary care professionals do seem to wait for the hospital professionals declare a palliative approach. An important barrier, also found in previous studies, was the lack of identification of palliative needs and uncertainty in prognosis.[32] This was further emphasised by the understanding of the professionals that palliative care referred to the last months of life. This in part was caused by the need for professionals to make a declaration of a prognosis of less than three months before patients could be referred to a hospice or become eligible for terminal home care. Fortunately, this 'terminal declaration' is no longer required for referrals to hospice and home care in the last months of life. In our study, a clear declaration about palliative care needs, independent of prognosis, was found to be a minimum requirement in the written handover, as well as the extent to which conversations about this approach were communicated with patients in addition to description of the presence of psychosocial issues.

Communication between professionals was thought to be insufficient during the transition between hospital and primary care, and was previously found to negatively affect patient care.[33] Additionally, uncertainty in roles and responsibilities for especially physicians, was thought to lead to no one taking the lead in decision making and starting conversations about the end of life. A warm handover, where professionals talk in person or by phone was suggested to overcome these barriers and was previously found to be appropriate for patients with complex care needs.[34, 35]

The introduction of specialist palliative care teams led to some fear that the involvement of specialists would hinder general practitioners in their role in the community setting. Improving collaborations and working arrangements between specialist palliative care and generalists are thus necessary aspects to ensure continuity of care.[36]

Transmural palliative care interventions could potentially aid overcoming the barriers in care transitions and improve continuity of care. While previous studies have shown that team-based palliative care interventions had the best results on patient outcomes in oncological care,[37] it is unknown to what extent team-based transmural interventions can further improve care at the end of life. To assess whether transmural team-based palliative care interventions could be effective in prevention of hospital admissions and could improve patients dying at their preferred place of death, we performed a systematic review and meta-analysis of the literature (Chapter 6). The outcomes hospital admissions and place of death were chosen as surrogates for appropriate care. If hospital admission can be prevented, this suggests that symptoms are sufficiently controlled. While it also shows that care is proven to be in line with patients wishes to enable death at home. Defining team-based transmural palliative care for this systematic review proved difficult. Health care systems differ greatly per country and even within countries. Based on previous research, we chose to incorporate three different types of intervention: collaborative teams that worked together across care settings, hospital-based teams that follow patients in the primary care setting and case-management interventions. In total we included 19 studies in the systematic review. There was significant heterogeneity between interventions, study population, comparison group, follow-up and outcomes. Nonetheless, we did choose to perform a meta-analysis to summarize our findings. While these results should thus be interpreted with caution, we did find positive overall effects on reduction in hospital admissions and a higher percentage of patients with home deaths. This effect was largest in the subgroups of hospital-based teams that follow patients in the primary care setting.

Another important finding from the review was the lack of process evaluations in the studies included. All studies included were complex interventions, and to understand the effect you find in these type of studies, either positive or negative, it is important to understand which parts of interventions were implemented and what components resulted in the found effect.

Based on the results of our review, a specialist hospital-based team that follows patients in the primary care settings and takes over care from generalists is the preferred model of transmural palliative care. However, as our focus group study also found, this would undermine the important role of general practitioners and community nurses as well as nursing homes and hospices. In the Netherlands we have an especially strong primary care system that provides most of the non-specialist palliative care. When we were developing our model for transmural palliative care, we therefore opted for a model where a hospital-based specialist palliative care team follows patients in primary care but does this is in collaboration with the generalist professionals from hospital and community.

The PalliSupport care pathway was developed with the aim to improve palliative care for older patients through timely identification of palliative needs, timely conversations about wishes and preferences, improved handover, transmural care and informal caregiver support. To achieve this, we developed training modules on early identification and advance care planning. We also developed protocols on interprofessional and transitional collaboration and establishment a transmural palliative care team consisting of hospital-based palliative care specialist as well as generalists from hospital and primary care. The starting point of our study was an acute hospital admission basis, because this is often the result of unidentified palliative care needs,[1, 12, 38] in addition to the high number of patients dying following an acute hospital admission.[12]

In chapter 7 we performed a mixed-method feasibility study before embarking on a stepped-wedge randomised controlled trial to assess the effects of our transmural palliative care intervention (PalliSupport). As part of the MRC-framework after the development stage of a complex intervention a feasibility study should be performed to assess whether the different steps that were developed are workable in a clinical setting.[39] We thus set out to assess if our study protocol for the PalliSupport intervention was feasible on recruitment, data collection, implementation and patient burden. In addition, we assessed the experiences of care professionals with aspects of the intervention. The importance performing a feasibility study becomes evidently clear when looking at the results of our study. We formulated a set of criteria before the start of the feasibility study to assess success or failure. We were especially unsuccessful in including the anticipated number of patients in our study which in turn led to difficulty in assessing the other formulated criteria on protocol implementation and data collection. Low recruitment in palliative care studies is not uncommon,[40] and obstacles can be found on clinician, patient and system levels.[41] Based on the findings of our qualitative data, we found that clinicians formed an important barrier to inclusions. Even though part of our intervention was education on timely identification of patients in need of palliative care and starting conversation about the end of life, clinicians still understood palliative care to be synonymous with terminal care and nurses felt uncomfortable suggesting patients for participation to the physicians. One of the other arguments given by interview participants was that end of life conversations do not belong in the hospital and should be held by primary care physicians, which was also brought up in previous studies.[42, 43] Reasons given were that the hospital admissions are short and that patients don't know the professionals very well. Nonetheless, goals of care conversations during hospitals admissions have also shown positive effects on reduction of hospital admissions.[44]

Even though we aimed to improve the collaboration between the specialist palliative care team and primary care professionals, we confirmed with the findings from chapter 5 that the palliative care team and GPs feared that home visits by the palliative team would take away responsibility from the GP and could potentially lead to patients gravitating towards the hospital and thus more hospital admissions. Though this fear is understandable, our systematic review results do suggest a reduction in hospital admissions and more home death when transmural palliative teams are involved.

The findings of the feasibility studies led to adjustments in the study protocol for PalliSupport stepped wedge trial (chapter 8). Adjustments were made on recruitment where the researchers actively screen for participants and additional training was added on timely identification of the palliative phase and starting conversations about the end-of-life. To improve collaboration but also to enhance familiarity with the project, meetings were held between researchers, the participating hospitals and primary care organisations. We also look at regional structures already in place and build upon these structures when unrolling the different study components. Unfortunately, the PalliSupport trial had to be terminated early. The trial had just started with the intervention phase when the Covid-19 pandemic started. The pandemic resulted both in priorities of professionals being elsewhere as well as in difficulties in recruitment. A rigorous process evaluation will look into other reasons for the trial not being successful.

Methodological considerations

We worked according to the MRC-framework for complex intervention development where we started with development of theory, followed by identification of evidence and modelling of process and outcomes before our feasibility study. In this thesis only a proportion of these steps are represented. Here we discuss some of our main methodological considerations.

