

# Safer care for frail people

Rapid research review

# EXECUTIVE SUMMARY

## SCOPE

The NHS strives to provide safe, high quality care for all. There are special challenges associated with caring for frail older people. Older people are more likely to use health services and more likely to experience healthcare-associated harm. Frailty refers to having decreased reserve and resistance to stressors. UK research suggests that about 14% of people aged over 60 may be frail and about 65% of those aged over 90 may be frail. Improving the safety of care for frail older people may be of particular importance, given that even small incidents can have significant impacts on these people's physical and psychological health.

The Eastern Academic Health Science Network is supporting a quality improvement collaborative to enhance the safety of care for frail people. The collaborative is focusing on:

- improving medicines safety
- improving transfers of care
- identifying and responding to deterioration

To support the quality improvement collaborative, this rapid review compiles empirical research about initiatives that have been tested to improve medicines safety, transfers of care or identifying and responding to deterioration in frail people.

To identify empirical research, two reviewers from an independent organisation searched 20 bibliographical databases for published and grey literature. In total 5,722 potentially relevant articles were read and 131 were selected for summary in the review. The majority of the research was from North America, involved non-experimental study designs and focused on ways to prevent or identify deterioration.

## MEDICINES SAFETY

Twenty-four studies focused primarily on ways to improve medicines safety for frail older people. Most of these were from North America (33%) and Asia and the Middle East (17%). The most commonly tested approaches included:

- educating prescribers
- checklists, dashboards and other tools
- audit and feedback
- computerised systems and alerts
- medicines reconciliation by pharmacists
- educational interventions for patients

The three initiatives with most evidence of effectiveness were:

1. **Checklists**, dashboards and other tools to reduce potentially inappropriate medications, sometimes combined with audit and feedback. Checklists, including those used for medicines reconciliation have been tested in primary care and hospital. They are often developed in partnership with pharmacists and may take the form of electronic or paper tools.
2. **Alerts** for prescribers. These have been tested in primary care and hospital. They are usually delivered using computerised decision support tools and implemented by doctors and pharmacists. However alert systems are not always sensitive or tailored towards the needs of frail older people.
3. Integrating **pharmacists** as part of the care team. This has been tested in primary care and hospital. Pharmacists and pharmacy technicians have been found to help with medication reconciliation and can identify potentially inappropriate medications and drug interactions.

## SAFER CARE TRANSFERS

Seventeen studies focused primarily on ways to improve the safety of transfers between care settings for frail older people.

The most commonly researched initiatives included:

- education for professionals
- direct admission to elderly care wards
- discharge plans, care pathways and protocols
- discharge planners or flow managers
- follow-up of patients after hospital discharge

The three interventions where there was most evidence of effect were:

1. **Standardised transfer forms and tools.** This includes checklists and plans for use when transferring to and from hospital. These have been implemented in primary care, care homes and hospitals. They are usually used by nurses and doctors.
2. **Specific wards for elderly people.** Specialist wards for frail and elderly people have been implemented in hospital. This includes care by specialist nurses and geriatricians. Some studies have tested allowing direct transfers to such wards rather than admission via A&E.
3. **Written or group education for professionals.** This has been tested in primary care, care in the community, care homes and hospitals. Often it involves multiprofessional learning, though uniprofessional education has also been found to be effective with nurses and doctors.

## DETERIORATION

Ninety studies focused primarily on ways to prevent, identify or respond to deterioration in frail older people.

The most commonly researched initiatives included:

- risk identification and assessment tools
- falls prevention strategies such as exercise therapy
- telehealth and assistive technologies
- nurse visits
- multiprofessional teams

The three interventions where there was most evidence of effect were:

1. **Comprehensive geriatric assessment** and other tools for identifying risk and potential deterioration. This has been tested in people's homes, in primary care, in the community, in care homes and in hospital. Usually it is undertaken by a nurse or junior doctor.
2. Ongoing **monitoring**, including via telehealth and nurse home visits. This has been tested in people's own homes and in care homes. Usually telemonitoring data are reviewed and followed-up by nurses.
3. **Exercise therapy programmes.** These have been tested in people's homes, in the community, in care homes and in hospital. Usually they are facilitated by occupational therapists or physical therapists. They have been found to improve strength and reduce the risk of falls.

## KEY POINTS

A great deal has been published about medicines safety, transfers of care and deterioration, but relatively little of this is empirical research amongst frail older people.

The research that does exist tends to come from North America and most uses cross-sectional study designs, often at single centres.

Bearing in mind caveats regarding the quality and quantity of evidence available, the review suggests there are interventions with potential targeting patients, professionals and to a lesser extent organisations and systems. Table 1 summarises key evidence about these interventions.

The most promising interventions across the three priority areas and those that may be transferable across care settings include:

### *Interventions targeting patients and carers*

- tools to identify frailty, screen for risks and plan to address needs
- telehealth monitoring
- nurse home visits and follow-up calls
- exercise programmes

### *Interventions targeting professionals*

- education
- audit and feedback
- computerised decision support / alerts
- involving pharmacists in care teams

There may be less evidence about other interventions but this does not mean that they are not effective, only that less empirical research is available about them.

