Risk of readmission and the elderly patient's perspective of return to everyday life after discharge from a short-stay unit at the Emergency Department

PhD dissertation

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Preface

This PhD project was accomplished during my part-time employment at the Department of Physiotherapy and Occupational therapy, Aarhus University Hospital, Aarhus, Denmark. This work has been made possible because of the advice, help and support from numerous people.

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Louise M. Nielsen
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The PhD project and dissertation are based on the following three papers:

I. Development of a complex intervention aimed at reducing the risk of readmission of elderly patients discharged from the emergency department using the Intervention Mapping protocol. Published in: BMC Health Services Research 2018;18:588 (1).

II. Effectiveness of the "Elderly Activity Performance Intervention" on elderly patients discharge from a short stay unit at the Emergency Department – A quasi-experimental trial. Published in: Clinical Interventions in Aging 2018;13:737-747 (2).

**List of abbreviations**

ADL: Activities of Daily Living  
AMPS: Assessment of Motor and Process Skills  
bADL: basic Activities of Daily Living  
CCI: Charlson's Comorbidity Index  
CGA: Comprehensive Geriatric Assessment  
CI: Confidence Interval  
CONSORT: Consolidated Standards of Reporting Trials  
COPM: Canadian Occupational Performance Measure  
COREQ: Consolidated Criteria for Reporting Qualitative Research  
EAP intervention: Elderly Activity Performance intervention  
ED: Emergency Department  
FIM: Functional Independence Measure  
GP: General Practitioner  
ISAR: Identification of Seniors at Risk  
IADL: Instrumental Activities of Daily Living  
IQR: Inter Quartile Range  
HR: Hazard Ratio  
HRQol: Health-related quality of Life  
MoHO: Model of Human Occupation  
NEADL: Nottingham Extended Activities of Daily Living scale  
OR: Odds Ratio  
PICO(c): Population Interventions Comparators Outcomes (context)  
PPI: Patient and public involvement  
RCT: Randomized Controlled Trial  
RD: Risk Difference  
RR: Risk Ratio  
SD: Standard Deviation  
TIDieR: The Template for Intervention Description and Replication  
TUG: Timed Up and Go  
WHODAS 2.0: World Health Organisation Disability Assessment Schedule 2.0  
30s-CST: 30s-Chair Stand Test
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English summary

**Background:** Increasing numbers of older people are admitted to emergency departments’ (EDs) short-stay units in Denmark. Elderly patients often present atypical symptoms, comorbidity and limitations in performing activities, complicating care and treatment, and increases their risk of readmission after discharge. Due to the their health conditions’ complexity, elderly patients typically need to receive care and rehabilitation from different healthcare sectors. Therefore, it is important to find a way to meet the rehabilitation needs of elderly patients discharged from a short-stay unit at an ED and provide a well-coordinated and safe transition from the secondary to the primary healthcare sector.

**Aim:** The present PhD project aims to improve and inform current practices regarding the discharge of elderly patients from a short-stay unit at an ED in order to reduce their risk of readmission. This was done through two studies, reported in three papers.

**Methods:** Study I comprised two parts. In the first part (Study Ia, Paper I), development of the Elderly Activity Performance-intervention was conducted and described systematically through the Intervention Mapping approach. In the second part (Study Ib, Paper II), an outcome evaluation of the effectiveness of the developed intervention was conducted in a quasi-experimental trial comparing an intervention group (n=144) and a usual practice group (n=231). In Study II (Paper III), qualitative interviews were conducted with 11 elderly patients who received the intervention in study Ib to examine their experiences of being discharge and returning to everyday life after discharge from a short stay unit at an ED.

**Results:** In Study I, the Elderly Activity Performance intervention was developed to address two risk factors: 1) limitations in performing activities and 2) an incoherent discharge for elderly patients discharged from a short-stay unit at the ED. In total, 375 elderly patients were included in the study to evaluate the effectiveness of the developed intervention. The outcome evaluation revealed that the Elderly Activity Performance intervention was not effective in reducing the risk of readmission compared to usual practice. However, the results revealed that 60% of patients in the intervention group had limitations in performing activities, thus, the need for further rehabilitation was identified. It also revealed that the elderly patients identified as having activity limitations were at higher risk of readmission than patients with no identified limitation. This was supported by results from Study II,
where eleven elderly patients expressed that their everyday lives after discharge were influenced by pain, fatigue and lack of energy, which limited their performance of activities. Speculations concerning their health condition and the future were also present in their everyday lives. The qualitative interviews further revealed that factors such as receiving information, feeling secure and being involved and prepared were considered important by the elderly patients during discharged from a short-stay unit at an ED.

**Conclusion:** Evaluating the effectiveness of the Elderly Activity Performance intervention revealed no effectiveness in reducing risk of readmission in elderly patients discharged from a short stay unit at the ED. The results, however revealed that elderly patients identified with limitations in performing activities were at higher risk of readmission than patients with no identified limitations. In addition, the PhD project contributed with knowledge concerning how elderly patients experienced being discharged and returning to everyday life after discharge from a short-stay unit at an ED. Receiving information, being prepared and involved and feeling secure about returning home were identified as factors of importance for the elderly patients during discharge. Factors such as limitations in performing activities and speculations concerning health condition and the future were present in the elderly patients’ everyday lives after discharge.
Danish summary/Dansk resume

Baggrund: Et stigende antal ældre bliver indlagt på korttidsobservations- og behandlingsafsnit tilknyttet akutafdelinger i Danmark. Ældre patienter indlægges ofte med atypiske symptomer, komorbiditet og begrænsninger i udførelsen af aktiviteter, hvilket komplicerer pleje og behandling og øger risikoen for genindlæggelse efter udkrivelse. På grund af kompleksiteten i deres helbredstilstand har ældre patienter typisk behov for at modtage pleje og genoptræning fra forskellige sundhedssektorer. Det er således vigtigt at finde en måde at imødekomme genoptræningsbehovet hos ældre patienter, der udkrives fra akutafdeling og at sikre en velkoordineret og sikker overgang mellem den primære og sekundære sundhedssektor.

Formål: Dette Ph.d. projekt har som formål at forbedre og informere nuværende praksis vedrørende udkrivelse af ældre patienter fra akutafdeling med henblik på at reducere de ældres risiko for genindlæggelse. Ph.d. projektet omfattede to studier, der blev afrapporteret i tre artikler.

Metode: Studie I bestod af to dele. Den første del (Studie Ia, artikel I) omfattede udviklingen af interventionen "Ældres Aktivitets Udførelse" som blevet beskrevet systematisk ud fra metoden Intervention Mapping. I anden del (Studie Ib, artikel II) blev effekten af den udviklede intervention evalueret i et kvasi eksperimentelt design ved sammenligning af en interventionsgruppe (n=144) og en sædvanlig praksis gruppe (n=231). I Studie II (artikel III) blev der gennemført kvalitative interviews med elleve ældre patienter der havde modtaget interventionen i Studie Ib. Interviewene blev gennemført for at undersøge de ældres oplevelse af udkrivelsen samt hvordan de oplevede at vende tilbage til hverdagen efter udkrivelse fra akutafdelingen.

Resultater: I Studie I blev interventionen "Ældres Aktivitets Udførelse" udviklet for at adressere to risiko faktorer for genindlæggelse: 1) begrænsninger i udførelsen af aktiviteter og 2) usammenhængende udkrivelse af ældre patienter der udkrives fra korttidsobservations- og behandlingsafsnit tilknyttet akutafdeling. I alt 375 ældre patienter blev inkluderet i studiet for at evaluere effekten af den udviklede intervention. Evalueringen viste, at interventionen ikke signifikant kunne reducere risikoen for genindlæggelse sammenlignet med sædvanlig praksis. Imidlertid viste resultaterne at 60% af patienterne i
interventionsgruppen havde begrænsninger i udførelsen af aktiviteter og et behov for videre genoptræning. Resultaterne viste desuden at de ældre patienter der blev identificeret med begrænsninger i udførelsen af aktiviteter i højere grad var i risiko for genindlæggelse end de patienter der ikke havde begrænsninger. Det blev understøttet af resultaterne fra studie II hvor elleve ældre patienter udtrykte at deres hverdag efter udskrivelsen var påvirket af smerte, træthed og manglende energi, hvilket begrænsede dem i udførelsen af aktiviteter. Hverdagen var for de ældre patienter også præget af spekulationer omkring deres helbredsstilstand og fremtiden. Resultaterne fra de kvalitative interviews viste ligeledes at faktorer som at modtage information, føle sig tryg, blive involveret og føle sig forberedt var vigtige for de ældre patienter i forbindelse med deres udskrivelse fra en akutafdeling.

**Konklusion:** Evalueringen af interventionen "Ældres Aktivitets Udførelse" viste at interventionen ikke var effektiv til at reducere risikoen for genindlæggelse for ældre patienter udskrevet fra akutafdeling. Resultaterne viste dog at de patienter der blev identificeret med begrænsninger i udførelsen af aktiviteter var i højere risiko for genindlæggelse end de patienter hvor der ikke blev identificeret begrænsninger. Ph.d. projektet bidrager ligeledes til en forståelse af, hvordan ældre patienter oplever udskrivelsen og det at vende tilbage til en hverdag efter udskrivelse fra akutafdeling. At modtage information, føle sig forberedt og involveret samt føle sig tryg ved at vende hjem blev identificeret som faktorer af betydning for de ældres oplevelse af udskrivelsen. Faktorer som begrænsninger i udførelsen af aktiviteter og spekulationer omkring helbredsstilstand og fremtiden var tilstede i de ældres hverdag efter udskrivelsen.
1. Introduction

Internationally, as well as in Denmark, the increasing proportion of people above 65 years of age, has been pressuring the healthcare system (4–6). The number of elderly patients admitted to emergency departments (EDs) has been increasing and accounts for up to a quarter of all ED visits (5,7,8). Elderly patients often present atypical symptoms, comorbidity and limitations in performing activities. This complicates treatment, especially at an ED, which is designed to deal with trauma and acute illnesses within a short time frame (6,8). As a result, elderly patients’ serious health needs easily can go unmet, and subsequently, adverse events such as readmission and death after discharge from the ED can occur (7–9). In addition, elderly patients typically receive care and rehabilitation from different providers across multiple healthcare settings due to their health conditions’ complexity. An important challenge is to find a way to identify and meet the rehabilitation needs of elderly patients to be discharged from a short-stay unit at an ED and to provide a well-coordinated discharge and transition from the secondary to the primary healthcare sectors.

The aim of the present PhD project is to improve and inform current practices concerning elderly patients’ discharge from a short-stay unit at an ED in order to reduce their risk of readmission.

Definitions

This PhD dissertation focusses on two factors associated with the risk of readmission; elderly patients’ performance of activities and incoherent discharge. Some terms used often in this dissertation are clarified below:

Elderly patients: An elderly patient is age 65 or older and is characterised by at least two of the following: severe illness, comorbidity, polypharmacy, limitations in performing activities, poor nutrition, living alone or needing assistance with personal and/or practical tasks (10). In this dissertation, the term is used when such a patient is admitted to a hospital.

Older people: This term is used to describe the population that is age 65 and up generally.

Performing activities: Identifying and addressing limitations in performing activities are key issues addressed in occupational therapy. Performing activities is defined as "the execution of a task or action by an individual in his or her current environment” (11).
**Coherent discharge:** A coherent discharge is characterised by health professionals’ collaboration across health care sectors with a high level of coordination, and with a clear distribution of responsibilities supported by consistent information pathways (10). The definition is based on the Danish National Action Plan for the Elderly Medical Patient (10).
2. Background

The Danish healthcare system

The healthcare system in Denmark operates across three political and administrative levels: the state, regions and municipalities. The system is tax-financed and almost fully free of charge for citizens (12). The regions comprise the system’s secondary sector and are responsible for hospital care, including emergency care and general practitioners’ (GP) healthcare services. The service in this sector primarily aims to prevent and treat diseases and disabilities according to the Danish Health Act (13). The municipalities comprise the primary sector and are primarily responsible for rehabilitation and homecare services for all other citizens in need, including discharged patients (14). One of the goals of providing rehabilitation services is to promote individuals’ ability to care for themselves including to facilitate the performance of activities and improving quality of life (14). The Danish Health Act specifies that rehabilitation begins during a patient’s hospital admission and continues in the primary care sector after discharge (13). Recently, legislative changes to the Danish Health Act specify that the primary sector’s initiation of rehabilitation after discharge must begin within seven days after referral (15). Professionals involved in post-discharge rehabilitation primarily are occupational therapists, physiotherapists and home-care assistants.

In Denmark, political forces aim to improve and strengthening efforts directed towards elderly patients with medical diagnoses in order to optimise coordination between the primary and secondary sectors (10).

Short-stay units in emergency departments: Demand for acute hospital care continues to rise as aging populations grow. One proposed solution to challenges from this demand on the healthcare system is to establish short-stay units in the secondary sector. The term short-stay unit applies to a wide range of hospital units that provide short-term care and treatment for certain patients (16). In Denmark, emergency departments (EDs) are organised with short-stay units in which patients are admitted for observation or brief treatment before they are either discharged to their homes or transferred to other hospital departments. In some countries like Australia, North America and the UK, occupational therapy services have been provided at EDs for over 20 years, while in Denmark, such services are merely
emerging (17–21). The evidence for providing occupational therapy at EDs in Denmark remains limited (20). Occupational therapists’ role at a short-stay unit at the ED emphasises assessment of the patient’s performance of activities, prescribing assistive devices and referring the patient to the services of primary sector service to ensure a safe and coordinated discharge (18–21).

**Elderly patients in emergency departments**

Elderly patients' contact with EDs is high when compared with younger patients' use; this is persistent across countries with different healthcare systems (6,22). In general, elderly patients who attend an ED, are characterised by the following: severe illness, comorbidity, polypharmacy, limitations in performing activities and needing assistance with personal and/or practical tasks (6,10). The complexity that characterises elderly patients' health conditions may be seen as a result of the aging process, that increases their sensitivity to diseases. As a person ages, the immune system weakens and the body becomes more susceptible to a variety of diseases (23). Common health conditions that are presented in elderly patients include cardiopulmonary diseases, neurological conditions, diabetes, cancer, dementia, fractures and depression (8). Atypical presentation of symptoms is frequent in elderly patients, because symptoms vary, and psychological and cognitive domains also are involved (24).

**Readmission**

Readmission is a common and well-known adverse event for elderly patients discharged from an ED (5,25). In Western countries, up to 20% of elderly patients’ admitted to an ED are readmitted within 30 days after discharge (7,24,26). After 26 weeks, more than 40% of discharged elderly patients’ are readmitted (9,27). Readmissions have considerable consequences for both the elderly patient and society in general. For elderly patients, readmission disrupts their routines in everyday life and exposes them to avoidable risks such as hospital-acquired infections and medical complications (7,28). In addition, during hospitalisation elderly patients are more likely to develop a hospitalisation-associated disability between the onset of the illness and discharge to their homes (29,30). From a societal perspective, readmissions are costly and have become a policy priority in efforts to improve healthcare quality (31,32). From an occupational therapy
perspective, two risk factors have been identified as particularly relevant in practice concerning risk of readmission: elderly patients’ limitations in performing activities and an incoherent discharge (18,20).

**Limitations in performing activities:** Several studies have examined which risk factors predict readmission among elderly patients in general (24,33–35). Limitations in performing activities can be either a pre-existing limitation or a limitation arising from acute illness. In general limitations in performing activities appears as an important predictor of readmission (35–37), as well as other adverse events such as a greater need for home care after discharge (38) and death (39). A systematic review from 2011 concluded that morbidity and limitations in performing activities were the most common risk factors for readmission in elderly patients, whereas age and gender were not associated with readmission (34). For elderly patients with decreased capacity, inactivity during even a short admission is associated significantly with the onset or additional loss of the ability to perform activities (40,41). Limitations in performing activities can also affect elderly patients’ everyday lives after discharge (37). Elderly patients may encounter difficulty maintaining independence and may experience fatigue and decreased physical function including loss of muscle function (42,43). This may hinder the performance of activities and thereby induce a vicious circle, with more inactivity and further dependency as a result (29,44).

**Incoherent discharge:** Readmissions also may indicate that different healthcare sectors are not working together optimally, or that discharges are not coordinated sufficiently to handle elderly patients’ complex needs (45). Due to the complexity of their health conditions, elderly patients often receive treatment, care and rehabilitation from different sectors of the healthcare system, and the transfer of elderly patients’ rehabilitation from the hospital to primary care may present a challenge (10,37,46). Therefore, effective collaboration between healthcare providers from both settings is essential to ensure that the discharge and transition of rehabilitation is well-coordinated and coherent (46,47). Premature discharge or discharge to an environment that is incapable of meeting patients’ needs may result in hospital readmission. In addition, providing information to the elderly patients about diagnoses and a plan for further treatment and rehabilitation is important during discharge (48). The time-pressures within a short-stay unit at an ED can present challenges to effective deliverance of such information. Elderly patients in particular may have a higher risk of poor
understanding because of a high prevalence of communication barriers such as vision and hearing impairments and confusion (48). A qualitative study based on interviews with elderly patients readmitted to hospitals indicated that factors such as lack of information sharing and discharge planning, as well as not reacquiring their habitual levels of functioning before discharge, were the main reasons for readmission (49). Discharge planning is an essential element in optimising discharge and transition of care and rehabilitation to reduce adverse post-discharge events among elderly patients (50). The process of discharge planning strives to ensure that patients are discharged at an appropriate time and that sufficient support is accessible after discharge (51). Factors such as collaboration among healthcare professionals and information exchange have been identified as important in the discharge-planning process and in coordinating a coherent discharge (50–52). A review from 2012 aimed to identify interventions designed to improve patient safety during transitional care, with a particular emphasis on discharge interventions, revealing that interventions that combined discharge planning with primary-care support or follow-up were the most effective (46). Another systematic review from 2016 that aimed to assess the effectiveness of discharge planning concluded, based on its meta-analysis, that a structured discharge plan probably elicits a small reduction in readmissions among elderly patients (53).

**Elderly patients’ perspectives on discharge**

Involvement of the users of the healthcare system is generally recognised as important with regard to improving the quality of healthcare services. Qualitative research among users can lead to important insights into processes of change in both developing and evaluating interventions (54,55). To date, research conducted on EDs predominantly has comprised quantitative studies that address health professionals’ views, whereas little research has addressed patient-perceived factors (56). To improve the discharge process from hospitals, it is necessary to include elderly patients’ perspectives on which factors they perceive as important for their experience of the discharge (57). In a Scandinavian context, some qualitative studies have examined elderly patients’ perspectives in relation to discharge from hospitals (58–60). All three of these studies revealed that after discharge, difficulties in performing activities affected elderly patients’ everyday lives (58–60). Concerns about how to manage activities in their everyday lives after discharge were present in the discharge process among the elderly patients’ (58,59). Some
elderly patients also experienced lack of information and participation in the discharge process, despite their expressed need to be informed (60). The three aforementioned studies were conducted with elderly patients after longer hospitalisation periods; therefore their experiences with the discharge process may not be directly transferable to elderly patients discharged after an admission to an ED. In addition, little is known about how elderly patients experience their everyday lives after discharge from an ED which may be especially challenging for elderly patients due to the short admission time and limited time available to prepare and coordinate the discharge and transition to primary care rehabilitation.

Identifying limitations in performing activities
Assessment of performance of activities is one of the first steps in identifying the need for further rehabilitation in elderly patients before discharge (61). Reports in the medical literature differ with regard to how large a proportion of elderly patients admitted to EDs are limited in performing activities. An Australian cohort study concludes that more than half of the elderly patients discharged from EDs are at risk of limitations in performing activities and suggests that all patients aged 65+ should be assessed before being discharged (25). Other studies reveal that up to two-thirds of elderly patients admitted to EDs are limited in performing at least one daily activity (24,62).

The assessment of activity performance can vary considerably. A systematic review including 43 papers on functional assessments utilised in EDs identified 14 different assessment tests (63). However, the review does not provide any information about whether the assessments were based on self-reports from patients or observations from staff during the elderly patients’ EDs stay (63). In some studies, it has been questioned whether self-reported measures of activity performance, as opposed to performance-based measures, provide a valid picture of activity performance (64,65). Studies that have compared self-reported measures with performance-based measures conclude that discrepancies exist between the two approaches (65–69). Although self-reported measures provide information on elderly patients’ habitual performance, elderly patients tend to overestimate their performance (65,67). Since self-reported and performance-based measures seem to provide different, but complementary, information about performance of activities, a combination of the two different approaches may offer some advances (68,70). Performance-based measures seem to be highly relevant in assessing patients’ performance during admission to short-stay
units, while self-reported measures may be relevant when the objective is to assess patients’ habitual performance before admission.

Self-reported measures generally may have the advantage in that they are less time-consuming than performance-based measures. However, simple performance-based measures related to mobility, such as gait speed and the ability to rise from a chair, are feasible and easy to apply for all healthcare professionals to use in populations of elderly patients (71,72). In Denmark, the Ministry of Health has developed national recommendations on the use of such measures to identify elderly patients’ need for further rehabilitation (73).

Little is known about the use of more complex performance-based measures, especially in ED settings. From an occupational therapy perspective, the focus is not only on whether a person is independent or requires assistance, but also on the quality of that person’s performance of activities (74,75). When occupational therapists assess performance of activities, they consider parameters such as safety risks, efficiency (decreased time-space organisation), independence and physical efforts related to the performance of activities (75). Such parameters are found to be relevant to determining the need for further rehabilitation and/or home care (75,76).

**Review of the literature**

In the initial stage of this PhD project and throughout the process, systematic literature searches were undertaken to identify studies that could inform the development and outcome evaluation of an intervention aimed to reduce risk of readmission in elderly patients. Two different searches were conducted, each with its own specific search question. The first literature search aimed to examine the effectiveness of interventions aiming to reduce the risk of readmission in elderly patients discharge from an acute or emergency department. The second literature search aimed to identify studies that examine the effectiveness of occupational therapy that aimed to enhance older peoples’ performance of activities. In the following section, the results from the literature search will be presented.

**Interventions aimed at reducing risk of readmission for elderly patients:** The Population Interventions Comparators Outcomes (context) (PICO(c)) was used to guide the structuring of search question and frame inclusion and exclusion criteria (77) (Appendix A). The search was conducted in two phases. First, a search for systematic reviews and meta-analyses was performed. Secondly, a search was performed for single experimental studies of either
randomised (Level I) or non-randomised (Level II) design. The second literature search was performed to identify studies not included in the systematic reviews or meta-analyses, as well as identify single studies in which the descriptions of the applied interventions were not described clearly in the reviews or meta-analyses. Additional references were identified through hand search in the reference lists of relevant papers.

The literature search was performed in the databases PubMed, Embase, CINAHL and Cochrane Database of Systematic Reviews and limited to a population of 65+. The following terms were used as search keywords: discharge combined with readmission, re-visit or rehospitalisation, combined with emergency department or acute. The selection of studies to include was done in three steps. First, titles were assessed and obviously irrelevant studies were excluded. Second, remaining studies’ abstracts were assessed based on their relevance to the search question. Third, the full texts of all remaining studies were screened for eligibility based on the specific inclusion and exclusion criteria. The full search strategy with stated inclusion- and exclusion criteria is presented in Appendix A.

Data were extracted using an evidence table that summarised the studies’ methods and findings. Risk of bias in the single experimental studies was assessed by the use of Cochrane Collaboration’s Risk of Bias Assessment tool which assess the five domains: 1) Selection bias; 2) Performance bias; 3) Detection bias; 4) Attrition bias; and 5) Reporting bias (78,79). All domains were assessed as having a high, low or unclear risk of bias. Risk of bias in the included studies is presented in Appendix B.

The literature search identified nine systematic reviews that included interventions that aimed to reduce the risk of readmission in elderly patients discharged from an acute or emergency department. Three of the systematic reviews were conducted as meta-analyses (80–82). The literature search also identified nine single studies on pre-discharge and/or post-discharge interventions that aimed to reduce risk of readmission.

In the following tables, an overview of the nine systematic reviews (Table 1) and nine single studies (Table 2) is presented.
<table>
<thead>
<tr>
<th>Author, year</th>
<th>Objective</th>
<th>Design and studies included</th>
<th>Interventions</th>
<th>Outcome</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conroy et al. 2011 (80)</td>
<td>To assess the role of Comprehensive Geriatric Assessment (CGA) for elderly patients who attend acute hospital settings.</td>
<td>Systematic review and meta-analysis. Included 5 studies.</td>
<td>Hospital-based geriatric assessment or/and home based intervention.</td>
<td>Readmission, Mortality, Nursing home, Functional status, Quality of life</td>
<td>There was no clear evidence of benefit for CGA interventions in any of the outcomes.</td>
</tr>
<tr>
<td>Deschodt et al 2013 (83)</td>
<td>To determine the impact of inpatient geriatric consultation teams on clinical outcomes of interest in elderly patients.</td>
<td>Systematic review and meta-analysis. Included 12 studies.</td>
<td>Inpatient geriatric consultation teams which should consist of at least three different health professionals. The intervention consisted of comprehensive assessment and feedback with recommendations, without the team being in control of the patient management.</td>
<td>Readmission, Mortality, Length of stay, Functional status</td>
<td>Inpatient geriatric consultation team have no significant impact on readmission, length of stay or functional status. However a significant impact was found for mortality.</td>
</tr>
<tr>
<td>Fox et al. 2012 (81)</td>
<td>To compare the effectiveness of acute geriatric unit care with usual care.</td>
<td>Systematic review and meta-analysis. Included 13 studies.</td>
<td>Acute geriatric unit care characterized by one or more components: Patient-centered care, frequent medical review, early rehabilitation, early discharge planning and prepared environment.</td>
<td>Readmission, Functional decline, Hospital stay, Nursing home, Mortality, Costs</td>
<td>No differences were found regarding readmission, functional decline or mortality. There was a difference between the groups regarding hospital stay, nursing home and costs in favour of patients receiving the experimental intervention.</td>
</tr>
<tr>
<td>Graf et al. 2011 (84)</td>
<td>Focus is on the use and value of CGA in emergency department (ED) for evaluation of elderly patients and its influence on adverse outcomes.</td>
<td>Systematic review. Included 13 studies, 8 studies on efficiency and 14 on screening tools.</td>
<td>Comprehensive Geriatric assessments which include multidisciplinary evaluation, examination of comorbidities and polypharmacy, assessment of risk of falls and functional status (basic activities of daily living) and instrumental activities of daily living as well as nutritional status and social support.</td>
<td>Readmission, Mortality, Nursing home, Functional status</td>
<td>CGA in ED is efficient for decreasing readmission, functional decline and possibly nursing home admission in high-risk patients. There was no effect related to mortality.</td>
</tr>
<tr>
<td>Study (Year)</td>
<td>Objective</td>
<td>Methodology</td>
<td>Intervention Types</td>
<td>Outcomes</td>
<td>Summary</td>
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<tr>
<td>Hastings et al. 2005 (85)</td>
<td>To evaluate the evidence for interventions designed to improve outcomes for elders discharged from the ED.</td>
<td>Systematic review. Included 27 studies.</td>
<td>Telephone Follow-up, Trained Nurse/Team in the ED, Rapid Home-based Services, Health Visitors</td>
<td>Readmission, Mortality, Nursing home, Quality of life, Functional status, Length of stay</td>
<td>The results of trials aimed at decreasing hospital readmission were mixed.</td>
</tr>
<tr>
<td>Hickman et al 2015 (86)</td>
<td>To identify multidisciplinary team interventions to optimise health outcomes for elderly patients in acute care settings.</td>
<td>Systematic review. Included 6 studies.</td>
<td>Tailored treatment by clinicians with geriatric expertise, Focus on transitional care interventions that enhance discharge planning, Communication</td>
<td>Readmission, Length of stay, Mortality, Functional status</td>
<td>The results demonstrate that coordination and clear communication can have an impact on readmission, mortality and functional status in elderly patients.</td>
</tr>
<tr>
<td>Karam et al. 2015 (9)</td>
<td>A systematic review on interventions within ED targeted towards reducing readmission, hospital stay, nursing home admissions and deaths in older patients after initial ED discharge</td>
<td>Systematic review. Included 9 studies of which 3 were randomized trials</td>
<td>Referral to community based interventions, Program/follow-up, Integrated model of care</td>
<td>Readmission, Hospital stay, Nursing home, Mortality</td>
<td>More intensive interventions more frequently resulted in reduced adverse outcomes than did simple referral intervention types.</td>
</tr>
<tr>
<td>Lowthian et al. 2015 (82)</td>
<td>The aim was to provide robust estimates of effect of care models on risk of re-admission or functional decline in activities of daily living, nursing home admission and mortality in elderly patients discharged from ED.</td>
<td>Meta-analysis. Included 9 studies of which 5 were randomized trials.</td>
<td>The interventions included geriatric assessment with referral for post-discharge community-based assistance, that differed in components and delivery method.</td>
<td>Readmission, Mortality, Functional decline, Nursing home</td>
<td>Compared with usual care, the evidence indicates no appreciable benefit regards readmission, mortality, functional decline or nursing home.</td>
</tr>
<tr>
<td>McCusker et al. 2006 (22)</td>
<td>The aim was to systematically review the literature and compare the effects of comprehensive geriatric interventions on emergency department visits.</td>
<td>Systematic review. Included 26 studies – seven were using samples of ED patients of which 4 were randomized trials.</td>
<td>Comprehensive geriatric assessment conducted either as: *Inpatient interventions (hospital) *Outpatient/Primary care interventions *Home care interventions *Community interventions</td>
<td>Readmission</td>
<td>Hospital-based interventions had little overall effect on ED readmission, whereas interventions conducted either as outpatient/primary care or home care settings were beneficial in reducing risk of readmission.</td>
</tr>
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</table>
### Table 2. Overview of intervention studies aimed at reducing risk of readmission in elderly patients discharged from an acute or emergency department

