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## 1. Introduction

The ADVANTAGE Joint Action (JA) aims to build a shared understanding among policy makers and stakeholders across Europe on how to prevent and manage frailty through the development of a Frailty Prevention Approach. Work Package (WP) 7 of the JA and the State of the Art Report (SoAR) document produced by member of the WP presents evidence on models of care to prevent or delay progression of frailty. The evidence summarised in the SoAR highlights the importance of comprehensive assessment, enablement and rehabilitation to optimise function, particularly at times of a deterioration in health, or when moving between home, hospital or care home. Transitional care and intermediate care are two important elements of the continuum of services that enable older people to maintain or recover their independence following a period of illness, injury or hospitalisation. However, the many definitions and descriptors applied to this diverse range of services limit our ability to fully understand their contribution to the Frailty Prevention Approach. In order to better understand this contribution, WP 7 partners conducted two complementary studies: an e-Delphi study to build consensus amongst experts on the definitions and principles of transitional care and intermediate care for older adults, and a systematic review of the evidence for their effectiveness. This report presents the results of the systematic review. Annex 1 outlines the e-Delphi process and the ten consensus statements agreed by the experts.

## 2. Objective

Although transitional care and intermediate care are increasingly proposed as a means to deliver care closer to home, support earlier hospital discharge and reduce readmissions, there is limited data on outcomes and costs from studies in older adults. This systematic review seeks to identify and analyse the effectiveness of transitional care and intermediate care and to understand the benefits and costs of these interventions in an older adult population, with a specific focus on hospital utilisation and (re)admissions as well as health-related outcomes including function and continuity of care. The key messages will guide policy makers, funders, commissioners, providers and professionals to design, deliver and scale-up effective transitional care and intermediate care interventions as an important part of the Frailty Prevention Approach.

### 3. Methods

#### 3.1 Search strategy

Peer-reviewed medical literature published from 01/01/2002 to 05/02/2019 in English, French, Italian, and Spanish were analysed to identify articles that assessed the effectiveness of transitional or intermediate care interventions for older adults in any care setting. The search was conducted in CINAHL, EMBASE, PubMed and Cochrane Library databases by combining following search terms: (("intermediate care" OR "transitional care") AND (frailty OR frail OR "older person\*" OR "older adult\*" OR "hospital at home" OR "reablement" OR "independ\*" OR "readmission" OR "prolonged stay" OR "community hospital")). This search yielded 1891 records. Cross referencing of systematic review and narrative review articles resulted in an additional 79 articles for screening. A search of OpenGrey using "intermediate care" OR "transitional care" for grey literature reports published from 01/01/2002 to 05/02/2019 resulted in 14 reports for screening.

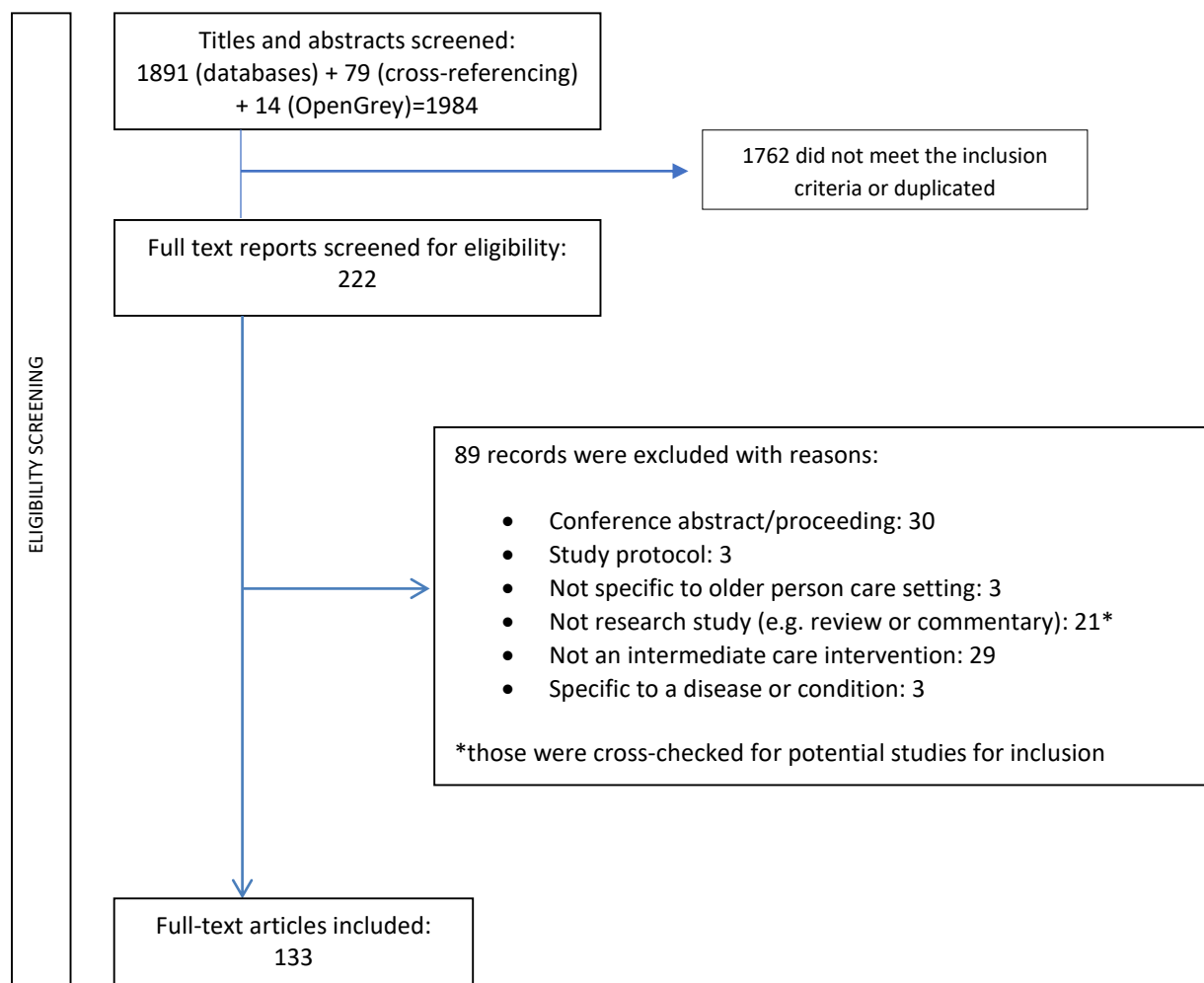
#### 3.2 Search output and eligibility criteria

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used as illustrated in Figure 1. Articles and grey literature were included if they were (1) report of an intervention for intermediate care and/or transitional care for older adults, (2) conducted in a health care setting, (3) published in English, French, Italian or Spanish, (4) published between 01/01/2002 and 05/02/2019, and (5) had full text available.

Titles and/or abstracts (where available) of 1984 records retrieved using the search strategy were independently screened by pairs of review authors (AH-DS, AMC-LLS, CA-RRA) considering inclusion and exclusion criteria. Any disagreements were first discussed by the paired reviewers before a third reviewer was invited to resolve any persisting conflict. After removal of 1762 records (duplicates or exclusions), data extraction was performed by four reviewers (AH, DS, MS, MOD) on 222 full-text records, with support from a native Spanish speaker (LSS) for one paper.

Of the 222 publications or grey literature reports analysed, 89 did not meet the eligibility criteria: 30 papers were excluded as they were conference abstract/proceeding; three were study protocols; three were not specific to the care of older adults; 21 were a review or commentary; 29 did not report results of a transitional care or intermediate care intervention; and three were specific to a disease or condition.

The remaining 133 articles reported results of transitional care or intermediate care interventions for older adults in terms of health related outcomes or benefits and costs for health and social care systems. These 133 articles were scrutinised in detail using an adhoc template as illustrated in figure 2 and as detailed in Annex 2.



**Figure 1: Flow chart for paper screening**

### 3.3 Data collection

In order to standardise the information gathered, a template was designed to capture: (1) Author name, title, year and country; (2) Type of evidence; (3) Aim; (4) Definitions (e.g. transitional care or intermediate care) (if reported); (5) Model/system/ policy/intervention (main components); (6) Use of technologies and electronic health records; (7) Characteristics of population group (including mean age and sample size); (8) Health condition/problem; (9) Healthcare context/setting for study recruitment; (10) Organizational structure and governance; (11) Outcomes - user / carer experience, functional ability, impact on hospitalisation / institutional care (12) Resource implications (such as cost and staff); (13) Transferable lessons for practice and policy; (14) Barriers or limitations (if reported); (15) Additional comments/key recommendations/messages. The sections are briefly illustrated in Figure 2 below.