Studying identification instruments

One of the important questions when we set up the PalliSupport trial was to determine how best to identify older patients during hospital admission that could benefit from palliative care and if identification instruments could be of aid. We thus performed two studies to evaluate the prognostic accuracy of identification instruments when used in clinical practise (chapter 3 and 4). Methodologically both studies had some shortcomings. In retrospect our studies could have been improved if we had presented the SQ or instruments more often to each professional. This would have allowed for changes over time during the hospital admission to be incorporated into their assessment. However, especially for physicians, filling out the instruments already cost quite some time and we would probably not have achieved more measurement points. Furthermore, inter-user reliability could not be assessed because we only asked one professional for each instruments. The fact that physicians did not always accurately filled out the identification instruments could also have influenced our results. On the other hand, this does show how these instruments would have been used in daily practise instead of when a researcher would have filled them out based on electronic patient files which is often done (retrospectively). Based on the findings of chapter 4 in particular, we were not convinced we could use one of the four instruments in our trial. In addition, our feasibility study revealed that a more pro-active approach from the researchers is needed to increase inclusion rates. Therefore, we performed additional analysis and found that combining three criteria that could easily be found in medical patient record and were also part of the instruments (previous hospital admission, weight loss and ADL function) with age resulted in acceptable sensitivity and specificity (chapter 8). More importantly, the presence of these criteria also suggests the presence of more complex needs and would thus select patients that could benefit from a palliative care approach. These three criteria were used for the control phase in the effectiveness trial. Because our qualitative research revealed the discomfort of professionals to solely look at criteria, as well as physicians having to start conversations about the end of life as a consequence of these criteria, we decided to incorporate the Surprise Question, posed to the treating physician, for the selection of patients in the intervention phase.

Use of mixed-methods in building complex interventions

When formulating a complex intervention it is important to incorporate points of view from different stake holders. In this thesis the qualitative studies aided in gaining an in-depth understanding of care professionals' views and experiences with the subject of timely identification, care transitions and the PalliSupport care pathway (chapters 2, 5 and 7). While in this thesis views and experiences of professionals are represented, two important voices are missing, that of the patient and informal caregivers. Patient and caregiver perspectives were studied by different researchers within the PalliSupport research group and will be published later on. Nonetheless, an important shortcoming of our feasibility study was that we did not included the patients and caregivers' perspectives.

Our qualitative research led to surprising outcomes that influenced our study components development. In chapter 2 we assessed how hospital-based professionals identified the palliative phase in their patients. An important finding was that many professionals associated palliative care with terminal care, which was also found in chapters 5 and 7. This finding led to the development of an e-learning module on timely identification and starting end of life conversations. In addition, nurses explained they are uncomfortable discussing that they believe a patient is in the palliative phase with physicians out of fear of they are seen as giving up or not wanting to question the physicians' treatment plan. This led to us combining the training about end of life conversations for nurses and physicians so they had the same knowledge and would feel more comfortable discussing end of life issues with each other.

The qualitative data from our feasibility study (chapter 7) led to understanding why the inclusion rate was low, due to the aforementioned misunderstanding about palliative care as terminal care, but also because some professionals felt end of life conversations belonged in primary care. In addition both our focus group study (chapter 5) as well as our feasibility study revealed the hesitation some generalist felt about involvement of specialist palliative care teams and uncertainty about responsibilities. These insights led to the adjustment in how we set up the PalliSupport trial in each region, and to involve GPs, medical specialists, nurses and the palliative care team from the start as well as organise meetings between the involved parties to enhance familiarity with the project.

Our incorporation of qualitative research thus very much aided us in the development of our intervention, but also helped us understand why certain aspects did not work. We highly recommend incorporating mixed-methods when developing complex interventions, as well as incorporating qualitative studies in process evaluations.

An important aspect of qualitative research is data saturation, meaning that new interviews or focus groups do not result in new concepts or themes independent on how many people participate (45). Our focus group study (chapter 5) is limited especially by the low number of physicians that participated and we cannot be certain that we did not miss any points of view. In our feasibility study we did not seek data saturation because we knew beforehand that the variety of professionals was wide and we only interviewed one or two from each profession/setting. The ability of these studies to be generalised might thus be limited. However, within the context of developing and evaluating our intervention these studies contribute greatly to our understanding of barriers to transition between hospital and primary care and why our feasibility study was unsuccessful.

Feasibility studies

The step before an effectiveness trial is to assess feasibility of different steps that were developed to see if they are workable in a clinical setting.[39] Following the MRC guidelines, when the protocol proves to not be feasible, the protocol should be revised and an additional feasibility study should be performed. Our feasibility study showed our protocol to not be feasible on multiple aspects. While our results did lead to a revision of our study protocol, we did not in return perform an additional feasibility study. In research we are dependent on funding and are often given strict time-frames in which to perform studies. This does not always allow for additional steps in study development. Grant providers could look at manners to improve this, for example by asking researchers to first assess feasibility before investing in a larger trial. Nonetheless, in the development of our final study protocol, the lack of a successful feasibility study is an important shortcoming. Interestingly, in the hospital in which we performed the feasibility study in and surrounding primary care organisations, the transmural palliative care team has seen a large increase in consultations and are still seeing patients at home. This is another important argument for why time is an important factor in development and especially implementation of a complex intervention.[46] It takes time for professionals to incorporate new work methods and to change how they perform certain aspect of their jobs. This is especially true in palliative care as it asks of physicians and nurses to start conversations they are uncomfortable with.

Implications for clinical practice and research and future perspectives

Further improvement of timely identification of palliative needs of older patients and starting of end of life conversations

Lack of timely identification of older patients during hospital admission created multiple barriers for starting conversations about the end of life, for initiating palliative care, for a proper handover but also for including patients in our studies.

Traditionally, the focus in hospitals is on managing acute diseases, curation and life-prolongation. Changing that focus to assessing quality of life requires a culture change. A change that is necessary, especially considering the increasing number of older patients living and dying with multiple chronic disease that are frequently admitted to the hospital. In recent months, the Covid-19 pandemic further highlighted the importance of timely discussion of goals of care. Health care professionals as well as patients were confronted with the question of whether hospital admission or ICU admissions would benefit patients' quality of life.

An important barrier that needs to be overcome is the misunderstanding about palliative care as terminal care. Our studies have shown that this misunderstanding is still extremely common amongst hospital-based professionals and clearly hinders timely identification. Increasing knowledge of the importance of timely palliative care and what benefits this has for patients could improve this. Besides identification, providing hospital-based professionals with the skills to act on their findings, in other words starting conversations about the end of life and initiating palliative care is highly encouraged. Our studies, as well as a recent review, show that hospital based professionals feel they do not have sufficient skills.[47] Specialist palliative care teams can play an important role in this educational effort[48, 49] with the additional benefit that they might be consulted more often when other professionals become more familiar with them. Combining training modules for both nurses and physicians has the additional benefit of making palliative care something that can be discussed during morning rounds and might take away some of the anxiety nurses experience when bringing up the subject.