<table>
<thead>
<tr>
<th>Author, year, country</th>
<th>Objective</th>
<th>Setting and population</th>
<th>Design and follow-up</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>Caplan et al. 2004 Australia (87)</td>
<td>To study the effects of a Comprehensive Geriatric Assessment (CGA) intervention on elderly patients discharge from the emergency department (ED).</td>
<td>Emergency Department n=739 Mean age 82 years</td>
<td>Randomized, Controlled Trial Follow up at 3, 6, 12 and 18 month after discharge</td>
<td>Patients in the intervention group underwent initial CGA and were followed at home for up to 28 days by a hospital-based multidisciplinary team. The team implemented or coordinated recommendations. The control group received usual care.</td>
<td>Readmission Nursing home Mortality Physical function Cognitive function</td>
<td>Intervention patients had a lower rate of readmissions during the first 30 days after discharge 16.5% vs 22.2% (p=0.048), after 18 month 44.4% vs 54.3% (p=0.007), and longer time to first emergency admission. There was no difference in mortality or nursing home admissions. Patients in the intervention group maintained a greater degree of physical (6 month) and cognitive (12 month) function.</td>
</tr>
<tr>
<td>Cossette et al. 2015 Canada (88)</td>
<td>To determine whether a nursing intervention delivered at emergency departments would reduce risk of readmission.</td>
<td>Emergency Department n=265 Mean age 67 years</td>
<td>Randomized, Controlled Trial Follow up 30, 90 and 365 days after discharge.</td>
<td>Patients in the intervention group received one patient-nurse meeting before discharge and two additional telephone contacts over the next two weeks.</td>
<td>Readmission</td>
<td>An interim analysis that stopped the study with half of the planned sample showed that number of readmissions were similar in both groups at 30, 90 and 365 days.</td>
</tr>
<tr>
<td>Courtney MD et al. 2009 Australia (89)</td>
<td>To evaluate the effect of an exercise-based model of hospital and in-home follow-up care for elderly patients at risk of readmission.</td>
<td>Acute Department n= 128 Mean age 79 years</td>
<td>Randomized, Controlled Trial Follow-up at 4, 12 and 24 weeks by telephone.</td>
<td>Comprehensive nursing and physiotherapy assessment and individualized program of exercise strategies and nurse-conducted home visit and telephone follow-up at the hospital and continuing for 24 weeks after discharge.</td>
<td>Readmission</td>
<td>The intervention group required significantly fewer emergency hospital readmissions, 22% of intervention group and 47% of control group (p=0.007) and emergency visits, 25% of intervention group and 67% of control group (p=0.001).</td>
</tr>
<tr>
<td>Study</td>
<td>Setting</td>
<td>Objective</td>
<td>Study Design</td>
<td>Intervention Details</td>
<td>Outcomes</td>
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<tr>
<td>Dedhia et al. 2009 USA (90)</td>
<td>Acute Department</td>
<td>To study the feasibility and effectiveness of a discharge planning intervention.</td>
<td>Quasi-experimental pre–post study design.</td>
<td>The intervention had five core elements: admission form with geriatric cues, information to the primary care provider, interdisciplinary worksheet to identify barriers to discharge, pharmacist–physician collaborative medication reconciliation, and pre-discharge planning.</td>
<td>Patient satisfaction, Readmission, Return to the ED within 3 days of discharge was lower in the intervention group, 10% vs 3%, Odds Ratio (OR)=0.25, 95% CI (0.10;0.62). At 30 days, there was a lower rate of readmission, 22% vs 14%, OR=0.59, 95% CI (0.34;0.97) and fewer visits to the ED, 21% vs 14%, OR=0.61, 95% CI (0.36;1.03) in favour of the intervention group.</td>
<td></td>
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<tr>
<td>Guttman et al. 2004 Canada (91)</td>
<td>Emergency Department</td>
<td>The objective was to evaluate the impact of an ED-based nurse discharge plan coordinator for elder patients on ED revisits.</td>
<td>Pre/post design Follow-up at 8 and 14 days after discharge.</td>
<td>Patients in the intervention group received a comprehensive individualized discharge planning implemented by one of three nurse coordinators. Telephone follow-up were conducted at day 1, days 8 and days 14 after the ED visit.</td>
<td>Readmission, There was no difference between the groups regards readmission within 14 days after discharge, Relativ Risk (RR)=0.79, 95% CI (0.62;1.02).</td>
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<tr>
<td>Legrain et al. 2011 France (92)</td>
<td>Acute Department</td>
<td>To determine whether a new multimodal comprehensive discharge-planning intervention would reduce emergency readmissions in elderly patients.</td>
<td>Randomized Controlled Trial Follow-up 3 and 6 months after discharge.</td>
<td>Comprehensive discharge-planning intervention which consisted of three components: comprehensive chronic medication review, education on self-management of disease, and detailed transition-of-care communication with outpatient health professionals or usual care.</td>
<td>Readmission, Mortality, 23% of patients in the intervention group were readmitted 3 months after discharge, compared with 30.5% of control group patients (p= 0.03). Survival was significantly higher in the intervention group at 3 months HR= 0.72, 95% CI (0.53;0.97) but not at 6 months HR= 0.81, 95% CI (0.64;1.04).</td>
<td></td>
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<tr>
<td>Mion et al. 2003 USA (93)</td>
<td>Emergency Department</td>
<td>To examine the effectiveness of a model of care for community-dwelling elderly patients at the emergency department.</td>
<td>Randomized Controlled Trial Follow-up at 30 and 120 days after discharge</td>
<td>Intervention consisted of geriatric assessment in the ED by an advanced nurse and subsequent referral to a community or social agency, primary care provider, and/or geriatric clinic for unmet health, social, and medical needs or usual care.</td>
<td>Readmission, Hospital days, Mortality, Nursing home Health costs, There was no differences in readmission, hospital days, mortality or health costs. The intervention was effective in lowering nursing home admissions at 30 days, 0.7% versus 3%, OR=0.21, 95% CI (0.05;0.99).</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Objective</td>
<td>Setting</td>
<td>Study Design</td>
<td>Intervention</td>
<td>Follow-up</td>
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<tr>
<td>Pedersen et al. 2016</td>
<td>Denmark (94)</td>
<td>To reduce the frequency of readmissions in a population of geriatric patients admitted to an emergency department.</td>
<td>Emergency Department</td>
<td>Quasi Randomised Trial</td>
<td>Geriatrician and nurse home visit on the day following hospital discharge or usual practice.</td>
<td>Follow-up 30 days after discharge.</td>
</tr>
<tr>
<td>Rosted et al. 2013</td>
<td>Denmark (95)</td>
<td>To examine the effect of a two-stage nursing intervention to prevent re-admission and functional decline.</td>
<td>Acute Department</td>
<td>Randomised Controlled Trial</td>
<td>A brief standardized nursing assessment and intervention was carried out after discharge and at follow-up. Focus in the assessment and follow-up were patients unresolved problems.</td>
<td>Follow-up 30 and 180 days after discharge</td>
</tr>
</tbody>
</table>
The interventions described in the systematic reviews (Table 1), were either pre-discharge (e.g., comprehensive geriatric assessment (CGA), discharge planning, medication reconciliation and/or referral to community-based interventions) or post-discharge (e.g., home visits by nurses and/or GPs and follow-up telephone calls). In general, the evidence was mixed, and only three of the systematic reviews revealed effectiveness regards readmission (22,84,86). In a systematic review from 2011, with the aim to examine the effectiveness of a comprehensive geriatric assessment (CGA), the authors conclude that CGA interventions are effective with regard to ED readmission (84). However, they also conclude that CGA takes too much time to perform routinely at an ED as it includes a multidimensional diagnostic process focused on the elderly patient’s medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and follow-up (84). In another systematic review, the authors only found two studies that reported reduced risk of readmission owing to interventions conducted at the ED (22). Both interventions consisted of assessment by a nurse with a short-term liaison with primary-care services (22). The authors behind a systematic review from 2015 describes that their review demonstrate that coordination and clear communication can have an impact on readmission, mortality and functional status in elderly patients (86).

Nine single studies of pre-discharge and/or post-discharge interventions that aimed to reduce risk of readmission were identified (Table 2). Three of the studies were non-randomised trials (90,91,94) of which two (90,94) found significant results in favour of the intervention. The six randomised trials were all assessed as having a low to moderate risk of bias (Appendix B). The identified studies were heterogeneous and showed a great variability in type and duration of the interventions, patient selection, and follow-up after discharge. This may account for the inconsistency of reported results in the studies. However, some trends were seen in those interventions that were beneficial in reducing risk of readmission in elderly patients after discharge. A follow-up home visit after discharge as part of the intervention may be beneficial in reducing risk of readmission (87,89,94). An individualised discharge plan with referral to community-based interventions may also be an important component to include in the intervention (87,92).

In general, the literature review revealed inconsistent results regarding the effectiveness of pre-and post-discharge interventions. Descriptions of the delivered interventions and how
they were developed were sparse, which makes them difficult to replicate. The interventions that were beneficial in reducing risk included a pre-discharge assessment, a discharge plan and post-discharge follow-up visits.

A second literature search was conducted in order to specifically identify occupational therapy interventions aimed to enhance older peoples’ performance of activities in general (not ED specific). The Population InterventionsComparators Outcomes (PICO) was used to guide the structuring of the search question and to frame the inclusion and exclusion criteria (77) (Appendix C). The search was performed in the databases PubMed, Embase and CINAHL, limited to a population of 65+. The following terms were used as search keywords: *occupational therapy* or *enablement* or *accessibility* combined with *occupation* or *activities* or *daily living* or *everyday life* or *activities of daily living (ADL)*. The same search strategy was applied to all of the databases.

The selection of studies to include was done in two steps. First, all titles and abstracts were screened for relevance by the use of in- and exclusion criteria. Then the remaining studies were read in full text and studies not meeting the inclusion criteria were excluded. The full search strategy with stated inclusion and exclusion criteria is presented in Appendix C. The reference lists of selected papers were also scrutinised for other relevant papers. Systematic reviews and single experimental studies were included. Data were extracted using an evidence table summarising the methods and findings of the studies. Risk of bias in the single experimental studies were assessed by the use of Cochrane Collaboration’s risk of bias assessment tool. All five domains were assessed as having a high, low or unclear risk of bias (78,79). Risk of bias in the included studies are presented in Appendix D.

In the following tables, an overview of the nine systematic reviews (Table 3) and ten single studies (Table 4) is presented.
<table>
<thead>
<tr>
<th>Author, year</th>
<th>Objective</th>
<th>Design and studies included</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barras et al. 2005 (96)</td>
<td>To identify and assess the literature regarding discharge planning involving occupational therapy homebased assessments.</td>
<td>A systematic review including 12 studies. One review, 4 randomized controlled trials (RCT) and 7 descriptive studies.</td>
<td>Occupational therapy discharge planning and homebased assessment. The interventions were consistent in the studies and based on assessment in the patients home including: mobility, access, safety, kitchen, transfer and toileting.</td>
<td>Functional status Institutionisation Readmission Falls Quality of life Frequency of visits</td>
<td>There is no conclusive evidence to support the effectiveness of occupational therapy home assessment and discharge planning.</td>
</tr>
<tr>
<td>Berger et al 2018 (97)</td>
<td>To assess the effectiveness of health promotion, management and maintenance interventions to improve occupational performance, quality of life and decrease health care utilisation for community dwelling older people.</td>
<td>A systematic review including 36 studies.</td>
<td>Intervention types were classified in one of the following: *Disease self-management programs (coping, problem solving and exercise) *Group interventions *Individual interventions *Combined groups and individuals</td>
<td>A variety of outcomes measures such as: Occupational performance Quality of life Health care utilisation</td>
<td>There is strong evidence that disease self-management programs or group interventions has an impact on occupational performance. There was also strong evidence in favour of individual health promotion interventions over an extended period. Moderate evidence for enhancing occupational performance was found for combining single and groups interventions.</td>
</tr>
<tr>
<td>De Coninck et al. 2017 (98)</td>
<td>To assess the effectiveness of occupational therapy to improve performance in daily living activities in community-dwelling physically frail older people.</td>
<td>A systematic review and meta-analysis including 9 studies.</td>
<td>The study included trials reporting on occupational therapy as intervention (one study), or as part of a multidisciplinary approach (eight studies). All interventions were individually homebased and consisted of assessment, education, prevention strategies, exercise, home hazard modification, advice on aids and service. Number of occupational therapy interventions differed from 1-7.</td>
<td>Mobility Functioning in daily living activities Social participation Fear of falling Cognition Disability Falls</td>
<td>The pooled result for functioning in daily living activities was a standardized mean difference of -0.30, 95% CI (-0.50;-0.11), for social participation -0.44, 95% CI (0.69;-0.19) and for mobility -0.45, 95% CI (-0.78;-0.12).There is strong evidence that occupational therapy improves functioning in community-dwelling physically frail older people.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Title</td>
<td>Methodology</td>
<td>Intervention Types</td>
<td>Outcome Measures</td>
<td>Findings</td>
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<tr>
<td>Hunter et al. 2018 (99)</td>
<td>What is the evidence for the effect of interventions within the scope of occupational therapy on the performance of IADL for community dwelling older people.</td>
<td>A systematic review and meta-analysis including 14 studies.</td>
<td>Intervention types were classified in one of the following: *Cognitive interventions *Self-management *Prevention *Home-based multidisciplinary rehabilitation</td>
<td>Instrumental Activities of Daily Living (IADL) Activity participation Quality of life</td>
<td>The results revealed that there is strong evidence that cognitive interventions were able of enhancing IADL performance and that prevention interventions could prevent deterioration in IADL performance. Strong evidence was also found in favour of multidisciplinary intervention to enhance IADL performance. There is moderate evidence that self-management programs improve the level of activity participation.</td>
</tr>
<tr>
<td>Liu et al. 2018 (100)</td>
<td>What is the evidence for the effect of interventions to improve ADL outcomes for community-dwelling older people.</td>
<td>A systematic review including 43 studies (16 studies with older adults with ADL difficulty)</td>
<td>The intervention approach for older adults with difficulties in ADL were either: *Physical exercise (5 studies) *Home-visits or home based (6 studies) *Multicomponent programs (2 studies) *Additional occupational therapy (2 studies) *Multidisciplinary team (1 study)</td>
<td>ADL</td>
<td>The benefits of using task-specific exercise to improve ADL outcomes in older people with ADL difficulties was moderate, while the benefit of using home visits or home-based intervention was high.</td>
</tr>
<tr>
<td>Nielsen et al. 2016 (101)</td>
<td>To synthesizes the evidence for the effectiveness of occupation focused and occupation based occupational therapy for older people (60+) at home</td>
<td>Systematic review including 8 papers, reporting 6 studies of which two was concerning older people with non-specific diagnosis</td>
<td>Occupational therapy aiming at improving occupational performance, primarily through the practice of activities and tasks. Number of occupational interventions was up till five in one study and a mean 1.9 in the other study</td>
<td>ADL</td>
<td>A significant difference in ADL performance was found post intervention but not on long-term for older people with non-specific diagnosis</td>
</tr>
<tr>
<td>Authors</td>
<td>Aim</td>
<td>Methodology</td>
<td>Interventions</td>
<td>IADL</td>
<td>Evidence</td>
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<tr>
<td>Orellano et al. 2012 (102)</td>
<td>The aim was to examine the effectiveness of occupation- and activity-based interventions on the performance of selected instrumental activities of daily living for community-dwelling older people.</td>
<td>Systematic review including 38 studies</td>
<td>The interventions were divided in: 1. Occupation-based and client-centred interventions (only OT or multicomponent) 2. Functional activities interventions (functional task exercise programs and simulated IADL programs) 3. Performance skills interventions (interventions that target specific performance skills, e.g., physical activity, cognitive skills) 4. Home modifications and assistive technology</td>
<td>IADL</td>
<td>Within occupation based and client-centred interventions, the evidence that multi-component interventions improve and maintain IADL performance in community-dwelling older people is strong. The evidence is moderate for functional task exercise programs and limited for simulated IADL interventions. The evidence for performance skills interventions were mixed and there was no evidence for interventions related to home adaptations or assistive devices</td>
</tr>
<tr>
<td>Stark et al. 2017 (103)</td>
<td>The aim was to explore the evidence for the effectiveness of home modification interventions for adults and older people.</td>
<td>Systematic review including 36 studies. Seven studies investigated interventions for older people with a variety of conditions</td>
<td>The home modification interventions targeting older people included: Recommendation of modifications Installation of smart home technology Training with equipment and assistive technology</td>
<td>Functional performance</td>
<td>Strong evidence was found in favour of home modification interventions are an effective treatment to improve functional performance for older people with a variety of conditions.</td>
</tr>
<tr>
<td>Steultjens et al. 2004 (104)</td>
<td>To determine whether occupational therapy improves outcome for older people (60+) who live independently</td>
<td>Systematic review, including 17 studies</td>
<td>Interventions were classified into specific categories:  a) training of sensory-motor functions; b) training of cognitive functions; c) training of skills; d) advice and instruction regarding the use of assistive devices; and e) counselling of primary care</td>
<td>Falls Quality of life Functional ability</td>
<td>There is strong evidence for efficacy of advising on assistive devices as part of home hazard assessment on functional ability and some evidence for the efficacy of skills training combined with the use of assistive devices on the incidence of falls. There is evidence for the efficacy of a home assessment with incorporation of the provision of assistive devices on increasing functional ability.</td>
</tr>
<tr>
<td>Author, year, country</td>
<td>Objective</td>
<td>Setting and population</td>
<td>Design and follow-up</td>
<td>Intervention</td>
<td>Outcome</td>
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<tr>
<td>Abizanda et al. 2011 Spain (105)</td>
<td>To compare the benefits of a short term occupational therapy intervention when added to the conventional treatment model.</td>
<td>Acute geriatric unit. (Intervention=198) (Control=202) Mean age 83 years</td>
<td>Randomized, controlled trial Follow-up at discharge</td>
<td>Intervention included needs assessment, retraining in activities of daily living, and instructions for caregivers in three groups of patients defined a priori (cardiopulmonary disease, stroke, other conditions) 5 days a week, 30-45 min a day.</td>
<td>Functional ability measured with Barthel-Index Reduction in confusional episodes</td>
</tr>
<tr>
<td>Clemson et al. 2016 Australia (106)</td>
<td>To determine whether an occupational therapy discharge planning intervention would be superior to a usual care intervention to individuals receiving acute care.</td>
<td>Acute and medical hospitals wards (Intervention=198) (Control=202) Mean age 80 years</td>
<td>Randomized controlled trial Follow-up after 90 days</td>
<td>HOME intervention that included in-hospital interview and assessment, client-centred goal setting, and one pre- and one post-discharge home visit. Furthermore two telephone follow-up was conducted at 2 and 4 weeks.</td>
<td>Activities of daily living measured with Nottingham Extended activities of Daily Living scale (NEADL) Participation Readmission</td>
</tr>
<tr>
<td>DeVrindt et al. 2015 Belgium (107)</td>
<td>To examine the effectiveness of a client-centered and activity oriented intervention for frail community living older people.</td>
<td>Community care (Intervention =86) (Control =82) Mean age 80 years</td>
<td>Single blind RCT Follow-up at discharge</td>
<td>Client-centred and activity oriented intervention: a)Training of functions/skills b)Education of caregiver c)Use of assistive devices Intervention period were 8-10 weeks and one third of the participants received more than two visits. Mean time spent on a participant was 134 minutes.</td>
<td>Basic Activities of Daily Living (b-ADL) Health-related quality of Life (HRQoL)</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Aim</td>
<td>Population</td>
<td>Intervention</td>
<td>Control</td>
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<tr>
<td>Gitlin et al. 2006 USA (108)</td>
<td>To test the efficacy of a multi-component intervention to reduce functional difficulties, fear of falling, home hazards and enhance self-efficacy and adaptive coping in older people with chronic conditions</td>
<td>Community care (Intervention =160) (Control =159)</td>
<td>Randomized controlled trial</td>
<td>Occupational and physical therapy sessions to instruct participants in compensatory strategies, home modifications, home safety, fall recovery techniques and balance and muscle strength exercises. 5 occupational therapy contacts and 1 physiotherapy contact in the active intervention period</td>
<td></td>
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<tr>
<td>Lannin et al. 2007 Australia (109)</td>
<td>The aims was to investigate the feasibility of a randomised controlled trial in a clinical setting and the effect of pre-discharge home visits on functional performance in elderly patients undergoing rehabilitation.</td>
<td>Rehabilitation unit (Intervention=5) (Control=5)</td>
<td>Randomized controlled feasibility trial</td>
<td>Participants were randomly assigned to receive either a pre-discharge home visit (intervention), or standard practice in-hospital assessment and education (control). The pre-discharge home visit involved assessment of the elderly patients function and environment, and education, and took an average 45 minutes.</td>
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<tr>
<td>Nielsen et al. 2018 Denmark (110)</td>
<td>To examine whether 11 weeks of intensive client-centred occupational therapy was superior to usual practice in improving the occupational performance of home-dwelling older people.</td>
<td>Community care (Intervention=59) (Control=60)</td>
<td>Randomized controlled trial</td>
<td>The aim of the intervention was to improve occupational performance by practising the necessary tasks. The intervention was tailored to the individual and built on acquisitional, adaptive and restorative models. The participants in the intervention group received on average 11 hours of occupational therapy</td>
<td></td>
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<tr>
<td>Study</td>
<td>Country</td>
<td>Objective</td>
<td>Setting</td>
<td>Intervention</td>
<td>Research Design</td>
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<tr>
<td>Shearer et al. 2013 Australia (111)</td>
<td>The aim was to investigate whether individualised activities of daily living retraining improve functional outcomes, influence discharge destinations and reduce length of stay for elderly patients in acute care.</td>
<td>Geriatric unit (Intervention=22) (Control=26) Mean age 86 years</td>
<td>Pilot study, Randomized controlled trial Follow-up at discharge</td>
<td>The programme included personal ADL (e.g., showering, dressing, grooming and toileting), simple domestic tasks (e.g., hot or cold drink preparation, toast preparation) and functional ambulation (i.e., ambulation in the context of an ADL. The intervention group received training three times per week for one hour.</td>
<td>Functional status measured by Barthel-Index Length of hospital stay</td>
</tr>
<tr>
<td>Tuntland et al. 2015 Norway (112)</td>
<td>The aim was to investigate the effectiveness of reablement in home-dwelling older people compared with usual care in relation to daily activities, physical functioning, and health-related quality of life.</td>
<td>Community care (Intervention=31) (Control=30) Mean age 79 years</td>
<td>Randomized controlled trial Follow-up at 3 and 9 months</td>
<td>The intervention group received home-based rehabilitation. The therapists supervised the homecare personnel, in how to encourage and assist the person in the daily training. The focus were on training in daily activities, adaptations to the environment or the activity, and exercise. Mean length of intervention was 10 weeks.</td>
<td>Self-perceived activity performance and satisfaction with performance - COPM Physical capacity Health-related quality of life</td>
</tr>
<tr>
<td>Whitehead et al. 2016 United Kingdom (113)</td>
<td>The objective was to test the feasibility of conducting a randomised controlled trial of an intervention targeted at activities of daily living delivered by an occupational therapist, in homecare reablement.</td>
<td>Community care (Intervention=15) (Control=15) Mean age 83 years</td>
<td>Feasibility RCT Follow-up at two weeks, 3 and 6 months</td>
<td>In addition to usual care, a targeted ADL programme, delivered by an occupational therapist incorporating goal setting, teaching/practising techniques, equipment/ adaptations and provision of advice/support. A median of 5 home visits was provided and a median length of intervention period was 56 days</td>
<td>ADL (Barthel Index and NEADL) Quality of life Falls Use of health and social services</td>
</tr>
<tr>
<td>Wressle et al. 2006 Sweden (114)</td>
<td>The aim was to evaluate whether occupational therapy interventions in acute care could improve the elderly patient’s perception of ability to manage at home after discharge</td>
<td>Acute care unit (Intervention=22) (Control=19) Mean age 83 years</td>
<td>Pilot study, Randomized controlled trial Follow-up at 3 months</td>
<td>The intervention consisted of: Prescription of assistive devices Reports to primary care ADL assessment/training Information/instruction Planning of discharge Training of physical function Contact with relatives Ability to perform activities measured with structured questionnaire</td>
<td>There was no difference between the groups in managing at home after discharge.</td>
</tr>
</tbody>
</table>
Nine systematic reviews were identified (Table 3), of which one review aimed to examine the effectiveness of interventions including discharge planning and occupational therapy homebased assessment (96). The review included 12 studies and identified minimal evidence, primarily due to a lack of high quality studies. The interventions were based on assessments in elderly patients’ homes including: mobility, access, safety, kitchen activity, transfer and toileting. The other eight identified systematic reviews evaluated the effectiveness of occupational therapy for community-dwelling older people (97–104). Five of the systematic reviews concluded that moderate or strong evidence supported using occupational therapy that aimed to enhance older people’s performance of activities when the interventions conducted were activity-based (e.g., practicing activities that were limited) (98,100–102,104). In a review that included 14 studies, the authors found strong evidence that occupational therapy, as part of a multidisciplinary intervention, can enhance the performance of instrumental activities in daily living among community dwelling older people (99). In a review conducted in 2017, the authors found strong evidence that home-modification interventions can improve activity performance among older people with a variety of conditions (103). In a systematic review of 36 studies, Berger et al. found strong evidence that self-management programmes that include coping strategies, problem solving and exercise improved activity performance (97). In studies included in the systematic reviews, the duration and frequency of interventions varied, from one session to nine within a time frame of up to nine months.

Ten studies (Table 4) that aimed to enhance elderly patients’ or older people’s performance of activities also were identified during the literature search. Five of the studies were conducted in hospital settings (105,106,109,111,114), of which two involved home visits (106,109). In a sample of 400 elderly patients, Clemson et al. examined the effectiveness of an occupational-therapy planning intervention, including pre- and post-discharge home visits, but they did not find evidence that the intervention enhanced activity performance (106). In their feasibility study with 10 elderly patients, Lannin et al. found that a pre-discharge home visit significantly enhanced the performance of activities by two and eight weeks (109). In the other three studies conducted in a hospital setting without home visits, no positive effects on activity performance or any secondary outcomes were found. The duration and frequency of the interventions varied, from a single session lasting one hour to several sessions lasting 30 to 45 minutes each, five days a week, for two weeks (105,111,114). In four of the five studies conducted in primary care settings, significant differences in performance of activities
in favour of occupational-therapy intervention groups were reported compared with the usual practice (107,108,110,112). The frequency and duration of the interventions varied, from a single session to 15 sessions over an 11-week period, indicating broad variance in doses and intervention duration

**Summary of background**

One of the most serious and adverse events for elderly patients after being discharged from hospitals is readmission. Elderly patients’ performance of activities and a coherent discharge to their homes are essential factors that influence elderly patients’ risk of readmission and thus may be highly relevant to address in interventions aimed at reducing risk of readmission after discharge from a short stay unit at the ED.

The primary focus when people are admitted to a short-stay unit at an ED is on treating illnesses with less attention paid to elderly patients’ limitations in performing activities and need for rehabilitation post-discharge. The role of occupational therapists in a short-stay unit at the ED is to identify patients with limitations in performing activities and to coordinate the discharge and referral to post-discharge rehabilitation in primary care. However, further research on the effectiveness of such interventions is required. Occupational therapy interventions that focus on enhancing community dwelling older peoples’ performance of activities reports some to strong evidence in favour of occupational therapy interventions, while the research on occupational therapy interventions initiated in acute hospital settings is sparse.