<p><b>The article:</b> Record no Authors Title Country</p> <p><b>Eligibility criteria:</b> Language Year Aim Type of evidence Definitions</p> <p><b>Study design:</b> Model/system/ policy/intervention Use of technologies and electronic health records Setting for study recruitment Participants Health condition/problem Organizational structure and governance</p>	<p><b>Results:</b> User / carer experience, Functional ability, Hospitalisation/ institutional care, costs</p> <p><b>Lessons learned:</b> Transferable lessons for practice and policy Resource implications (costs, staff) Barriers or limitations</p> <p><b>Conclusion of the authors:</b> Key recommendations/messages</p>
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**Figure 2. Sections included in the analysis of the impact of transitional care or intermediate care interventions.**

## 4. Results

The following section provides a brief overview of the 133 studies that report on the effectiveness of transitional care or intermediate care interventions. The characteristics and outcomes of these studies are summarised in Annex 3. Most papers described complex interventions consisting of a varying mix of multiple components delivered in hospital and / or community. Sixty-five studies reported on interdisciplinary interventions. To minimise the heterogeneity of the extracted data, the types of evidence and interventions were grouped under four main categories as illustrated in Table 1:

- Transitional care interventions delivered only in hospital
- Transitional care interventions delivered at discharge and up to 30 days after discharge
- Intermediate care at home
- Intermediate care in a community hospital, care home or post-acute facility

**Table 1: Types of evidence with summary of interventions**

Type of evidence	Total	TC delivered only in hospital	TC delivered at discharge and up to 30 days after discharge	Intermediate care at home	IC delivered in a community hospital, care home or post-acute facility
<i>Randomised controlled trial</i>	47	1	25	16	5
<i>Quasi experimental</i>	16	3	8	3	2
<i>Cohort</i>	9	0	2	5	2
<i>Pre-post intervention study</i>	18	1	9	6	2
<i>Prospective observational study</i>	7	1	2	4	0
<i>Retrospective cohort</i>	15	1	13	1	0
<i>Retrospective analysis</i>	7	0	0	4	3
<i>Pilot</i>	6	0	6	0	0
<i>Other</i>	8	1	5	2	0
<b>Total</b>	<b>133</b>	<b>8</b>	<b>70</b>	<b>41</b>	<b>14</b>

#### 4.1 Transitional care interventions delivered only in hospital

Eight studies mainly focused on improving discharge planning, co-ordination and patient and / or caregiver education in hospital. Three of these studies included medicine reconciliation. Most interventions were nurse or social worker led with mixed results in terms of hospital readmissions. Coaching interventions delivered by social workers reduced readmission rates<sup>1</sup>, as did some transitional care interventions by hospitalists or nurses<sup>2,3</sup>. Although a nurse or social worker led discharge planning and patient education intervention did not reduce readmissions, it was associated with lower rates of long-term care placement<sup>4</sup>.

Three studies reported interdisciplinary hospital transitional care interventions. One of these studies, a RCT by Legrain et al.<sup>5</sup>, focused on coordinated discharge and medicines reviews by a geriatrician led multidisciplinary team and reported lower mortality rates, fewer Emergency Department (ED) attendances, less readmissions and reduced healthcare costs. Of the eight hospital-based transitional care interventions in the review, Legrain's study most closely reflects the model of multidisciplinary Comprehensive Geriatric Assessment (CGA).

#### 4.2 Transitional care interventions delivered at discharge and up to 30 days after discharge

Just over half of the papers in the review were studies of transitional care delivered in hospital and for up to 30 days after discharge. Three quarters of the 70 studies in this category were conducted in the USA or Canada. Six studies were conducted in Europe, seven in Hong Kong and three in Australia.

Twenty-two transitional care studies (30%) were interdisciplinary interventions. Even when the transitional care interventions were uni-professional (nurse, pharmacist or social worker), this lead professional generally delivered a complex bundle of interventions in hospital and in the community including: improving planning and co-ordination of discharge; patient education and medicine reconciliation prior to discharge; telephone advice and support for patients and carers after discharge; coaching and educational support for self-management and recovery; and coordination of follow up care from primary care providers and other specialists.



Several RCTs reported no significant difference in ED visits or readmissions at 30 days<sup>6,7</sup> or 90-180 days<sup>7</sup>. On the other hand, several RCTs reported lower rehospitalisation rates and reduced readmissions at 28-30 days<sup>8-10</sup>, 60 days<sup>8</sup> and 84-90 days<sup>9</sup>. With the large amount of heterogeneity between these complex multi-component interventions it is difficult to describe a common pattern for effectiveness and value. Therefore, we further classified the studies according to service provider, intensity and duration, and the specific focus of the interventions.

#### **a) Outreach by hospital professional(s) (n=51)**

Almost three quarters of the transitional care models involved outreach by a hospital based professional, often a nurse, who provided time limited follow up and coordination of support by other professionals after discharge. For example, the Care Transitions Intervention involves guidance from a nurse “transition coach” who uses tools to promote cross-site communication, and support patient self-management<sup>8</sup>. In a RCT of this intervention patients had lower rehospitalisation rates at 30 and 90 days and lower condition-specific re-hospitalisation rates at 90 and 180 days<sup>8</sup>. Another well studied outreach model is the nurse-led, largely telephone-based, C-TraC protocol that aims to empower older adults and caregivers in medication management and encourage them to contact healthcare providers when needed. This protocol was reported to reduce 30-day rehospitalisations<sup>11</sup> and healthcare costs<sup>12</sup>.

The Bridge Care Coordinator model is a short-term outreach transitional care programme based on review of inpatient medical records by an experienced social worker, discussion with the multidisciplinary hospital team and follow up at home for an average of 6 days. Studies of Bridge Care models reported a 20% relative reduction in readmissions at 30 days<sup>13</sup>, reduced ED attendances and re-hospitalisations, and lower average hospital costs per episode and total costs per person<sup>14</sup>. The report of a similar “Enhanced Discharge Planning Program” by the Agency for Healthcare Research and Quality<sup>15</sup> concluded that this intervention enhanced patients' and caregivers' knowledge of medications and reduced caregiver stress.

Arbaje et al<sup>16</sup> piloted a multidisciplinary outreach model of a Geriatric Floating Interdisciplinary Transition Team (Geri-FITT) that undertook inpatient assessments, encouraged self-

management, communicated with primary care providers, and followed up patients at home. Patients managed by this team had slightly, but insignificantly, higher quality care transitions, and increased patient satisfaction with inpatient care.

#### **b) Community based or in-reach models (n=24)**

Less than half of the transitional care interventions studied were led by, or implemented in equal partnership with, community-based providers. A well-developed example of an in-reach model is the Preventable Admissions Care Team (PACT) that involves social worker-led holistic assessment and personalised care planning in hospital, followed by home-based post-discharge care coordination for around 30 days. In a large retrospective study of PACT by Weerahandi et al<sup>17</sup>, PACT patients had reduced mortality over 180 days and significantly lower readmissions at 30, 60 and 90 days.

Farrell et al<sup>18</sup> reported results from a primary care-based transitional case management programme involving prompt identification and telephone contact with recently discharged patients. This led to reduced 30-day hospital readmission rates and delayed mean time to hospital readmissions within 180 days. Similarly, pre and post-discharge assessments for care needs, medication reconciliation, support for self-care, and follow up interventions delivered by a primary care-based nurse care coordinator are reported to reduce post-discharge Medicare and inpatient expenditures<sup>19</sup>.

An experimental study by Welch et al<sup>20</sup>, described an innovative model using trained students as volunteer Health Coaches to provide community-based liaison between the interdisciplinary hospital-based team and patients at home through an academic service partnership. This motivational interviewing transitional care intervention resulted in decreased hospital readmission rates.

#### **c) Transition Clinics (n=7)**

Several studies evaluated early follow-up in a transition clinic, often combined with telephone and / or nurse follow up. For example, Chakravarthy et al<sup>21</sup> reported that patients who

completed a scheduled transition clinic appointment were three times less likely to be readmitted compared with patients who did not attend the transition clinic or their primary care physician. A post-discharge clinic intervention for male veterans being discharged from a Skilled Nursing Facility (SNF) also illustrated reduced acute care use over a 30-day period<sup>22</sup>. In addition, Baldwin et al<sup>23</sup> noted a significant reduction in readmission rates for patients attending a multidisciplinary discharge clinic staffed by a family nurse practitioner, clinical pharmacist, nurse case manager and social worker. The authors estimated potential Medicare savings for the intervention cohort at \$689,199.84.

Positive outcomes were reported in a hospitalist led transitional care programme in Taiwan involving a disease-specific care plan, telephone monitoring and counselling, and a hospitalist-run discharge clinic. Intervention patients had lower rates of readmission, adverse events and death within 30 days after discharge<sup>24</sup>. Yu et al<sup>25</sup> reported a decrease in 30-day hospital readmissions, an increase in identified medication errors and improved care documentation with a combination of telephone follow-up and an inter-professional discharge clinic.