Chapters 3 and 4 showed that unfortunately the studied identification instruments had limited prognostic accuracy and we do not advise using them to determine a one-year prognosis of acutely hospitalized older patients. However, these instruments could potentially be used as a starting point for end of life conversations or a holistic assessment of needs by generalists, in both hospital and primary care. The use of instruments in this manner needs further exploration. To this end instead of using mortality as an outcome using palliative care interviews and assessments as referencing standards was suggested in a recent review Elmokhallalati *et al*.[50] Additionally, it should be assessed whether the use of these instruments would lead to overburdening of the specialist palliative care services.

This thesis focused on timely palliative care for older patients during hospital admission. However, many advocate for timely identification, and especially end of life conversations, to occur in primary care. This was also an important hesitation we found with some of our study participants. We agree that primary care might be the preferred place to have conversations about the end of life, because of an often longer relationship with patients, less focus on a single disease and insight in how a patient functions at home. Previous studies have also shown that timely identification in primary care enhances patients outcomes.[51] However, this does not mean that the identification and initiation of end of life conversations should solely lie in primary care. Especially since our focus group study (chapter 5) showed that primary care professionals sometimes also wait for hospital-based professionals to determine if a patient is palliative. Complete advance care planning conversations might not be realistic during hospital admission and collaboration between hospital and primary care professionals in this effort is important.

Working towards transmural palliative care

To enhance continuity of care for older patients with palliative needs, transmural palliative care could be part of the solution.

Our focus group study (chapter 5) revealed barriers in the transition between hospital and primary care for patients at the end of life. It also revealed three aspects that are essential in the handover: a clear declaration of a palliative approach, if and how this approach has been communicated with patients, and a description of psychosocial problems (if any). In addition, direct contact between primary care and hospital care is also recommended to discuss social aspects and discuss coordination of care. Another method that could aid in patients receiving their preferred care in all settings is the use of an individualised care plan. This care plan can contain goals and preferences of care, treatment limitations but also information for the patient about whom to contact in case of an emergency. If all care professionals and informal caregivers would with the use of the care plan be aware of the patient's wishes, this could potentially prevent unwanted care. This care plan should move with the patient and adjusted when necessary. Ideally the care plan is thus part of a joined electronic patient file that is accessible in all care settings. An example is a digital information system palliative care (DIS PZ) that was developed alongside the PalliSupport intervention and is tested in one of the participating regions.

Our review (chapter 6) revealed different types of transmural palliative care interventions that benefitted patients. Although hospital-based teams that take over care and follow patients in primary care showed the largest effects, we do not recommend this model in the Netherlands. In the Netherlands, palliative care is provided as a generalist plus specialist model, where specialist palliative care teams are consulted but not the primary providers for patients. Because primary care is very strong in the Netherlands, we advocate for a collaborative team that involves both general practitioners and community nurses, which is based on the specialist palliative care teams that currently already exist within hospitals. Such a collaborative team will then follow-up patients in their home setting. Future studies, including lessons learned from our PalliSupport trial, could contribute to our understanding if this model are effective in improving transmural palliative care.

Another point of attention that has been underexposed in this thesis is the role geriatricians could play in palliative care. Palliative care and geriatrics are distinct medical specialities that share similarities.[52, 53] Both specialities provide patient and family-centred care and aim at improving quality of life through goal-oriented care, team-based working and proactive multidimensional assessments of needs. Currently, most hospitals have geriatric and palliative care experts in separate teams. Combining their expertise could further improve care for older patient at the end of life, especially for frail patients and those with cognitive impairments. Efforts should be made to assess how these two specialities can work together.

An important lesson we learned during the development of our transmural palliative care trial is to take the time to identify regional structures and involve the professionals from all setting involved in the intervention from the start. In our feasibility study in one of our participating hospitals, we mainly collaborated with the palliative care team and to a lesser extent with the departments and primary care organisations. While for non-complex studies this might be sufficient, complex interventions require actions from different professionals in different settings and if one does not understand the regional structure or organisational culture beforehand, the chance of an intervention becoming successful are slim. In addition when performing a complex interventions, it is essential to perform a rigorous process evaluation,[54] preferably mixed-method. This will allow for a determination of which components made your intervention successful or unsuccessful, but will also aid in the next step, wider implementation. Because we perform a process evaluation in the PalliSupport trial we are still able to contribute to the evidence on this subject even though inclusion of patients in had to be stopped due to the Covid-19 pandemic and the resulting difficulties in organizing the trial and recruitment.

Final conclusions/recommendations

This thesis started with the case of Mrs Smit, a vulnerable older patient with the wish to spend as much time as possible at home. During the last months of life she was admitted three times, and only during the last admission were her palliative needs identified and she eventually died in the hospital. Had physicians and nurses identified her needs earlier based on the frequent admissions, physical deteriorations and the fear she experienced, her needs and preferences could have been discussed. In addition, the handover and collaboration between hospital and home could have been improved and might have resulted in Mrs Smit's preferences to remain at home and also die at home being honoured.

This thesis sheds light on identifying older patients that could benefit from palliative care, such as Mrs Smit, during hospital admission and how better collaboration and transmural care has the potential to improve outcomes at the end of life.

To improve timely identification of palliative needs of older patients during hospital admission, hospital-based professionals should be educated on its meaning and benefits. In addition, professionals should be trained on how to start conversations about the end of life. We do not recommend the use of the identification instruments we studied to determine prognosis, but do advise further study of the use of these instruments as starting point of end of life conversations or holistic need assessments.

To improve continuity of care, we recommend studying the effectiveness of transmural palliative care interventions where generalists from hospitals and primary care collaborate with specialist palliative care teams. Before embarking on these complex interventions, we highly recommend performing feasibility studies. Additionally, we advise incorporating qualitative research when developing complex interventions as well as in evaluation its effects.

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Chapter 10

Summary
Nederlandse samenvatting

Summary

Chapter 1 is the general introduction of this thesis and provides the background and context of the research we performed. Due to the rising number of older patients living and dying with multiple chronic diseases, well organised palliative care is important. However, there are several barriers to the provision good palliative care in older patients. Firstly, care transitions are frequent in older patients in the last months of life and continuity of care is not optimal when patients move between care settings. In addition, patients often do not die at their preferred place. Palliative care needs are often not identified timely and consequently conversations about preferences about the end of life are not held. Palliative care specialists are also often not consulted for patients.

The overall aim of this thesis was to provide scientific evidence concerning timely identification, collaboration between hospitals and home, and transmural palliative care, needed for the development of the building blocks for the PalliSupport transmural care pathway intervention. In the first part of this thesis we aimed to assess how hospital-based professionals identify the palliative phase in their patients and if identification instruments could help in this effort. In part II of this thesis we focused on collaboration between hospital and primary care for palliative patients and assessed if transmural care can decrease the number of hospital admissions and increase the number of patients dying at the preferred place of death.