Coordinated, consistent information exchanges and collaborations among healthcare professionals have been identified through the literature as important for a coherent discharge. However, studies on discharges from EDs are most commonly examined from a health professional or societal perspective and do not include the elderly patients’ experiences. Identifying factors of importance for the elderly patients’ experience of being discharged and returning to everyday life may contribute with new knowledge to guide future discharge of elderly patients.
3. Aims and hypotheses

The overall aim of the present PhD project was to improve and inform current practices regarding the discharge of elderly patients from a short-stay unit at an ED in order to reduce their risk of readmission. The dissertation builds on two studies, each with its own specific aim. The two studies are reported in three papers.

Study I

**Aim Ia:** To develop and describe a short-term intervention that aims to reduce elderly patients' risk of readmission after discharge from a short-stay unit at the ED (1).

**Aim Ib:** To examine the clinical effectiveness of a developed intervention in reducing risk of readmission in elderly patients discharged from a short-stay unit at the ED (2).

**Hypotheses:** The primary hypothesis was that the intervention would be superior to usual practice in reducing risk of readmission within 26 weeks after discharge. The secondary hypotheses were that the intervention would be superior to usual practice in reducing risk of readmission within 30 days, would reduce mortality within 26 weeks, and would reduce the number of contacts to general practitioners and EDs within 26 weeks. It was hypothesised further that the time to readmission would be longer for patients in the intervention group than for patients in the usual practice group.

Study II

**Aim:** To add to the knowledge base concerning elderly patients’ experiences of being discharged and of returning to their everyday lives after discharge from a short-stay unit at the ED, in order to understand which factors they find of importance during and after discharge (3).
4. Methodology and methods

Design

This project’s overall research design was a multimethod design that included both quantitative and qualitative strands (115). Using a multimethod design is based on the realisation that no single research method would have been sufficient to support the complexity of this PhD project’s overall aim. The multimethod design does not mix quantitative and qualitative data in the collection or analysis phases of the study and are thus different from a mixed method design (115). In this PhD project, the multimethod design comprise two distinct stages. In the first stage the Elderly Activity Performance intervention (EAP intervention) was developed and retrospectively described. In the second stage, an outcome evaluation of the effectiveness of the EAP intervention (Study Ib) and qualitative interviews (Study II) with elderly patients receiving the intervention were carried out concurrently. The results from the two studies are integrated in the discussion section of this dissertation.

The specific aims of the two included studies defined the methodology and methods used in each study and are described in more detail below.

Figure 1. Overview of the three studies in the PhD project

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Ia: Development of the EAP intervention</td>
<td>Study Ib: Outcome evaluation of the EAP intervention</td>
</tr>
<tr>
<td>Study II: Description of elderly patients’ experiences</td>
<td></td>
</tr>
</tbody>
</table>

Integration in the discussion of the dissertation

Theory and evidence-based literature
Study I comprised two parts. In the first part (Study Ia), the EAP intervention was developed and in the second part (Study Ib) an outcome evaluation of the effectiveness of the developed intervention was conducted. According to the Medical Research Council’s guidance for the development and evaluation of interventions, a clear description of how the intervention was developed is needed to allow for replication and avoid "black boxes" in which effective or non-effective ingredients are unknown (54). A detailed description of the intervention components and their underlying theory and evidence was reported retrospectively in Paper I using the intervention mapping approach. This, also included a detailed description of how to implement and evaluate the effectiveness of the intervention (117).

The outcome evaluation of the effectiveness of the developed intervention was conducted pragmatically as a non-randomised, quasi-experimental, superiority trial comparing an intervention- and a usual practice group. Quasi-experimental designs utilise structures similar to those used in a randomised controlled trial; however, due to the lack of random assignment, the degree of control is limited and the risk of bias increases. Therefore, the conclusions drawn from such a study must therefore take into account the potential biases of the selected sample (118). Although the quasi-experimental trial has some limits, it also has some advantages. Quasi-experimental trials accommodate for the limitations of natural settings where random assignment may be difficult or impractical (118). The choice of a quasi-experimental trial design was based on experiences from a previous minor study, designed as a randomised controlled trial, performed in the same short-stay unit (not published). The outcome evaluation of the previous study revealed that it was difficult to recruit patients in the defined time period, as 67% of eligible patients refused to participate. One of the principal reasons that patients cited in their refusal was the randomisation procedures, as they had to agree to participate before knowing which group they would be assigned to. Therefore, we chose to design our full scale experimental study as a non-randomised quasi-experimental trial (54,119).

Study II was a qualitative interview study conducted concurrently with the outcome evaluation in Study Ib, and it included patients who received the EAP intervention. Individual interviews were conducted in order to gather descriptions of elderly patients’ experiences of being discharged and returning to everyday life. This was done to identify the factors that elderly patients view as important during and after discharge from a short-stay unit at the ED.
Theoretical perspectives

The methodology and methods used to address the aim of this PhD project builds on theoretical perspectives that inform the research process. Crotty describes theoretical perspectives as "the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria" (119, p.3).

As this PhD project uses both quantitative and qualitative methods in a multimethod design, it builds on different theoretical perspectives. In Study I, post-positivist perspectives underlie the methodology and methods. Knowledge is based on cause-and-effect thinking focusing on detailed observations and measures of variables, and generalisability is sought (121). Post-positivism recognises that all observations are fallible, and that theories can be modified (120).

The methodological approach in the qualitative study (Study II) was inspired by Giorgi's phenomenological descriptive method, which is based on the phenomenological philosophy of Husserl (122,123). The phenomenological philosophy focuses on human beings and their life world. The inspiration from Giorgi’s method was based on its suitability for describing individuals’ experiences as expressed by themselves by putting aside past knowledge concerning the phenomenon of interest (122,124). According to Giorgi’s phenomenological descriptive approach, experiences can be described and understood in terms of how people perceive them and that they should not necessarily be interpreted (124–126). Through the qualitative study, we sought to understand how elderly patients experienced their discharge and their everyday lives after discharge. The description of these experiences focuses on what is essential and meaningful for the person who has these experiences. To do so, researchers need to bracket their preconceptions, which can be approached in different ways (122). My preconceptions were based on clinical experiences with the population of interest, empirical research concerning the population and problem and theoretical assumptions concerning activity limitations. When conducting the qualitative interviews and the analysis, my preconceptions were shared and continuously reflected upon with senior researchers and before conducting the interviews, they were written down to ensure transparency and reflexivity.


**Study population**

Recruitment of eligible patients to the two studies took place at the short-stay unit at the ED at Aarhus University Hospital, Denmark. Patients in study II were included from the sample in study I. Inclusion- and exclusion criteria for participants in the two studies are presented in Table 5.

**Table 5. Inclusion- and exclusion criteria for the study population**

<table>
<thead>
<tr>
<th>Inclusion criteria:</th>
<th>Patients with medical diagnoses admitted on weekdays to the short-stay unit at Aarhus University hospital</th>
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<tbody>
<tr>
<td></td>
<td>Age 65+</td>
</tr>
<tr>
<td></td>
<td>Residents in the Municipality of Aarhus</td>
</tr>
<tr>
<td>Exclusion criteria:</td>
<td>Patients transferred to other hospital departments from the short-stay unit</td>
</tr>
<tr>
<td></td>
<td>Patients admitted from a nursing home</td>
</tr>
<tr>
<td></td>
<td>Patients declared terminally ill</td>
</tr>
<tr>
<td></td>
<td>Patients unable to communicate in Danish</td>
</tr>
</tbody>
</table>

As the overall aim was to improve and inform current practices concerning elderly patients’ discharge from a short-stay unit at the ED, all patients transferred to other hospital departments were excluded. Patients admitted from nursing home were also excluded, as their access to municipal rehabilitation services was different from that of home-dwelling older people admitted to hospital. One of the factors addressed in the intervention was the coordination between the hospital and primary care. A plan for such coordination was an integrated part of the intervention developed and evaluated in study I. This coordination was especially developed between Aarhus University hospital and the Municipality of Aarhus. Therefore, only residents in the Municipality of Aarhus were included.

**Methods study Ia: Development and description of the intervention**

The intervention was systematised and described through the use of the Intervention Mapping approach, which describes the iterative path from problem identification to problem solving (117). Originally, Intervention Mapping was used in health promotion programmes ranging from HIV prevention, to overweight management, to physical activity motivation (117).
The Intervention Mapping approach provides a methodological, step-by-step procedure and comprise six steps with several tasks. The first two steps involve the description of a needs assessment and the intervention’s objectives. In Step 3, theory- and evidence-based methods and strategies are selected, which then inform the intervention developed in Step 4. Steps 5 and 6 describe the plan for implementation and evaluation of the developed intervention (117). The Template for Intervention Description and Replication (TIDieR) checklist was consulted to ensure that the final intervention was described sufficiently (127).

In the following steps, the methods used in the development of the intervention are described using the Intervention Mapping approach as a framework to enhance the transparency of the process (117). The methods used in the development of the intervention will be outlined briefly in this method section, while the results of Steps 1-4 are presented in the results section. Steps 5 and 6 are outlined in the Appended Paper I.

In Step 1, a needs assessment was conducted to identify and describe risk factors for readmission, underlying behavioural and environmental factors that could affect risk factors, and determinants for behavioural and environmental factors. The needs assessment primarily was based on findings from the literature and informal consultations with two occupational therapists and two physiotherapists from the hospital and primary care sectors who contributed their clinical experience concerning the population. The needs assessment was conducted later in the process and structured with a logic model, as recommended in the Intervention Mapping approach (117). To bring expertise into the project, a steering group, project group and reference group were established. The steering group was responsible for the project’s success, comprising 11 experts from both the hospital and primary care. Five of these experts comprise the project group, including the project leader (PhD candidate). The project group was responsible for planning, implementing and evaluating the intervention. Finally, a reference group of physiotherapists and occupational therapists from the ED contributed information about the clinical context.

In Step 2, a basis for the intervention was established by specifying overall outcomes and dividing them into separate performance objectives of the intervention. The performance objectives explicitly described what should happen to achieve the outcome (117). Then the most important internal (relating to the person) and external (relating to the environment) determinants identified in Step 1 were combined with the specified performance objectives to
formulate change objectives, which specified what would change in the determinants as a result of the intervention and were required to achieve performance objectives and the overall outcome.

In Step 3, different literature searches were undertaken. First, we searched for tests to assess limitations in elderly patients’ performance of activities (See Appendix E). Tests were selected on the basis that they were performance-based, generic tests that were validated for the older population and simple to administer in a clinical setting. Next, we searched systematically for studies that examined the effect of interventions that aimed to reduce readmission risk among elderly patients discharged from an acute-care or emergency department (See Appendix A). Theoretical and evidence-based literature concerning occupational therapy also was identified in this step to inform the intervention. Decisions about specific methods and suitable strategies to include in the intervention were made within the project group and in conjunction with the reference group.

In Step 4, specific intervention components were created by combining and sequencing the methods and strategies identified through literature searches in Step 3. In total, three components were developed. A description for delivering the components was developed, and Component 1 was examined during a two-week period within a population of elderly patients admitted to the short-stay unit at the ED. The tests in Component 1 were examined to consider whether they were viable in an acute setting and to train therapists in how to perform the tests in a standardised manner. During the examination period, the project leader supervised the therapists to ensure that the tests were used as described in the test manual. The description of how to deliver the intervention also included a checklist to be used within Component 3.

**Methods study Ib: Outcome evaluation of the intervention**

**Setting and recruitment of study participants**
The study took place from March to December 2014 at the short-stay unit at the ED at Aarhus University Hospital. Each weekday at 8 a.m., a research occupational therapist reviewed a list of all patients admitted during the previous 24 hours and screened for eligibility. The allocated resources allowed us to include and allocate a maximum of two
patients for the intervention group per day. If more patients were eligible, allocation was based on the date of birth (day of the month). The two patients born closest to the first day of a month (e.g. 1 March) would be allocated to the intervention group, and others to the usual practice group. Patients admitted after 8 a.m. who met the inclusion criteria but were discharged out of hours (during afternoons and evenings) could not be allocated to the intervention group, because the research occupational therapists were not present later in the day/evening to include and assess them before their discharge. Instead, these patients were allocated to the usual practice group.

Patients allocated to the intervention group were provided with verbal and written information about the study. Patients agreeing to participate signed a consent form. Patients allocated to the usual practice group were not informed about their participation, because only data from the National Patient Registry were used. Instead, the National Board of Health gave permission to obtain health-related data on patients in the usual practice group.

**Interventions provided**

**Usual practice:** Patients in both groups received the standard course of medical treatment and care at the short-stay unit at the ED. Referral to occupational therapy and physiotherapy took place only if the medical doctor or nurse considered it necessary. If the occupational therapist was summoned to assess a patient, the occupational therapist performed a short interview and a non-standardised observation of the patient’s performance of activities in relation to self-care with results communicated to municipal homecare staff. If necessary, ED nurses organised referrals to home health care after discharge.

**Elderly Activity Performance (EAP) intervention:** In addition to the standard course of treatment delivered at the short stay-unit at the ED, patients in the intervention group received the developed EAP intervention (described in the results section).

**Intervention fidelity**

Three occupational therapists and two physiotherapists delivered the intervention after having participated in a one-day training course that introduced them to the intervention. The content of the one-day training course included an introduction to the components of the intervention combined, with the rationale for the choice of components. The course also included education in the assessments in Component 1 and introduced a plan for a two week programme that aimed to train the therapist in delivering the assessments. The
physiotherapists were only part of delivering Component 1, while the occupational therapists delivered all three components. During the recruitment period, weekly meetings were organised between the participating research therapists and the project leader with the objective of discussing and solving potential problems related to either recruitment of participants and/or intervention delivery. This was done to enhance intervention fidelity. To examine whether the EAP intervention was delivered as intended, the number of patients receiving different intervention components was registered.

**Data collection and measures**

Data used in study I compromised both patient reports and data from national registries. An overview of the different data sources and data is given in Table 6.

<table>
<thead>
<tr>
<th>Table 6. Data sources and data used in study I</th>
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<tr>
<td><strong>Data source</strong></td>
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<td>The Danish Civil Registration System</td>
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<td></td>
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<tr>
<td>The Danish National Patient Register</td>
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<td></td>
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<tr>
<td>National Health Insurance Service Register</td>
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<td></td>
</tr>
<tr>
<td>Questionnaire</td>
</tr>
</tbody>
</table>

At baseline and at 30 days and 26 weeks’ follow-up, all patients in the intervention group were interviewed using a structured interview questionnaire. Although the design of the study did not allow a between group comparison of changes in self-reported activity performance, we wanted to measure and describe possible changes within the EAP intervention group. Self-reported activity limitations during the previous 30 days were measured with the World Health Organisation Disability Assessment Schedule (WHODAS 2.0), a generic assessment for measuring functioning and disability in accordance with ICF (128,129). WHODAS 2.0 covers the six domains: cognition, mobility, self-care, getting along, life activities and
participation. During the interview, respondents are asked questions about the degree of difficulty that they experience in doing different activities. Having difficulty with an activity means experiencing at least one of the following: 1) increased effort, 2) discomfort or pain, 3) slowness, 4) changes in the way the person does the activity. The score used in this study was the simple summary score of 32 items with a maximum score of 160, which indicates severe disability. The psychometric properties of WHODAS 2.0 seem strong, including good reliability, responsiveness and concurrent validity (128,129). WHODAS 2.0 was chosen as we wanted a self-reported measure that was capable of measuring limitations in activity performance in a broader sense than degree of dependence/independence.

Baseline data, including gender, age, civil status, admission time and comorbidity calculated with Charlson's Co-morbidity Index (CCI) were extracted for patients in both groups (130–132). These data were obtained through national registries (see Table 6). The primary outcome was risk of first-time all-cause readmission within 26 weeks. Readmission was defined as an acute admission at least 4 hours after discharge in accordance with former studies (94). Although several studies use 30-day readmission as outcome, a follow-up time of 26 weeks was considered more appropriate, as limitations in performing activities may not be improved in such a short time frame as 30 days (33,133). Secondary outcomes were risk of first-time 30-day all-cause readmission and all-cause mortality, number of contacts to GPs and EDs within 26 weeks, and time to first readmission. All data on outcome variables were obtained through national registries.

**Data analyses**

All analyses in study I were performed using the Stata 14.2 statistical program. Hypothesis tests were conducted at the 5% level of significance, two-sided. Although the study used a non-randomised allocation, the reporting of the study complied with the Consolidated Standards of Reporting Trials (CONSORT) guidelines to ensure transparent reporting (134). The study was registered in Clinicaltrials.gov (NCT02078466). The Biostatistical Advisory Service from Aarhus University was consulted during the development of the analysis plan and during the analyses.
Sample size calculation: Based on the literature, the intervention was expected to reduce the risk of readmission within 26 weeks with 16 percentage points, from 37% to 21% (135). Power calculation revealed that the sample size should be 304 patients allocated equally (1:1), assuming that 10% of the participants were lost to follow-up, e.g. due to death, with a two-sided significance level of 5% and a statistical power of 80%.

Description: A descriptive analysis was performed summarising baseline characteristics for both the intervention group and the usual practice group. Data were presented by mean and standard deviation (SD) or number and percentage. The two groups were compared and tested for significant differences using chi-square test for categorical variables, Student’s t-test for normally distributed continuous variables and the Wilcoxon rank sum test for non-normally distributed variables. This was necessary due to the non-randomised design, where it was not possible to assume that potential confounding was evenly distributed between the two groups (118,136). Also, an explorative analysis was performed to compare baseline differences for those patients in the usual practice group admitted during the day-time and those admitted during afternoon and evenings in order to include possible differences in the adjusted analyses.

Primary analysis: The analysis was performed according to the intention to treat principle, regardless of the amount of intervention received. Risk of first-time readmission within 26 weeks was estimated by cumulative incidence proportion using a pseudo-value approach accounting for death as a competing risk (137–139). In the pseudo-value approach, a new set of pseudo observations are generated to boost the number of cases in the analysis to be used in a generalised linear model. The two groups were compared by risk difference (RD) and risk ratio (RR) with 95% confidence intervals (CI), as described in the CONSORT guidelines (134). Due to the non-randomised study design, a similar analysis was performed by adjusting for factors that a priori were considered to be potential confounders: age, gender and co-morbidity. Also differences in baseline variables between the two groups were included in the adjusted analysis. Secondary outcomes were 30-day all-cause readmission and all-cause mortality within 26 weeks, which were estimated by RD and RR with 95% CI and secondly adjusted for potential confounding. Time to first readmission with unadjusted cumulative incidence proportions was illustrated in a graph. Number of contacts to GPs and
the ED were described with medians and range and differences were tested with non-parametric Wilcoxon rank sum tests.

**Analyses within the EAP intervention group:** An exploratory analysis within the EAP intervention group was performed to examine whether the number of intervention components received was associated with risk of readmission. Self-reported limitations in performance of activities measured with WHODAS 2.0 was described for the EAP intervention group at baseline, 30 days and at 26 weeks’ follow-up by simple summary scores.

**Methods study II: patients’ perspective**

**Recruitment of study participants**

Patients were recruited among those patients allocated to the intervention group in Study Ib between 15 October 2014 and 20 November 2014. No established method of determining sample size seems to exist within qualitative research, although it has been suggested that an approximation of sample size is necessary for planning a study (140). Therefore, when preparing the study and its time frame for data collection, it was determined in advance that the number of participants should be between 10 and 15, in accordance with a phenomenological approach in which we intended to rely on in-depth, rich data rather than number of participants (141). We sought to achieve data that were detailed, nuanced and of sufficient quality (142).

Purposive sampling was used to ensure variety in diagnosis, age, gender and material status as these aspects could contribute to the data’s richness (142). The occupational therapists delivering the intervention in Study Ib undertook the sampling in collaboration with the project leader. Shortly before discharge, 15 elderly patients were invited to participate and were given written information about the study’s purpose. Thirteen gave their oral consent to be contacted after discharge. Approximately one week after discharge, patients were contacted by phone and verbal information was provided. Eleven elderly patients gave their informed and written consent to participate.
Data collection

Individual interviews by the same interviewer were conducted with 11 elderly patients receiving the EAP intervention in Study Ib. The interviews lasted 30 to 60 minutes each and took place in the elderly patients’ homes two weeks after discharge.

A semi-structured interview guide with primarily open-ended questions was used in order to have a specific set of instructions to stay focused on the topic while simultaneously striving to encourage the patients to describe their experiences. Although the qualitative study was inspired by Giorgi’s descriptive phenomenological method, Giorgi offered no advice on how the interviews should be conducted other than via open-ended questions (122,123,125). Instead, we found inspiration from Kvale and Brinkmann, who outlined phenomenology as a basis for their approach to qualitative interviewing (143,144). Kvale and Brinkmann outline that questions should aim to describe specific situations and actions, not general opinions and suggested using a semi-structured interview guide to structure the interview (143,144). The interview guide was developed with four themes, starting with a preliminary question concerning the experience of being admitted to hospital (Table 7). This was done to encourage participants to tell their stories about what led to their admission. The second theme concerned the experience of being discharged and the third theme sought to illuminate the experience of returning to everyday life after discharge. The last theme concerned the elderly patients’ experiences of receiving rehabilitation as part of their everyday lives after discharge. The interview guide was based on the aim of the study (theme two and three). No professional language was used in the interview guide or during the interview. The validity of the interview guide was strengthened through discussion with a senior researcher and through a single pilot interview, which led to minor revisions in the wording. Questions used in the interview guide are presented in Table 7.
Table 7: Interview guide

<table>
<thead>
<tr>
<th>Theme</th>
<th>Interview questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the hospital</td>
<td>Please try to explain how you experienced being admitted to hospital.</td>
</tr>
<tr>
<td></td>
<td>During your hospital stay, did anybody talk to you about how you manage different tasks at home?</td>
</tr>
<tr>
<td>Discharge</td>
<td>Please describe the discharge from hospital and how you experienced this.</td>
</tr>
<tr>
<td>Getting home</td>
<td>What was it like to come home again after hospital admission?</td>
</tr>
<tr>
<td></td>
<td>What was important to you after you came home from the hospital?</td>
</tr>
<tr>
<td></td>
<td>Please try to describe to me how you manage your everyday life at home.</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>How do you experience being offered to participate in rehabilitation?</td>
</tr>
</tbody>
</table>

In the process of collecting data, I sought to obtain rich descriptions with details, nuances and examples. After a short briefing, patients were invited to talk freely and in detail about their admission, discharge, and how they experienced returning to their everyday lives, and both positive and negative aspects were explored. The role as interviewer was to be a neutral facilitator so that the patients could account for their experiences as fully as possible. Prompts such as "Could you give an example of this" or "Could you elaborate on what you are telling me" were used to encourage the patients to describe more in detail how they felt and acted. This was done so I could get closer to understanding their individual experiences (144,145). Active listening and periods of silence were also used. All interviews were audiotaped and transcribed verbatim afterwards, which resulted in 202 pages of text.

Data analysis

Malterud’s systematic text condensation which is a modification of Giorgi’s descriptive phenomenological method, was used in the analysis of the qualitative interviews (146,147). Malterud’s description provides a clear procedure for coding, decontextualisation and recontextualisation (146–148). Systematic text condensation is an explorative and descriptive method for thematic cross-case analysis. The method focused on patterns and variations in the data and identified what was meaningful to an individual patient and what was meaningful across several patients (146,147). An inductive or data-driven approach was
chosen in the analysis, as I wanted the aspects from the elderly patients’ experiences to shape the themes and codes, not theory or other preconceptions.

The method consists of the following steps, leading to a description of the patients’ experiences:

1) Forming an overall impression: All of the interviews were listened to and transcripts were read as a whole several times to gain an overview of the total content. Then nine preliminary themes were identified.

2) Identifying and sorting meaning units: Meaning units containing information that related to the nine preliminary themes were identified and colour coded.

3) Condensation: Data were reduced and condensed into a decontextualised selection of meaning units and sorted into thematic sub-codes across the patients using a matrix. In the process, the focus was on maintaining the participants’ original terminology to describe the experiences as accurately as possible.

4) Synthesising the codes into descriptions: The condensed meaning units were synthesised into descriptions that related to each theme and subtheme. Meaningful quotations describing the content of the subthemes were added in the description. The quotations demonstrate both similarities and differences in how the participants experienced being discharged and returning to their everyday lives. In this step, the nine themes were reduced to four themes including subthemes.

Moving between the four steps was done iteratively, from the overall impression of all text to particular parts of the transcripts, identifying themes and subthemes of importance from the elderly patients’ perspectives (146,147). To maximise the validity of the analysis, all the identified themes and codes were first discussed with a senior researcher and then the final selection of themes was discussed with the whole project group. After the analysis, a retrospective check was performed to ensure that at least three of the elderly patients had added to each single code (146,147). This was done in order to ensure that the analysis was conducted as a cross-case analysis.

The reporting of this study was presented in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) to ensure trustworthiness and transparency (149).
Ethical issues

The studies in the PhD project were conducted in agreement with the principles of the World Medical Association of Helsinki (150). Conduction of study II required no ethical approval as it did not include any experimental interventions. The Regional Ethics Committee confirmed that approval of Study I in the PhD project was not required as the project was classified as a quality assurance project (J. nr.1-10-72-108-14). The National Board of Health gave permission to obtain health-related data on patients in the usual practice group in study I, as it was not possible to obtain their personal permission (J.nr. 3-3013-608/1/). Both studies were approved by the Danish Data Protection Agency (J.nr. 2012-41-0763). Handling and storage of data were in accordance with guidelines from the Danish Data Protection Agency and were kept confidential.

When conducting qualitative interviews, there are some ethical considerations concerning the relation between the interviewer and the participant. As an interviewer, it is my responsibility not to manipulate the dialogue. Before each interview, I made the premise behind the interview clear for the elderly patient, and I was explicit about their rights during and after the interview (144).
5. Results

The results in this section are presented in relation to each study, as each study has its own specific aim. Additional results and more detailed presentations are available in the appended papers.

Results study Ia: Description of the intervention

Step 1: A large proportion of elderly patients who are readmitted after discharge from an ED have limitations in performing activities (34,38,39). Owing to the occupational therapy perspective of the PhD project, such limitations were chosen as the primary risk factor to address in the intervention. Another important factor associated with risk of readmission was identified as coherent discharge (46–48), which also was addressed in the intervention. The result of the needs assessment is presented in the logic model in Figure 2.

Underlying behavioural and environmental factors and determinants for the two risk factors were identified using the International Classification of Functioning, Disability and Health (ICF) Model of Human Occupation (MoHO) and informal consultation with occupational therapists and physiotherapists (11,151).

The underlying internal determinants that influence a person’s performance of activities were identified primarily as decreased skills in performing activities and low coping ability. When a person experiences decreased skills, his or her way of performing activities may change in relation to efficiency, effort, safety and independence (74,75). Inappropriate design of the home was identified as an external determinant that could influence the environmental factor; “level of accessibility in the patient’s home” and thus identified as an important determinant in relation to performing activities (151).

Lack of information exchange and collaboration in providing rehabilitation needs when a patient is transferred from the hospital to primary care were identified as external determinants that influences a coordinated discharge. Waiting time for rehabilitation in the municipality and lack of information provided for the patient were identified through informal consultations.
Based on the needs assessment, the goal of the intervention was to reduce the risk of readmission by:

- Enhancing elderly patients’ performance of activities
- Supporting a coherent discharge by coordinating elderly patients’ discharge and transfer of rehabilitation needs from the ED to primary care
Step 2: The logic model was followed by a description of the intervention outcomes in Step 2. Intervention outcomes were related to underlying behavioural and environmental factors, and they were selected based on considerations regarding their potential to influence risk factors and, thus, readmission. In addition, outcomes had to be both changeable and possible to address in the acute setting (1). The outcomes were:
- Enhanced ability to perform activities
- Enhanced accessibility in the home
- Enhanced coordination between hospital and primary care

The chosen outcome ‘enhanced ability to perform activities’ was divided into five performance objectives, and the two chosen outcomes related to the environmental factors were divided into three performance objectives. Changes objectives were generated by combining the most important and changeable determinants (as identified in Step 1) with the specified performance objectives (1).

The product of step 2 was a matrix of change objectives for personal and environmental determinants, i.e. the most immediate targets of the intervention (1) (See Paper I).

In Step 3, theory- and evidence-based methods and strategies were identified in the literature. Although literature searches revealed inconsistent results from interventions that aimed to reduce the risk of readmission in elderly patients, some trends were seen. The interventions that were beneficial in reducing risk of readmission included pre-discharge assessment, a discharge plan and post-discharge follow-up visits. These three components were all applied in the developed intervention.