#### **d) Telephone follow up without home visits (n=48)**

The studies of transitional care represent a continuum from one or two 'light touch' telephone call prompts in the first few days after discharge to more frequent telephone based advice and coordination for up to 30 days after discharge.

Both the timing and intensity of telephone follow-up are important variables. A RCT by Biese et al<sup>26</sup> reported that a single scripted telephone call from a trained nurse to an older adult after discharge from the ED did not reduce ED and hospital return rates or death within 30 days. Although there was no impact on rehospitalisation, a pre-discharge holistic assessment and telephone call at 30 days by an experienced social worker improved adherence with primary care follow-up appointments<sup>27</sup>. Early telephone case management reduced the likelihood of 60-day readmissions for selected high-risk discharges<sup>28</sup>. A telephone-based, protocol-driven, low-cost, nurse-led, C-TraC transitional care programme sustained for up to 30 days post discharge had a lower 30-day readmission rate<sup>11,12,29</sup>.

#### **e) Telephone follow up and Home Visits (n=21)**

Only 21 studies (30%) reported home visits as part of the transitional care intervention. Basso Lipani et al<sup>30</sup> studied home visits within their pilot of the PACT intervention delivered by experienced social workers and reported lower ED visits and hospital admissions in the first 30 days following discharge. In some studies, home visits provided generic transitional care plus specialist advice and support for nutrition or medication management.

For example, in their study in Denmark, Beck et al<sup>31</sup> reported that follow-up home visits by registered dieticians had a positive effect on the functional and nutritional status of geriatric medical patients after discharge. In a study from the United States in which a community-based organisation delivered a transitional care service for home meals and medication management, the intervention group had self-reported readmissions below the state average at both three and six months as well as improved medicine scores<sup>32</sup>.

However, the evidence for pharmacist home visits is mixed. For example, in a study conducted in the UK, home visits by pharmacists within two and eight weeks of discharge were associated with a significantly higher rate of hospital admissions and did not significantly improve quality of life or reduce deaths<sup>33</sup>. Further research is needed to explain this counterintuitive finding and to identify more effective methods of medication review. In contrast, Naunton et al<sup>34</sup> studied the effect of a pharmacist visit at day five post-discharge and found statistically improved compliance and reduced unplanned readmissions at 90 days. Pharmacist medication review, patient counselling, and telephone follow-up were associated with a lower rate of preventable adverse drug events 30 days after hospital discharge<sup>35</sup>.

#### **f) Patient and / or Caregiver Education (n=65)**

Patient and carer education and coaching interventions were almost universally included within the transitional care interventions. Half of these educational interventions specifically addressed medication management while the remainder offered coaching and support for patients and caregivers to understand their conditions and recognise triggers that should prompt additional treatment or review. For example, an RCT delivering assessment, coaching and follow-up by

patient navigators facilitated reduced costs per patient over 180 days<sup>36</sup>. Other studies reported reduced readmission rates<sup>37,38</sup>. More often, studies reported positive outcomes for patient satisfaction<sup>6,10,39</sup>; self-rated health and self-efficacy<sup>10,40</sup>; and improved confidence for obtaining information, communication with members of the healthcare team, and self-management<sup>16,41</sup>. Other studies noted improvements in quality of life<sup>10</sup>, and gains in Quality Adjusted Life Years and increased likelihood to meet a cost-effectiveness threshold of £20000/QALY<sup>9</sup>.

#### **g) Decision support tools (n=5)**

Most studies used electronic health records and patient information systems to support case finding, risk stratification, targeting of interventions, and to schedule follow up calls or appointments. A small number of studies (n=5) described specific decision support solutions as a key component of the transitional care intervention. For example, Balaban et al<sup>42</sup> noted the feasibility of a low-cost structured discharge proforma to increase adherence with primary care appointments and the recommended follow up monitoring and investigations.

A study of a Discharge Decision Support System that shares standardised information with case managers reported a 26% relative reduction in readmissions at 30 and 60 days<sup>43</sup>. In contrast, a study of an electronic health record-based intervention that provided detailed information about drugs, interactions, dose changes, monitoring and alerts to the primary care provider's support staff found no difference in the rates of primary care visits or rehospitalisation<sup>44</sup>.

Embedding transitional care tools in standard patient health records systems and processes helped to facilitate the systematic spread of transitional care across multiple sites in a large health management organisation - with associated improvements in transitional care quality measures and reduced medication errors and readmission rates<sup>45</sup>.

### **4.3 Intermediate care at home**

The review identified forty-one studies of intermediate care delivered at home. Thirteen studies were conducted in North America, 11 in Europe, 12 in Australia or New Zealand, four in Singapore and one study in Thailand. All of the intermediate care at home services in the review combined

several interventions, commonly telephone advice and support for patients and carers, coaching and educational support for self-management and recovery, and coordination of follow up care from primary care providers and other specialists. Twelve studies included a specific focus on medication reconciliation and review.

Although several intermediate care at home interventions provided no evidence on reducing readmission rates<sup>46-50</sup> or length of hospital stay<sup>48</sup>, many other combined interventions demonstrated positive outcomes for short-term and long-term (re)hospitalisation rates<sup>51-59</sup>, ED visits<sup>55</sup>, quality of life<sup>51</sup>, and costs<sup>59</sup>.

In view of the significant heterogeneity between the studies of intermediate care at home, we classified the interventions according to their approach, components and focus.

#### **a) Uni-disciplinary support (n=12)**

Twelve of the studies classified as intermediate care at home involved a single professional, mainly nurses. Some of these studies report similar interventions to the transitional care group and may be considered as transitional care extending beyond the 30-day cut off that we used in our classification. The remainder describe time limited nurse led case management and educational interventions.

For example, coaching and support for self-management by a nurse coordinator was associated with increased quality of life and self-rated health at 4-6 weeks after discharge as well as reduced rehospitalisation and ED attendance<sup>60</sup>. A study comparing different skill mix in a nurse-led continuity of care programme for elders reported increased carer satisfaction associated with the advanced practice nurses<sup>61</sup>. Similarly, a study of extended transitional case management by an advance nurse practitioner reported a significant decrease in re-hospitalizations (45 vs. 60,  $p<0.041$ ) and total hospital days (252 vs. 351,  $p<0.032$ ) at three months; a short-term decrease of \$439 per member per month in total health care costs at three months; and cumulative per member savings of \$2170 at 1 year<sup>57</sup>.

## **b) Interdisciplinary support with rehabilitation (n=19)**

Almost half of the studies of intermediate care at home involved interdisciplinary rehabilitation to improve function and help the older adults regain independence in activities of daily living. Many adopted a comprehensive geriatric assessment approach and were physician or geriatrician led with allied health professionals, nurses and social care workers as part of the community team enabling early supported discharge, rehabilitation and recovery closer to home

An early example from the UK is the study of a home-based rehabilitation and care programme for up to four weeks for medical and surgical inpatients with mean age 80 years. The early supported discharge intervention was associated with fewer days in hospital, better function, extended Activities of Daily Living (ADL) and improved General Health Questionnaire scores at three months. Significant increases in Nottingham Extended ADL domestic and General Health Questionnaire scores remained at 12 months. The early discharge and rehabilitation service carers had better General Health Questionnaire scores at three months<sup>62</sup>.

In an RCT comparing in-hospital rehabilitation with early discharge rehabilitation at home for frail older patients in Australia, Caplan et al<sup>63</sup> reported that the early discharge intervention group had lower odds of delirium, decreased duration of rehabilitation, and reduced hospital utilisation. According to another Australian study by Courtney et al<sup>52</sup>, a combined nurse and physiotherapy intervention at home reported improvements in IADL scores. Similarly, a study by Miller et al<sup>64</sup> in England found that an early supported discharge and intensive community rehabilitation intervention employing a multidisciplinary approach reduced mean length of stay and led to improvements in ADL and psychological well-being.

## **c) Interdisciplinary support for recovery and self-management (n=10)**

The absence of a rehabilitation component in some studies of intermediate care at home contributes to the mixed outcomes observed for basic and instrumental ADL scores (ADL and IADL, respectively). In contrast to the studies that reported positive benefits of early supported discharge with rehabilitation, a RCT of a transitional care bridge programme delivered by a

transitional care nurse and geriatrician, without rehabilitation, showed no effect on ADL functioning but a decreased risk on the time to death within 6 months after hospital admissions<sup>65</sup>.