In part 1 of this thesis we assess manners in which hospital-based professionals could identify palliative needs in patients. **Chapter 2** describes a qualitative study where we assessed how hospital-based professionals identify patients in the palliative phase and what barriers exist. Over the past years the benefits of timely initiation of palliative care have become known. However, identification of which patients are in the palliative phase, has been proven to occur late, resulting in patients not receiving palliative care. It is therefore of importance to understand how hospital-based professionals currently identify the palliative phase in their patients and what makes this process difficult. Therefore, we performed a qualitative study amongst 28 Dutch hospital-based nurses and physicians. Findings of this qualitative analysis show that hospital-based nurses and physicians are insecure about defining the palliative phase. Identification of the palliative phase is a relatively unstructured process that occurs based on prognostication, assessment of treatment trade-off and assessment of patients' needs and preferences. Difficulties occur because of a persistent focus on treatment, the unpredictability of non-oncological diseases, and obstacles in communication with patients and in the collaboration with other professionals. The results of this study provided insight on how we could educate hospital-based professionals to ensure timely identification of patients with palliative care needs.

In **Chapter 3** we analysed the usability of the Surprise Question (SQ) in determining one year mortality of acutely hospitalised older patients when used by nurses. The SQ is an intuitive question ‘would I be surprised of the patients died in the next year?’ and aims to aid in identifying patients who need palliative care. Previous research has focused on the use of the SQ by physicians. Its use by nurses, who often have close contact with patients during hospital admission, have thus far not been studied much. We posed the SQ to 66 registered nurses about 252 patients of 70 years or older that were acutely admitted to the hospital. Additionally 22 student nurses answered the question about 73 patients. Answer options were ‘No’ (a positive SQ), ‘Don’t Know’ and ‘Yes’(both negative SQ). Of the included patients 30.6% died in the year after hospital admission. The sensitivity and specificity of the SQ when used by registered nurses were 76.7% and 56.6%, respectively. The positive and negative predictive values were 43.7% and 84.6 %. When student nurses answered the SQ the sensitivity and specificity were 46.7% and 72.1%, with a positive and negative predictive value respectively of 53.8% and 66.0%. 85% of the patients who died during admission or in the first three months post-discharge were identified with the SQ. The predictive values of the SQ in our study were lower compared to previous studies. This could be explained by the fact that nurses were asked to answer the question for patients they did not have a long relationship with. In addition, because we included older patients, nurses might have felt they would not be surprised if patients died because of their age, even though age alone is not a predictor of mortality.
Because of the high number of false positives, e.g. patients who did not die in the year after admission were identified as such, using the SQ for referral to specialist palliative care could lead to overburdening of these specialists. However, the SQ could potentially be used as a manner to further assess palliative needs. The role of nurses in identification of palliative care needs and the provision of palliative care warrants further attention.

Chapter 4 is the last chapter of Part 1. We aimed to assess which out of four instruments was best at assessing one year mortality for acutely hospitalized older patients when used by physicians. Besides the Surprise Question (SQ), these instruments were the Supportive Palliative Care Indicators Tool (SPICT™), Gold Standard Framework - proactive identification guidance (GSF-PIG) and Palliative Performance Scale (PPS). The SPICT and GSF-PIG consist of a set of general and disease specific indicators, whereas the PPS scores functional status We offered the instruments to 57 physicians (in and not in training) about 278 patients. The results show that none of the four studied instruments had both high sensitivity and specificity in determining one year mortality. The sensitivity and specificity for one-year mortality was 81.5% and 41.1% for the SQ, 51.0% and 75.7% for the SPICT, 56.9% and 75.6% for the GSF-PIG and 55% and 66.7% for the PPS. The diagnostic odds were low and ranged between 2.4 (95% CI 1.5-4.1) for the PPS to 5.2 (95% CI 2.4-11.5) for the GSF-PIG. Differences in usability rated by professionals were not detected, and usability was judged as moderate. Based on our findings none of the instruments can be recommended to predict one-year mortality in older hospitalized patients.

In part two of this thesis we looked at transmural collaboration in palliative care. **Chapter 5** shows the results of a qualitative focus group study on the barriers in the transition between hospital and primary care for palliative care patients. We performed three focus groups with nurses and two with physicians and included both professionals from primary and secondary care to enhance discussions about barriers and potential solutions. The results show that multiple barriers hinder good transitions between hospital and primary care for palliative patients. The first barrier is that patients are not identified as ‘palliative’ and consequently their palliative status is not incorporated in the handover. The handover was found to primarily focus on physical aspects and not on other palliative domains, where especially the description of psychosocial problems were thought to be important for a good handover. Another important barrier for especially physicians was the uncertainty in roles and responsibilities, for example not knowing who is in charge of a patient.

Chapter 6 consists of a systematic review of the literature and meta-analysis on the effectiveness of transmural palliative team interventions in reducing hospital admissions and improving the number of patients with home deaths. We systemically searched MEDLINE (Ovid), Embase (Ovid), CINAHL (Ebsco), PsychINFO (Ovid), Cochrane Library (Wiley) databases for eligible articles. For the purpose of this study we included studies incorporating collaborative teams where hospital and community professionals co-managed patients, hospital-based teams that followed patient in the community, or case-management interventions lead by palliative care teams. Eligible studies were randomized control trials or observational studies with a control group. We included 19 studies with hospital admission and/or place of death as their outcome. The quality of the studies was moderate for most. There was high heterogeneity between the studies on intervention, patient population, control group, follow-up time as well as the effects. Nonetheless we decided to perform a meta-analysis including a sensitivity analysis. The overall pooled effect showed a reduction in patients with a hospital (re)admission in favor of the intervention groups, as well as an increase in home deaths. For both outcomes the highest effect was seen in hospital-based teams with community follow-up. This meta-analysis provides evidence that transmural team-based palliative care interventions can lower hospital admissions and improve the number of patients dying at their home. The moderate quality, and especially the lack of reporting on adherence to protocol of the included studies in combination with the statistical heterogeneity warrants caution in interpreting these results.

Chapter 7 presents the results of a mixed-method feasibility study. The aim of this study was to determine whether components of the PalliSupport transitional care pathway were feasible in a clinical setting. We performed this study in one hospital in Amsterdam with surrounding primary care facilities. Based on the previous studies, studying best practises and in collaboration with experts, we developed the Pallisupport transitional care pathway. The study protocol consisted of training modules on early identification, advance care planning, protocols on interprofessional and transitional collaboration and establishment of a transitional palliative care team. We formulated feasibility criteria on patient and informal caregiver recruitment, data collection, protocol adherence and patient burden. In addition we performed qualitative interviews with care professionals involved in the care pathway to assess their experiences and views on the different components.