A pre-discharge assessment of the elderly patient’s performance of activities was chosen as the first intervention component as such an assessment is the first step in identifying a need (75). Assessment tests were selected based on their being performance-based generic tests that were validated for use on older people. A self-reported measure of activity performance was also included to capture the elderly patient’s perspective on limitations in performing activities (see Table 8).

The most frequently reported interventions aimed to enhance older peoples performance of activities that occupational therapists use, were found to be retraining of activities, skill development, task and environmental modifications, and the use of assistive devices (102,104,105,108,109). These intervention models were used in the third component, the
follow-up home visit. The evidence-based methods were supplemented with theoretically derived methods and practical strategies from the Behaviour Change Techniques taxonomy and MoHO (151,152).

To coordinate the discharge and transfer of rehabilitation needs, a plan for information exchange and fast referral was described in collaboration with occupational therapists from the municipality (see Table 8).

Step 4 presents the final developed intervention. The Elderly Activity Performance (EAP) intervention was developed to achieve the goal of reducing risk of readmission by addressing two factors, performance of activities and coordination of discharge, including transfer of elderly patients’ rehabilitation needs. The intervention’s focus was on a pre-discharge assessment of each individual elderly patient's performance of activities, referral to rehabilitation in primary care and a follow-up home visit the day after discharge with the purpose of enabling the elderly patient to perform basic activities and start rehabilitation immediately.

In Component 1, elderly patients’ were assessed with the Timed Up and GO (TUG) (153), 30s- Chair Stand Test (30s-CST) (154) and the Assessment of Motor and Process Skills (75). Patients’ with identified limitations in performing activities received a rehabilitation plan and referral to post-discharge rehabilitation in primary care (Component 2). Primary care was informed by telephone about the patients discharge, and referral of the patient to further rehabilitation was carried out the same day in order to start rehabilitation immediately after discharge. In addition, the patient received both oral and written information about further rehabilitation and the follow-up home visit the day after discharge.

During the follow-up home visit, the occupational therapist encouraged the patient to perform basic activities and provided direct training on how a specific activity could be performed differently to enable the patient to perform the activity (1).

The occupational therapist screened the home for safety risks and factors that potentially could limit the performance of activities by using a checklist. If limitations and/or risk factors for safety were identified, the occupational therapist initiated minor relevant modifications of the home environment, such as removing a rug, moving a chair, etc (2).

The final developed intervention reflects the client-centred and problem-solving occupational therapy approach in which the rehabilitation plan and follow-up visit at home was tailored to the individual patient’s need. In practice, this meant that the rehabilitation plan was based on
the individual patient’s limitations in performing valued activities. Basic within-home activities of importance to the patient were addressed during the follow-up home visit.

Component 1 was provided for all patients. Based on the results in Component 1 (assessment of activity performance), patients with identified limitations when performing activities received Component 2 (rehabilitation plan) and Component 3 (follow-up visit at home). The content of the EAP intervention is provided in Table 8.
<table>
<thead>
<tr>
<th>Component</th>
<th>Health professional/setting</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 1</td>
<td>Occupational therapists and physiotherapist / the short-stay unit at the ED</td>
<td>Assessing the patient’s performance of daily activities with the measures; Timed-Up and Go (72,153,155,156). 30s-Chair Stand Test (154,157). Assessment of Motor and Process Skills (75,76,158). Barthel-20 used as self-report by interview (159–161). Limitation in performing activities was determined using the following cut-off values: Time Up and Go &gt; 12 seconds (155). Chair Stand Test &lt; 8 times in 30 seconds (157). AMPS motor ability &lt; 1.50 logits and process ability &lt; 1.00 logits (75). Patients that scored under/above cut-off values in at least one test were offered component 2 and 3.</td>
</tr>
<tr>
<td>Component 2</td>
<td>Occupational therapist/ the short-stay unit at the ED</td>
<td>A rehabilitation plan for patients with identified limitations in performing activities in component 1 was conducted. Primary care was informed by telephone about the patients discharge, and referral of the patient to further rehabilitation was carried out the same day in order to start rehabilitation immediately after discharge. In addition, the patient received both oral and written information about further rehabilitation and the follow-up visit (2).</td>
</tr>
<tr>
<td>Component 3</td>
<td>Occupational therapist from the short-stay unit/ in the patient’s home</td>
<td>The occupational therapist who assessed the patient and defined the rehabilitation plan visited the patient at home the day after discharge in order to enhance the patient’s performance of activities. An adaptive³ and/or an acquisitional⁴ approach was used—depending on the patient’s limitations in performing activities (1). The occupational therapist screened the home for safety risks and factors that potentially could limit the performance of activities by using a checklist. If limitations and/or risk factors for safety were identified, the occupational therapist initiated minor relevant modifications of the home environment, such as removing a carpet, chair e.g. Moreover, the occupational therapist encouraged the patient to perform activities and provided direct training on how a specific activity could be performed differently to enable the patient to perform the activity. A checklist was used to guide the occupational therapist and enhance standardised procedures at the follow-up visit.</td>
</tr>
</tbody>
</table>

³Adaptive approach refers to that the occupational therapist teaches the patient alternative or compensatory strategies or demonstrates the use of an assistive device in order to perform the activity independently. ⁴Acquisitional approach refers to that the occupational therapist train the patient’s skills using graduated activities
Results study Ib: Outcome evaluation

During the inclusion period, 945 patients were screened for eligibility. A total of 410 patients met the inclusion criteria; 35 patients declined to participate when asked for consent to participate in the intervention group. In all, 144 patients were allocated to the intervention group and 231 patients to the usual practice group, a total of 375 patients (2) (Please see the section for data analysis for power calculation). The enrolment of study participants is shown in Figure 3.

Figure 3. Flow-chart of the study population in study I (2).

Characteristics of the study participants:
The sample consisted of 375 elderly patients discharged from a short-stay unit at the ED. At baseline, the EAP intervention group and the usual practice group appeared comparable concerning gender, comorbidity and marital status. Patients in the EAP intervention group were on average older than patients in the usual practice group (81 years vs. 78 years, p =
0.003), and they were admitted longer than patients in the usual practice group (22.6 hours vs. 19.7 hours, p = 0.002). Baseline characteristics of the study participants are presented in Table 9 (2).

### Table 9. Baseline characteristics of the study participants (n=375) (2).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>EAP intervention (n = 144)</th>
<th>Usual practice (n = 231)</th>
<th>Test for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, years (SD)</td>
<td>81 (7.9)</td>
<td>78 (8.6)</td>
<td>p = 0.003</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>79 (55)</td>
<td>122 (53)</td>
<td>p = 0.699</td>
</tr>
<tr>
<td>Marital status, n (%)</td>
<td></td>
<td></td>
<td>p = 0.171</td>
</tr>
<tr>
<td>Married</td>
<td>56 (39)</td>
<td>99 (43)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>48 (33)</td>
<td>68 (29)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>33 (23)</td>
<td>41 (18)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>7 (5)</td>
<td>23 (10)</td>
<td></td>
</tr>
<tr>
<td>Comorbidity, n (%)*</td>
<td></td>
<td></td>
<td>p = 0.183</td>
</tr>
<tr>
<td>Low: score 0–1</td>
<td>75 (52)</td>
<td>131 (57)</td>
<td></td>
</tr>
<tr>
<td>Moderate: score 2–3</td>
<td>45 (31)</td>
<td>62 (27)</td>
<td></td>
</tr>
<tr>
<td>High: score &gt;4</td>
<td>24 (17)</td>
<td>38 (16)</td>
<td></td>
</tr>
<tr>
<td>Hours of admission, median, (IQR)</td>
<td>22.6 (17.8;31.9)</td>
<td>19.7 (13.7;26.2)</td>
<td>p = 0.002</td>
</tr>
</tbody>
</table>

* Charlson’s Comorbidity Index

### Risk of readmission and mortality

No differences between groups were found regarding the primary outcome readmission within 26 weeks. In all, 44% of the patients in the EAP intervention group and 42% of patients in the usual practice group were readmitted within 26 weeks, RD = 0.02, 95% CI (-0.08;0.12) and RR = 1.05, 95% CI (0.83;1.33) (2). No differences in 30 days readmission were found between the two groups. Eighteen per cent of the patients in the EAP intervention group and 23% in the usual practice group were readmitted, RD = -0.05, 95% CI (-0.13;0.03) and RR = 0.78, 95% CI (0.51;1.19) (2). Mortality 26 weeks after discharge was 10% in both groups (Table 10).

The within group analysis of the usual practice group revealed differences in marital status and length of admission comparing those admitted in day-time with those admitted during afternoon and evenings (2). Patients in the usual practice group that were included in daytime had longer admission time; 25.4 (21.1;46.1) hours versus 17.5 (10.1;23.0) hours than those patients admitted during afternoons and evening. Forty-seven per cent of the patients in
the usual practice group that were admitted in afternoons and evenings and 34% of the patients admitted in day-time were married (p = 0.044).

Adjusting for those factors that were different within the usual practice group in combination with the a priori confounders age, gender and comorbidity did not show any significant difference in either readmission within 26 weeks, readmission within 30 days or mortality (2).

Table 10. Comparison of risk of readmission and mortality for the study participants (n = 375) (2)

<table>
<thead>
<tr>
<th></th>
<th>EAP intervention n = 144</th>
<th>Usual practice n = 231</th>
<th>Risk Difference (RD)</th>
<th>Risk Ratio (RR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readmission 26 weeks</td>
<td>64 (44)</td>
<td>99 (42)</td>
<td>0.02 (-0.08;0.12)</td>
<td>1.05 (0.83;1.33)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.02 (-0.09;0.12)</td>
<td>1.07 (0.84;1.36)</td>
</tr>
<tr>
<td>Readmission 30 days</td>
<td>25 (18)</td>
<td>55 (23)</td>
<td>-0.05 (-0.13;0.03)</td>
<td>0.78 (0.51;1.19)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-0.04 (-0.12;0.04)</td>
<td>0.83 (0.51;1.35)</td>
</tr>
<tr>
<td>Mortality 26 weeks</td>
<td>14 (10)</td>
<td>23 (10)</td>
<td>-0.00 (-0.06;0.06)</td>
<td>0.98 (0.52;1.83)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-0.01 (-0.09;0.08)</td>
<td>1.06 (0.68;1.66)</td>
</tr>
</tbody>
</table>

*Adjusted for age, gender, admission time, marital status and comorbidity measured with Charlson’s Comorbidity Index (CCI)

A total of 26% of the patients in both the EAP intervention group and the usual practice group were readmitted once within 26 weeks. Eighteen per cent of patients in the EAP intervention group and 17% of patients in the usual practice group were readmitted two times or more within 26 weeks (2). Figure 4 shows the percentage distribution of readmissions within 26 weeks following discharge.
Figure 4. Bar plot of the percentage distribution of elderly patients readmitted within 26 weeks after discharge (n = 375).

Analysis within the EAP intervention group
Table 11 shows the distribution of the intervention components on patients in the intervention group. All patients in the intervention group were assessed with at least one of the performance-based assessments in component 1. Based on the results from that assessment, a total of 87 (60%) of the patients in the intervention group were referred to primary care rehabilitation. Of those, 69 (79%) patients received a follow-up visit by the occupational therapist the day after discharge (2).

Table 11: Intervention components in the EAP intervention group (n = 144) (2)

<table>
<thead>
<tr>
<th>Component</th>
<th>Frequency of total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 1</td>
<td></td>
</tr>
<tr>
<td>Assessment of limitations in performing activities</td>
<td>144 (100)</td>
</tr>
<tr>
<td>Assessment with the TUG*</td>
<td>120 (83)</td>
</tr>
<tr>
<td>Assessment with the 30s-CST*</td>
<td>126 (88)</td>
</tr>
<tr>
<td>Assessment with the AMPS §</td>
<td>96 (67)</td>
</tr>
<tr>
<td>Component 2: Rehabilitation plan</td>
<td>87 (60)</td>
</tr>
<tr>
<td>Component 3: Follow-up visit</td>
<td>69 (48)</td>
</tr>
</tbody>
</table>

*All patients in the intervention group were assessed with at least one of the performance-based measures in component 1
*Timed-up and go
*30s-Chair Stand Test
*Assessment of Motor and Process Skills
An exploratory analysis within the EAP intervention group showed a significant difference between patients who received all components and patients only receiving component 1. Fifty-one per cent of the patients receiving all components in the EAP intervention were readmitted within 26 weeks compared to 33% of the patients who only received component 1, RD = 0.18 (0.02;0.35) and RR = 1.55 (1.02;2.36). Regards risk of readmission within 30 days, 23% of patients receiving all components in the EAP intervention were readmitted, while 11% of the patients who only received component 1 were readmitted, RD = 0.12 (0.01;0.24) and RR = 2.18 (0.93;5.12) (Table 12).

<table>
<thead>
<tr>
<th></th>
<th>All components* n = 87</th>
<th>Only component 1# n = 57</th>
<th>Risk difference (95%CI)</th>
<th>Risk Ratio (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readmission 26 weeks, n (%)</td>
<td>45 (51)</td>
<td>19 (33)</td>
<td>0.18 (0.02;0.35)</td>
<td>1.55 (1.02;2.36)</td>
</tr>
<tr>
<td>Readmission 30 days, n (%)</td>
<td>19 (23)</td>
<td>6 (11)</td>
<td>0.12 (0.01;0.24)</td>
<td>2.18 (0.93;5.12)</td>
</tr>
</tbody>
</table>

*All components: Assessment of the limitations in performing activities (component 1), rehabilitation plan (component 2) and follow-up visit at the patient’s home (component 3).
# Component 1: assessment of limitations in performing activities.

**Self-reported activity limitations**

Figure 5 describes self-reported limitations in performing activities measured with WHODAS 2.0 at baseline, 30 days and 26 weeks after discharge, within the EAP intervention group. The median summary score at baseline was 62 (IQR 48-86) (n = 142), at 30 days it was 61 (IQR 47-85) (n = 102), and at 26 weeks the median summary score was 49 (IQR 38-63) (n = 56). There was a tendency towards a lower disability score at 26 weeks than at baseline and 30 days after discharge.
Figure 5. Self-reported limitations in performing activities within the EAP intervention measured with WHODAS 2.0

*Scores for the domains in WHODAS 2.0: Cognition = 0-30, Mobility = 0-25, Self-care = 0-20, Social = 0-25, Life activities = 0-20, Participation = 0-40. High score indicates severe disability

Results study II: Patients’ perspectives

Patient characteristics
Eleven elderly patients participated in individual interviews, three men and eight women, aged 65–86 years. Eight were living alone and five of the eleven elderly patients’ received support from primary care. Table 13 present characteristics of the participants.

Table 13: Characteristics of the participants (n = 11)

<table>
<thead>
<tr>
<th>Patient</th>
<th>Gender</th>
<th>Age</th>
<th>Marital status</th>
<th>Reason for admission</th>
<th>Length of admission</th>
<th>Support from primary care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anna</td>
<td>Female</td>
<td>83</td>
<td>Living alone</td>
<td>Back pain</td>
<td>2 days</td>
<td>+</td>
</tr>
<tr>
<td>Bo</td>
<td>Male</td>
<td>70</td>
<td>Living alone</td>
<td>Infection</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>Carla</td>
<td>Female</td>
<td>86</td>
<td>Living alone</td>
<td>Respiratory</td>
<td>2 days</td>
<td>+</td>
</tr>
<tr>
<td>Dorthe</td>
<td>Female</td>
<td>76</td>
<td>Living with partner</td>
<td>Neurological</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>Erik</td>
<td>Male</td>
<td>65</td>
<td>Living alone</td>
<td>Neurological</td>
<td>1 day</td>
<td>+</td>
</tr>
<tr>
<td>Frida</td>
<td>Female</td>
<td>83</td>
<td>Living alone</td>
<td>Infection</td>
<td>2 days</td>
<td>-</td>
</tr>
<tr>
<td>Grethe</td>
<td>Female</td>
<td>73</td>
<td>Living alone</td>
<td>Respiratory</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>Hanne</td>
<td>Female</td>
<td>67</td>
<td>Living alone</td>
<td>Heart problem</td>
<td>1 day</td>
<td>+</td>
</tr>
<tr>
<td>Iben</td>
<td>Female</td>
<td>67</td>
<td>Living alone</td>
<td>Infection</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>Jette</td>
<td>Female</td>
<td>76</td>
<td>Living with partner</td>
<td>Neurological</td>
<td>1 day</td>
<td>+</td>
</tr>
<tr>
<td>Kurt</td>
<td>Male</td>
<td>76</td>
<td>Living with partner</td>
<td>Neurological</td>
<td>1 day</td>
<td>-</td>
</tr>
</tbody>
</table>
Four themes emerged during the qualitative analysis; “The importance of being involved and listened to during admission”, “The importance of being prepared for discharge”, “Pain and fatigue limited performance of activities” and “Frustrations and concerns about lack of clarification”. The four themes are presented in more details in the appended Paper III. In this section, results from the analysis will be presented in two categories; the first will describe the elderly patients’ experiences of being discharged, the second category will describe the elderly patients’ experiences of returning to everyday life after discharge from a short-stay unit at the ED (Table 14). A synthesis of factors of importance for the elderly patients’ experiences of being discharged and returning to their everyday lives is presented at the end of the result section.

**Table 14. Themes and categories identified in the qualitative analysis**

<table>
<thead>
<tr>
<th>Themes</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>The importance of being involved and listened to during admission</td>
<td>Experiences of being discharged</td>
</tr>
<tr>
<td>The importance of being prepared for discharge</td>
<td>Experiences of returning to everyday life after discharge</td>
</tr>
<tr>
<td>Pain and fatigue limited performance of activities</td>
<td></td>
</tr>
<tr>
<td>Frustrations and concerns about lack of clarification</td>
<td></td>
</tr>
</tbody>
</table>

**Experiences of being discharged**

To be involved in decision-making and listened to during admission were important factors for the elderly patients and the experience of not being listened to could make them feel uninvolved in the discharge process. They found that although some physicians were good at informing about further actions and/or examinations, the physicians were sometimes too busy to ask for the patient’s perspective. Some patients expressed that they were too tired to ask the physicians questions, which could lead to several unresolved issues in relation to discharge.

Being prepared before discharge was also of importance. The elderly patients’ were all discharged shortly after admission (1–2 days), which for several of them came as a surprise. Not everyone agreed with the decision about being discharged, and some felt that they had not been involved in the decision. The elderly patients’ experienced that they were discharged home with ongoing health problems and limitations in performing activities that
should have been resolved. Some of them experienced their admission to hospital as a waste of time.

Another factor that was central to the elderly patients’ experiences of the discharge was feeling secure about returning home. The elderly patients’ who lived with a spouse experienced a sense of security, as there was someone to care for them after discharge. Information about whether there was going to be further examinations, rehabilitation, or care after the discharge was deemed important in relation to the quality of the elderly patients’ discharge. Some of the elderly patients experienced that they got the information they needed in relation to their discharge, while others experienced that they did not. To receive written information was of importance, as it was considered helpful to have something to turn to when feeling unsecure about the situation.

**Experiences of returning to everyday life after discharge**

The elderly patients’ experienced their everyday lives as being marked by fatigue, lack of energy and pain, all of which affected their performance of activities. Pain was experienced as a limitation in performing activities. For some of the elderly, it was difficult to be as mobile as they had been previously, which meant that they did not get outside their home as often as before admission. Fatigue and lack of energy made it difficult to perform their usual activities as they had before admission, which led to a feeling of irritation about not being able to manage activities at the moment. Sometimes, the elderly patients’ were able to adapt to this by dividing a specific activity into smaller tasks that could be carried out over several days or by using assistive devices. In other cases, resting in the middle of the day could help provide the energy needed to get through the afternoon and evening.

Expectations regarding rehabilitation after discharge were mostly positive. The elderly patients wanted to be able to perform activities as they used to before they were admitted to the ED. For participants who did not receive a clear diagnosis during admission, thoughts of further rehabilitation were difficult to manage. They were concerned about their health condition and how they would be able to handle further examinations. Lack of clarification as to what led to their admission, also created speculations that affected their everyday lives. Concerns about what caused the admission meant that some speculated on how their lives would look in the long term. The elderly patients were also concerned about whether they would be able to perform their activities in the long term.
Factors of importance for elderly patients

The analysis of elderly patients’ experiences of their discharge and returning to everyday lives revealed different factors of importance for ensuring a coherent discharge. The identified factors are presented in Table 14.

Table 14. Factors of importance for elderly patients discharge and their returning to everyday lives

<table>
<thead>
<tr>
<th>Factors</th>
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<tbody>
<tr>
<td>Of importance for the discharge</td>
</tr>
<tr>
<td>Being prepared before discharge</td>
</tr>
<tr>
<td>Feeling secure about returning home</td>
</tr>
<tr>
<td>Receiving needed information</td>
</tr>
<tr>
<td>Being involved and listened to</td>
</tr>
<tr>
<td>Of importance for the everyday life after discharge</td>
</tr>
<tr>
<td>Reduced performance of activities</td>
</tr>
<tr>
<td>Speculations and lack of clarification about health condition</td>
</tr>
</tbody>
</table>

Summary of results

An intervention was developed and evaluated in Study I, with the aim of reduce the risk of readmission in elderly patients discharged from a short-stay unit at the ED. The developed EAP intervention addressed the two risk factors for readmission: limitations in performing activities and an incoherent discharge for elderly patients. The EAP intervention was not effective in reducing the risk of readmission in the intervention group compared to usual practice. The within group analysis of patients in the EAP intervention group revealed that elderly patients identified as having limitations in performing activities were at higher risk of readmission within 26 weeks after discharge than patients with no identified activity limitations. In the qualitative interviews in Study II, the elderly patients expressed that their everyday lives after discharge were influenced by pain, fatigue and lack of energy which limited their performance of activities. Speculations concerning their health condition and the future were also present in their everyday lives. The qualitative interviews also revealed that factors such as receiving information, feeling secure and being involved and prepared are important for elderly patients when they are discharged from a short-stay unit at the ED.
6. Discussion

In the first part of this section, a discussion of the main results is provided in the context of existing literature. This is followed by methodological considerations of strengths and limitations of importance to the internal validity in the overall multi-method design and two specific studies. In addition, the studies external validity is discussed.

Discussion of the main results

The results from the studies conducted in this PhD project contribute with new knowledge to inform future practice and research regarding the discharge of elderly patients from a short-stay unit at an ED. It was expected that a short-term intervention that combined identification of elderly patients with limitations in performing activities with a coordinated discharge and a referral to rehabilitation immediately post-discharge had the potential to reduce the risk of readmission. However, the EAP intervention was not effective in reducing risk of readmission and thus did not improve current practice in discharging elderly patients. However, the intervention was capable of identifying patients with limitations in performing activities who were at high risk of readmission. The findings from the qualitative interviews revealed that factors such as receiving information, feeling secure and being involved and prepared are important for elderly patients when they are discharged from a short-stay unit at the ED.

Effectiveness of the EAP intervention

The outcome evaluation of Study I showed that the intervention was not effective compared with usual practice in reducing risk of readmission within 26 weeks after discharge. Thus, the study’s results contribute to the divergent evidence concerning reducing the risk of readmission in elderly patients discharged from a short-stay unit at an ED. As described in the background section of this dissertation, other studies that aimed to reduce the risk of readmission in elderly patients discharged from an ED also reported zero effect (88,91,93,95). However, other studies showed some effectiveness regarding readmission (87,89,90,92,94). Common to them is that the interventions are rather comprehensive in addressing different risk factors, and in three of five studies, follow-up visits in patients’ homes were part of the intervention. A study from 2004 with 739 elderly patients discharged from an ED reported that a comprehensive geriatric assessment was effective in reducing risk
of readmission after 30 days and 18 months compared with usual practice (87). In addition, a comprehensive discharge planning intervention was reported to be effective in reducing risk of readmission in a study from 2011 with 656 elderly patients (92). Another study, including 128 elderly patients, reported a significant reduction in ED readmission for the intervention group that received comprehensive nursing and physiotherapy assessment, exercise programmes, home visits and follow-up phone calls (89). Home-visits were also a part of the intervention in a study conducted in another Danish healthcare setting (94). This trial included 1,330 elderly patients and found that a home visit by a geriatrician and nurse the day after discharge was effective in reducing readmission within 30 days (94).

These studies’ results seem to indicate that the components discharge planning and home visits are effective in interventions that aim to reduce the risk of readmission. Thus, we included these two components in the EAP intervention. More emphasis could have been put on other factors, but it was an important premise of the EAP intervention that it should be delivered as an *addition* to usual practice and should be feasible to implement in the existing healthcare system.

An explanation for the non-effectiveness of the EAP intervention may be related to the intensity and duration of the intervention. Within the intervention group limitations in performing activities showed no changes in performance of activities from baseline to 26 weeks for patients in the EAP intervention group. This may indicate that the intervention was not intensive enough to change this intermediate outcome. Enhancing a person’s performance of activities often involves a change in behaviour of the person such as change or adaptation in performance skills (151). To ensure that a change is adopted and becomes part of a daily routine, a certain amount of intervention exposure is required (151).

Studies that include occupational therapy interventions, either as mono-disciplinary or part of multidisciplinary approaches, have shown positive results in enhancing performance of activities in elderly patients when interventions were conducted over a longer period and with several sessions (98,102,104,107,110). However, a comparison between these studies and the EAP intervention should be done with caution, as none of these occupational therapy interventions aimed to reduce the risk of readmission for elderly patients discharged from a short-stay unit at the ED. In addition, the studies included a different study population, namely, community dwelling older people who had not been hospitalised (98,101). Although the EAP intervention may have been too short or too low in intensity, some studies showed
that short-term interventions with low intensity can produce effects related to both performance of activities (107,109) and the final goal, reducing risk of readmission (90,94). The EAP intervention was conducted in collaboration with primary care which was responsible for fast referral to further rehabilitation. Type and duration of further rehabilitation was decided by responsible healthcare professionals from the municipality and could include reablement, individual or group-based occupational therapy and/or physiotherapy. In a Danish healthcare setting, the municipalities are obligated by law to initiate post-discharge rehabilitation if the patient is referred to rehabilitation in primary care from the hospital. Thus, we relied on the primary care sector to initiate rehabilitation in relation to elderly patients’ needs as specified in their rehabilitation plan. However, we did not measure whether this was implemented as intended. A recent published study (162) conducted in a similar healthcare setting in Denmark showed that although an agreement was made in relation to immediate post-discharge rehabilitation, only 48% of patients in the intervention group received the rehabilitation they were assigned to post-discharge.

**Risk factors addressed in the EAP intervention**

To our knowledge, the developed EAP intervention in Study I is the first to involve a specific focus on enhancing elderly patients’ performance of activities to reduce their risk of readmission. Although the EAP-intervention was not effective, the results from the exploratory within group analysis in Study Ib revealed an association between limitations in performing activities and risk of readmission in the intervention group. Patients who only received Component 1 were less likely to be readmitted than those who received all intervention components. This may be due to patient characteristics, as patients who only received Component 1 did not have limitations in performing activities; thus, they did not need a rehabilitation plan or further post-discharge rehabilitation in the municipality. Along with the body of scientific knowledge about risk factors for readmission and the results from Study II, it enables us to confirm that addressing limitations in performing activities as part of the EAP intervention was a well-chosen element to include in the discharge of elderly patients (33,35).

Another risk factor addressed concerning readmission was incoherent discharge of the elderly patients, and that factor was addressed through Component 2. Determinants viewed as negatively influencing the underlying factor (coordination) of a coherent discharge were waiting time for rehabilitation, lack of shared information between the hospital and
municipality and lack of information given to patients. The design of the outcome evaluation in Study I did not allow for direct measurement of whether the intervention changed this intermediate outcome. However, in Study II, qualitative interviews with some of the elderly patients from the EAP intervention group were conducted to explore their experiences of being discharged. The interviews revealed that factors such as receiving written information about future examinations, rehabilitation or care, feeling secure and being involved and prepared were important to elderly patients when they were discharged from a short-stay unit at the ED. These findings correspond with findings from other studies based on interviews with elderly patients discharged from hospital (58–60). A qualitative study in which 26 elderly patients and their relatives were interviewed, describes different areas in which it was considered important for elderly patients to have certain relevant information and arrangements made to feel prepared for discharge. The areas were 1) information on care issues such as health status, treatment and continuing care, 2) activity performance such as support at home and/or training and 3) knowing whom to contact if immediate help is needed. Feeling prepared was considered of great importance to these elderly patients and their relatives and influenced their experiences with discharge quality. All three areas were also important in their everyday lives after discharge (59).