Around one half of the interdisciplinary programmes in the review did not include a rehabilitation component. These studies reported on combined interventions to enable recovery from acute illness, coordinate transition from hospital, and support self-management of chronic disease. Many of these services were based on time-limited case management approaches, usually by a trained nurse drawing on the expertise of a team of professionals. For example, Hernández et al<sup>66</sup> reported on the effectiveness of a hospital outreach service supported by a nurse, physician and telemedicine monitoring for over 4000 patients with exacerbation of chronic illness. The patients, carers and health professionals expressed high levels of satisfaction (98%) and the service reduced in-hospital days per patient by an average of six days.

#### **d) Crisis response or hospital admission avoidance (n=7)**

Another way to classify studies of intermediate care at home is whether the intervention included a crisis response that offered a rapid alternative to emergency hospital admission, sometimes described as admission avoidance hospital at home. Although most studies of intermediate care at home were of early supported discharge and home rehabilitation following hospital care, seven studies reported outcomes of a crisis response or hospital avoidance model, in some cases building on an established early supported discharge service.

For example, in 2017 Mas et al<sup>67</sup> reported on a quasi-experimental study of a CGA-based hospital at home intervention integrating acute care and rehabilitation for inpatients with an acute medical or surgical condition. The CGA-based hospital at home supported discharge programme showed better functional resolution and favourable crisis resolution with a reduction in hospital stay of 5.7 days compared to bed-based intermediate care. In a subsequent study published in 2018, the researchers reported that patients presenting to ED or day hospital with an acute exacerbation of chronic disease and managed by the Home Hospitalisation Unit as an alternative to hospital admission had lower 30-day readmissions to acute care and higher functional



resolution compared to patients admitted for bed based intermediate care. There were no significant differences in their 30-day mortality rates<sup>68</sup>.

Several Cochrane reviews<sup>69-71</sup> have reported outcomes for both early supported discharge and hospital avoidance hospital at home services. Cross-referencing of these studies resulted in inclusion of a further two hospital avoidance RCTs in this review. Harris and colleagues implemented a nurse-led multidisciplinary hospital at home intervention through a hospital outreach programme and reported increased patient satisfaction and decreased Caregiver Strain Index scores. They noted that hospital at home services were costly, but this was largely due to not operating the service at full capacity<sup>72</sup>. A pragmatic RCT by Wilson et al<sup>73</sup> reported that patients who received a hospital at home service found it more satisfying than hospital care since they perceived it as personalised and therapeutic. They also noted that caregivers indicated that relief from the duties of caring at home as a result of admission to hospital would be offset by the added strain of visiting the older persons in hospital.

#### **e) Setting for follow up**

All but one of the intermediate care at home services in the review provided home visits as part of the complex intervention. Follow up interventions provided by home visits during the post discharge period generally improved communication<sup>48</sup> and patient satisfaction with care<sup>74</sup>. In two studies, the outcomes of home visits were compared with outpatient clinic attendance. For example, secondary analysis of a cohort study data by Carnahan et al<sup>75</sup> revealed that home visits within a week following discharge from a skilled nursing facility (SNF) reduced the 30-day hospital readmission risk in contrast with outpatient provider visits.

The evidence for telephone follow up in transitional care is highlighted in section 4.2d. A study of intermediate care at home in which telephone follow up was more common than home visits reported increased use of healthcare and community care services following discharge<sup>46</sup>.

#### **f) Intermediate care for patients with specific needs (n = 6)**

This review excludes studies of transitional care or intermediate care for specific conditions as our particular focus is on services for older adults who are frail or have multimorbidity. However, several studies acknowledge that this care group may include adults who are cognitively impaired or need palliative care and suggest that transitional care and intermediate care services should be able to draw on staff with the relevant expertise. For example, a prospective study by Baxter et al<sup>76</sup> reported that a palliative care transition team for patients with palliative care needs being discharged from hospitals or SNFs improved communication with community providers and decreased readmission rates.

Naylor et al<sup>56,77</sup> studied the effects of three evidence-based interventions of varying intensity for hospitalised cognitively impaired older adults. The Transitional Care Model (TCM), delivered by a master's level nurse who followed the patient for up to two months post discharge, had a significant impact on rehospitalisation rates for six months following the index hospital discharge among cognitively intact older adults compared to the less intensive interventions by nurses with some training in cognitive impairment or by general nurses.

#### **4.4 Intermediate care in a community hospital, care home or post-acute facility**

Fourteen studies in the review reported the effectiveness of bed-based intermediate care. Eight of these studies were conducted in Europe in either community hospitals or residential care units with dedicated beds for rehabilitation. Five studies conducted in North America studied the effect of enhanced support for post-acute care delivered in skilled nursing facilities (SNF) or transitional care units. One RCT in Australia<sup>78</sup> studied the effectiveness of dedicated intermediate care beds within an acute hospital for a cohort of patients awaiting long term care.

The most commonly reported outcome was hospitalisation. Eleven of the 14 studies reported decreased index length of stay and fewer hospital days or readmissions. For example, although a controlled observational study found that discharge to an intermediate care hospital did not have a significant effect on activities of daily living, mortality, acute hospital readmissions, or primary healthcare utilization, the patients managed in the intermediate care beds spent fewer days in

hospital over 12 months<sup>79</sup>. Three of five studies with long term care as an end point reported reduced utilisation of long term institutional care<sup>80-82</sup>.

All the facilities studied were staffed by a mix of nurses, allied health professionals or social care workers and aimed to provide a recovery and rehabilitation ethos. However, the facilities differed in terms of the provider organisation, the timing of admission or transfer, and the level of specialist support available to the core staff. Therefore, the interventions were classified by the following factors.

#### **a) Interdisciplinary Assessment and Rehabilitation (n=11)**

Eleven of the fourteen studies involved interdisciplinary rehabilitation, either embedded in the facility or as in-reach support to augment the core staff. Most of these services included additional support from a physician (geriatrician or general practitioner) led interdisciplinary team, either on site or by telephone advice. These enhanced care models were generally associated with improved functional outcomes and reduced hospitalisation.

For example, a study by Blewett et al<sup>83</sup> reported significantly shorter length of stay and lower total hospital costs associated with telephone based medical consultations to enhance support for the on-site care team. In contrast, the RCT conducted by Garasen et al<sup>84,85</sup> involved an embedded physician led community hospital interdisciplinary team offering intermediate care closer to home and to existing social and care networks. This skilled physician-led interdisciplinary community hospital intervention was associated with greater independence and reduced need for community care after 26 weeks of follow-up, and reduced mortality at 12 months.

A cohort study by Goodwin et al<sup>80</sup> reported that higher quality SNFs that provided additional rehabilitation and recovery reduced the risk of admissions to long term care.

A retrospective analysis of interdisciplinary geriatric rehabilitation in a transitional care unit in hospital reported reduced inpatient costs as well as improvements in patients' ability to transfer, reduced length of stay, decreased hospital-acquired infections and antipsychotic prescriptions<sup>82</sup>.

### **b) Education and training for existing staff (n=3)**

Three of the studies of bed-based intermediate care considered the effectiveness of education for the core staff in the unit alongside transitional care support for patients in the units. A retrospective cohort study of a combined nurse practitioner and pharmacist education and medicine reconciliation intervention for 2394 patients discharged to a SNF reported decreased short term (30 days) and long term (up to 6 months) rates of hospital readmissions and emergency department visits<sup>86</sup>. Berkowitz and colleagues<sup>87</sup> reported that education and training for SNF staff coordinating discharge improved the preparedness of patients for discharge, increased compliance with primary care follow up appointments and reduced 30-day rehospitalisation rates.

### **c) Rapid Transfer from Acute Care (n=3)**

Three studies specifically addressed early transfer from acute hospital for intermediate care. These were conducted in different community settings. A RCT by Young et al<sup>88</sup> reported that early transfer to community hospital for older patients (mean age 86 years) with falls, incontinence, confusion or immobility, increased their Nottingham extended ADL score. Inzitari and colleagues<sup>89</sup> reported feasibility and positive outcomes for rapid transfer to an intermediate care hospital from the ED or from an acute medical unit after a mean stay of 2.6 days for selected older adults (mean age 82) with exacerbations of chronic disease. A parallel group randomised study from Norway reported improved independence, and reduced hospital and nursing home length of stay for older patients who had early transfer for intermediate care in a nursing home<sup>81</sup>.

### **d) Provider**

As indicated above, positive outcomes were reported from bed-based intermediate care in residential care units, local community hospitals, a specialised intermediate care hospital, and in skilled nursing facilities. None of the studies of bed based intermediate care directly compared the effectiveness of rehabilitation by different providers in different community facilities.

However, the nature of the provider may have implications for the costs of bed-based intermediate care. For example, a study of intermediate care in a social care led rehabilitation unit reported no aggregated NHS/social care cost savings over 12 months of follow up compared to usual community services. However, the authors identified potential 'see saw' cost shifts between providers as the cost of care in the residential care facility fell more heavily on Social Services compared to the costs for community services most of which were borne by the NHS<sup>90</sup>.