The results of this study reconfirm the importance of performing a feasibility study prior to embarking on a large and complex trial in palliative care. Important lessons for the improvement of the PalliSupport transitional care pathway and the upcoming stepped wedge randomised controlled trial (see chapter 8) were learned. The inclusion rate was much lower than anticipated and resulted in difficulty assessing other feasibility criteria. The qualitative analysis identified three barriers to recruitment: misunderstandings about palliative care, uncertainty about professionals' roles, and difficulties in initiating end-of-life conversations. Patients experienced low burden and training programs were well received and professionals found the intensified collaboration beneficial for patient care.

Chapter 8 contains the study protocol of pragmatic stepped wedge randomised controlled trial of the PalliSupport transitional care pathway. In this chapter we build on the feasibility study and provide the final study protocol. In this stepped wedge randomized controlled trial, clusters would consist of hospitals and surrounding primary care organizations and would be randomized according to the moment they switch from care as usual phase to intervention phase. The interventions would consist of 5 components: 1) identification of palliative care needs during admission, 2) palliative care assessment and advance care planning by a transitional palliative care team, 3) multidisciplinary team meetings, 4) discharge and comprehensive handover, 5) home visits and follow up. We aimed to include 490 patients ≥ 65 years of age with an unplanned hospital admission and determined as needing palliative care based on previous hospital admissions, functional status, weight loss and a 'positive' Surprise Question. The primary outcome would be the number of patients with an unplanned readmission. Secondary outcomes would be death at preferred place, quality of life, symptom burden, health care utilization and caregiver burden. In this chapter recruitment, data collection, statistical analysis as well as the interventions different components and how they are implemented are discussed in detail. Unfortunately the PalliSupport trial had to be terminated early due to the Covid-19 pandemic and the resulting difficulties in organizing the trial and recruitment.

The final chapter, **Chapter 9**, is the general discussion. In this concluding chapter we reflect on the main findings of our studies, discuss methodological considerations as well as implications for research and clinical practice.

This thesis shed light on the difficulties in timely identification of palliative needs of older patients by hospital professionals. It further found that identification instruments do not have sufficient prognostic accuracy to be used as a method to determine one year mortality in acutely hospitalized older patients. To improve timely identification of palliative needs of older patients during hospital admission, education on the benefits of timely start of palliative care should be improved, but also professionals should be trained on how to start conversations about the end of life. To improve continuity of care we studying the effectiveness of transmural palliative care interventions is crucial. Incorporating qualitative study designs is recommended both during development stages as well as in evaluation the effects. We further recommend performing feasibility studies before starting effectiveness studies and to allow enough time in the development of transmural interventions to get acquainted with regional structures and culture before aiming to implement complex interventions.

Nederlandse samenvatting

Hoofdstuk 1 vormt de algemene introductie van dit proefschrift. Het hoofdstuk beschrijft de achtergrond en context waarin wij de onderzoeken hebben uitgevoerd. Door het stijgende aantal oudere patiënten dat leeft met en sterft ten gevolge van verschillende chronische ziektes, is goed georganiseerde palliatieve zorg belangrijk. Echter bestaan er verschillende barrières in de palliatieve zorg voor oudere patiënten. Allereerst hebben oudere patiënten in de laatste maanden van hun leven frequent te maken met zorgovergangen en is de continuïteit van zorg niet optimaal wanneer patiënten tussen zorgsettingen bewegen. Daarnaast sterven patiënten niet altijd op hun plek van voorkeur. Palliatieve zorgbehoeftes worden vaak niet tijdig herkend met als gevolg dat er geen gesprekken worden gevoerd over voorkeuren rondom het levenseinde. Ook worden palliatieve zorgspecialisten weinig geconsulteerd.

Het overkoepelende doel van dit proefschrift is om wetenschappelijk bewijs te vinden over tijdig identificeren van palliatieve zorgbehoefte, voor passende samenwerking tussen ziekenhuis en thuissituatie en over transmurale palliatieve zorg. Deze onderzoeken waren nodig voor de ontwikkeling van bouwstenen voor het PalliSupport transmurale zorgpad. Het doel van het eerste deel van dit proefschrift was te onderzoeken hoe ziekenhuisprofessionals de palliatieve fase van hun patiënten identificeren en in hoeverre identificatie-instrumenten hierbij zouden kunnen helpen. In het tweede deel van dit proefschrift hebben we ons gericht op de samenwerking tussen ziekenhuizen en eerstelijnszorg voor palliatieve patiënten. Als mede hebben we onderzocht of transmurale palliatieve zorginterventies het aantal ziekenhuisopnames kunnen verlagen en het aantal mensen dat op plaats van voorkeur komt te overlijden kunnen vergroten.

In het eerste deel van dit proefschrift onderzoeken we manieren waarop ziekenhuisprofessionals palliatieve zorgbehoefte in hun patiënten identificeren. **Hoofdstuk 2** beschrijft de resultaten van een kwalitatieve studie waarbij we onderzocht hebben hoe ziekenhuisprofessionals de palliatieve fase in hun patiënten identificeren en welke barrières er bestaan. In de laatste jaren is het belang van tijdige start van palliatieve zorg bekend geworden. Het is echter aangetoond dat identificatie van patiënten die baat kunnen hebben bij palliatieve zorg laat plaatsvindt met als gevolg dat patiënten geen palliatieve zorg krijgen. Het is daarom belangrijk om te begrijpen hoe ziekenhuisprofessionals momenteel de palliatieve fase identificeren en wat dit proces van identificeren moeilijk maakt. Daarom hebben wij een kwalitatieve studie verricht met 28 Nederlandse verpleegkundigen en artsen die in het ziekenhuis werken. Deze kwalitatieve studie laat zien dat verpleegkundigen en artsen onzeker zijn over het definiëren van de palliatieve fase. Identificatie van de palliatieve fase is een relatief ongestructureerd proces dat gebaseerd is op prognosticeren, afwegen van behandelingsopties en evaluatie van de behoeftes en voorkeuren van patiënten. Moeilijkheden in identificeren komen voort uit de aanhoudende focus op behandeling, de onvoorspelbaarheid van niet oncologische ziektes, moeilijkheden in communicatie met patiënten en moeilijkheden in samenwerking tussen professionals. De resultaten van deze studie geven inzicht in hoe ziekenhuisprofessionals onderwezen kunnen worden om patiënten met palliatieve zorgbehoefte tijdig te identificeren.