Concerning the factor “being prepared for discharge” which the elderly patients identified as important, it is a great challenge in the acute setting in which patients may only be admitted for up to 48 hours. Elderly patients may not have experienced this kind of hospital admission before, and may not be able to modify their expectations to the reality adequately. They may be surprised that they were discharged so soon, even before they felt better. This amplifies their need to feel that the health professionals know what they are doing, and it places a great responsibility on the health professionals to live up to this expectation.

Although the qualitative study conducted in this PhD project revealed findings that resembled those of other studies, it differs in that it interviewed elderly patients discharged from a short-stay unit at an ED which has very short admission times (one to two days). Thus, the circumstances may be different when compared with patients hospitalised for up to a week or more. Short admission time combined with limited preparation for elderly patients’ discharge, may influence coordination between healthcare sectors. A focus on identifying these factors seems to be an important step in the process of improving discharge and avoiding serious adverse events, including readmission.
Identifying patients at risk of readmission

The within-group analysis of patients in the EAP intervention group revealed that 60% of the patients had limitations in performing activities when they were discharged from the short-stay unit at the ED, thus 40% did not experience activity limitations and had no need for Components 2 and 3 in the intervention. This high proportion of patients with no identified limitations in performing activities may have contributed to the non-effectiveness of the EAP intervention as it may have diluted possible effects. To achieve a more homogenous sample in which all patients are identified with limitations in performing activities, the use of a screening instrument to identify and select patients at high risk may have been relevant prior to inclusion. In the literature, some studies noted that using a screening instrument to identify high risk patients frequently was beneficial in reported outcomes such as readmission and nursing home admissions, compared with interventions with no risk stratification (9,84). One screening instrument that can be used to identify patients at high risk and that is translated and validated in a Danish context is the Identification of Seniors at Risk (ISAR) questionnaire (163,164), which comprised six questions with dichotomised answers (yes/no) and a sum-score (range of 0–6), with a score of 2 or more used as a cut-off for high risk. However, the evidence concerning the use of ISAR is divergent. Studies found that using ISAR as a screening instrument to identify high risk patients prior to interventions may be beneficial, but that it did not reduce risk of readmission (95,165). We chose to include comprehensive performance-based assessment of limitations in performing activities as part of the EAP intervention (Component 1). This choice was based on the rationale that the use of a few self-reported questions would not be enough to identify elderly patients with limitations in performing activities, as elderly patients acutely admitted may not yet be aware of possible limitations. Also, results from performance-based measures of elderly patients’ performance of activities were used in the rehabilitation plan (Component 2) to provide high quality information delivery to primary care. The use of three performance-based measures in Component 1 may be viewed as too comprehensive for use in elderly patients at a short-stay unit at an ED, in that not all patients in the EAP intervention group wanted or were able to perform all three tests in Study Ib. By using both the TUG and 30s-CST to assess basic mobility, the possibility that the patients could perform at least one of the tests was high. Both the TUG and 30s-CST are simple to administer and have been validated for use with populations of older community-dwelling people (71,72,157,166). However, the tests’ validity and usefulness in acute settings are still
sparse. A study from 2017 (167) found that concurrent validity of the 30s-CST compared with the de Morton Mobility Index was acceptable when used in a sample of 156 elderly patients at a short stay unit at the ED. In another ED setting with 911 elderly patients, the TUG was found to be useful in identifying patients at risk of functional decline after discharge (168). A significant association between TUG score and risk of functional decline within three and six months after discharge was reported (168). Although some aspects of validity had been examined, it would be relevant to further examine different aspects of the tests’ validity when used with elderly patients in acute settings.

AMPS was included in the test-battery as it provides a more comprehensive picture of the quality of activity performance. As described in the background section of this dissertation, when assessing performance of activities, it is important to include quality parameters and not just determine whether the person can/cannot perform (AMPS). Assessing the quality of how the specific task or activity is performed is an important part of the OT assessment approach, and the AMPS seems to be the only standardised and validated test to use (75). The AMPS test results identified motor and process skills that needed to be improved or compensated for in the individual or the environment to ensure safe, independent and efficient performance of activities, without increased physical effort. The results from the AMPS test were used not only to identify limitations in performing activities, but also in the rehabilitation plan to describe the elderly patients’ actual activity performance and recommend which kind of rehabilitation should be provided to the patient after discharge.

Another important aspect of the AMPS test is the interview in which the patient in collaboration with the occupational therapist determines the person’s need and determines what performance of activities the person reports as problems. From an occupational therapy and client-centred perspective, the patients perception of his or her performance of activities is of great importance when assessing limitations in performing activities (169). Combining performance-based and self-reported approaches may be especially relevant when identifying elderly patients limitations in performing activities. Studies that have compared the two approaches have reported that performance-based and self-reported measures seem to provide different information and they recommend a combination of both approaches (65,68–70). In our study, the use of three performance-based measures, including the interview as part of the AMPS test, identified patients with limitations in performing activities and who were at higher risk of readmission. Whether a less comprehensive assessment to the same extent
would be able to identify patients with limitations in performing activities is unknown and requires further research.

**Everyday life after discharge**

Some of the elderly patients who participated in Study II experienced unresolved health problems and limitations in their performance of activities after discharge. Those findings resembled findings from another qualitative study conducted among elderly patients discharged from an acute medical unit and their care givers (170). The consequences of limitations in performing activities and how they are handled may have a major impact on an individual's everyday life. Some elderly patients in Study II were able to handle their limitations in performing activities by using adaptation strategies, such as dividing activities into smaller tasks or otherwise changing their performance. These findings are recognised in other qualitative studies (56,171,172). In a qualitative study from 2015, elderly patients and their caregivers found adaption to everyday life after discharge to be challenging but also of great importance (56). A qualitative study of 15 elderly patients revealed that they adopted different adaptation strategies in their everyday lives to avoid negative experiences due to their health conditions (172).

Not all the elderly patients in Study II were capable of using adaptation strategies, which for some resulted in abstaining from performing those activities when limitations were experienced. Continuing to perform activities that are meaningful generally is considered important for the well-being of older people (173–175). Therefore, elderly patients may benefit from support and guidance in how to use effective adaptation strategies to enable them to perform meaningful activities after discharge.

For some of the elderly patients in Study II, their everyday lives were influenced by thoughts about their un-clarified health conditions as well as concerns for the future. They speculated on whether they would be able to perform their usual activities in the long run or if they would experience a loss of activities. Our findings on elderly patients’ concerns are in accordance with the findings of another study in which elderly patients were concerned about how to handle their life situation after being discharged (59). In our study, elderly patients with diagnoses that were un-clarified were particularly concerned about the impact of their health conditions on their everyday lives. These findings are important to consider in clinical practice. The occupational therapist and physiotherapist who deliver rehabilitation in the
municipality should address such concerns and individual strategies to deal with present and future problems should be strengthened.

**Methodological considerations**

The overall aim of this PhD project warrants the use of both quantitative and qualitative approaches to provide experimental results, as well as produce a deeper understanding of elderly patients' experiences. A multi-method design including both qualitative and quantitative methodologies is considered a strength in the PhD project as the different methodologies and findings complement each other in addressing the overall aim.

The choice of timing in the studies in the multi-method design provided advantages as well as disadvantages. The outcome evaluation of the effectiveness of the EAP intervention in Study Ib and the qualitative interviews in Study II were conducted concurrently, and thus the results of one study could not influence the design of the other. Conducting qualitative interviews with elderly patients before developing and evaluating the EAP intervention may have been beneficial in strengthening the components that were addressed in the intervention. For example, the interviews stressed the importance of being well-prepared for discharge, and elderly patients’ involvement in the study’s development phase might have resulted in a greater focus on this. Patient and public involvement (PPI) is highly recommended today when an intervention is developed, tested, evaluated and implemented to enhance a study’s relevance (119). We considered it a limitation that no patients were involved in the development phase, but we also viewed it as a strength that the qualitative interviews were conducted with patients who had received the intervention, as they had useful, first-hand experiences with the discharge process. Although the specific aim of Study II was not to evaluate patients’ experiences with the intervention, the inductive approach allowed us to examine how the intervention during their hospital stay and post-discharge rehabilitation was experienced in their everyday lives.

**Study Ia**

In describing the development and content of the EAP intervention, we used the Intervention Mapping approach (117), which provides a methodological step-by-step procedure. It is widely used in the development of health promotion programmes and when describing the intervention such an approach is considered a strength as it emphasises the transparency of the development phase (117). Multiple methods such as systematic literature searches,
consultations with clinical health-professionals, establishing a steering group and conducting a logic model of the problem were used during the development phase to strengthen the EAP intervention. Further along in the development phase, the Intervention Mapping approach enabled us to ensure that those methods and practical applications that were chosen for the three components in the EAP intervention were based on either theory or evidence-based literature. Following the Intervention Mapping approach in describing the intervention allowed us to be transparent in reporting its underlying theory, thereby enhancing the possibility of replicating the intervention, as recommended by the Medical Research Council in its guidance on the development and evaluation of complex interventions (54).

The use of a logic model to link the goal of the intervention with risk factors and their underlying factors and determinants allowed us to define what should change to receive the goal of reducing risk of readmission. However, we do not know whether the intervention actually was capable of enhancing the performance of activities and supporting a coherent discharge. Change in self-reported performance of activities was only possible to measure within the intervention group, as patients in the usual practice group were followed only with registry-based data. A single group pre-post design is not optimal for evaluating the effectiveness of an intervention, however it can provide preliminary results. In our study, the within-group description of activity performance showed no changes for patients in the EAP intervention group.

Whether a coherent discharge was achieved could not be measured either. The lack of a clear definition of what characterises a coherent discharge makes it difficult to measure. From the literature, coordination was identified as an underlying factor of importance for a coherent discharge, but although we chose coordination of the discharge as a specific outcome (Step 2) we did not operationalise or measure it. Hence, we do not know whether the discharge of patients in the intervention group was well-coordinated nor do we know whether a well-coordinated discharge leads to a coherent discharge. This is considered a study weakness. If we had used the Intervention Mapping approach prospectively we would have placed a greater focus on how to operationalise and measure the two intermediate outcomes or the more specific outcomes related to the underlying factors. This way, we could have gained deeper insight into whether a disconnect existed in the linked factors and outcomes in the logic model, and important insights into why the intervention was not successful in reducing risk of readmission could have been gained.
**Study Ib**

*Evaluation and study design*

The evaluation of the effectiveness of the intervention was conducted as an outcome evaluation. Outcome evaluations of experimental trials measure the impact of the intervention in the target population but fail to elucidate the reasons why the intervention was a success or failure (119). A process evaluation conducted alongside the outcome evaluation would have provided deeper insights into intervention fidelity (176,177). Also, implementation of the post-discharge intervention in the municipality was not monitored adequately. This was not planned, and a process evaluation was impossible to conduct afterward due to the registry practice in the municipality. Consequently, we do not know whether the therapists in the municipality delivered the post-discharge rehabilitation as intended. This preferable could have been examined further by registration of dose (time), frequency and the kind of therapy that the therapist offered in the municipality after the follow-up visit (119).

To evaluate the effectiveness of the EAP intervention, a pragmatic non-randomised, quasi-experimental superiority trial was conducted, comparing an intervention and a control group. Multitudes of factors constrain conduct during clinical trials within the acute care setting. Explanatory trials tend to be tightly controlled and include homogeneous patient groups and both factors are challenged in acute settings with a high flow of patients. Pragmatic trials are designed primarily to determine intervention’s effects under usual conditions (178). The quasi-experimental design was found feasible to evaluate the effectiveness of the intervention in a real-world clinical setting, although it is placed lower than the randomised controlled trial in the evidence hierarchy (54,118).

*Study participants*

The allocation of patients resulted in two groups that seemed quite similar at baseline on several factors, but allocation bias may have occurred due to the non-randomised allocation and concealment of patients. Patients allocated to the intervention group were included during mornings, while patients assigned to the usual-practice group were included during both daytime and after hours. We consider this to be a systematic difference that may have introduced bias, and the differences between the two groups in baseline characteristics support this. Admission time was significantly different between the two groups, in which
patients in the intervention group were admitted three hours longer than patients in the usual practice group. One reason for this could be related to the health status of patients in the intervention group. Although no significant differences existed between the two groups in relation to comorbidity, patients in the intervention group were significantly older than patients in the usual practice group and increased age is associated with disabilities (179). Therefore, the higher age in the intervention group may be associated with a higher need for a more comprehensive assessment which is more time demanding. Another possibility of the difference in length of admission is related to the organisational structure of short-stay units. In our clinical practice, elderly patients admitted during evening or overnight hours usually are discharged first the following day, not at night.

In the analyses, we adjusted for factors that we a priori had considered potentially could confound the results, as well as for baseline differences, such as age and admission time, by performing multivariate analyses – the recommended method to use after a study has been conducted (180). Although the results revealed no differences between the adjusted and unadjusted results, we cannot rule out the possibility that other unknown factors might have caused allocation bias. Whichever direction the possible allocation bias may have steered the results seems impossible to establish, as allocation bias can steer the results in both directions inconsistently (181). A systematic review from 2016 (182) that aimed to study the mechanisms and direction of allocation bias found that such bias in many trials will exaggerate the estimated intervention effect (e.g., overestimate the effect). For studies that do not report the effects from the intervention, the impact of allocation bias seems less important to the results. If we use the knowledge from the systematic review to our study (Study Ib), which found no tendency toward a between-group difference, this may suggest that the impact of possible allocation bias would only be minor.

The within group analysis of the usual practice group revealed differences in the subgroups (daytime vs. afternoon and evening admissions) in relation to marital status and admission time. This was handled by adjusting for the influence of those two factors in the subanalyses, and this did not alter the overall findings of the study.

As a method for preventing potential confounding when using a non-randomised design, we could have used restriction in the selection of participants (180). However, the use of restriction in form of several exclusion criteria may very well have hampered the external validity of the findings and made the trial less pragmatic (178).
**Intervention provided**

The occupational therapists and physiotherapists delivering the intervention at the ED’s short-stay unit participated in a one-day course during which they were introduced to the EAP intervention’s components. Afterward, they participated in a two-week programme in which they practised delivering the assessments in Component 1 over a two-week period. No tests of inter-rater reliability between the two physiotherapists who delivered the TUG and 30s-CST were performed. Ideally, such tests should have been carried out to examine whether discrepancies existed in the results. As far as the AMPS used by the occupational therapist, all three recently (within six months) had been calibrated in relation to rater reliability.

To enhance the intervention’s fidelity, weekly meetings were organised between participating research therapists and the project leader. At the meetings, the therapists had the opportunity to report and discuss problems related to delivering the intervention as intended. Some discrepancies were reported, including that the AMPS could be difficult to deliver due to both time and the physical environment at the short-stay unit at the ED. In such cases in which the AMPS was not possible to conduct, a rehabilitation plan was drawn up based only on the results from the TUG and 30s-CST.

Due to the nature of the study, we were unable to blind patients or health professionals at the short-stay unit regarding who received the intervention. To reduce the possibility of contamination, the occupational therapists and physiotherapists who delivered the EAP intervention were not allowed to assess or prepare the discharge of patients in the usual practice group. Thus, none of the patients in the usual practice group received follow-up visits after discharge, although some may have, via self-referral, received some kind of municipal or private rehabilitation and/or home care after discharge. This is a consequence of our pragmatic approach and should not be viewed as a study weakness.

**Outcome measures**

Readmission within 26 weeks after discharge was chosen to be primary outcome as the overall aim was to reduce elderly patients' risk of readmission. Should the intervention be able to affect the risk, a rather long follow-up period was considered necessary. Conversely, it would be possible that a potential effect would phase out during a long follow-up period. Thus, risk of readmission within 30 days was chosen as a secondary outcome.
Several important methodological concerns were related to the choice of readmission as an indicator of the delivered intervention’s quality or effectiveness (183). Readmission may not necessarily indicate poor quality of care and treatment at the hospital, but rather may be influenced by the care that patients receive after discharge. Readmission also may indicate a patient and/or relative’s proper reaction to symptoms and disease progression which necessitates a readmission. In such cases, readmission can serve to improve health status. All-cause readmission was chosen although it is subject to influences from factors that may be non-modifiable, such as disease progression. Instead, we could have focused only on potentially preventable readmissions, as others recommended (183,184). However, the definition of a potentially preventable readmission is, not well-determined (184). An element to consider when using readmission as an outcome is that comparing rates or risk of readmission between different healthcare systems and countries may be problematic due to the ill-defined concept of readmission (183). In our study, we found readmission to be a relevant primary outcome, as the goal of the EAP intervention was to reduce the risk of readmission.

National registers were used for the collection of data, which is considered a strength. Data in these registers are recorded prospectively and they provide a high level of completeness (185,186). Thus, the use of register-based data ensured a complete follow-up (100 %) on all outcomes measured. The power calculation revealed that a sample of 304 patients, 152 in each arm, was required allowing for a 10% drop out. During the recruitment period, we were able to include 144 patients in the intervention group. Therefore the study may have been underpowered. However, the use of a pseudo-value approach, accounting for death as a competing risk by estimating the cumulative incidence function, meant that it was possible to include those who actually died during the 26 week follow-up period in the analysis, thereby eliminating drop out. Patients who died during the study period (10%) remained in the risk set until their competing event (death), thereby contributed with risk time. A revised power calculation that omitted a dropout percentage shows that a sample of 274 patients with 137 in each arm should be enough to detect a reduction in risk of readmission a 16 percent point – given that the intervention had succeeded. Thus, we do not think that the statistical results were underpowered.
Study II
The study findings’ trustworthiness was established with a well-described method for analysing data and a clear description of the whole research process to ensure transparency. A detailed description of the study setting and participating elderly patients was provided to be clear about findings’ the transferability to other contexts.

The inspiration from a phenomenological approach allowed me to pursue what was important for the elderly patients, rather than seeking answers to predefined questions. The use of a semi-structured interview guide during the interviews served as a frame to ensure that all themes important to answering the research question were approached while simultaneously giving me the opportunity to discover new and important themes. However, the approach posed challenges related to how the elderly patients expressed themselves, as their ability to communicate and describe their experiences varied.

Broad variations in elderly patients’ gender, age, diagnosis, marital status and home care use, were achieved to provide nuanced insights into the elderly patients’ experiences, and extensive interviews were conducted. This resulted in rich and varied data that provide insights into the elderly patients’ experiences of being discharged and returning to their everyday lives, in accordance with our strategy, in which we relied on rich and varied data rather than seeking data saturation. The term “data saturation” is generally discussed in the qualitative methodological literature as a criterion for discontinuing data collection (142,187). The term indicates that the researcher continues collecting data until nothing new is apparent (187). Originally, saturation was used in grounded theory but today, it is used across different qualitative approaches (142,187). Despite the fact, that it has been adopted widely in qualitative literature, research on whether it is consistent in relation to different approaches or how to achieve it, interestingly is lacking. In our study, the goal was not data saturation, as we wanted to explore elderly patients’ experiences of being discharged and returning to their everyday lives to identify factors of importance that could contribute with new knowledge to guide future discharge of elderly patients, rather than build a comprehensive theory (188).

External validity
Elderly patients with multiple health conditions were represented in all three studies, which is a strength in term of external validity, as they present a general picture of elderly patients discharged from short-stay units at EDs. However, the elderly patients who participated in
this PhD project cannot be expected to represent the population of interest entirely, as most of them specifically were invited and agreed to participate (189). The participating elderly patients were 65 years or older, spoke Danish, were residents in the municipality of Aarhus and were discharged directly from a short-stay unit at the ED to their homes. As inclusion criteria were used in recruiting patients, the results cannot be generalised directly to the entire elderly population. On the other hand, it can be inferred that the results from Study I are valid for elderly patients admitted on weekdays and discharged from a short-stay unit at an ED in a Danish health-care setting. As a large variation exists between how the health-care systems are organised and financed in different countries, the results of the studies in this PhD project may be difficult to generalise beyond Denmark.

In Study II, the voluntary participation might have yielded a sample that held strong views about the discharge process, which may affect the findings’ transferability. Recruiting elderly patients who had been involved in a clinical trial is relevant in relation to transferability. The results from Study II cannot be transferred to all elderly patients, but can be viewed as an important knowledge contribution to developing future interventions.
7. Conclusion

The overall research aim was to improve and inform current practice regarding the discharge of elderly patients from a short-stay unit at an ED in order to reduce their risk of readmission. Two studies, each with its own specific aim, were conducted to achieve this. Across the included studies, the findings in this PhD project contributed with new knowledge from the intervention and from the qualitative interviews, which can contribute to further research and development in this important area.

In Study I, an intervention that emphasised on enhancing performance of activities and a coherent discharge from a short-stay unit at the ED for elderly patients was developed, described systematically and evaluated in a clinical setting. The intervention did not prove to be effective, as it did not lead to a reduction in the primary outcome, risk of readmission compared with usual practice, nor did any of the secondary outcomes differ between the intervention and the usual practice group. Therefore, implementation of the EAP intervention cannot be recommended in its current form.

Although the intervention did not prove effective in reducing risk of readmission, the initial assessment in Component 1 revealed that 60% of the elderly patients in the intervention group had limitations in performing activities and a need for further rehabilitation after discharge. Thus, the assessment in Component 1 seems to be capable of identifying elderly patients at high risk of readmission. It also revealed that the elderly patients’ identified as having activity limitations were at a significantly higher risk of readmission than patients with no identified limitations. This supports our underlying assumptions about the association between limitations in performing activities and risk of readmission.

Study II provided in-depth knowledge about how elderly patients experienced being discharged and returning to everyday life from a short-stay unit at an ED. Receiving information, being prepared and involved, and feeling secure about returning home were identified as factors of importance for the elderly patients during discharge. Factors such as limitations in performing activities and speculations concerning health condition and the future were present in the elderly patients’ everyday lives after discharge.
8. Clinical implications and future research

In this PhD project, an intervention that aimed to reduce the risk of readmission was developed and evaluated experimentally along with qualitative interviews with some of the elderly patients who received the intervention. Based on the outcome evaluation of the EAP intervention conducted in Study I, the intervention in the applied form cannot be recommended as a means to reduce risk of readmission in elderly patients discharged from a short-stay unit at an ED. Nevertheless, important lessons were learned from both the outcome evaluation of the intervention and the elderly patients’ perspectives, and some recommendations for clinical practice and future research can be inferred from the present PhD project.

Although the EAP intervention did not prove to be effective in this trial, the results indicate that a large number of elderly patients discharged from a short-stay unit at the ED has activity limitations which are associated with a higher risk of readmission. The assessment in Component 1 in this study was able to identify 60% as having activity limitations. This calls for increasing efforts to identify elderly patients with such limitations, but we do not know whether other tests would be more sensitive in identifying patients. This should be examined in future studies.

The role of occupational therapists in a short-stay unit at the ED is to identify patients with activity limitations and coordinate their discharge and referral to post-discharge rehabilitation in primary care, which was the focus of this project’s intervention. However, further research on the effectiveness of such interventions is required in combination with a more comprehensive post-discharge rehabilitation intervention that emphasises reducing the risk of preventable readmission in high risk elderly patients discharged from short-stay units at the EDs. Alongside the outcome evaluation of the effectiveness of such intervention, a process evaluation should be conducted to determine whether the intervention is delivered as intended.

Findings from the qualitative interviews suggest that elderly patients wish to be more prepared and involved within their discharge and that some expressed concerns and experienced activity limitations after their discharge. This indicates that health-care professionals should more thoroughly inform elderly patients during their discharge about
their situation including the consequences of their condition and their influence on performing activities in everyday life. This illustrates a need for further research to examine how this can be addressed in clinical practice. In such research, the population of interest should be involved during the development phase.
9. References

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10. Papers

Paper I
Development of a complex intervention aimed at reducing the risk of readmission of elderly patients discharged from the emergency department using the Intervention mapping protocol.
Published in: BMC Health Services Research 2018;18:588 (1).

Paper II
Effectiveness of the "Elderly Activity Performance Intervention" on elderly patients discharge from a short stay unit at the Emergency Department – A quasi-experimental trial.
Published in: Clinical Interventions in Aging 2018;13:737-747 (2).

Paper III
Returning to everyday life after discharge from a short stay unit at the Emergency Department– a qualitative study of elderly patients’ experiences.
Paper I
Development of a complex intervention aimed at reducing the risk of readmission of elderly patients discharged from the emergency department using the intervention mapping protocol

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Abstract

Background: Limitations in performing daily activities and an incoherent discharge are risk factors for readmission of elderly patients after discharge from the emergency department. This paper describes the development and design of a complex intervention whose aim was to reduce the risk of readmission of elderly patients discharged from the emergency department.

Methods: The intervention was described using the Intervention Mapping approach. In step 1, a needs assessment was conducted to analyse causes of readmission. In steps 2 and 3, expected improvements in terms of intervention outcomes, performance objectives and change objectives were specified and linked to selected theory- and evidence-based methods. In step 4, the specific intervention components were developed; and in step 5, an implementation plan was described. Finally, in step 6, a plan for evaluating the effectiveness of the intervention was described. The intervention was informed by input from a literature search, informal interviews and an expert steering group.

Results: A three-phased theory- and evidence-based intervention was developed. The intervention consisted of 1) assessment of performance of daily activities, 2) defining a rehabilitation plan and 3) a follow-up home visit the day after discharge with focus on enhancing the patients’ performance of daily activities.

Conclusion: The intervention mapping protocol was found to be a useful method to describe and systemize this theory- and evidence-based intervention.

Keywords: Intervention, Functioning, ADL, Emergency department, Acute care, Occupational therapy, ICF

Background

Readmission to hospital or Emergency Department (ED) is a common and important healthcare problem among elderly patients in many parts of the world [1–3]. In Western countries, up to 20% of elderly patients admitted to an ED are readmitted during the first 30 days after their discharge [4–6]. These readmissions have considerable consequences for both the elderly patients and society in general. Readmission is associated with an increase in elderly patients’ risk of infections, medical complications and limitations in performing daily activities [7, 8]. Different factors such as age, comorbidity, medication, diagnoses and activity limitations contribute to elderly patients’ risk of readmission and mortality [2, 7]. A large proportion of elderly patients admitted to the ED are discharged directly to their home [9]. Transferring the patients’ care and rehabilitation at
discharge from the ED to primary care is a challenge and involves a risk of lost information, which may influence the patients’ experiences of the discharge and their further rehabilitation [10].

Interventions that are aimed at preventing readmission in elderly patients discharged from the ED have been previously evaluated, but there is a lack of consensus regarding which initiatives are the most effective [9–15]. A systematic review from 2005, revealed that different home-based interventions improved the elderly patients performance of daily activities after their discharged from the ED [10]. However, despite this, the home-based interventions did not seem to have any effect on the risk of readmission. A systematic review from 2015 evaluated the effect of transitional interventions for elderly patients discharged from the ED [9]. It found no effect on either readmission or mortality. A systematic review from 2012 evaluated the effect of care coordination after ED discharge and concluded that the majority of studies evaluating such initiatives reported that they were effective in reducing readmission in the elderly [13]. However, the evidence on how to prevent readmission of elderly patients discharged from the ED is inconclusive and conflicting and, as several studies have highlighted, quality studies of the effectiveness of transitional interventions for the elderly are needed [9, 10, 13]. Limitations in performing daily activities have been identified as a predictor for readmission and mortality in elderly patients [1, 2, 16, 17]. However, to our knowledge, only a few studies have evaluated the effectiveness of enhancing the elderly patients’ performance of daily activities in order to prevent their readmission and reduce their mortality [18–20]. None of these interventions was short-term or conducted in an acute hospital setting. We therefore found it relevant to develop and design a short-term intervention that focused on enhancing the elderly patients performance of daily activities and to ensure a coherent discharge from a short-stay unit at the ED.

The purpose of this paper is to describe the development of a complex intervention that is aimed at reducing the risk of readmission of elderly patients discharged from a short-stay unit at the ED.

**Methods**

There is growing understanding that the development and design of interventions should be more transparent [21–23]. The description of the present intervention followed the steps of the Intervention Mapping (IM) protocol for developing health promotion programmes [24]. IM provides a methodological, step-by-step procedure in an iterative process. The six steps in the protocol include several tasks that describe the development process. The first two steps involve the description of a needs assessment and the objectives of the intervention.

In step three, theory-and evidence-based methods and strategies are selected which then inform the intervention developed in step four. Steps five and six describe the plan for implementation and evaluation, respectively [24].

**Step 1: Logic model of the problem**

A steering group, a project group and a reference group were established with the aim of bringing expertise to the project. A steering group counting 11 members was established with experts from both hospital and primary care. Five of these experts were also part of the project group, including the project leader. The project group was responsible for planning, implementing and evaluating the intervention. A reference group with physiotherapists (PT) and occupational therapists (OT) from the ED contributed with information about the clinical context. In the developing phase, two meetings with the steering group and approximately five meeting with the reference group were conducted. All decisions from those meetings were based on discussion. If any disagreement should occur, the project leader had the final decision.