## 5. Strengths and limitations of the review

This systematic review was conducted by academics and clinicians from different disciplines and countries across Europe. The review considered all intermediate care and transitional care interventions and all levels of evidence. Since the search was not limited to English language, studies published only in French, Italian and Spanish were also reviewed enhancing the scope of the review. The data extraction was conducted by five reviewers with different backgrounds and from four countries, adding a wider interdisciplinary and international perspective.

The main limitation is the heterogeneous nature of the interventions which resulted in barriers to the synthesis of data and inability to conduct a meta-analysis. To mitigate this constraint, the data were classified according to the delivery setting and further explored according to the principal components delivered within the intervention in that care setting.

## 6. Discussion

In this report we analysed the effectiveness of a wide range of transitional care and intermediate care models in older adults. The studies were conducted in different care settings, applied different inclusion criteria and assessed a range of different outcomes such as function; quality of life; adverse events; ED attendances; re-hospitalisation; and healthcare costs. With such a heterogeneous set of studies it is hard to identify and describe a common pattern for effectiveness and value. The further classification of these services allowed us to unpack the results for four different models of care.

The small number of studies of **hospital based transitional care** reported mixed results in terms of reducing hospital readmissions, regardless of discipline conducting the planning and coaching intervention. The strongest evidence on effectiveness and costs was from a multidisciplinary Comprehensive Geriatric Assessment (CGA) approach.

Positive outcomes were observed in both hospital outreach and community based **transitional care interventions**. There is good evidence for positive patient experience self-rated health, self-efficacy and self-management but most of the system benefits were in reducing early readmissions to hospital and ED attendances. Telephone follow up enables higher volume at low cost but the evidence for transition clinics for older adults is limited.

The evidence for **intermediate care at home** is positive for both short-term and long-term (re)hospitalisation rates, ED visits, quality of life, and costs. Evidence is strongest for interdisciplinary supported discharge and rehabilitation at home and the benefits also include improved function. The evidence base for hospital avoidance hospital at home is encouraging but there have been a smaller number of empirical studies. In practice, some services provide both early supported discharge and hospital avoidance intermediate care at home, with selection of the appropriate option determined by the patient's clinical acuity, comorbidity and the availability of family caregiver support. They may start up as early supported discharge support and begin to offer crisis response and hospital at home alternatives to admission as they build capacity and expertise and develop confidence in managing clinical risk.

Studies of **bed based intermediate care** reported fewer hospital days or readmissions and three of five studies reported reduced long-term institutional care. There were no studies that directly compared intermediate care provided in a community hospital, residential care home, nursing facility or transitional care unit. Although there is no evidence to favour a particular setting or provider, enhanced specialist support for the core team seems to be effective.

Although few services in the review were specifically designed for older persons with frailty, many included elements of the effective model of care for frailty outlined in the SoAR:

- a single point of entry
- use of simple frailty specific screening tools in all care settings
- comprehensive assessment and individualised care plans
- tailored interventions by an interdisciplinary team in hospitals and community
- case management and coordination of support across providers
- effective management of transitions between care teams and settings
- shared electronic information tools and technology enabled care solutions
- clear policies and procedures for service eligibility and care processes.

### **Single point of entry**

Most services provided a single-entry point to multiple interventions that address different aspects of care and support: from discharge planning; patient and carer education; coaching advice and support for self-management; medicine reconciliation and review; navigation and coordination of follow up with the primary care provider or outpatient clinic; enablement and rehabilitation to promote independence; to palliative and end of life care.

### **Use of screening tools**

Many studies used simple screening tools to identify patients with complex needs who may particularly benefit from transitional care or intermediate care services: older adults with multiple morbidity, polypharmacy, living alone or with complex social circumstances. As this



cohort has a significant overlap with frail older adults, these studies offer transferable learning for the management of older persons living with frailty.

### **Comprehensive assessment and individualised care plans**

Many of the intermediate care services in the review applied a Comprehensive Geriatric Assessment approach with rehabilitation supported by personalised goal setting. Most transitional care interventions included patient education, coaching and support for self-management, particularly helping patients and carers understand and manage their medicines. Specialist support for medicine reconciliation and review are prominent in many studies, highlighting the need for collaboration between pharmacists, transitional care and intermediate care services to minimise adverse events and risk of harm associated with changes in prescriptions and inappropriate polypharmacy.

### **Tailored interventions by an interdisciplinary team**

Effective models are generally interdisciplinary, albeit sometimes with a specific case manager or coordinator allocated to the patient and their caregiver. Few of the transitional care studies included older adults with dementia or delirium. This raises important questions about how these models can be tailored to meet the particular needs of this growing caseload. The studies of intermediate care interventions were more likely to include patients with physical and cognitive impairment. There is little information about the provision or contribution of palliative care advice and support within either transitional care or intermediate care services.

### **Case management and coordination of support across providers**

Although most of the coordinating roles were undertaken by nurses with additional training, there is no clear evidence to support the case for a specific discipline as the lead professional for case management and coordination of support. Some nurse-led services were delivered by a skill mixed nursing team with examples of innovative models that have trained volunteers or students to work alongside the professionals and provide additional capacity to the service. Most community-based studies offered telephone advice or home visits to support patients and

families, but few studies were designed to compare different intensity and competencies of the professionals who delivered telephone support or home visits.

### **Shared electronic information tools and technology enabled care solutions**

Communication by telephone was widely used but use of electronic health records and patient held records was less well developed. Technology solutions may help across the pathway from home to hospital and transition to community. Technology solutions can help to identify individuals at higher risk, enhance communication with patients and carers, and improve continuity and coordination of care transitions between different professionals and levels of care. To date, few studies of intermediate care have exploited the emerging opportunities from remote monitoring, video consultations and professional to professional decision support.

### **Clear policies and procedures for service eligibility and care processes**

Service eligibility criteria were most often clinical complexity, risk of adverse outcomes, particularly early readmission, and a recognition of potential for functional recovery. Patients were identified by clinical triage or screening of electronic records. All services were time-limited, with transitional care generally available only for a few weeks and often administered as a prescribed bundle of interventions. The intensity and duration of intermediate care interventions was more often tailored to the needs of the individual.

## 7. Lessons for Member States

Although it is difficult to attribute impact in multiple complex interventions delivered across teams and care settings, there is clear evidence that transitional care and intermediate care can make an important contribution to a number of positive outcomes for older adults and for healthcare systems. Therefore Advantage JA MSs should include transitional care and intermediate care models as an important part of their Frailty Prevention Approach. However the development of these services must be carefully planned and adapted to the organisational and cultural context of the specific regions or MSs.

As for any complex intervention, there are many levers, barriers and enablers that need to be considered to understand ‘how’ to successfully contextualise, adapt and transfer transitional care and intermediate care models across care providers, care settings and health and social sectors. Successful implementation requires time and support to develop positive and trusting professional relationships and skills in effective team working. Therefore it is important to allow a realistic timescale for realising the anticipated gains from these services.

The review generates a set of principles that member states can use to develop their intermediate care approach. The principles that underpin effective intermediate care are:

- Delivered at home, if safe and appropriate, or as locally as possible
- Accessible, flexible and responsive through a single point of contact that operates for extended hours, seven days per week
- Target individuals who have recently lost function, are at higher risk of emergency admission, or re-admission, to hospital, or to avoid premature permanent admission to long term institutional care
- Comprehensive assessment and a focus on rehabilitation, reablement and recovery to maximise independence, confidence and the outcomes that matter to the individual
- Time limited, with person centred anticipatory care and discharge planning from day one

- Delivered by an interdisciplinary team with patients, caregivers and families as partners and in collaboration with primary care, community support, social care, care homes and specialist hospital services within an integrated health and social care system
- Service has sufficient capacity and appropriate expertise to manage individuals who have complex needs
- Workforce education and training that fosters trusting relationships between staff from different disciplines, care settings and sectors
- Clear governance, care standards and arrangements to monitor and report on the demand, activity, quality and outcomes of care
- Use of technology (electronic records, home and mobile health monitoring, video consultations, assistive living equipment, and digital tools to support self-management).

## 8. Conclusions

There is clear and growing evidence that many examples of transitional care and intermediate care are effective and can make an important contribution to many positive outcomes for older adults and for healthcare systems.

Several combined transitional care interventions are well evidenced, have been replicated beyond their index study, and can be readily adopted by MSs. Some components may be less critical in a more integrated system with good access to well developed primary healthcare. Although transitional care is a relatively low cost and potentially high volume intervention that can reduce preventable early readmissions for older adults, the impact of transitional care on outcomes such as function, independence and health and social care costs is not clear.