In **hoofdstuk 3** analyseerde we de bruikbaarheid van de ‘Surprise Question’ (SQ) door verpleegkundigen in het bepalen van de éénjaarssterfte van acuut opgenomen ouderen. De SQ is een intuïtieve vraag: ‘zou ik verbaasd zijn als deze patiënt in het komende jaar zou overlijden?’. Deze vraag heeft als doel te helpen in het identificeren van patiënten die behoefte hebben aan palliatieve zorg. Eerder studies betroffen het gebruik van de SQ door artsen. Het gebruik van de SQ door verpleegkundigen, die vaak nauw contact hebben met een patiënt gedurende een opname, is dusver nog niet veel onderzocht. We hebben de SQ voorgelegd aan 66 verpleegkundigen over 252 acuut in het ziekenhuis opgenomen patiënten van 70 jaar of ouder. Daarnaast hebben 22 verpleegkundigen in opleiding de SQ beantwoord over 73 patiënten. Antwoordmogelijkheden waren ‘Nee’ (een positieve SQ), ‘Weet ik niet’ en ‘Ja’ (beide een negatieve SQ). Van de geïncludeerde patiënten overleed 30.6% in het jaar na de ziekenhuisopname. De sensitiviteit en specificiteit van de SQ gebruikt door afgestudeerde verpleegkundige waren respectievelijk 76.7% en 56.6%. Positief en negatief voorspellende waardes waren 43.7% en 84.6%. Wanneer verpleegkundigen in opleiding de SQ beantwoordden, waren de sensitiviteit en specificiteit 46.7% en 72.1%, met een positief en negatief voorspellende waarde van respectievelijk 53.8% en 66%. Van de patiënten die gedurende de opname of in de eerste drie maanden na ontslag overleden, werd 85% geïdentificeerd. De voorspellende waarde van de SQ in onze studie was lager dan in voorgaande studies. Dit kan verklaard worden doordat aan de verpleegkundigen de SQ werd gesteld over patiënten waarmee ze ’slechts een korte relatie hadden. Omdat we oudere patiënten includeerden is het mogelijk dat verpleegkundigen niet verbaasd zouden zijn als patiënten snel zouden overlijden, hoewel leeftijd alleen geen voorspeller is van sterfte. Het aantal vals positieve patiënten (patiënten die middels de SQ werden geïdentificeerd maar niet overleden in het jaar na opname) was hoog. Het gebruik van de SQ voor verwijzing naar specialistische palliatieve zorg kan deze specialisten dus overbelasten. Echter kan de SQ potentieel wel gebruikt worden als een manier om palliatieve zorgbehoefte verder te evalueren. De rol van verpleegkundigen in identificatie van palliatieve zorgbehoefte en in het geven van palliatieve zorg verdient verdere aandacht.

Hoofdstuk 4 is het laatste hoofdstuk van het eerste deel van het proefschrift. We wilden nagaan welke van vier instrumenten, ingevuld door artsen, het beste de éénjaarssterfte van acuut opgenomen ouderen kon voorspellen. Naast de

Surprise Question (SQ) waren deze instrumenten de Supportive Palliative Care Indicators Tool (SPICT ™), Gold Standard Framework – proactive identification guidance (GSF-PIG) en de Palliative Performance Scale (PPS). De SPICT™ en GSF-PIG bestaan uit een set van algemene en ziektespecifieke indicatoren, terwijl de PPS op functioneren scoort. We legden de instrumenten voor aan 57 artsen (deels in opleiding tot specialis en deels niet in opleiding) over 278 patiënten. De resultaten laten zien dat geen van de vier bestudeerde instrumenten een hoge sensitiviteit en specificiteit had bij het bepalen van de sterfte na één jaar. De sensitiviteit en specificiteit voor vaststellen van éénjaarssterfte was 81.5% en 41.1% voor de SQ, 51.0% en 75.7% voor de SPICT, 56.9% en 75.6% voor de GSF-PIG en 55% en 66.7% voor de PPS. De diagnostische odds waren laag en varieerden van 2.4 (95% confidence interval 1.5-4.1) voor de PPS tot 5.2 (95% BI 2.4-11.5) voor de GSF-PIG. Er werden geen verschillen in bruikbaarheid gedetecteerd en bruikbaarheid werd door professionals als niet hoog beoordeeld. Op basis van onze bevindingen kan geen van de instrumenten worden aanbevolen om de éénjaarssterfte bij oudere opgenomen patiënten te voorspellen.

In het tweede deel van dit proefschrift hebben we gekeken naar transmurale samenwerking in palliatieve zorg. **Hoofdstuk 5** laat de resultaten zien van een kwalitatieve focusgroepstudie naar de barrières in de overgang tussen ziekenhuiszorg en eerstelijnszorg voor palliatieve patiënten. Er werden drie focusgroepen gehouden met verpleegkundigen en twee met artsen. Professionals uit de eerstelijnszorg en de tweedelijnszorg deden mee om discussies over barrières en mogelijke oplossingen te versterken. De resultaten tonen dat verschillende barrières goede overgangen tussen ziekenhuiszorg en eerstelijnszorg belemmeren. De eerste barrière wordt gevormd doordat patiënten niet als ‘palliatief’ worden geïdentificeerd waardoor hun palliatieve status niet wordt meegenomen in de overdracht. De overdracht bleek met name gericht op het fysieke aspect, terwijl juist aandacht voor psychosociale aspecten nodig wordt gevonden voor een optimale overdracht van ziekenhuiszorg naar eerstelijnszorg. Een andere belangrijke belemmering voor goede overgangen, voor met name artsen, was onzekerheid over rollen en verantwoordelijkheden. Bijvoorbeeld onzekerheid over wie de hoofdbehandelaar is van een patiënt.

Hoofdstuk 6 bestaat uit een systematische review en meta-analyse van de literatuur met behulp waarvan we de effectiviteit van transmurale palliatieve teaminterventies in het verminderen van ziekenhuisopnames en in het vergroten van het aantal patiënten dat thuis overlijdt onderzochten. We doorzochten systematisch de databases van MEDLINE (Ovidius), Embase (Ovidius), CINAHL (Ebsco), PsychINFO (Ovidius), Cochrane Library (Wiley) op geschikte artikelen. Voor het doel van deze studie hebben we studies meegenomen met teams waarin ziekenhuisprofessionals en eerstelijns professionals samen de leiding hadden over patiënten, ziekenhuisteams die de patiënt in de eerstelijn volgden, of casemanagement interventies geleid door palliatieve zorgteams. Geschikte studies waren gerandomiseerde studies of observationele studies met een controlegroep. We hebben 19 onderzoeken meegenomen die als uitkomstmaat ziekenhuisopname en/of plaats van overlijden hadden. De meeste studies waren van matige kwaliteit. Er was een hoge heterogeniteit tussen de onderzoeken betreffende interventie, patiëntenpopulatie, controlegroep, follow-up tijd en de effecten. Desalniettemin hebben we besloten om een meta-analyse uit te voeren waarbij we ook een sensitiviteitsanalyse hebben gedaan. Het samenvattende resultaat toonde in de interventiegroepen een afname van het aantal patiënten met een (her)opname in het ziekenhuis, evenals een toename van het aantal patiënten dat thuis overleed. Voor beide uitkomsten werd het hoogste effect gezien in ziekenhuisteams die hun zorg voor patiënten thuis continueerden. Deze meta-analyse levert bewijs dat transmurale palliatieve teaminterventies het aantal ziekenhuisopnames kunnen verminderen en het aantal patiënten dat thuis sterft, kunnen verbeteren. De matige kwaliteit van de geïncludeerde studies, met name het gebrek aan rapportage over hoe studieprotocollen werden nageleefd en de statistische heterogeniteit, vereist wel voorzichtigheid bij het interpreteren van deze resultaten.