Then a needs assessment was performed based on findings from the literature, and informal interviews with health professionals from the hospital and primary care were undertaken. The needs assessment was structured using a logic model that defined phase 1) the problem; phase 2) risk factors; phase 3) underlying behavioural and environmental factors that could affect the risk factors; and phase 4) determinants for the behavioural and environmental factors [24]. After conducting the needs assessment, the context for the intervention was described based on input from clinical experts from the steering group, reference group and the literature. Finally, the goals for the intervention were set.

**Step 2: Outcomes and objectives**

To outline the goals for the intervention, we identified overall outcomes for behavioural and environmental change after discussions in the project group and the reference group. The overall outcomes were then divided into separate performance objectives that explicitly described what should happen in order to achieve the outcome. The most important internal (relates to the person) and external (relates to the environment) determinants, identified in step 1, were then combined with the specified performance objectives to formulate change objectives. These change objectives were actions that specified what would change in the determinants as a result of the intervention and were required in order to achieve the performance objectives and the overall outcome. The performance objectives and change objectives were then discussed in the project group before matrices for behavioural and environmental changes were constructed.
Step 3: Selecting methods and strategies
A search of the literature was undertaken to identify theory- and evidence-based methods that relate to the change objectives in step 2 and that could influence change in the determinants and outcomes.

First, we searched for tests to assess limitations in elderly patients’ performance of daily activities (please see Additional file 1). Tests were selected on the basis that they were performance-based generic tests that were validated for the elderly population, and that were simple to administer in a clinical setting. Next, we searched for studies that examined the effect of interventions that aimed at reducing the risk of readmission (please see Additional file 2). The identified methods from the literature were then linked to the change objectives in the form of practical strategies suitable for implementation in the concrete setting. Decisions about methods and suitable strategies were made in conjunction with the reference group.

Step 4: Developing intervention components
Key components of the intervention were selected based on the identified criteria of importance, feasibility and resource constraints. The components were described and practical applications for use in the different components were constructed. A description for performing the components in the intervention was developed and component 1 was pretested with a similar population of elderly patients admitted to the ED. The tests in component 1, identified in step 3, were pretested in a two weeks period, in order to examine whether the tests were possible to use in an acute setting. The pretest was done by the therapists responsible for delivering the intervention. During the pretest, the therapist received supervision from the project leader in order to ensure that the test was used as described.

Step 5: Implementation plan
A plan for ensuring the implementation of the intervention was conducted in cooperation with the reference group. Potential problems and barriers associated with implementation of the intervention were discussed with the reference group. Also, a plan for educating health professionals performing the intervention was devised.

Step 6: Evaluation plan
In step 6, we developed a plan for evaluating the effectiveness of the intervention and for examining the elderly patients’ experiences of being discharged from the ED and their return to everyday lives. A protocol was drawn up that described the design of the study, aim, hypothesis, recruitment plan and the methods used to evaluate the intervention. We also conducted a pilot study designed as a randomized controlled trial to test the feasibility of the intervention and to examine how the intervention could be delivered in practice. The pilot study was evaluated by registration of how many patients it was possible to include, how many refused to participate, time used for component 1 and registration of the possibility of referral of rehabilitation plan and follow-up visits.

Results
The results of the development process are presented following the six steps as described in the method section. Steps 1 to 3 address the development of the intervention, step 4 presents the final intervention and steps 5 to 6 describe the implementation and evaluation plan.

Step 1: Logic model of the problem
In the needs assessment, we defined the overall problem as high risk of hospital readmission in the elderly after their discharge from an short stay unit at the ED. This is a well-described problem in the literature [1, 7, 16, 25] and is supported by experiences of the health professionals involved in developing the intervention. The outcome of the needs assessment is presented in the logic model in Fig. 1.

Factors associated with the risk of readmission of elderly patients were identified from the literature. Limitations in performing daily activities was chosen as the most significant risk factor, as a large proportion of elderly patients re-admitted has limitations in performing daily activities and because it is a factor that is possible to address in an acute setting with a short-time frame. In the elderly, both the perceived illness and hospitalisation involve a risk of limitations in performing daily activities [26–30]. Another important factor associated with risk of readmission was an incoherent discharge [31, 32]. After ranking the risk factors, underlying behavioural and environmental factors and determinants for the two risk factors were identified using the International Classification of Functioning, Disability and Health (ICF) and the Model of Human Occupation (MoHO) [33–35]. The focal points chosen for further development were the behavioural factor ‘decreased ability to perform daily activities’ and the two environmental factors, ‘poor accessibility in the home’ and ‘poor coordination between hospital and primary care’ (see Fig. 1). The internal determinants that influence a person’s ability to perform daily activities were identified as decreased skills in performing daily activities. When a person experiences decreased skills, his or her way of performing daily activities may change in relation to efficiency, effort, safety and independence [36]. In addition, the environment can influence the elderly individual’s ability to perform daily activities by either enabling or inhibiting performance. Accessibility in the patient’s home and in the community was identified as
important environmental factors in relation to performing daily activities [35].

On the basis of informal interviews with health professionals, the determinant related to the identified incoherent discharge from the short stay unit at the ED was defined as lack of information exchange between health professionals from the hospital to primary care. Waiting time for rehabilitation and lack of information provided to the patient were also identified as determinants for an incoherent discharge.

Based on the needs assessment, the goals of the intervention were to reduce the risk of readmission by:

- Enhancing the patient’s performance of daily activities
- Ensuring a coherent discharge

**Step 2: Outcomes and objectives**

Specific outcomes related to behavioural and environmental factors were stated. The outcomes were selected on their basis of considerations regarding their potential to influence readmission, as described in the literature. Furthermore, the outcome had to be both changeable and possible to coordinate in the acute setting. The outcomes were:

- Increase the patient’s ability to perform daily activities
- Increased accessibility in the home
- Enhanced coordination between hospital and primary care.

The outcome ‘Increasing the patient’s ability to perform daily activities’ was divided into five performance objectives, and the two outcomes that related to the environment were divided into three performance objectives (see Table 1). Then, the most important and changeable determinants (as identified in step 1) were combined with the specified performance objectives in the form of change objectives in a matrix. The matrix for the behavioural and environmental outcomes is presented in Table 1.
Step 3: Selecting methods and strategies

In order to address the determinants and performance objectives specified in step 2, suitable theoretical and evidence-based methods were identified in the literature. Based on our search of the literature, we found the most frequently reported approaches used to increase the performance of daily activities to be skill development, task and environmental modification, and the use of assisted devices [20, 37, 38]. We found sparse evidence on the following environmental outcomes: safety and prevention, use of adaptive equipment, environmental modification and assisted devices [20, 37]. There seems to be evidence that skills training leads to increased ability to perform daily activities [38, 39]. The evidence-based methods were then supplemented with theoretically derived methods and practical strategies from the Behaviour Change Techniques taxonomy [40] and MoHO [35]. Table 2 shows the identified methods and practical strategies applied for each determinant that related to each performance objective.

Step 4: Developing intervention components

The practical strategies were combined to produce the intervention which consisted of three different components (Fig. 2).

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Table 1: Matrix of performance objectives, change objectives and determinants in elderly patients with limitations in the ability to perform daily activities

<table>
<thead>
<tr>
<th>Time/setting</th>
<th>Performance objectives, patients related</th>
<th>Performance skills</th>
<th>Coping ability</th>
<th>Internal determinants</th>
<th>External determinants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0/ At the ED</td>
<td>Decide to participate in assessment of activity limitations</td>
<td>Performance skills</td>
<td>Coping ability</td>
<td>Lack of knowledge about access to rehabilitation</td>
<td>Lack of experience in relation to current situation</td>
</tr>
<tr>
<td>Day 0/ At the ED</td>
<td>Participate in performance-based assessment</td>
<td>Agree to be assessed in relation to perform activities</td>
<td></td>
<td>Receive relevant information about the assessment</td>
<td></td>
</tr>
<tr>
<td>Day 0/ At the ED</td>
<td>Decide to participate in further rehabilitation</td>
<td>Agree to participate</td>
<td></td>
<td>Recognize that the ability to perform activities have changed due to illness</td>
<td></td>
</tr>
<tr>
<td>Day 1 and after/ Patient home</td>
<td>Perform the training</td>
<td>Train to perform activities in a different way</td>
<td>Train in how to ask for assistance and/or help</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Train motor and process skills</td>
<td>Consider information about possible strategies</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time/setting</th>
<th>Performance objectives, staff related</th>
<th>Lack of information between hospital and primary care</th>
<th>Waiting time for rehabilitation after discharge</th>
<th>Inappropriate design of the patient’s home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 0/ At the ED</td>
<td>Inform primary care about patient being discharged and plans for further rehabilitation</td>
<td>OT prescribe rehabilitation plan</td>
<td>Fast referral of the patient</td>
<td></td>
</tr>
<tr>
<td>Day 0/ At the ED</td>
<td>Change visitation procedure for patients referral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1/ Patient home</td>
<td>Access accessibility in the patients home</td>
<td></td>
<td></td>
<td>Screen the patients home in relation to safety risk when performing daily activities</td>
</tr>
<tr>
<td>Day 1/ Patient home</td>
<td>Make minor necessary changes in patients home</td>
<td></td>
<td></td>
<td>Remove carpets</td>
</tr>
</tbody>
</table>

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Component 1 involved an assessment, lasting up to two hours, of individual patients’ performance of daily activities at the ED. Three performance-based measures Timed-Up and Go, 30s-Chair Stand Test and the Assessment of Motor and Process Skills were selected as the test battery and performed by OTs and PTs [41–45].

A rehabilitation plan was then conducted for patients with identified activity limitations in component 2. After discharge, the patient’s rehabilitation plan was used as a referral to further rehabilitation in primary care. Primary care practitioners were informed about the patient’s discharge, and referral of the patient to further rehabilitation was carried out the same day with the aim of starting rehabilitation immediately after discharge.

In component 3, the OT who assessed the patient and defined the rehabilitation plan visited the patient at home the day after discharge in order to enhance the patient’s independence in performing daily activities. The OT used an adaptive and/or an acquisitional approach [36]. The OT screened the home for safety risks and factors that could potentially limit the individual’s performance of daily activities. If limitations and/or risk factors for safety were identified, the OT provided advice on modifications of the home environment. Moreover, the OT encouraged the patient to perform daily activities and provided direct training on how a specific activity could be performed differently to enable the patient to perform the activity. To ensure standardised procedures in the intervention, a checklist was developed to guide the OT at the home visit. Additionally, these visits aimed to ensure a coherent post-discharge period.

Step 5: Implementation plan
As part of the developed plan for implementation, the PTs and OTs delivering the intervention participated in a one-day training course that introduced the components in the intervention. After this introduction, the therapists received supervision and feedback on how they delivered the intervention during the first weeks of implementation. During the recruitment period, weekly meetings were organised between the participating staff and the project leader with the aim of discussing and solving potential problems. Meetings between healthcare managers from primary care and the project leader were held to discuss implementation of the rehabilitation plans. At each primary care unit (eight) in the catchment

<table>
<thead>
<tr>
<th>Determinanta</th>
<th>Methodsb</th>
<th>Practical applications/Strategiesc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance skills</td>
<td>Assessment</td>
<td>OT and PT at the ED use performance-based tests to assess the patients ability to perform daily activities</td>
</tr>
<tr>
<td>Information</td>
<td>OT at the ED gives oral and written information about test result</td>
<td></td>
</tr>
<tr>
<td>Tailoring</td>
<td>OT at the ED match the further intervention to the patients need of rehabilitation</td>
<td></td>
</tr>
<tr>
<td>Acquisition</td>
<td>Skills training with the OT after discharge using graduated daily activities until the goal of activity is achieved</td>
<td></td>
</tr>
<tr>
<td>Restorative approach</td>
<td>Skills training with the OT after discharge using graduated daily activities until the goal of body function is achieved</td>
<td></td>
</tr>
<tr>
<td>Adaptive approach</td>
<td>OT from primary care teach alternative or compensatory strategies and teach in use of assistive devises after discharge</td>
<td></td>
</tr>
<tr>
<td>Coping ability</td>
<td>Feedback</td>
<td>OT gives the patient information regarding the extent to which they accomplish learning and performance</td>
</tr>
<tr>
<td>Knowledge about access to rehabilitation</td>
<td>Information</td>
<td>The patient receive oral and written information about opportunities from the OT at the ED</td>
</tr>
<tr>
<td>Consulting</td>
<td>OT from the ED advise the patient about opportunities</td>
<td></td>
</tr>
<tr>
<td>Lack of experience in relation to new situation</td>
<td>Direct experience</td>
<td>The patient performs daily activities both at the ED and at the home visit the day after discharge</td>
</tr>
<tr>
<td>Inappropriate design of the home</td>
<td>Adaptive approach</td>
<td>The OT from the ED advises on minor home modification at the home visit the day after discharge</td>
</tr>
<tr>
<td>Lack of information between hospital and primary care</td>
<td>Information</td>
<td>OT uses results from the tests in the patients rehabilitation plan</td>
</tr>
<tr>
<td>Intergroup contact</td>
<td>Telephone meetings between OT/PT’s at the ED and form primary care to coordinated discharge and further rehabilitation</td>
<td></td>
</tr>
<tr>
<td>Waiting time for rehabilitation</td>
<td>Change visitation process</td>
<td>The project leader conducts meetings with chief of rehabilitation from primary care</td>
</tr>
<tr>
<td>Start training immediately after discharge</td>
<td>The OT from the ED conducts home visit with training the day after discharge</td>
<td></td>
</tr>
</tbody>
</table>

aDeterminants identified in the needs assessment step 1
bMethods identified in the literature that could influence change in the determinants
cPractical applications/strategies describes how the method practically could be delivered
areas, a contact person (PT or OT) was appointed to the study in order to ensure early initiation of the rehabilitation plan. These contact people participated in a day course that introduced them to the components of the intervention. Meetings with PTs and OTs from primary care who refer patients to further rehabilitation were held with the aim of discussing how quick referrals could be conducted to minimise waiting time for patients.

**Component 1: Assessment (Emergency department)**
Assessment of performance of daily activities with the performance-based measures;
- Timed-Up and Go (TUG)
- 30s-Chair Stand Test (30s-CST)
- Assessment of Motor and Process Skills (AMPS)
Cut points, identified in the literature were used to determine the need for further rehabilitation (component 2 and 3).

**Component 2: Rehabilitation plan.**
The OT drafts a rehabilitation plan for patients with identified rehabilitation need and refers the patient to further rehabilitation in primary care.

**Component 3: Follow-up visit (Patient home)**
The day after discharge from the emergency department the OT visits the patient at home with the aim of enhancing the patient's performance of daily activities and to ensure a coherent discharge.

General approach: Adaptive/compensatory, acquisitional and restorative
- Screening of the home for safety risk and factors that potentially limits the performance of daily activities, by using a standardized checklist
- Use of alternative and compensatory strategies to improve daily activities
- Advice on appropriate assistive device and adaption in the environment to enhance independence, efficiency and safety in performing daily activities
- Advice on how to perform daily activities in new routines
- Train skills (motor and process)

To test the acceptability of the intervention, recruitment and randomization procedures before conducting a large scale study, we made a pilot study designed as a randomised controlled trial. The study included 52 patients allocated to the intervention ($n = 24$) and the usual practice group ($n = 28$). The pilot study revealed that it was difficult to include patients as 67% of the eligible patients refused to participate. One of the main reasons for patients to refuse was that they, because of the randomisation procedures, had to agree to participate before knowing which group they would be assigned to. The evaluation from the pilot study also revealed that the intervention was feasible to deliver and the design of the intervention therefore was not changed.

A quasi-experimental study with an intervention and a control group will be conducted (Clinicaltrial.gov, NCT02078466). Inclusion criteria are the following: age 65+, residency in a larger city in Denmark, admission at a short-stay unit at the ED at a university hospital for medical reasons with the expectation of being directly discharged home. Exclusion criteria are patients with terminal illness, dementia, not speaking Danish or transfer to another hospital department. Due to limited resources the evaluation was conducted in three study areas.

**Step 6: Evaluation plan**
An evaluation of the intervention will be conducted in order to evaluate the following aims:

1. The effectiveness of the intervention with respect to readmission of elderly patients discharged from the ED
2. The cost-effectiveness of the intervention
3. Change in activity performance for patients in the intervention group
4. The elderly patient's experience of being discharged and returning to everyday life after an acute admission

![Fig. 2 Overview of the intervention components in the Elderly Activity Performance Intervention](image-url)
resources and time, it will be possible to include and allocate up to two patients in the intervention group per day, Monday - Friday. Each weekday at 8.00 am, a research therapist will review all patients admitted in the last 24 h and screened for eligibility. If more than two patients are eligible, allocation will based on the date of birth so that patients born closest to the first day of a month (e.g. March 1st) will be allocated to the intervention group. Patients not included in the intervention group will be allocated to usual practice group. In addition, patients admitted after 8.00 am meeting the inclusion criteria and discharged out of hours (afternoons and evenings) will be allocated to the usual practice group.

The effectiveness of the intervention (aim 1) will be analysed by comparing the intervention group with the usual practice group in relation to readmission, mortality and contacts to general practitioners, emergency physician and the ED. The primary outcome is allcause readmission within 26 weeks registered in the National Patient Register. A follow-up time of 26 weeks is chosen as it is considered appropriate for enhancing elderly patients performance of daily activities [1]. The secondary outcomes are mortality and number of contacts to general practitioners, an emergency physician and the ED within 26 weeks. Readmission within 30 days is also measured as a secondary outcome. Based on the literature, we assume that the intervention can reduce the risk of readmission within 26 weeks from 37 to 21% [46]. Power analysis revealed that the sample size should consist of 152 patients in each group, assuming that 10% of the participants are lost to follow-up. This implies that a total of 304 patients will be needed to detect a risk difference of 16 percentage point regarding readmission with a two-sided significance level of 5% and a power of 80%. Patients in both the intervention group and the usual practice group will receive standard treatment in relation to their medical conditions; the intervention group will receive the developed intervention.

Alongside the quasi-experimental study, we will make a economic evaluation (aim 2) as a cost-effectiveness analysis with the main parameters being readmission and mortality. A healthcare viewpoint will be taken to estimate the cost of all activities and resource use related to the patients’ rehabilitation. National registers will be used to estimate resource use in primary and secondary healthcare sectors. The cost of the intervention will be based on micro-costing. To assess cost-effectiveness, the incremental cost-effectiveness ratio will be calculated.

Change in performance of daily activities (aim 3) will be examined within the intervention group. Data regarding self-reported limitations in performing daily activities measured with Barthel-20 and WHODAS 2.0 and health-related quality of life measured with EQ-5D will be collected using a structured interview questionnaire during admission and at both 30 days and 26 weeks after discharge [47–50].

Elderly patients’ experiences of being discharged from ED and returning to everyday life will be examined in a qualitative study (aim 4). Individual interviews with 10 patients who received the intervention will be conducted. The interviews will be analysed from a phenomenological descriptive viewpoint, using systematic text condensation. Purposive sampling of patients will be used to ensure variety in diagnosis, age, gender, material status and support from primary care, as this could contribute to the richness of data [51]. In accordance with a phenomenological approach, we intend to rely on in-depth and rich data rather than the number of participants and the goal is to achieve data that are detailed, nuanced and of sufficient quality rather than seek data saturation [51].

Discussion
This paper describes the development and planned evaluation of a complex intervention aimed at reducing the risk of readmission of elderly patients following a stay at the ED. The development followed the six steps in the IM protocol [24].

Using an IM approach in developing interventions has several strengths. Multiple methods, such as interviews, a literature search and involving an expert steering group helped to define the problem and identify methods used to target it. The use of IM during the process ensured that the intervention was systematically described and based on available evidence and theory. The logic model in step 1 enables project planners to be specific about the problem and the underlying determinants and to decide what should change as a result of the intervention.

As on of the goals for the intervention, we chose to focus on enhancing elderly patients’ performance of daily activities, as limitations in performing daily activities have been identified as high-risk factors for readmission [1, 3, 7, 16, 17]. Despite the fact that limitations in performing daily activities is documented as a risk factor for readmission, this focus is seldom used in interventions aimed at reducing the risk of readmission in elderly patients. Frequently, interventions that aim to reduce readmission in elderly patients include medical treatment, discharge planning and coordination of care [12, 51–54]. Some studies within comprehensive geriatric care have developed interventions aimed at improving geriatric care patients’ performance of daily activities. However, the descriptions of these interventions are insufficient, making it impossible to replicate them [11, 14, 15, 55].

Although IM was found to be a useful and systematic method for describing the intervention, it was also
time-consuming. Developing matrices with performance objectives (step 2) was particularly time-consuming because of the lack of clear guidance on how to select both the performance objectives and the most important determinants. We chose pragmatically the determinants that had the greatest influence on readmission and were considered changeable and feasible to address in the setting.

In the implementation plan, we chose a different strategy than recommended by the IM protocol. Instead of constructing a matrix with performance objectives and change objectives for the use of the intervention, we found it less time-consuming and more feasible to list the performance objectives.

Patient representatives were not included in the development of the intervention. Involvement of users is generally recognized as important when improving the quality of healthcare services. Lack of user involvement is therefore considered as a limitation in the development of the intervention.

Although it was time-consuming to follow the IM protocol, doing so allowed us to describe and design an intervention that was focused, theory-based and partly evidence-based. Our intention with this paper is to describe how we developed the intervention using different methods, and to describe the intervention with sufficient detail and transparency so that replication is possible. This is in line with the recommendation from the Medical Research Council (MRC) that reporting the underlying theory, methods and strategies is valuable because it enhances the possibility of replicating effective interventions [21].

Further studies will evaluate the effectiveness of the developed intervention and will be conducted according to MRC guidance on how to develop and evaluate complex interventions [21]. This means that besides the systematic development process and pilot testing of the intervention, the evaluation will include an effectiveness evaluation, an economic evaluation and a description of the patients’ perspective. The evaluation of effectiveness will contribute with knowledge on strategies for reducing the risk of re-admission in elderly patients with limitations in performing daily activities and is an important part of building evidence-based practice in rehabilitation.

**Conclusion**

The present paper describes the development and design of a complex intervention using the IM protocol. The intervention is aimed at reducing the risk of readmission of elderly patients discharged from the ED. Despite the time-consuming process, the IM protocol was found to be a useful method with which to guide the development of the complex intervention. It allowed us to develop a theory- and evidence-based intervention that can be delivered in a clinical ED context.

**Additional files**

**Additional file 1:** Keywords and search string. (PDF 27 kb)

**Additional file 2:** Keywords and search string for effectiveness studies. (PDF 29 kb)

**Abbreviations**

CGC: Comprehensive geriatric care; ED: Emergency Department; ICF: International classification of functioning, disability and health; IM: Intervention mapping; MoHO: Model of human occupation; MRC: Medical research council; OT: Occupational therapist; PT: Physiotherapist

**Acknowledgements**

We acknowledge participants from the steering group and from the reference group.

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**Availability of data and materials**

All data generated or analysed during this study are included in this published article.

**Authors’ contributions**

LGOE completed the intervention mapping process with feedback from LGOE, conducted the literature review and drafted the manuscript. LGOE, HK, KSP and TM participated in the intervention mapping process and helped to draft the manuscript. All authors read and approved the manuscript.

**Ethics approval and consent to participate**

Evaluation of the effectiveness of the intervention is approved by the Danish Data Protection Agency (Jnr. 2012–41-0763) and by the National Health Board (3-3013-608/1). The regional ethics committee confirmed that approval of the study was not required because biomedical experiments were not included (J. nr. 1–10–72-108-14). All patients in the intervention group will receive written and verbal information about the conditions of their participation and sign informed consent prior to inclusion. The study is registered in Clinicaltrial.gov (NCT02078466). The pilot study was approved by the Danish Data Protection Agency (Jnr. 2012–41-0763). All of the participants in the pilot study received written and verbal information about the conditions of their participation and signed informed consent prior to inclusion.

**Consent for publication**

Not applicable.

**Competing interests**

The authors declare that they have no competing interests.

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References


Paper II
Effectiveness of the “Elderly Activity Performance Intervention” on elderly patients’ discharge from a short-stay unit at the emergency department: a quasi-experimental trial

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Purpose: To examine the effectiveness of the Elderly Activity Performance Intervention on reducing the risk of readmission in elderly patients discharged from a short-stay unit at the emergency department.

Patients and methods: The study was conducted as a nonrandomized, quasi-experimental trial. Three hundred and seventy-five elderly patients were included and allocated to the Elderly Activity Performance Intervention (n = 144) or usual practice (n = 231). The intervention consisted of 1) assessment of the patients’ performance of daily activities, 2) referral to further rehabilitation, and 3) follow-up visit the day after discharge. Primary outcome was readmission (yes/no) within 26 weeks. The study was registered in ClinicalTrial.gov (NCT02078466).

Results: No between-group differences were found in readmission. Overall, 44% of the patients in the intervention group and 42% in the usual practice group were readmitted within 26 weeks (risk difference = 0.02, 95% CI: [-0.08; 0.12] and risk ratio = 1.05, 95% CI: [0.83; 1.33]). No between-group differences were found in any of the secondary outcomes.

Conclusion: The Elderly Activity Performance Intervention showed no effectiveness in reducing the risk of readmission in elderly patients discharged from a short-stay unit at the emergency department. The study revealed that 60% of the elderly patients had a need for further rehabilitation after discharge.

Keywords: occupational therapy, rehabilitation, performance of daily activities, activities of daily living, acute care

Introduction

The number of elderly people admitted to an emergency department (ED) is increasing and today, elderly patients (65+) account for up to 25% of all ED admissions.1-4 Elderly patients discharged from the ED are at high risk of adverse outcomes such as readmission and death.5-8 Some of the risk factors leading to readmission are limitations in performing daily activities, comorbidity, and changes in medical condition.6-10 A large proportion of the elderly patients admitted to the ED are discharged directly to their home.6 After discharge, they often need treatment, care, and rehabilitation from both hospital and primary care.4,9 A safe and coherent discharge of elderly patients is, therefore, highly dependent on effective collaboration between health care providers across hospital and primary care sectors.11,12

Studies emphasize that current ED discharge processes should be optimized to meet the complex needs of elderly patients.5,13,14 So far, a number of interventions have
been designed to improve the outcomes of elderly patients discharged from the ED, including comprehensive geriatric assessment, discharge planning, follow-up initiatives, and care transition interventions. However, the evaluations of the effectiveness of these interventions vary. A meta-analysis from 2011 concluded that there was no clear evidence supporting comprehensive geriatric assessment in terms of reducing risk of readmission. In accordance with the review from 2011, a meta-analysis from 2015 concluded that there was no effect of care transition interventions on reducing readmission and mortality rates. However, a systematic review from 2016 implied that pre-discharge interventions consisting of a follow-up visit after discharge may reduce the risk of readmission. Follow-up visits have been recommended as a way to ensure sustainable care for elderly patients after discharge from the hospital. Only a few studies aiming to reduce the risk of readmission in elderly patients have focused on enhancing performance of daily activities, although it is a well-known high-risk factor for readmission.

Occupational therapy as part of the hospital discharge generally aims at enhancing the patients’ performance of daily activities and ensuring that discharge and transition of elderly patients’ rehabilitation needs are coordinated. In Denmark, occupational therapy as part of hospital discharge planning is not a part of the standard discharge procedure of elderly patients at the ED. A focus on elderly patients’ performance of daily activities and on ensuring a coherent discharge may be essential in reducing elderly patients’ risk of readmission after discharge, as these factors are associated with the risk of readmission.

The current study proposes a novel discharge planning intervention focusing on two risk factors in the prevention of readmissions: 1) to enhance performance of daily activities and 2) to ensure a coherent discharge to home. The “Elderly Activity Performance Intervention” (EAP-intervention) was developed and designed as a theory- and evidence-based intervention using the Intervention Mapping approach.

The objective of this study was to examine the effectiveness of the EAP-intervention compared to usual practice in terms of reducing the risk of readmission in elderly patients discharged from the ED. We hypothesized that the intervention would be superior to usual practice in reducing the risk of readmission measured 26 weeks after discharge.

**Patients and methods**

**Design**

A nonrandomized, quasi-experimental, parallel study was conducted. Follow-up was performed at 30 days and at 26 weeks after discharge from the short-stay unit at the ED.

**Participant enrollment and setting**

The first part of the intervention took place in the period March–December 2014 at a short-stay unit in the ED at a 1,150-bed university hospital in Denmark, where ~42,000 patients are visiting the ED annually. In Denmark, a short-stay unit provides treatment and care for up till 48 hours, followed by patient discharge or transfer to an in-patient unit. The second part of the intervention took place at the patients’ home after discharge. In Denmark, the health care system is tax-financed and free of charge; home-based rehabilitation is offered after hospitalization.