Intermediate care is a more complex and multidimensional intervention that combines transitional care interventions with support for rehabilitation and recovery and requires a higher degree of interdisciplinary and integrated working. There is strong evidence that intermediate care services can improve functional outcomes and reduce adverse events, including preventable early readmissions and premature admission to long term care. There is more evidence for

intermediate care delivered at home than for bed-based interventions. Intermediate care is a moderate cost, low volume intervention that has high impact in both short and medium term, particularly if delivered at home with an interdisciplinary team to enable independence and reduce harm.

Few studies have addressed the consequences of intermediate care on primary care activity, the need for long term community support, and the associated healthcare and social care costs. There is little information on the experience and outcomes of family and unpaid caregivers. More studies are required to address these research gaps.

## 9. Annexes

### Annex 1: Delphi Study and Consensus Statements

#### Methods

A two-round electronic Delphi study was conducted, followed by two virtual consensus meetings. The first Delphi survey contained 28 high level statements generated from analysis of definitions extracted from the systematic review. Using a five-item Likert scale, experts were asked to indicate whether or not they agreed with the statements. Statements were included in the next stage if 70% or more participants scored the statement as agree/completely agree and less than 15% of participants scored it as completely disagree / disagree.

#### Participants

A total of 55 experts from 17 countries (Greece, Spain, Italy, Mexico, Austria, Ireland, Scotland, England, Malta, Singapore, New Zealand, Argentina, Canada, USA, Denmark, Finland, and The Netherlands) were invited to participate in the Delphi surveys. Experts were actively involved in policy, research, audit or expert practice in frailty, intermediate or transitional care services. To achieve a wider consensus, the invitation to the virtual meeting was extended to members of the International Foundation for Integrated Care Special Interest Group on Intermediate Care.

#### Results of Delphi Rounds

A total of 27 experts from 13 countries (Greece, Spain, Italy, Mexico, Austria, Ireland, Scotland, England, Malta, Argentina, Canada, USA, and Finland) responded (response rate 49%). Responses to 21 statements in Round 1 met the criteria to progress to Round 2. These were revised to form 18 statements. Twenty-three experts participated in Round 2 (response rate 85%). Two of the 18 statements were excluded on the basis of insufficient consensus between experts. The results of Round 2 were discussed in the virtual consensus meetings.

#### Virtual consensus meetings

The morning meeting involved nine people (one Delphi participant, three external experts, a patient advocate, and four research team members). The afternoon session involved eight people (one Delphi participant, two external experts and five research team members). Through discussion, the number of statements was reduced to 11.

The researchers further edited the statements to reduce duplication and to reflect the oral and written comments by the experts in the surveys and the virtual meetings. These revisions reduced the final number of statements to 10.

Delphi survey participants and external experts have endorsed the following definitions and principles:

## Definitions and Purpose

Intermediate care and transitional care are a broad range of time limited services, from crisis response to support for several weeks or months, that aim to ensure continuity and quality of care and promote recovery at the interface between hospital and home, care home, primary care and community services.

**Intermediate care**, at home or in intermediate care beds, aims to enable recovery, restore independence and confidence, or prevent a decline in functional ability at times of change in health.

**Transitional care** services are a subset of intermediate care designed to enable safe, coordinated and timely transfers between care settings.

## Who may benefit?

These services may particularly benefit persons who have complex support needs or circumstances, are vulnerable to a decline in health status or functional ability, or are at increased risk of (re)admissions to hospital or long-term care.

## What is the approach to care?

Both transitional care and intermediate care are based on principles of holistic comprehensive assessment; person-centred care planning; education for patients, family and caregivers; support for self-management (including nutrition and medication management); and continuity and coordination of care. The use of a reablement approach and interdisciplinary rehabilitation has a specific role for persons who have experienced a decline in functional ability.

The nature, duration and intensity of the multi-dimensional interventions are tailored to the needs of the individual, in collaboration with their family and caregivers, and may involve a case management approach for the duration of the episode.

Health and care workforce should adopt relational approaches, creative solutions and simple technologies that enable and support patients, their families and caregivers to be fully involved in care planning, goal setting and monitoring from early stages.

## How should the services be organised?

Intermediate care is best delivered by an interdisciplinary team within an integrated health and social care system that links different providers and levels of care in a collaborative network of care and support that includes partners from community and voluntary sectors.

A single point of contact helps to optimise service access, communication and coordination of care.

To be effective, intermediate care services should have sufficient capacity and responsiveness, appropriate expertise, clear governance arrangements, and opportunities for education and training to support the team members to work collaboratively and to continually improve service quality and outcomes for people and care systems.

## Annex 2: Ad hoc template for data extraction

### 1. Information about the article

**Record no**

**Authors**

**Title**

**Country**

#### Eligibility criteria

Inclusion criteria

The article is published

In English, French, Italian or Spanish

Yes

☐

No

☐

Between 2002 and 2019

Yes

☐

No

☐

The publication aims at

Evaluating outcomes of a transitional or intermediate care intervention

Yes

☐

No

☐

The publication

Clearly reports an intervention

Yes

☐

No

☐

(Optional)

Yes

☐

No

☐

Addresses definition of transitional or intermediate care

First step conclusion

The publication fulfils the whole inclusion criteria

Yes

☐

No

☐

**Stop here in case of “non-eligibility”**



## 2. Information about study

### 2.1. Study design

Study description
Model/system/ policy/intervention
Use of technologies and electronic health records
Setting
Participants
Health condition/problem
Organizational structure and governance

### 2.2 Results

Results
Outcomes - user / carer experience, functional ability, reduced/prevented hospitalisation/ institutional care, costs

### 2.3

Lessons learned
Transferrable lessons for practice and policy
Resource implications (such as cost and staff)
Barriers to the intervention or limitations

### 2.4 Conclusion of the authors

Conclusions
Key recommendations/messages
<b>Your comments</b>
Insert here:

### Annex 3: Characteristics and effectiveness of the included studies

Summary of study				Main Components of Intervention					Key Positive Outcomes				
Lead Author Year Country	Design Intervention cohort	Patients (Mean age)	Intervention Interdisciplinary *	Patient / Carer Education	Telephone Support	Home Visits	Rehab	Medicines review	Function or ADL	ED Visits	Hospital stay	Institutional care	Costs
Mudge 2006 AUS	Prospective control Total = 1538	Medical units (74)	* mobile specialist team	√			√		√		NS		
Midlov 2008 SWED	Quasi- experimental N=248	65+ Medical discharges to community	Medication reconciliation and report at discharge	√				√					
Hwang 2018 USA	Prospective observational N=5930	ED attenders aged over 65	ED transitional care nurse assessment	√							√		
Dedhia 2009 USA	Pre and post N= 185	Medical discharges (77)	* 5 STEPS team transitions worksheet	√				√		√	√		
Legrain 2011 FRA	Pragmatic RCT N=317	Acute geriatric care (86)	* specialist team coordination, self- management advice, medicines review	√				√		√	√		√
Epstein- Ludlow 2014 USA	Quasi experimental Control N=482	Medicare 65+ with family caregiver	Pre discharge coaching of family caregivers	√									
Adler 2009 USA	Prospective control N=156	Inpatients with special needs (64.5)	Social worker review and advice pre discharge	√							√		√
Steeman et al 2006 USA	Quasi experimental N=355	Medical and geriatric rehab, 60+	Nurse or Social worker led advice and planning	√							NS	√	

Bowles 2014 USA	Quasi-experimental N=252	55+ high risk (69)	Decision Support info for case managers		√						√		
Park 2013 USA	Pre and post N= 217	65+ veterans in SNF	* Nurse & geriatrician review + clinic / phone follow-up	√	√			√		√	√		
Nadash 2013 USA	Non-randomised control N=69	Multimorbid	Modified Care Transitions Intervention	√	√					NS	NS		
Cho 2015 USA	Observational study N=121	Discharges (71.5)	* Home delivered meals + meds reviews	√	√	√		√			√		
Houlahan 2017 USA	Pilot N=863	Medical discharges	Nurse led CTraC Coordinated-Transitional Care	√	√	√		√			√		
Kind 2016 USA	Non-randomised control N=964	High risk medical (77)	CTraC Coordinated-Transitional Care	√	√	√		√			√		√
Misky 2010 USA	Prospective cohort N=65	Medical (62.4)	Primary Care medical follow up		√						√		
Baldwin 2018 USA	Pilot N=75	Hospital discharges	* Early MDT review at post discharge clinic	√	√			√			√		√
Biese 2018 USA	RCT N=974	65+ ED discharge	Scripted telephone call by nurse after ED	√	√			√		NS	NS		
Atfeld 2013 USA	RCT N=360	At risk (74.5)	Social work telephone support		√						NS		
Gurwitz 2014 USA	RCT N=1870	Discharges (79)	Electronic automated alerts to PC team								NS		
Holland 2015 UK	RCT N=429	80+, 2+ drugs, going home	Pharmacists follow up and home visits	√	√	√		√			NS		
Melton 2012 USA	RCT N=1994	High risk (50)	Telephone-based case management	√	√						√		√
Naunton 2003 AUS	RCT N=57	High risk (74)	Pharmacist visits post discharge	√	√	√		√			√		
Rytter 2010 DMK	RCT N= 148	Discharges (84)	* Post discharge GP and nurse visits	√	√	√		√			√		√
Wong 2008 H Kong	RCT N= 166	Discharges (72.5)	Education and follow up visits	√	√	√					NS		