Hoofdstuk 7 presenteert de resultaten van een ‘mixed-method’ haalbaarheids-studie. Het doel van deze studie was te bepalen of onderdelen van het PalliSupport transmurale zorgpad haalbaar waren in een klinische setting. We hebben dit onderzoek uitgevoerd in één ziekenhuis in Amsterdam met omliggende eerstelijnszorgvoorzieningen. Op basis van eerdere onderzoeken, bestudering van ‘best practices’ en samenwerking met experts ontwikkelden we het Pallisupport transmurale zorgpad. Het studieprotocol bestond uit trainingsmodules over vroege identificatie, advance care planning, protocollen over interprofessionele en transmurale samenwerking en het opzetten van een transmuraal palliatiefteam. We hebben haalbaarheidscriteria geformuleerd op het gebied van rekrutering van patiënten en mantelzorgers, dataverzameling, protocolnaleving en patiënt belasting. Daarnaast hebben we kwalitatieve interviews gehouden met zorgprofessionals die bij het zorgpad betrokken waren om hun ervaringen en opvattingen over de verschillende onderdelen te beoordelen.

De resultaten van deze studie bevestigen het belang van het uitvoeren van een haalbaarheidsstudie voorafgaand aan een grotere effectiviteitsstudie binnen de palliatieve zorg. Er werden belangrijke lessen getrokken voor de verbetering van het PalliSupport transmurale zorgpad en de aanstaande gerandomiseerde effectiviteitsstudie. Het inclusiepercentage was veel lager dan verwacht en resulteerde in moeilijkheden bij het beoordelen van andere haalbaarheidscriteria. De kwalitatieve analyse identificeerde misverstanden over palliatieve zorg, onzekerheid over de rollen van professionals en moeilijkheden bij het initiëren van gesprekken rond het levenseinde als belemmeringen voor rekrutering van patiënten. Patiënten ervoeren een lage belasting. De trainingsprogramma's werden goed ontvangen door professionals, die bovendien ook de intensievere samenwerking bevorderend vonden voor de patiëntenzorg.

Hoofdstuk 8 bevat het studieprotocol van een pragmatische 'stepped-wedge' gerandomiseerde studie van het PalliSupport transmurale zorgpad. In dit hoofdstuk bouwen we voort op de haalbaarheidsstudie en beschrijven we het uiteindelijke studieprotocol. In deze gerandomiseerde studie zullen clusters bestaan uit ziekenhuizen en omliggende eerstelijnszorgorganisaties en wordt het moment waarop zij zullen overschakelen van gebruikelijk zorg naar de interventiefase gerandomiseerd. De interventies zullen bestaan uit 5 componenten: 1) identificatie van palliatieve zorgbehoeftes tijdens opname, 2) beoordeling van palliatieve zorgbehoefte en proactieve zorgplanning door het transmurale palliatieve team 3) multidisciplinaire teambijeenkomsten, 4) uitgebreide overdracht bij ontslag, 5) thuisbezoeken en opvolging. We streefde ernaar om 490 patiënten van 65 jaar en ouder met een ongeplande ziekenhuisopname te includeren van wie is vastgesteld dat ze palliatieve zorg nodig hebben op basis van eerdere ziekenhuisopnames, functionele status, gewichtsverlies en een 'positieve' Surprise Question. De primaire uitkomstmaat is het aantal patiënten met een ongeplande heropname. Secundaire uitkomsten zijn overlijden op de plaats van voorkeur, kwaliteit van leven, symptoomlast, gebruik van gezondheidszorg en belasting van mantelzorgers. In dit protocol worden rekrutering, gegevensverzameling, statistische analyse en de verschillende componenten van de interventie en de implementatie ervan in detail besproken. Helaas is de PalliSupport studie vroegtijdig gestopt door de organisatorische moeilijkheden en problemen met includeren die ontstaan zijn door de Covid-19 pandemie.

Het laatste hoofdstuk, **hoofdstuk 9**, is de algemene discussie. In dit afsluitende hoofdstuk reflecteren we op de belangrijkste bevindingen van onze studies. We geven methodologische overwegingen en bespreken de implicaties voor onderzoek en klinische praktijk. Dit proefschrift werpt licht op de moeilijkheden die bestaan bij het tijdig identificeren door zorgprofessionals van palliatieve zorgbehoeftes van oudere patiënten. Daarbij hebben we vastgesteld dat identificatie-instrumenten niet voldoende prognostische nauwkeurig zijn om te worden gebruikt als een methode om de éénjaarssterfte te bepalen bij acuut opgenomen ouderen. Om de tijdige identificatie van palliatieve behoeftes van oudere patiënten tijdens ziekenhuisopname te verbeteren, moeten inspanningen worden geleverd om het onderwijs over de voordelen van een tijdige start van palliatieve zorg te verbeteren. Daarnaast moeten professionals ook worden opgeleid in het starten van gesprekken over het levenseinde. Om de continuïteit van de zorg te verbeteren, is het onderzoeken van het effectiviteit van transmurale palliatieve zorginterventies cruciaal. Het gebruik van kwalitatief onderzoek wordt aanbevolen zowel tijdens de ontwikkelingsfasen als bij de evaluatie van de effecten. We raden verder aan om haalbaarheidsstudies uit te voeren voordat effectiviteitsstudies worden gestart en om voldoende tijd uit te trekken in het ontwikkelen van transmurale interventies om regionale structuren en cultuur te leren kennen alvorens complexe interventies te implementeren.