The following criteria were used to recruit participants.

**Inclusion criteria**

- Patients age 65+
- Patients admitted with a medical diagnosis (as distinct from surgical or psychiatric diagnosis) to the short-stay unit
- Patients who were residents in a larger municipality (Aarhus) in Denmark

**Exclusion criteria**

- Patients transferred to other hospital departments
- Patients admitted from a nursing home
- Patients who were unable to communicate in Danish
- Patients declared terminally ill

**Patient allocation**

Each week day at 8:00 am, a research occupational therapist reviewed a list of all patients admitted in the last 24 hours and screened them for eligibility. Due to limited resources and time, it was possible to include and allocate up to two patients to the intervention group per day. If more patients were eligible, allocation was based on the date of birth (day of the month). The two patients born closest to the first day of a month (e.g., March 1) would be allocated to the intervention group. Patients not included in the intervention group were treated according to usual practice and formed the control group. Likewise, patients admitted after 8:00 am and meeting the inclusion criteria, but were discharged out of hours (afternoons and evenings) were allocated to the usual practice group.

**Interventions**

**Usual practice**

Patients in both groups received relevant medical treatment and care. Referral to occupational therapy and physiotherapy took place only if the medical or nursing staff considered it necessary. If the occupational therapist was summoned...
to assess a patient, the occupational therapist performed a short interview and a non-standardized observation of the patient’s performance of basic daily activities and the results were communicated to the municipality homecare staff. If necessary, nurses from the ED organized referral to nursing home care after discharge.

The EAP-intervention

The EAP-intervention was offered in addition to usual practice. An extended description of how the intervention was developed and designed in accordance with theory and evidence is reported elsewhere.29 The intervention was initiated immediately after the patient was allocated to the intervention group. The intervention consisted of three components (Figure 1).

Component 1

Assessment of the patients’ performance of daily activities using three performance-based measures: Timed Up and Go,30,31 30s-Chair Stand Test,32 and Assessment of Motor and Process Skills.33,34 Limitations in performing daily activities were determined using the following cut-off values: Time Up and Go >12 seconds,35 Chair Stand Test <8 times in 30 seconds,16 and Assessment of Motor and Process Skills motor ability <1.50 logits and process ability <1.00 logits.33 Component 1 was provided for all patients. Based on the results in component 1, patients with limitations in performing daily activities received components 2 and 3.

Component 2

A rehabilitation plan was prescribed for patients with identified limitations in performing daily activities. The rehabilitation plan included a description of the patient’s previous and current performance of daily activities and specified the need for further rehabilitation. Primary care was informed about the discharge, and visitation of the patient to further rehabilitation interventions was carried out on the same day in order to start the rehabilitation immediately after discharge.

Component 3

For patients with a prescribed rehabilitation plan, a home visit by an occupational therapist was performed the day after discharge from the emergency department.

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**Figure 1** Overview of the Elderly Activity Performance Intervention.

**Abbreviation:** OT, occupational therapist.
after discharge. The home visit aimed to enhance the patient’s performance of daily activities and to start rehabilitation. The occupational therapist screened the home for safety risks and factors that potently could limit the performance of daily activities. If limitations and/or safety risks were identified, the occupational therapist made relevant modifications of the home environment. To ensure standardized procedures at the follow-up visit, a checklist was developed.

None of the three components in the EAP-intervention were applied to patients in the usual practice group.

Outcomes
The primary outcome was all-cause readmission within 26 weeks. Secondary outcomes were all-cause readmission within 30 days and all-cause mortality, number of contacts to general practitioners (GPs) and EDs (without admission) within 26 weeks, and time to first readmission. All data on outcome variables were obtained from the National Patient Register.

Data related to patient characteristics were extracted for both groups from the National Patient Register and included gender, age, civil status, admission diagnosis, comorbidity, and admission time. Comorbidity was measured with the Charlson’s Comorbidity Index calculated from International Statistical Classification of Diseases and Related Health Problems 10th Revision diagnosis retrieved from the National Patient Register, at the day of inclusion.37–39

Sample size estimation
Based on the literature, the intervention was expected to reduce the risk of readmission within 26 weeks with 16 percentage points, from 37% to 21%.37 A total of 152 patients in each group were needed to achieve 80% power with a two-sided type I error of 5%, assuming that 10% of the participants were lost to follow-up, for example, due to death.

Statistical methods
A detailed statistical analysis plan was developed prospectively in accordance with the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) statement, and data were reported according to the extended Consolidated Standards of Reporting Trials (CONSORT) statement.40,41 Hypothesis tests were conducted at the 5% level of significance and were two-sided. All analyses were performed using the Stata 14.2 statistics program. Biostatistician was consulted in developing the analysis plan and when performing the analyses.

First, a descriptive analysis was performed summarizing baseline characteristics for both the intervention group and the usual practice group. Data were presented as mean and SD or numbers and percentages. The two groups were compared and tested for significant differences at baseline using chi-square test, the Student’s t-test for normally distributed continuous variables, and the Wilcoxon rank sum test for nonparametric variables. Risk of readmission within 26 weeks was estimated by cumulative incidence proportion using a pseudo-value method accounting for death as a competing risk.42,43 The two groups were compared by risk difference (RD) and risk ratio (RR) with 95% CI. Due to the nonrandomized study design, similar analysis was performed by adjusting for factors that a priori were considered to be confounders: age, gender, and comorbidity. Thirty-day all-cause readmission and all-cause mortality within 26 weeks were estimated by RD and RR with 95% CI and secondly adjusted for potential confounding. Numbers of contacts to GPs and ED were described with median and range and differences were tested with nonparametric Wilcoxon rank sum test. Time to first readmission with unadjusted cumulative incidence proportions was illustrated in a graph. An exploratory analysis was performed to compare the baseline differences for those patients in the control group admitted during the daytime and those admitted during afternoon and evenings, in order to include possible differences in the adjusted analyses. An exploratory analysis within the intervention group was performed to examine if the number of intervention components received was associated with the primary outcome, risk of readmission within 26 weeks.

Ethical approval and registrations
The ethical principles of the World Medical Association Declaration of Helsinki were followed.44 The Regional Ethics Committee responded that no approval was required as the study was classified as a quality assurance project (J. nr.1-10-72-108-14). The study was approved by the Danish Data Protection Agency (J.nr. 2012-41-0763) and by the Danish Health Authority (3-3013-608/1). The study was registered in ClinicalTrial.gov (NCT02078466). Patients included and allocated to the intervention group provided written informed consent. Patients allocated to the usual practice group were not informed about their participation, as only data from the National Patient Registry were used. The Danish Health Authority gave permission to obtain health-related data on patients in the usual practice group.

Results
During the inclusion period, 945 patients were screened for eligibility. A total of 410 patients met the inclusion criteria; 35 declined to participate. A total of 375 participants
were enrolled in the study; 144 were allocated to the EAP-intervention and 231 to the usual practice group. The enrollment of study participants is shown in Figure 2. No participants were excluded from the analysis.

Participant characteristics at baseline are shown in Table 1. Overall, the two groups appeared comparable at baseline concerning gender, diagnosis at discharge, comorbidity, and marital status. Patients in the intervention group were older on average than patients in the usual practice group (81 vs 78 years, \( p = 0.003 \)), and patients in the intervention group were admitted longer than patients in the usual practice group (0.94 [0.74; 1.33] vs 0.82 [0.57; 1.09] days, \( p = 0.002 \)).

Readmission
No between-group differences were found regarding the primary outcome readmission. A total of 44% of the patients in the intervention group and 42% of patients in the usual practice group were readmitted within 26 weeks (RD=0.02, 95% CI: [−0.08; 0.12] and RR=1.05, 95% CI: [0.83; 0.33]), as shown in Table 2 and Figure 3. There was no difference in 30 days readmission; 18% of the patients in the intervention group were readmitted and 23% in the usual practice group (RD=−0.05, 95% CI: [−0.13; 0.03] and RR=0.78, 95% CI: [0.51; 1.19]).

The within-group analysis of the usual practice group revealed differences in marital status and admission time on comparing those admitted in daytime with those admitted during afternoon and evenings. Patients in the usual practice group who were included in daytime had longer admission time; 1.06 (0.88; 1.92) vs 0.73 (0.42; 0.96) \( p<0.001 \) than those admitted during afternoons and evenings. Also, 47% of the patients in the usual practice group who were admitted in the afternoons and evenings and 34% of the patients admitted in daytime were married (\( p=0.044 \)). Adjusting for those factors in combination with the a priori confounders age, gender, and comorbidity did not show any significant difference in either readmission within 26 weeks or readmission within 30 days (Table 2).

Mortality
Overall, the mortality 26 weeks after discharge was 10% in both groups. Adjustment for potential confounding did not show any difference (Table 2).

Contacts to GP and ED
The median number of contacts to the ED within a period of 26 weeks from inclusion in both groups was zero (Table 3). A total of 21% of the patients in the intervention group and 17% from the usual practice group had at least one contact to the ED during the 26 weeks.
A total of 97% of the patients in the intervention group and 99% from the usual practice group had at least one contact to the GP during the 26 weeks. The median number of contacts to the GP for both groups was 9.

Exploratory analysis within the intervention group

Table 4 shows the number of patients receiving each component of the intervention and the results from the performance-based assessment in component 1. All patients in the intervention group were assessed with at least one of the performance-based assessments in component 1. Based on the results from the assessment, a total of 87 (60%) of the patients in the intervention group were referred to primary care rehabilitation (component 2). Of these, 69 (79%) patients received a follow-up visit by the occupational therapist the day after discharge (component 3).

An exploratory analysis within the intervention group showed that 51% of the patients who had a need for all of the components in the EAP-intervention were readmitted

### Table 1 Baseline characteristics of the study population (N=375)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention (n=144)</th>
<th>Usual practice (n=231)</th>
<th>Test for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, years (SD)</td>
<td>81 (7.9)</td>
<td>78 (8.6)</td>
<td>p=0.003</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>79 (55)</td>
<td>122 (53)</td>
<td>p=0.699</td>
</tr>
<tr>
<td>Marital status, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>48 (33)</td>
<td>68 (29)</td>
<td>p=0.171</td>
</tr>
<tr>
<td>Divorced</td>
<td>33 (23)</td>
<td>41 (18)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>56 (39)</td>
<td>99 (43)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>7 (5)</td>
<td>23 (10)</td>
<td></td>
</tr>
<tr>
<td>Diagnosis at discharge, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infectious and parasitic diseases</td>
<td>2 (1.4)</td>
<td>1 (0.4)</td>
<td></td>
</tr>
<tr>
<td>Neoplasms</td>
<td>13 (9.0)</td>
<td>21 (9.1)</td>
<td></td>
</tr>
<tr>
<td>Diseases of the blood</td>
<td>1 (0.7)</td>
<td>1 (0.4)</td>
<td></td>
</tr>
<tr>
<td>Endocrine and metabolic diseases</td>
<td>7 (4.9)</td>
<td>12 (5.2)</td>
<td></td>
</tr>
<tr>
<td>Diseases in the nervous system</td>
<td>4 (2.8)</td>
<td>7 (3.0)</td>
<td></td>
</tr>
<tr>
<td>Diseases of the eye and adnexa</td>
<td>7 (4.9)</td>
<td>5 (2.2)</td>
<td></td>
</tr>
<tr>
<td>Diseases of the ear and mastoid process</td>
<td>3 (2.1)</td>
<td>8 (3.5)</td>
<td></td>
</tr>
<tr>
<td>Diseases in the circulatory system</td>
<td>17 (11.8)</td>
<td>30 (13.0)</td>
<td></td>
</tr>
<tr>
<td>Diseases in the respiratory system</td>
<td>8 (5.6)</td>
<td>12 (5.2)</td>
<td></td>
</tr>
<tr>
<td>Diseases of the digestive system</td>
<td>4 (2.8)</td>
<td>9 (3.9)</td>
<td></td>
</tr>
<tr>
<td>Diseases of the skin</td>
<td>2 (1.4)</td>
<td>2 (0.8)</td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal diseases</td>
<td>13 (9.0)</td>
<td>25 (10.8)</td>
<td></td>
</tr>
<tr>
<td>Diseases of the genitourinary system</td>
<td>3 (2.1)</td>
<td>8 (3.5)</td>
<td></td>
</tr>
<tr>
<td>Symptoms and abnormal clinical findings</td>
<td>13 (9.0)</td>
<td>22 (9.5)</td>
<td></td>
</tr>
<tr>
<td>Injury</td>
<td>10 (6.9)</td>
<td>20 (8.7)</td>
<td></td>
</tr>
<tr>
<td>Factors influencing health status</td>
<td>37 (25.7)</td>
<td>48 (20.8)</td>
<td></td>
</tr>
<tr>
<td>Comorbidity, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low: score 0–1</td>
<td>75 (52)</td>
<td>131 (57)</td>
<td></td>
</tr>
<tr>
<td>Moderate: score 2–3</td>
<td>45 (31)</td>
<td>62 (27)</td>
<td></td>
</tr>
<tr>
<td>High: score &gt;4</td>
<td>24 (17)</td>
<td>38 (16)</td>
<td></td>
</tr>
<tr>
<td>Days of admission, median (IQR)</td>
<td>0.94 (0.74; 1.33)</td>
<td>0.82 (0.57; 1.09)</td>
<td>p=0.002</td>
</tr>
</tbody>
</table>

Note: Charlson’s Comorbidity Index.

### Table 2 Comparison of risk of readmission and risk of mortality for the study population (N=375)

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Intervention (n=144)</th>
<th>Usual practice (n=231)</th>
<th>Risk difference</th>
<th>Risk ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Crude (95% CI)</td>
<td>Adjusted* (95% CI)</td>
</tr>
<tr>
<td>Readmission 26 weeks, n (%)</td>
<td>64 (44)</td>
<td>99 (42)</td>
<td>0.02 (--0.08; 0.12)</td>
<td>1.05 (0.83; 1.33)</td>
</tr>
<tr>
<td>Readmission 30 days, n (%)</td>
<td>25 (18)</td>
<td>55 (23)</td>
<td>--0.05 (--0.13; 0.03)</td>
<td>0.78 (0.51; 1.19)</td>
</tr>
<tr>
<td>Mortality 26 weeks, n (%)</td>
<td>14 (10)</td>
<td>23 (10)</td>
<td>--0.00 (--0.06; 0.06)</td>
<td>0.98 (0.52; 1.83)</td>
</tr>
</tbody>
</table>

Note: *Adjusted for age, gender, admission time, marital status, and comorbidity measured with CCI.

Abbreviation: CCI, Charlson’s Comorbidity Index.
within 26 weeks compared to 33% of the patients who only had need for component 1 (RD=0.18, 95% CI: [0.02; 0.35] and RR=1.55, 95% CI: [1.02; 2.36]), as shown in Table 5.

Discussion

The aim of this nonrandomized, quasi-experimental, parallel study was to examine the effectiveness of the EAP-intervention compared to usual practice on reducing the risk of readmission in elderly patients discharged from a short-stay unit at the ED. We did not find the EAP-intervention to be superior compared to usual practice in reducing the risk of readmission in our study population. In addition, none of the secondary outcomes differed significantly between the two groups. When exploring the effectiveness in relation to different subgroups such as gender, comorbidity, and age, no differences were found.

The intention with the EAP-intervention was to improve usual practice by enhancing the elderly patients’ performance of daily activities and ensure a coherent discharge, without changing the overall organization of the Danish health care system.

We hypothesized that the EAP-intervention was more efficient compared to usual practice, but our results did not corroborate this. The EAP-intervention was developed to enhance the elderly patients’ performance of daily activities and ensure a coherent discharge to home, assuming that this would reduce the risk of readmission. This assumption was based on evidence in the literature and the use of a logic model as recommended in the Intervention Mapping approach.28,29 The use of a logic model in the developing phase allowed us to focus directly on factors and their underlying determinants associated with risk of readmission. Although limitations in performing daily activities are a well-known risk factor for readmission in elderly patients, the EAP-intervention may not have been sufficiently intensive to address the complexity in the health needs of elderly patients as only two factors were specifically addressed: performance of daily activities and a coherent discharge.7,10,12 Other risk factors for readmission, such as nutritional status and polypharmacy, were not specifically addressed in this intervention, although they are known to be important elements in geriatric interventions.18,23 Further studies should investigate the effectiveness of a multidisciplinary approach in a multicomponent intervention addressing the ability to perform daily activities and other selected factors such as psychosocial, socioeconomic, nutritional, and medication.

Although the EAP-intervention was designed to address the patients’ performance of daily activities, the design of the study did not allow us to test its effectiveness on the patients’ performance of daily activities. This was due to the fact that the assessments of the patients’ performance of daily activities were one of the three components of the
EAP-intervention. It would have been preferable to collect other measures on performance of daily activities for patients in both groups. However, this was not possible as solely register-based data were collected in the usual practice group. Measures on the performance of daily activities may have contributed with a deeper insight to whether the EAP-intervention resulted in enhancing the elderly patients’ performance of daily activities. A more comprehensive intervention, including task-specific training over a longer period, may potentially increase elderly patients’ performance of daily activities. Benefits from such interventions in elderly populations have been described broadly. A systematic review of home- and community-based occupational therapy from 2017 concluded that there is strong evidence that occupational therapy improves the ability to perform daily activities in elderly.

Participants in our study were comparable with participants in similar studies with regard to age and comorbidity, but may have differed in other factors such as socioeconomic status or home care received before admission. Age at 65 or above was an inclusion criterion in our study, which is in accordance with other studies aimed at reducing the risk of readmission in elderly patients. We did not select the participants due to their limitations in performing daily activities or other factors associated with the risk of readmission. If we had used a risk stratification instrument to screen and identify patients at high risk of readmission, it may have resulted in a different study population. Our results showed that 60% of patients in the intervention group had limitations in performing daily activities as identified with the performance-based assessment of performance of daily activities (component 1) and, thereby, the need for a rehabilitation plan and follow-up visits by an occupational therapist (components 2 and 3). If we had used a more homogenous population, which potentially could have benefited from the EAP-intervention. Two systematic reviews highlight that studies using risk stratification instruments to identify high-risk patients most frequently show beneficial results. Further research is needed in order to examine if risk stratification before an occupational therapy discharge planning intervention would be beneficial in reducing the risk of readmission in elderly patients.

The exploratory analysis within the intervention group revealed that patients (60%) who were identified with decreased ability to perform daily activities in component 1 were at higher risk of readmission within 26 weeks than patients with no limitations in performing daily activities. This indicates that a large proportion of elderly patients discharged from short-stay units at EDs have limitations in performing daily activities and thereby need further rehabilitation.

**Strength and limitations**

Due to the quasi-experimental design, we were able to include nearly all patients meeting the inclusion criteria, thus providing a representative result. The intervention was performed during routine clinical practice and not in selected cases, which enhances the clinical relevance. Furthermore, an important strength of the study is the use of register-based data, which ensured a complete follow-up (100%) on all outcomes measured.

The study did have some limitations. First, the nonrandomized allocation may have led to unequal distribution of unmeasured factors, for example, socioeconomic factors or physical functioning between the two groups. Although the patients in the two groups were similar in terms of gender, marital status, and comorbidity, patients in the intervention group were older and admitted longer than patients in the usual practice group. In the statistical analyses, we used a multiple regression model to control for those differences in baseline characteristics. However, there may be several unidentified or unmeasured confounding factors that possibly could have influenced the outcome.

Given the available resources and experiences from a previous pilot study, a randomized trial was not a viable option. In our previous pilot study, the randomization procedures were not feasible for the patients, which resulted in 67% of the patients refusing to participate. The quasi-experimental study design may be inferior to the randomized controlled trials on the study design hierarchy. However, the use of it may be beneficial in situations where randomization is not an option.

<table>
<thead>
<tr>
<th>Readmission</th>
<th>Need for components 2 and 3 (n=87)</th>
<th>Only component 1 necessary (n=57)</th>
<th>Risk difference (95% CI)</th>
<th>Risk ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readmission 26 weeks, n (%)</td>
<td>45 (51)</td>
<td>19 (33)</td>
<td>0.18 (0.02; 0.35)</td>
<td>1.55 (1.02; 2.36)</td>
</tr>
</tbody>
</table>

**Notes:** *Need for components 2 and 3: based on the assessment in component 1, the patient was identified with limitations in performing daily activities and a need for further rehabilitation. Component 1: assessment of performance of daily activities.
Allocation of patients to the usual practice group may have introduced selection bias, as some of the patients were included in daytime and others in afternoons and evenings. The within-group analysis of the usual practice group revealed differences in the group in relation to marital status and admission time. This was handled by adjusting for the influence of these two factors in the analyses, and the subanalysis did not alter the overall findings of the study. Referral to further rehabilitation in the municipality was planned to be carried out immediately after discharge from the hospital. However, it was not possible to get data on the actual services delivered from the municipality, and we do not know whether rehabilitation in primary care was carried out as planned. This may have affected the impact of the intervention on the risk of readmission, and the lack of data is considered a limitation of the study.

Due to the nature of the study, we were not able to blind patients or staff at the short-stay unit as to who received the intervention. In order to reduce the possibility of contamination, the occupational therapists delivering the EAP-intervention were not allowed to treat patients in the usual practice group. None of the patients in the usual practice group received follow-up visits after discharge, though some of them may have, by self-referral, received some kind of rehabilitation and/or home care after discharge.

Conclusion
The EAP-intervention showed no effectiveness in reducing the risk of readmission in elderly patients discharged from a short-stay unit at the ED. The results highlight the importance of assessing elderly patients’ ability to perform daily activities before discharge in order to determine the need for further rehabilitation. Although the intervention was not effective in reducing the risk of readmission, it revealed that 60% of patients in the intervention group had decreased ability to perform daily activities and there was a need for further rehabilitation after discharge. Further studies are needed to examine if a more intensive occupational therapy intervention with task-specific training over a longer period will increase elderly patients’ ability to perform daily activities and, thereby, reduce their risk of readmission after discharge from a short-stay unit at the ED.

Acknowledgments
We are grateful to the participants and their relatives, the occupational therapists, physiotherapist, doctors, and nurses at the participating short-stay unit, and to therapists from primary care/the municipality who actively participated in this project.

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Disclosure
The authors report no conflicts of interest in this work.

References


Effectiveness of the “Elderly Activity Performance Intervention” on elderly patients’ discharge from a short-stay unit at the emergency department: a quasi-experimental trial [Corrigendum]


On page 737, the author affiliations were listed incorrectly. They should have been listed as follows:

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Paper III
Title page: Returning to everyday life after discharge from a short-stay unit at the Emergency Department – a qualitative study of elderly patients’ experiences

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Returning to everyday life after discharge from a short-stay unit at the Emergency Department – a qualitative study of elderly patients’ experiences

Abstract
Elderly patients often receive care and rehabilitation from different providers across healthcare settings, due to the complexity of their health condition. Collaboration between hospital and primary care providers are therefore essential to ensure that the discharge and transition of rehabilitation is coherent. However, research that focuses on elderly patient’s experiences of the discharge and their everyday lives after, has attracted little attention. This study explores elderly patients’ experiences of being discharged and returning to everyday lives after discharge from a short-stay unit at the emergency department.

Eleven qualitative interviews with elderly patients were conducted two weeks after their discharge. The transcribed interviews were analyzed using systematic text condensation. The study identified four themes: "Pain and fatigue limited performance of daily activities", "Frustrations and concerns", "The importance of being involved and listened to during admission" and "The importance of being prepared for being discharged". In the participants perspective it was difficult, due to fatigue and pain, to perform daily activities after discharge. Participants who experienced not being prepared and clarified in relation to their discharge, continued to have several concerns for the future. They also experienced some challenges related to lack of being involved in the discharge and lack of receiving the information needed. The identified factors may be relevant to address in order to ensure a coherent discharge and return to everyday life for elderly patients after discharge form a short-stay unit at the emergency department.

Keywords: Elderly patients, transition, rehabilitation, everyday life, discharge, daily activities, patient perspective, emergency care.
Introduction

Elderly patients are especially vulnerable when they are being discharged from hospital to home due to the complexity of their health problems (Grimmer et al., 2013; Rydeman & Tornkvist, 2006). They are at high risk of readmission, with up to 20% being readmitted within 30 days after discharge (McCabe, 2015; Salvi et al., 2007). After discharge, elderly patients need to cope with changes in their everyday lives due to their health condition as well as decreased ability to perform daily activities (Jonsson, Appelros, & Fredriksson, 2017; McCabe, 2015; McKeown, 2007).

Elderly patients’ health problems are often more complex than those of younger patients with respect to comorbidity and limitation in performing daily activities (McCabe, 2015). Due to the complexity of their health problems, elderly patients typically receive care and rehabilitation from different providers across multiple healthcare settings after discharge. Effective collaboration between hospital and primary care providers are therefore essential to ensure that the discharge and transition of rehabilitation is coherent (Goncalves-Bradley, Lannin, Clemson, Cameron, & Shepperd, 2016; Hesselink, Schoonhoven, Plas, Wollersheim, & Vernooij-Dassen, 2013; Slatyer et al., 2013). A coherent discharge is characterised by collaboration between healthcare sectors with a high level of continuity and coordination, and with a clear distribution of responsibilities supported by consistent information pathways (Danish Health and Medicine Authority, 2016).

Discharging elderly patients and transitioning their rehabilitation from hospital to primary care are focal points of studies aimed at reducing risks of hospital readmission amongst the elderly patients’ (Goncalves-Bradley et al., 2016; Karam, Radden, Berall, Cheng, & Gruneir, 2015; Lowthian, McGinnes, Brand, Barker, & Cameron, 2015). However, research that focuses on patient-perceived factors has attracted little attention. A study from 2015 revealed that frail, elderly patients experienced the transition to home as unsafe and troublesome and that their everyday lives were affected one week after discharge (Andreasen, Lund, Aadahl, & Sorensen, 2015). Another study from 2015 revealed that elderly patients experienced lack of information and participation in the discharge process (Hvalvik & Dale, 2015). Important elements in feeling prepared to come home after discharge were described by elderly patients and their relatives in a study from 2010 (Rydeman & Tornkvist, 2010). The elderly patients in that study felt prepared to come home if information and arrangements about care issues, daily activities and contacts were organised (Rydeman & Tornkvist, 2010).
Although a number of studies have examined elderly patients’ experiences of being discharged and how they perceive their everyday lives after hospitalisation, none of the identified studies were based on elderly patients’ discharge after a brief hospitalisation from a short-stay unit at the Emergency Department (ED). Discharge from a short-stay unit at the ED may be especially challenging for elderly patients due to the short admission time and the short time to prepare and coordinate the discharge and the transition of rehabilitation to primary care. To address potential issues of importance for a coherent discharge and transition of rehabilitation from a short-stay unit at the ED to primary care, further examination of elderly patients’ perspectives is required. Elderly patients experiences of the discharge and the everyday lives after, may contribute with important knowledge to improve the quality of discharges.

The aim of this study was to explore and gain deeper understanding of elderly patients’ experiences of being discharged and return to everyday lives after discharge from a short-stay unit the ED.

Methods
In order to gain insight into elderly patients’ experiences of being discharged and return to everyday lives after discharge, a qualitative research design involving semi-structured interviews was chosen. Individual interviews were conducted in order to gather rich descriptions of elderly patients’ experiences and to increase our understanding of the phenomenon. The study was guided by Giorgi’s methodological descriptive approach which is based on the phenomenological philosophy of Husserl to provide an understanding of the phenomena of interest based on lived experiences (Giorgi, 1997; Giorgi, 2005; Sadala, 2002; Schiermer B, 2013). The experience of being discharged and returning to everyday life is a subjective phenomenon that is experienced individually and phenomenology emphasizes subjectivity. Thus a phenomenology approach guided the study to grant access to the individuals experience of the everyday life after discharge as it is perceived by the subject (Giorgi, 2005; Schiermer, 2013). According to the descriptive phenomenological approach, lived experience should not necessarily be interpreted, but can be described and understood in terms of how people perceive them and not from a theoretical standpoint (Bevan, 2014; Giorgi, 1997; Giorgi, 2005; Tuohy, Cooney, Dowling, Murphy, Sixmith, 2013).
**Participants and study setting**

The study setting was the participants’ own homes where the interviews were conducted two weeks after the participants had been discharged from a short stay unit at the ED. The qualitative study took place alongside a quasi-experimental study that was conducted at the ED of a 1150-bed university hospital in the central region of Denmark. The purpose of the experimental study was to examine the effectiveness of an intervention aimed at reducing risk of readmission for elderly patients. 144 elderly patients were allocated to receive the intervention and 231 patients to receive usual practice. Briefly, the intervention consisted of assessment of elderly patients’ performance of daily activities at the short-stay unit at the ED, referral to further rehabilitation in primary care and a follow-up at home visit the day after discharge. A detailed description of the study is reported elsewhere (Nielsen et al., 2018).