Wong 2014 H Kong	RCT N= 400	Discharges (76.5)	Nurse post discharge calls and home visits	√	√	√					√		
Beck 2012 DMK	Single blind RCT N= 73	Geriatric (72)	Dietician support post discharge	√	√	√			√		NS		
Farrell 2015 USA	Retrospective N=118	Multimorbid (58)	Care manager within primary care	√	√						√		
Costantino, 2013 USA	Retrospective N=48,538	Medicare (71.6)	Nurse led Telephone follow up	√	√					√	√		√
Weerahandi 2015 USA	Retrospective control N=579	Discharges (63.8)	Social worker led PACT Preventable Admissions Care Team program	√	√	√					√		√
Brock 2014 H Kong	ITS Populations	Medicare –14 areas	Quality improvement transitions support	√	√			√			√		
Shu 2011 H Kong	Pre / post N=219	Hospitalist cases (69)	* Transitional care and MDT clinic review	√	√						√		
Robinson 2015 FRA	Observational ITS N=2486	High risk (65+)	* MDT coordination pre / post discharge	√	√			√		NS	NS		
Basso lipani 2015 DMK	Retrospective N=620	High risk discharges	Social work led PACT programme	√	√	√				√	√		
Burns 2014 USA	Pilot study N=110	Older medical inpatients	Community Health worker transitions	√	√						NS		
Koehler 2009 USA	Pilot RCT N= 21	High risk (70+)	* Care manager & pharmacist	√	√			√		√	√		
Rice 2016 USA	Pre/ post N= 18,443	Population at high risk (54)	* Embedded care bundle and clinic appointments system	√	√			√			√		
Kind et al 2012 UK	Pre/ post N=605	65+ or high-risk	Nurse transition case manager	√	√			√			√		
Welch 2018 UK	Pre / post N=65	Chronic disease (69)	* MDT transitions and student coaches	√	√	√		√			√		
Hendrix 2013 USA	Pre / post N=47	High risk veterans	Nurse led transitional care	√	√	√		√			√		
Carter 2015 USA	Pre/ post N=2620	High risk (72.5)	* Discharge nurse and pharmacist	√	√			√			NS		

Baldwin 2014 USA	Prospective observational N=72	High risk discharges	Nurse specialist follow up	√	√						√		
Ohuabunwa 2013 USA	Pre/ post N=69	Chronic disease (65)	Care transition coaches	√	√			√		NS	NS		
Heidenreich 2016 USA	Controlled ITS N=59	Heart Failure (71)	* Hospital 2 Home meds rec; education and early clinic	√	√			√			√		
Brand et al 2004 AUS	Quasi experimental N=83	Medical (77.5)	Nurse led case management & clinic	√	√					√	√		
Voss et al 2011 USA	Quasi experimental N= 257	Medicare Inpatients	Nurse or social worker coaches	√	√			√			√		
Cowen 2006 USA	Quasi experimental N=581	Acute geriatric	* Nurse and physician rounds and follow up	√	√						√		√
Jenq 2016 USA	Quasi experimental N=10,621	High risk (80)	Education, meds reconciliation and follow up calls	√	√			√			√		
Balaban 2008 USA	RCT N=47	Community hospital (58)	Discharge Form and nurse advice call	√	√								
Englander 2014 USA	Cluster RCT N=209	Uninsured low-income	* Nurse and pharmacist coaching,	√	√	√		√		NS	NS		
Coleman 2006 USA	RCT N=158	Inpatients (76)	Transition coach and meds reconciliation	√	√	√		√			√		
Finn 2011 USA	RCT N=440	General wards (68)	Nurse practitioner discharge facilitator	√	√					√	√		
Forster 2005 CAN	RCT N= 307	Medical (69)	Nurse coordination and follow up	√	√						NS		
Goldman 2014 USA	RCT N= 700	Low income (66)	Nurse led education, phone calls	√	√					NS	NS		
Jack 2009 USA	RCT N= 749	English speaking (50)	Nurse education, meds review	√	√			√		√	√		
Chow 2014 H Kong	RCT N=281	2+ chronic diseases (76)	Self-management education & support	√	√	√					√		

Lim 2003 AUS	RCT N=311	Acute care (76.5)	Nurse or allied health care coordinator	√	√						√		
Schnipper 2006 USA	RCT N= 92	General (61)	Pharmacists review, education and calls	√	√			√					
Wong 2011 H Kong	RCT N=555	General (77)	* Community nurse + volunteer education	√	√	√			√		√		
AHRQ 2012 USA	RCT N= 370	High risk, 7+ meds (75)	Social worker assessment / review	√	√						√		
Wong 2012 H Kong	RCT N=272	General inpatients	* Nurse case manager and trained volunteer	√	√	√			√		√		√
Tuso 2012 USA	Retrospective N= 13 sites	High risk discharges	* Kaiser Permanente Transition bundle	√	√			√			√		
Xiang 2018 USA	Retrospective N= 586	Super utilisers high risk (65)	Social work based 30-day transitional care	√	√					√	√		√
Boutwell 2018 USA	Retrospective N= 6824	Medicare 50+ going home	Social work Bridge assessment & calls	√	√						√		
Wilcox 2018 USA	Retrospective N= 842	High risk Medicare	ComPASS case manager coaches	√	√				√		√		
Gil 2013 USA	Retrospective N=100	Older inpatients	* Daily MDT rounds, pharmacist review, social worker calls	√	√			√			√		
Boutwell 2016 USA	Retrospective N= 1546	Medicare 50+ going home	Social work-based Bridge transitional care and calls	√	√						√		
Hanson 2013 USA	Pre / post N= 11 sites	Hospital sites in project	Discharge checklist and follow up calls	√	√						√		
Lenaghan 2018 USA	Pilot pre/ post N=25	Sub acute illness (79)	* Pre / post discharge nurse visits with MDT	√	√	√		√					
Tang 2014 USA	Observational cohort N= 790	Medicine discharges	Nurse led calls in Primary Care	√	√								
Ballard 2018 USA	Retrospective N= 1884	Discharges (52.9)	Nurse / medical assistant coordination	√	√	√					√		
Chakravarthy 2018 USA	Retrospective cross section N=127	Transition clinic (49)	* Post discharge MDT transitions clinic		√						√		

Newcomer 2006 USA	RCT N=32	New in care home (60)	PACT case manager and follow up	√	√							NS	
Yu 2017 USA	Retrospective N=139	Discharges (60)	* interdisciplinary discharge clinic	√	√			√			√		
Kranker 2018 USA	Observational cohort N= 638	Medicare fee-for-service (FFS) beneficiaries	Nurse coordination and advice	√	√			√					√
Arbaje 2010 USA	Pilot cohort N= 366	Inpatients (79)	* Mobile CGA and follow up calls	√	√			√					
Coleman 2004 USA	Quasi exp N= 158	65+ high risk	Nurse coordination and calls	√	√			√			√		
Galbraith 2017 USA	RCT N= 448	Multimorbid, high risk (67)	Community Health worker / navigator	√	√								√
Lovelace 2016 USA	Retrospective N= 346	Veterans going home	* nurse and pharmacy support	√	√	√		√		√	√		√
Hernández 2018 SPAIN	Prospective N=4,165	Acute on chronic (71)	* early supported discharge to home	√	√	√		√			√		
Comans 2015 AUS	Prospective observational N=351	Multimorbid + orthopaedic	* Post discharge rehab and support	√	√	√	√				√	√	
Parsons 2018 NZ	RCT N= 97	Recent loss of function (80)	* Supported Discharge Team	√	√	√	√				√		√
Williams 2017 UK	Retrospective N=1710	Older, post-acute needs	* Intensive support community team	√	√	√	√				√		
Young 2005 UK	Pre / post cohort N=848	Geriatric (83)	* MDT assessment and care at home	√	√	√	√		√		√	√	
Armstrong 2008 CAN	Observational control N= 44	Acute illness hospital need	* Home based alternative to hospital	√	√	√	√	√			NEG		
Ornstein 2011a USA	Pre / post N= 532	Medicare (81) homebound	* Nurse practitioner in primary care team	√	√	√					NS		
Heppenstall 2018 NZ	Prospective observational N=224	Discharges (82)	* Community rehab Team	√	√	√	√				NS		
Naylor 2014 USA	Pre/ post N= 202	Cognitively impaired (80)	Transitional care for up to 2 months	√	√	√		√			√		