Addendum

Portfolio
Scientific publications
Dankwoord
Curriculum Vitae

Portfolio

Name PhD student:	Isabelle Flierman
PhD period:	2016-2021
PhD supervisors:	prof. dr. D.L. Willems prof. dr. B.M. Buurman
PhD co-supervisor:	Dr. M. van Rijn

1. PhD training	**Year**	**Workload (Hours/ ECTS)**
General courses		
- E-BROK	2016	1.0
- Project management	2017	0.6
Specific courses		
- Basis Course Qualitative Health Research	2016	1.9
- Clinical Data Management	2016	0.3
- Practical Biostatistics	2017	1.1
- Observational Epidemiology	2017	0.6
- University Masterclass: Ethical dilemmas in practice	2017	3.0
- Scientific Writing in English for Publication	2018	1.5
Seminars, workshops and master classes		
- Masterclass palliative care with prof. dr.Eduardo Bruera (presentation)	2016	0.2
- Masterclass transitional care by prof. dr. Mary Naylor (presentation)	2017	0.2
- Masterclass prof. Dr. Higginson (presentation)	2018	0.2
Oral Presentations		
- EAPC Palermo (digital)	2020	0.5
- Geriatriedagen 2020	2020	0.5
- Geriatriedagen 2019, symposium	2019	0.5
- Geriatriedagen 2018, symposium	2018	0.5
- Pre-symposium EAPC	2018	0.5
Poster Presentations		
- Nationaal Congres Palliatieve Zorg (two posters)	2017	0.5
- APH congres	2017	0.5
- Nederlands-Vlaamse Wetenschapsdagen Palliatieve Zorg	2017	0.5
- EAPC Bern (two posters)	2018	0.5
- EUGMS Berlin (two posters)	2018	0.5
- APH congres	2018	0.5

- Nationaal Congres Palliatieve zorg	2018	0.5
- EUGMS Krakow	2019	0.5
- EAPC Berlin	2019	0.5
(Inter)national conferences		
- Integrated Palliative Care: Are you ready for change? An EAPC RN/InSup-C Symposium, Brussels	2016	0.25
- Nationaal Congres palliatieve zorg, Lunteren	2016	0.50
- Nederlands-Vlaamse Wetenschapsdagen Palliatieve Zorg	2017 2018	0.25 0.50
- EAPC Bern (2 days)		
- Geriatriedagen 2018	2018	0.25
- Geriatriedagen 2019	2019	0.25
- Geriatriedagen 2020	2020	0.25
Other		
- Journal club department of family medicine	2016-2017	0.6
- Weekly meetings Geriatric department	2016-2020	1.5
- Monthy Geriatric Research meeting	2016-2020	2.0

2. Teaching	**Year**	**Workload (Hours/ ECTS)**
Lecturing		
- Seminars medical ethics for medical students	2017-2018	0.7
Supervising		
- Master thesis student: *Mirte Bosman*	2016	1.0
- Master thesis student: *Marety Laarman*	2017	1.0
- Master thesis student: *Judith Versluis*	2017	1.0
- Master thesis student: *Floor Rooskens*	2018	1.0
- Master thesis student: *Marit Pruis*	2018	1.0
- Master thesis student: *Dorende Niezink*	2018	1.0

3. Parameters of Esteem	**Year**
Awards and Prizes	
- Poster ribbon award EAPC	2017

Scientific publications

1. van Rijn, M., **Flierman, I.**, van Doorne, I., Willems, D. L., Buurman, B. M., Effectiveness of transmural team-based palliative care for older patients at the end of life, PalliSupport: protocol of a stepped-wedge cluster randomized trial. *submitted*

2. **Flierman, I.**, Gieteling, E., van Rijn, M., van Grootven, van Doorne, I., Jamaludin, F.S., Willems, D. L., Muller, M., Buurman, B. M., Effectiveness of transmural team-based palliative care in prevention of hospitalizations in patients at the end of life. A systematic review and meta-analysis. *submitted*

3. **Flierman, I.**, van Rijn, M., Diraoui, S.B., Willems, D. L., Buurman, B. M., Prognostic accuracy of the Surprise Question, SPICT, GSF-PIG and PPS in determining one-year mortality in acutely hospitalized older patients. *Submitted*

4. Jepma, P., Verweij, L., Tijssen, A., Heymans, M.W., **Flierman, I.**, Latour, C.H.M., Peters, R.J.G., Scholte op Reimer, W.J.M., Buurman, B.M., ter Riet, G., The performance of a frailty tool to predict the risk of readmission or mortality in older hospitalized cardiac patients. Accepted BMC Geriatrics.

5. **Flierman, I.**, van Rijn, M., de Meij, M., Poels, M., Niezink, D. M., Willems, D. L., Buurman, B. M., Feasibility of the PalliSupport care pathway: results from a mixed-method study in acutely hospitalized older patients at the end of life. Pilot Feasibility Stud. 2020 Sep 15;6:129.

6. **Flierman, I.**, van Rijn, M., Willems, D. L., Buurman, B. M., Usability of the surprise question by nurses to identify 12-month mortality in hospitalized older patients: A prospective cohort study. Int J Nurs Stud. 2020 Sep;109:103609.

7. **Flierman, I.**, van Seben, R., van Rijn, M., Poels, M., Buurman, B. M., Willems, D. L. Health Care Providers' Views on the Transition Between Hospital and Primary Care in Patients in the Palliative Phase: A Qualitative Description Study. J Pain Symptom Manage. 2020 Aug;60(2):372-380.

8. **Flierman, I.**, Nugteren, I. C., van Seben, R., Buurman, B. M., Willems, D. L., How do hospital-based nurses and physicians identify the palliative phase in their patients and what difficulties exist? A qualitative interview study. BMC Palliat Care. 2019 Jul 9;18(1):54.

9. Schön, S., **Flierman, I.**, Ofner, A., Stahringer, A., Holdt, L.M., Kolligs, F.T., Herbst, A., β-catenin regulates NF-κB activity via TNFRSF19 in colorectal cancer cells. Int J Cancer. 2014 Oct 15;135(8):1800-11.

Practice Publications

10. Van Rijn, M., **Flierman, I.**, Waarde van de Surprise Question. Nurse Academy O&T. 2020 (4)

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Curriculum Vitae

Isabelle Flierman werd geboren op 25 september 1988, te Naarden. Na behalen van haar diploma aan het Gemeentelijk Gymnasium te Hilversum, heeft zij een jaar biologie gestudeerd aan de Universiteit van Amsterdam. Hierna is zij in 2007 begonnen aan de studie Geneeskunde, eveneens aan de Universiteit van Amsterdam. Voor haar masterthesis deed zij onderzoek in München, naar de rol van het eiwit β-catenin in het ontstaan van darmkanker. Na afronden van haar opleiding, heeft zij anderhalf jaar als arts-assistent gewerkt op de afdelingen Interne geneeskunde, Longgeneeskunde en Maag-Darm-Leverziekte in het Rode Kruis Ziekenhuis te Beverwijk. Gedurende haar werk ontwikkelde zij interesse in palliatieve zorg en wilde zich hier verder in ontwikkelen. In 2016 startte zij haar promotieonderzoek bij het PalliSupport project op de afdeling huisartsgeneeskunde en oudergeneeskunde van het Amsterdam UMC locatie AMC. Vanaf 2018 combineerde zij haar promotieonderzoek met werk als arts-assistent ouderengeneeskunde in verschillende verpleeghuizen en geriatrische revalidatiecentra. Na haar promotie zal Isabelle haar opleiding tot internist aan het Amsterdam UMC, locatie AMC vervolgen, waar zij in mei 2020 mee is gestart.