Participants in the interviews were recruited among those patients who had experienced the intervention in the experimental study. The inclusion criteria were acutely admitted elderly patients over 65 years old, discharged directly to their own home from a short stay unit at the ED and living in a larger municipality in Denmark (335,000 inhabitants). Exclusion criteria were terminal illness, severe dementia or being unable to speak and understand Danish. Purposive sampling was adopted to ensure variation in characteristics such as diagnosis, gender, age and homecare services. This was done in order to ensure sufficient data richness (Creswell, 2013; Kvale & Brinkmann, 2015).

Recruitment took place from November to December 2014. Shortly before discharge, elderly patients (n=15) were invited to participate and were given written information about the purpose of the study. Thirteen gave their consent to be contacted after discharge. Approximately one week after discharge, the patients were contacted by phone by the first author and informed about the aim of the study, that it was voluntary and the duration of the interview. Eleven elderly patients gave their informed consent to participate: three men and eight women (Table 1). Two patients out of the thirteen asked, chose not to participate due to their poor medical condition. Written consent to participate was obtained from the 11 participants on the day of the interviews.
Table 1: Characteristics of the study participants (n=11)

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Age</th>
<th>Civil status</th>
<th>Reason for admission</th>
<th>Length of admission</th>
<th>Recieving Home care</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Female</td>
<td>83</td>
<td>Living alone</td>
<td>Back pain</td>
<td>2 days</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>Male</td>
<td>70</td>
<td>Living alone</td>
<td>Infection</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>Female</td>
<td>86</td>
<td>Living alone</td>
<td>Respiratory</td>
<td>2 days</td>
<td>+</td>
</tr>
<tr>
<td>D</td>
<td>Female</td>
<td>76</td>
<td>Living with partner</td>
<td>Neurological</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>E</td>
<td>Male</td>
<td>65</td>
<td>Living alone</td>
<td>Neurological</td>
<td>1 day</td>
<td>+</td>
</tr>
<tr>
<td>F</td>
<td>Female</td>
<td>83</td>
<td>Living alone</td>
<td>Infection</td>
<td>2 days</td>
<td>-</td>
</tr>
<tr>
<td>G</td>
<td>Female</td>
<td>73</td>
<td>Living alone</td>
<td>Respiratory</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>H</td>
<td>Female</td>
<td>67</td>
<td>Living alone</td>
<td>Heart problems</td>
<td>1 day</td>
<td>+</td>
</tr>
<tr>
<td>I</td>
<td>Female</td>
<td>67</td>
<td>Living alone</td>
<td>Infection</td>
<td>1 day</td>
<td>-</td>
</tr>
<tr>
<td>J</td>
<td>Female</td>
<td>76</td>
<td>Living with partner</td>
<td>Neurological</td>
<td>1 day</td>
<td>+</td>
</tr>
<tr>
<td>K</td>
<td>Male</td>
<td>76</td>
<td>Living with partner</td>
<td>Neurological</td>
<td>1 day</td>
<td>-</td>
</tr>
</tbody>
</table>

Data collection

Individual interviews that lasted between 30-60 minutes were conducted by the first author. In line with the phenomenological approach and the aim of the study, both open-ended and flexible questions was used to invited participants to describe their discharge, how they experienced returning to their everyday lives and receiving rehabilitation service (Table 2). The interview guide served as a guide to help stay focused on the themes, preventing unfocused interviewing but at the same time invite participants to describe their subjective experiences as it occur in their everyday lives after discharge. The use of open-ended questions aimed to get the participants to describe the specific situations and actions as it occur in their everyday lives, not their general opinions about the phenomenon. After a presentation of the interviewer and a short briefing, the participants were invited to talk freely and in detail about their experiences, and both positive and negative aspects were explored. Prompts such as "Could you give an example of this" or "Could you tell me more about that" were used to encourage the participants to tell more (Englander, 2012; Kvale & Brinkmann, 2015; Starks, 2007).

As a phenomenological approach was used to guide both the data collectation and the analysis, the first author attempt to bracket her preconception about the phenomenon to understand it as experienced by the participants (Giorgi, 2005). To maintain an open and flexible attitude during interviews, interview questions were discussed and reflected upon by the first and last author and
preconceptions was written down before conducting any of the interviews (Bevan, 2014). All of the interviews were audiotaped and transcribed verbatim by the first author and a research assistant.

**Table 2: Interview guide**

<table>
<thead>
<tr>
<th>Main theme</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the hospital</td>
<td>Please try to explain how you experienced being admitted to hospital.</td>
</tr>
<tr>
<td></td>
<td>During your hospital stay, did anybody talk to you about how you manage different tasks at home?</td>
</tr>
<tr>
<td>Discharge</td>
<td>Please describe the discharge from hospital and how you experienced this.</td>
</tr>
<tr>
<td>Getting home</td>
<td>What was it like to come home again after hospital admission?</td>
</tr>
<tr>
<td></td>
<td>What was important to you after you came home from the hospital?</td>
</tr>
<tr>
<td></td>
<td>Please try to describe to me how you manage your everyday life at home.</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>How do you experience being offered to participate in rehabilitation?</td>
</tr>
</tbody>
</table>

**Data analysis**

Malterud’s modification of Giorgi’s phenomenological approach to systematic text condensation was used in the analysis. This approach focuses on patterns and variations in the data, leading to a description of the participants’ experiences (Malterud, 2001; Malterud, 2011; Malterud, 2012). In accordance with a descriptive phenomenological methodology, an inductive approach was present in the analysis phase, as we wanted the aspects from the elderly patient's experiences to shape the themes and codes, not theory or other preconceptions (Giorgi, 1997).

The analysis followed the steps: 1) Forming an overall impression, 2) Identifying and sorting meaning units, 3) Condensation and 4) Synthesising the codes into descriptions (Malterud, 2001; Malterud, 2011; Malterud, 2012).

Following these steps, the first author listened to all of the interviews and read the transcripts as a whole several times to gain an overview of the total content. In step 1, preliminary themes were identified and discussed with the last author. In step 2, meaning units containing information that related to the preliminary themes were identified and coded using different colours. In step 3, data were reduced and condensed to a decontextualised selection of meaning units and sorted into
thematic sub-codes across the participants using a matrix. In the condensing process, the focus was on maintaining the original terminology as much as possible. Finally, the condensed meaning units were synthesised into descriptions that related to each theme and subtheme. The descriptions were discussed with the last author and four themes were agreed upon. Meaningful quotations describing the content of the subthemes were added in the description. The quotations demonstrate both similarities and differences in how the participants experienced returning to their everyday lives and how they experienced being discharged. The four main themes and subthemes are presented in Table 3; they are accompanied by illustrative quotes to ensure transparency. Moving between the four steps was done iteratively, from the overall impression to particular parts of the transcript, identifying themes and subthemes of importance from the elderly patients’ perspective (Malterud, 2012).
<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Golden quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain and fatigue limited performance of daily activities</td>
<td>Adapting daily activities because of fatigue</td>
<td>&quot;That’s what irritates me, I get tired too early. I am not used to that – to being tired&quot; (J, line 444)</td>
</tr>
<tr>
<td></td>
<td>Pain that limits</td>
<td>&quot;I try to keep it (pain) down with painkillers and by walking around and moving and so on. But now I've not been moving around much because I've been feeling bad – it's a vicious circle alright&quot; (F, lines 321-323)</td>
</tr>
<tr>
<td></td>
<td>Uncertainty concerning rehabilitation</td>
<td>&quot;But it's very overwhelming, all those things that are going to happen - so you're going to have rehabilitation? yes, I am and then I don't really say anything else&quot; (H, lines 382-383)</td>
</tr>
<tr>
<td>Frustrations and concerns</td>
<td>Uncertainty characterizes everyday life</td>
<td>&quot;Most of it is the psychological part – why has this happened and can it happen again, and does it mean that I should not be alone too much? Does this mean that I should not go skiing anymore - I've done this alone because my wife is not skiing. But should I stop that because something could happen?&quot; (K, lines 184-187)</td>
</tr>
<tr>
<td></td>
<td>The time while waiting</td>
<td>&quot;It (the health condition) comes back every time, I think. Now, I hope that they will figure something out soon. The doctor was not sure and she said &quot;before you have a diagnosis I cannot begin to treat you&quot;, and she could not find a diagnosis&quot; (F, lines 278-281)</td>
</tr>
<tr>
<td>The importance of being involved and listened to during admission</td>
<td>The Health professionals</td>
<td>&quot;And he admitted me to the hospital and that was also okay. But if they had all known what they should know, right....... and it's often the case with doctors - A doesn't know what B has said&quot; (J, lines 92-93)</td>
</tr>
<tr>
<td></td>
<td>Participation in Medical review</td>
<td>&quot;I talked to a doctor, but it was in the evening the first day; actually, it was about 23:30 in the evening - I was simply so tired, I had been up before 6 and had slept badly the night before .... There were some things I was asked about that I really didn't get around. I see that, I really see that today&quot; (G, lines 29-32)</td>
</tr>
<tr>
<td>The importance of being prepared for being discharged</td>
<td>Being discharged</td>
<td>&quot;Well, I did not feel so good about it (being discharged), because I was still in pain and all and I thought that it was a waste of time that I had come (to the hospital)&quot; (A, lines 150- 151)</td>
</tr>
<tr>
<td></td>
<td>Information</td>
<td>&quot;It would be nice to get something in writing. That's always nice, so you can return to it. You can’t do that when it is oral. That’s what I say, you should be two instead of one. But if you are alone, you can get in doubt about what it was. It is very different if you get it in writing – then you can go back&quot; (G, lines 316 to 319)</td>
</tr>
</tbody>
</table>

**Ethical considerations**

The participants in the study were elderly patients, some of which had severe disabilities. This called for special considerations in the interview situation were the interviewer tried to be attentive to the participants situation by trying to create a relaxed atmosphere and adjusting the length of the interview and not pressuring sensitive questions. The study was approved by the Danish Data
Protection Agency (J.nr. 2012-41-0763). Basic principles for research according to the Helsinki Declaration were followed (World Medical Association, 2017). All participants were given written and oral information about the study, and written informed consent was obtained from all of the participants. Anonymity and confidentiality were secured, and participants were informed that they could withdraw from the study at any time without there being any consequences for present or future health services.

Findings
Four themes emerged as central to the participants’ experience of return to their everyday lives and their experiences of being discharged: "Pain and fatigue limited performance of daily activities", "Frustrations and concerns", "The importance of being involved and listened to during admission" and "The importance of being prepared for being discharged" (Table 3).

Pain and fatigue limited performance of daily activities
Since discharge, the participants experienced their everyday lives as being marked by fatigue, lack of energy and pain, all of which limited their performance of daily activities. Fatigue and lack of energy made it more difficult to perform activities than before admission, which led to some of them feeling irritated about not being able to manage the activities. Before admission some of the participants received help to perform domestic tasks and after their discharge, some of them experienced need for either more help or receiving help more often. Sometimes, the participants were able to adapt to their changes by dividing an activity into smaller tasks that could be carried out over several days or by using assistive devices. In other cases, resting in the middle of the day could help provide the energy needed to get through the afternoon and evening.

"That's what irritates me, I get tired too early. I am not used to that – to being tired" (J, line 444)

Pain was experienced as a limitation on performing daily activities. Due to pain, it was difficult for some of the participants to be as mobile as they had been previously, which meant that they did not get outside their home. Despite the fact that they considered it important to get outside, pain reduced the possibility of doing so, or made it impossible.
"I try to keep it (pain) down with painkillers and by walking around and moving and so on. But now I've not been moving around much because I've been feeling bad – it's a vicious circle alright" (F, lines 321-323)

Participants’ expectations for rehabilitation after discharge were mostly positive as they expected to be able to perform daily activities as they used to before they were admitted to the ED. For participants not receiving a clear diagnosis while being admitted, thoughts of further rehabilitation were difficult to manage. Participants were concerned about their health situation and how they should handle further examinations. The uncertainty they experienced about how rehabilitation should be organised was related to whether they could continue with the specific rehabilitation training they received prior to admission and for how long. Being able to receive rehabilitation in once own home was considered important. Some participants stated that it could be difficult to leave home, particularly in the mornings where tiredness was prominent. It could also feel overwhelming if participants had to relate to a new therapist.

"But it's very overwhelming, all those things that are going to happen - so you're going to have rehabilitation? yes, I am and then I don't really say anything else" (H, lines 382-383)

Participants experienced that their everyday lives had changed after discharge, and that fatigue and pain affected their performance of daily activities, making adaptation necessary.

**Frustrations and concerns**
Participants experienced frustration and concerns after being discharged. Lack of clarification as to what led to their admission created concerns that affected their everyday lives. Concerns about what caused the admission meant that some speculated on how their lives would look in the long term. Participants were also concerned about whether they would be able to perform their daily activities in the long term but at the same time, performing small daily tasks, like hanging up the laundry, could feel unimportant for some. Participant K, a 76 old man was concerned about whether he and his wife would be able to travel abroad as they have done previously.
"Most of it is the psychological part – why has this happened and can it happen again, and does it mean that I should not be alone too much? Does this mean that I should not go skiing anymore - I've done this alone because my wife is not skiing. But should I stop that because something could happen?"

(K, lines 184-187)

The time spent waiting for further examinations was experienced as long and difficult with many concerns such as experiencing the condition getting worse and having less energy. Participant F explained that in her case, an actual treatment could not begin until there was clarity about the diagnosis.

"It (the health condition) comes back every time, I think. Now, I hope that they will figure something out soon. The doctor was not sure and she said "before you have a diagnosis I cannot begin to treat you", and she could not find a diagnosis" (F, lines 278-281)

Some of the participants also expressed confusion about lack of clear information about which further examinations that were planned. One of the participants experienced that he did not receive the help he needed and asked for. Another participant also experienced difficulties, but related it to several different health professionals, involved in her situation.

**The importance of being involved and listened to during admission**

Overall, the participants experienced being treated well during admission, but they stressed that there was a hectic atmosphere with a high turnover of health professionals. Participants emphasised that it was important to be involved in decision-making and be listened to during admission, especially during the medical interview. Some experienced that the various doctors did not know what each other had said or done. Furthermore, there was waiting time to see the doctors, and it was hard to establish what was going on because the health professionals had different views related to the patients situation.

"And he admitted me to the hospital and that was also okay. But if they had all known what they should know, right....... and it's often the case with doctors - A doesn't know what B has said" (J, lines 92-93)
The experience of not being listened to could make participants feel uninvolved in the discharge process. They found that although some physicians were good at informing about further actions and examinations, they were sometimes too busy to ask about how the participants thought and felt about the situation. Sometimes medical reviews took place late at night, which meant that the patient was too tired to ask questions about their condition or situation. This could lead to several unresolved issues in relation to discharge.

"I talked to a doctor, but it was in the evening the first day; actually, it was about 23:30 in the evening - I was simply so tired, I had been up before 6 and had slept badly the night before .... There were some things I was asked about that I really didn't get around. I see that, I really see that today"
(G, lines 29-32)

Some of the participants experienced waiting time during admission and that it was difficult to find out what was going on. One of the participants experienced lack of information from the healthcare staff, as they had packed her personal stuff together before she knew she were being discharged.

The importance of being prepared for being discharged
Participants found that it was important to be prepared before discharge. They were all discharged 1-2 days after admission, which for several of them came as a surprise as they did not feel ready. Not everyone agreed with the decision about being discharged, and some felt that they had not been involved in the decision. It felt like a waste of time to be admitted when the condition did not change for the better, and they might as well have been at home in their familiar environment. Participant A, a 83 year old woman, did not understand why she was being discharged when she was still in pain.

"Well, I did not feel so good about it (being discharged), because I was still in pain and all and I thought that it was a waste of time that I had come (to the hospital)"
(A, lines 150- 151)

Central to the participants’ experiences of a positive discharge was feeling secure about returning home. Participants who lived with a spouse experienced a sense of security, as there was someone to care of them after discharge.
Information about what was going to happen was deemed important by participants in relation to the quality of their discharge. For instance, were there going to be further examinations, rehabilitation, or care? Some of the participants experienced that they got the verbal and written information they needed in relation to their discharge, while others experienced they did not and expressed a wish for more relevant information. One of the informants experienced that lack of information about her medical treatment was problematic, because the general practitioner was not aware that she has changed medication. Furthermore, the written information could be difficult to relate to, as it was difficult to understand, and the material needed further clarification.

"It would be nice to get something in writing. That's always nice, so you can return to it. You can't do that when it is oral. That's what I say, you should be two instead of one. But if you are alone, you can get in doubt about what it was. It is very different if you get it in writing – then you can go back" (G, lines 316 to 319)

Discussion
With regard to being discharged from a short-stay unit at the ED, different factors, revealed in four themes, were considered by the participants to be important for their everyday lives after being discharged. Fatigue and pain, affected participants’ performance of daily activities, 14 days after their discharge. Although it is possible to let caregivers take over some of the participants’ daily activities, such as housekeeping tasks, the participants expressed dissatisfaction with not being able to perform these activities themselves. Some explained how they were able to handle their decreased ability to perform daily activities by using adaptation strategies, such as dividing activities into smaller tasks, while others abstained from performing these activities. Using different strategies to adapt to new situations is well-known from other studies (Aberg, Sidenvall, Hepworth, O'Reilly, & Lithell, 2005; Neiterman, Wodchis, & Bourgeault, 2015; Zakrajsek, Schuster, Guenther, & Lorentz, 2013). A study from 2005 revealed that elderly patients adopt different adaptation strategies in their everyday lives to avoid negative experiences due to their health condition (Aberg et al., 2005). The ability to continue with daily activities that are meaningful in their everyday lives is important, and different strategies can be used to reduce the gap between
decreased capacity and the demands of the environment (Kielhofner, 2008). The participants in our study were in an ongoing process of learning to use adaptation strategies to perform daily activities and changing roles, habits and routines, although some of them were challenged in that process. Their expectations for rehabilitation after discharge were mostly positive as they expected to be able to perform daily activities as they used to before they were admitted to the short-stay unit at the ED. This is in line with other studies which suggest that elderly patients admitted for acute illness should be targeted for rehabilitative services after discharge (Boyd, Landefeld, Counsell, Palmer, Fortinsky, et al, 2008; Goncalves-Bradley et al., 2016).

The participants’ everyday lives were also influenced by thoughts about their health condition as well as concerns for the future. Participants who experienced not being prepared or who did not have their diagnosis clarified felt frustrated and had concerns about whether they would be able to perform daily activities in the long term or if they would experience loss of activities. Uncertainty about their health condition and whether they should avoid performing daily activities may lead to a vicious spiral. If elderly patients avoid performing daily activities because of uncertainty, this may, in turn, decrease their ability to perform daily activities (Larsson, Ekvall Hansson, Sundquist, & Jakobsson, 2016; Mackichan, Adamson, & Gooberman-Hill, 2013).

Our findings about elderly patients’ concerns is in accordance with the findings of another study where elderly patients were concerned about how to handle their life situation after being discharged (Rydeman & Tornkvist, 2010). Our study, however, showed that especially participants who did not have a clear diagnosis felt unprepared to return home and were concerned about the impact of their health condition on their everyday lives. It is important to take these new findings into consideration in clinical practice and doing so may lead to the development of improved informational material about what is going to happen in relation to clarifying further the elderly patients’ condition. Moreover, provision of clear information about whether there are restrictions on certain activities may contribute to preventing decreased ability to performing daily activities and should be an important element in the discharge process.

The results of the present study show that elderly patients want to be involved and participate in their discharge from the ED, although lack of verbal and written information and lack of involvement in the discharge process were experienced by some of the participants. Not everyone agreed with the doctors’ decision about the time of discharge, and some did not feel that they had
been involved in the decision. Other studies support this finding (Hvalvik & Dale, 2015; Naylor, 2002). In a study from 2015, participants reported feeling invisible in the discharge process due to lack of involvement and communication with health professionals (Hvalvik & Dale, 2015). Providing sufficient information about further clarification, treatment and rehabilitation and allowing patients to describe their perceived health challenges are necessary to involve elderly patients in decision-making and for truly informed choice (Dyrstad, Testad, & Storm, 2015).

Methodological considerations
A strength of this study is that the qualitative individual interviews were conducted in a natural setting (e.g. the participants own home) to explore the complex phenomenon of elderly patients returning to their everyday lives after discharge from a short stay unit at the ED and how they experience being discharged. The home environment can facilitate more comfortable relationships between the researcher and participant and may encourage the participants to talk more freely during the interview (Sivell et al., 2015). The use of a phenomenological methodological approach for guiding both the collection and analysis of data was suitable for examining patients’ experiences of returning to their everyday lives, although it posed challenges in relation to the participants way of expressing themselves. The participants’ ability to express themselves and describe their experiences varied and great efforts was devoted to give the participants every possibilities to expres all their perceptions by using open-ended questions. A broad variation of participants e.g. gender, age and diagnosis was included to provide nuanced insights into the elderly patients’ experiences; and extensive interviews were conducted. The participants provided rich and varied data to a degree that ensured a qualified answer to the aim of the study.

When using a phenomenological methodological approach, researchers face the challenge of not letting preconceptions influence the interviewing or the findings. The researcher conducted interviews and analysis with as few preconceptions as possible. The first author primarily carried out the interviews and the analysis, and was supervised by the last author. Preconceptions were continuously reflected upon in order to achieve trustworthy findings and ensure transparency. Before conducting the interviews, the researchers had a preconception that the transition between hospital and primary care would be challenging for the participants. However, none of the participants expressed opinions on the transition; rather, they described the challenges of returning
to their everyday lives. The use of a phenomenological approach allowed the researcher to pursue what was important for the participants, rather than seeking answers to predefined questions.

The use of systematic textcondensation as a method for analysing data were found highly relevant as the method helped the researchers to stay focused on the participants experiences without the use of theory. This resulted in descriptions that provide insights into the elderly patients’ experiences of returning to their everyday lives and how they experience being discharged. These insights may help to improve the quality of transition from hospital to primary care for elderly patients in the future.

A limitation in this study was that it was conducted in a single hospital with recruitment of participants who had been involved in a clinical trial and received a specific intervention. Accordingly, we have provided a detail description of the setting and the intervention to enhance the transferability of findings to other similar settings. Voluntary participation might also have yielded a sample that held strong views about the discharge process which may affect the transferability of the findings. The results cannot be transferred to all elderly patients, but can be seen as illuminating patterns that can be used for hypothesis generation in further studies.

**Conclusion**

Our study revealed that factors such as decreased ability to perform daily activities, not having their diagnosis clarified and not being prepared and involved in the discharge process was important for the elderly patients’ discharge from the ED and their everyday lives after discharge. These findings contribute with important knowledge about elderly patients’ experiences and concerns, and these experiences and concerns should be taken into consideration by health professionals who plan the discharge process and refers patients to further rehabilitation. Further research is needed to examine how the process of discharge may be improved and how focus on elderly patients’ everyday lives and their performance of daily activities can be included both at hospital and in primary care.
Acknowledgement

We thank the study participants for their participation and valuable contributions.

Disclosure statement

No potential conflict of interest was reported by the authors.

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References


11. Appendices

Appendix A
Search strategy and search string for effectiveness studies

Appendix B
Assessment of risk of bias of effectiveness studies

Appendix C
Search strategy and search string for occupational therapy studies

Appendix D
Assessment of risk of bias of occupational therapy studies

Appendix E
Search strategy for assessment measures
Appendix A: Search strategy and search string for effectiveness studies

Search question: What characterizes interventions aimed at reducing risk of readmission in elderly patients discharged from an acute or emergency department?

Inclusion criteria:
P: Age 65+
I: Discharge interventions aimed at reducing risk of readmission
C: No explicit criteria
O: Readmission, stated as primary outcome
(c): Acute setting

Exclusion criteria:
P: Diagnosis specific studies (one single diagnosis, e.g. stroke, dementia, cancer)

Table 1a. Search strategy

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<th>Keyword 1</th>
<th>Keyword 2</th>
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<td>Elderly (A2)*</td>
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<td>Intervention</td>
<td>Discharge (B1)</td>
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<td></td>
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<td>Re visit (C2)</td>
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<td>Acute (D2)</td>
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*The keywords older and elderly were only used in Cochrane as no age limits exist.

Table 2a. Search string

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</tr>
<tr>
<td>Clinical trials</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Reviews</td>
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Appendix B
### Table 3a. Risk of bias assessment for intervention studies aimed at reducing risk of readmission in elderly patients discharged from an emergency department.

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<th>Study</th>
<th>Random Sequence Generation</th>
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<th>Attrition bias</th>
<th>Reporting bias</th>
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<td>Central allocation</td>
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<td>An interim analysis stopped inclusion</td>
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<td>Courtney et al (89)</td>
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<td>Central allocation</td>
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<td>All pre-specified outcomes are reported</td>
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<td>Dedhia et al (90)</td>
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<td>Objective measure of primary outcome (blinding)</td>
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<tr>
<td>Guttman et al (91)</td>
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Note. Categories for risk of bias: + = High risk of bias, - = Low risk of bias, ? = Unclear if there is risk of bias.
Appendix C
Appendix C: Search strategy and search string for occupational therapy interventions

Search question: *What characterizes interventions that are effective at enhancing performance of daily activities in older people*

**Inclusion criteria:**
P: Age 65+
I: Interventions aimed at enhancing the performance of daily activities
C: No explicit criteria
O: Quantitatively measured between group differences assessed with validated instruments.

**Exclusion criteria:**
P: Diagnosis specific studies (one single diagnosis, e.g. stroke, dementia, cancer)
I: Main focus on falls prevention, focus on driving a car, group-based interventions

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*No keywords was used for the population, only limits were used in the searches*

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<td>Abizanda/ Wressle/</td>
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Table 6a. Risk of bias assessment for occupational therapy interventions aimed at enhancing the performance of daily activities in older people

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<td>blinded</td>
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<td>available information</td>
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<td>Outcome assessor</td>
<td>Missing outcome for</td>
<td>All pre-specified outcomes are reported</td>
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<tr>
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<td>blinded</td>
<td>15% of participants</td>
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<td>Outcome assessor</td>
<td>Missing outcome for</td>
<td>Not able to judge from</td>
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<td>blinded</td>
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<td>Not able to judge from</td>
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<td>No information about</td>
<td>No reason for missing</td>
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<td>blinding</td>
<td>assessor blinding</td>
<td>data provided</td>
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<td>blinding</td>
<td>blinded</td>
<td>25% and 18%</td>
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<tr>
<td>Shearer et al (111)</td>
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<td>Not able to judge due to</td>
<td>No information about</td>
<td>Outcome reported for</td>
<td>Not able to judge from</td>
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<tr>
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<td>Pre/post design</td>
<td>insufficient information</td>
<td>assessor blinding</td>
<td>all patients</td>
<td>available information</td>
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<td>Outcome assessor</td>
<td>Missing outcome for</td>
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<td>blinding</td>
<td>blinded</td>
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<td>Outcome assessor</td>
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<td>All pre-specified outcomes are reported</td>
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<td>insufficient information</td>
<td>blinded</td>
<td>27 % of participants</td>
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<tr>
<td>Wressle et al (114)</td>
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<td>No information about</td>
<td>Missing outcome for</td>
<td>Not able to judge from</td>
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<td>on admission time</td>
<td>blinding</td>
<td>assessor blinding</td>
<td>19% of participants</td>
<td>available information</td>
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</table>

Note. Categories for risk of bias: + = High risk of bias, - = Low risk of bias, ? = Unclear if there is risk of bias
Appendix E
Appendix E: Search strategy and search string for assessments measures

Search question: Which performance-based assessments are validated in older people (65+)?

Inclusion criteria: Original peer reviewed articles
Performance-based assessment measures
Validated in a older population (65+)

Exclusion criteria: Diagnosis specific assessments

Table 7a. Search strategy

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Keyword 1</th>
<th>Keyword 2</th>
<th>Keyword 3</th>
<th>Keyword 4</th>
<th>Keyword 5</th>
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<tr>
<td>B. Assessment (B)</td>
<td>Tool (B1)</td>
<td>Instrument (B2)</td>
<td>Test (B3)</td>
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<tr>
<td>C. Validity (C)</td>
<td>Reliability (C1)</td>
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Table 8a. Search string

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<td>#3: C OR C1</td>
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<td></td>
<td>#4: #1 AND #2 AND #3</td>
<td>1.331</td>
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<td>#4: #1 AND #2 AND #3</td>
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<td>Cinahl</td>
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<td>#3: C OR C1</td>
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<td>#4: #1 AND #2 AND #3</td>
<td>2.299</td>
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