Mas 2017 SPAIN	Quasi experimental N = 244	Acute illness (83)	* Hospital at home post-acute care	√	√	√	√	√	√		√		
Buurman 2016 NL	RCT N=674	Internal medicine (80)	* In-reach nurse and geriatrician follow up	√	√	√		√	NS				
Caplan 2004 AUS	RCT N=370	ED discharges (82)	* Outreach CGA and follow up		√	√			√		√	NS	
Courtney 2009 AUS	RCT N=58	Medical at risk (79)	* Nurse and physio, Exercise programme	√	√	√	√		√				
Courtney 2012 AUS	RCT N=58	Medical at risk (79)	* Nurse and physio, Exercise programme	√	√	√	√		√		√		
Cunliffe 2004 UK	RCT N= 185	Medical and surgical (80)	* Early discharge home rehabilitation		√	√	√		√		√		
Finlayson 2018 AUS	RCT N= 167	Medical at risk, (77.6)	* Exercise and / or nurse follow up	√	√	√	√				√		
Lee 2015 SING	RCT N=419	General (68)	* MDT and early clinic review	√	√	√				NS	NS		
Sahota 2017 UK	RCT N=125	Frail acute care, (86)	* MDT planning, education and rehab	√	√	√	√				NS		
Shah 2018 USA	RCT in 422 subjects	Hospital ED attenders (71)	Paramedic coaching, meds reconciliation	√	√	√		√					
Wee 2014 SING	Retrospective N=4132	High risk inpatients	Care coordinator for up to 2 months	√	√	√				√	√		
Morrison 2016 USA	Retrospective N - 138	palliative care needs (69 -81)	* Specialist palliative transitional care	√	√	√		√		√	√		
Carnahan 2017 USA	Sec. analysis N=1534	Discharges from SNF	Early follow up of discharges from SNF	√	√	√					√		
Peel 2014 AUS	Prospective N= 351	Discharges (79)	* Case management & home rehabilitation	√	√	√	√		√				
Brooks 2003 UK	Documentary review N= 57	Older at risk	* Rapid Assessment Support Service		√	√					√		
Jeansawang 2012 THAI	Mixed N = 100	Chronic illness (77)	Nurse led education and care coordination	√	√	√			NS				
Hawes 2018 USA	Pre/ post N=268	At risk Patient medical home	Care coordination & liaison with acute	√	√	√		√		√	√		
Peel 2014 AUS	Prospective cohort = 364	Discharges (79)	* Post discharge rehab up to 3 months	√	√	√	√	√	√			NS	



Naylor 2014 USA	Quasi experimental N=172	Homecare or palliative (76)	Case management for up to 2 months	√	√	√					√		√
Parry 2009 USA	RCT N=49	Senior care clinic (85)	Transition coach post discharge	√	√	√					√		√
Low 2017 SING	RCT N=420	Discharges at high risk (70)	* Care coordination in virtual ward by MDT	√	√	√		√			√		√
Leng low 2017 SING	Retrospective cohort N=541	Discharges (79)	* Post-acute MDT led case management	√	√	√		√		√	√		
Bellon 2019 USA	Retrospective N=1900	Primary care at risk (72)	* MDT care plan, coach, coordination	√	√	√				NEG	√		
Naylor 2014 USA	Pre / post N=66	65+ cognitive impairment	Nurse case manager and home follow up	√	√	√					√		
Naylor 2016 USA	Pre/post N= 205	65+ cognitive impairment	Nurse case manager and home follow up	√	√	√					√		
Berry 2011 USA	Prospective cohort N= 84	Medicare discharges	Nurse led case management	√	√	√				NEG	√		
Baxter 2018 USA	Prospective study N =896	Palliative care - hospital/SNF	Nurse led education and liaison	√	√						√		
Mas 2018 SPAIN	Quasi experimental N=171	ED / day hospital (85)	* Home hospital unit v intermediate bed	√	√	√	√	√	NS		NS		
Miller 2005 UK	RCT N=185	For rehabilitation at home (80)	* Early supported discharge and community rehab	√	√	√	√		√		√		√
Caplan 2006 AUS	RCT N=104	For geriatric rehab (84)	* Hospital in the Home (early discharge) rehab	√	√	√	√				√		√
Harris 2005 NZ	RCT N=285	Acute medical (80)	* Hospital-at-home Hospital avoidance	√	√	√	√						NEG
Wilson 2002 UK	Pragmatic RCT N=102	Acute care needs (84)	* Hospital-at-home Hospital avoidance	√	√	√	√						
Garåsen 2008 NORW	RCT N=72	Community hospital (80.6)	*Transfer to community hospital	√	√		√	√	√		NS		
Garåsen 2007 NORW	RCT N=72	Community hospital (80.6)	* Transfer to community hospital	√			√	√	√		√	NS	

Ellis 2006 UK	Retrospective N= 94	New support needs (83.1)	* Social care led rehabilitation unit	√			√				√		NS
Trappes- Lomax 2005 UK	Quasi experimental control, N= 94	Potential for recovery (82)	* Post-acute rehab in NHS/ social care residential unit	√			√		NS		√		
Young 2010 UK	RCT N=234	Geriatric (86)	* Early transfer to community hospital	√			√	√	√				
Rosen 2017 USA	Retrospective N=2394	SNF for post- acute care	* Pharmacist and nurse in-reach to SNF	√	√			√			√		
Inzitari 2011 SPAIN	Cohort N= 68	ED or acute care (86.2)	* Rapid transfer to intermediate hospital	√			√	√	√		√		
Crotty 2005 AUS	RCT N= 212	Waiting long term care (83)	* Acute hospital MDT intermediate care	√			√	√			√	NS	
Herfjord 2014 NORW	RCT N=376	Post-acute recovery (84)	*Early transfer to post-acute rehab unit	√			√	√	√		√	√	
Berkowitz 2013 USA	Pre / post N=100	Admissions to SNF (80)	Transitions education and support to team	√	√						√		
Blewett 2010 USA	Retrospective N= 175	Transitional Care Unit	* Medical and pharmacy in-reach	√	√			√			√		√
Manville 2014 CAN	Pre/ post N=86	Post-acute care (86)	* Transitional care unit rehabilitation	√			√	√	√		√	√	√
Goodwin 2018 USA	Cohort N=552,414	Discharged to SNFs	* SNF based post- acute rehabilitation	√			√					√	
Dahl 2015 NORW	Non- Randomised controlled N=110	Transfers to intermediate care beds (60)	* Post-acute care in local Intermediate care hospital	√			√	√	NS		√		

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## Glossary

**Care coordination:** a proactive approach to bringing together care professionals and providers to meet the needs of service users to ensure that they receive integrated, person-focused care across various settings.

**Case management:** a targeted, community-based, proactive approach to care that involves case finding, assessment, care planning and coordination to integrate services to meet the needs of people with long-term conditions.

**Chronic condition:** a disease, disorder, injury or trauma that persists or has long-lasting effects.

**Comprehensive geriatric assessment:** a multidimensional assessment of an older person that includes medical, physical, cognitive, social and spiritual components; may also include use of standardised assessment instruments and interventions delivered by an interdisciplinary team.

**Continuity of care:** the degree to which a series of discrete health care events is experienced by people as coherent and interconnected over time and consistent with their health needs and preferences.

**Functional ability:** the ability to perform activities of daily living, including bathing, dressing, and other independent living skills, such as shopping and housework.

**Frailty:** a geriatric syndrome which can be regarded as a progressive age-related deterioration in physiological systems that results in extreme vulnerability to stressors and increases the risk of a range of adverse outcomes including care dependence and death.

**Interdisciplinary:** integrating approaches, knowledge and methods from different disciplines working together

**Intrinsic capacity:** the composite of all the physical and mental (including psychosocial) capacities that an individual can draw on at any point in time.

**Long term care:** the activities undertaken by others to ensure that people with a significant ongoing loss of intrinsic capacity can maintain a level of functional ability consistent with their basic rights, fundamental freedoms and human dignity.

**Multimorbidity:** the co-occurrence of two or more chronic medical disorders in one person that can lead to interactions; between one disorder and treatment recommendations for another; and between drugs prescribed for different disorders.

**Polypharmacy:** simultaneous administration of multiple drugs (medication) to the same person.

**Reablement:** a short and intensive service, usually delivered in the home, to enable persons who have experienced deterioration in their health and/or have increased needs to relearn the skills required to keep them safe and independent at home.

**Self-management:** the successful outcome of the person and all appropriate individuals and services working together to support him or her to deal with the very real implications of living with one or more chronic conditions.