Regardless of the specific initiatives implemented, the review identified key factors that may influence the success of safety improvement interventions for frail people. These include:

- **working across sectors**, spanning primary and secondary care, social services and care homes
- working with **multidisciplinary teams**, including pharmacists, GPs, practice nurses, hospital doctors and nurses, healthcare assistants, therapists and social workers
- providing **very specific information** to clinicians and teams about the improvements needed
- **including frail people and their carers** as integral components of the care and improvement team
- ensuring **leadership buy-in** and engagement across participating organisations
- using a **structured approach** to change management
- **sharing successes** and developing learning across networks
- recognising that **change takes time** and allowing initiatives time to embed rather than expecting immediate improvements in outcomes
- **combining interventions** into simple 'bundles' of changes that target at the level of patients, professionals, organisations and health and care systems

**Table 1: Interventions with most evidence of effect for improving the safety of care for frail older people**

Approach	Description	Settings tested	Staffing	Evidence level
<b>Medicines safety</b>				
Checklists	Checklists or guides to reduce potentially inappropriate medications, may be used in conjunction with audit and feedback	Primary care Hospital	Doctors Pharmacists	Limited quality and quantity
Alerts	Alerts or reminders for prescribers issued via computerised decision support systems	Primary care Hospital	Doctors Pharmacists	Medium quality and quantity
Pharmacists	Involving pharmacists or pharmacy technicians as part of the care team to support medication reconciliation	Primary care Hospital	Pharmacists Pharmacy technicians	Medium quality and quantity
<b>Care transfers</b>				
Standardised forms	Standardised checklists, protocols and guides to support transfer to and from care settings and ensure information is available to professionals	Primary care Care homes Hospital	GPs Care home staff Hospital nurses Hospital doctors	Limited quality and quantity
Elderly care wards	Specialist hospital wards for frail and elderly people, with a focus on improved quality of care and care transitions	Hospital	Hospital nurses Geriatricians	Limited quality and quantity
Education	Written information and group training sessions for professionals focused on improving care transfers	Primary care Care in the community Care homes Hospital	Multiprofessional learning	Medium quality and quantity
<b>Deterioration</b>				
Risk identification tools	Tools for identifying risk, deterioration and needs including comprehensive geriatric assessment	People's homes Primary care Care in the community Care homes Hospital	Nurses Junior doctors	Medium quality, large quantity
Ongoing monitoring	Monitoring of vital signs and deterioration, including using telehealth and nurse visits	People's homes Care homes	Primary care, community and hospital nurses	Medium quality, large quantity
Exercise therapy	Exercise and nutritional therapy programmes to promote strength and reduce frailty, particularly focused on falls prevention	People's homes Care in the community Care homes Hospital	Occupational therapists Physical therapists	Medium quality, large quantity

# CONTENTS

---

<b>IDENTIFYING EVIDENCE</b>	<b>7</b>
Context	7
Reviewing evidence	8
Evidence included	9
<b>MEDICINES SAFETY</b>	<b>11</b>
Key points	11
Care at home	11
Primary care	12
Community care	14
Care homes	14
Hospital care	15
Summary	17
<b>SAFER CARE TRANSFERS</b>	<b>18</b>
Key points	18
Transfer to hospital	18
In-hospital transfers	19
Transfer from hospital	20
Summary	22
<b>DETERIORATION</b>	<b>24</b>
Key points	24
Care at home	24
Primary care	26
Community care	26
Care homes	29
Hospital care	31
Summary	35
<b>IMPLICATIONS</b>	<b>37</b>
Effective interventions	37
Key success factors	39
<b>REFERENCES</b>	<b>40</b>

# IDENTIFYING EVIDENCE

## CONTEXT

In the UK people are living longer than ever before. The proportion of people aged 80 and above is growing the fastest of all age groups. There are currently about three million people over 80 and this is expected to double by 2030.<sup>1</sup>

Advancing age is associated with frailty, meaning that people have 'limited functional reserve'.<sup>2</sup> Frail older people tend to have multiple conditions, take many medications and may have sensory and cognitive impairment. These issues are all associated with an increased risk of healthcare-associated harm.<sup>3</sup> Safety incidents are also likely to affect frail people more since relatively small injuries can result in significant physical or psychological effects. Common adverse events in frail people include falls, delirium and pressure ulcers.<sup>4</sup>

The terms elderly and frail may be used interchangeably but they are not the same thing. Just because someone is older does not mean that they are frail.<sup>5</sup> Frailty refers to having decreased reserve and resistance to stressors. It may be evident through muscle weakness, poor exercise tolerance, factors related to body composition, reduced cognitive function, reduced ability to perform day-to-day activities and disability. Age and comorbidities may lead to frailty.<sup>6</sup>

A systematic review found that frailty is common, particularly in elderly people with complex long-term conditions such as heart failure and chronic obstructive pulmonary disease. There is a lack of consensus about how best to assess and diagnose frailty, but individual markers of frailty such as low gait speed have been found to be a feasible way of screening for frailty.<sup>7</sup>

The English Longitudinal Study of Ageing included 5,450 people aged 60 and over. The Fried Criteria were used to identify frailty, whereby participants were asked about difficulties with mobility or other everyday activities and whether they received help or used assistive devices. The overall prevalence of frailty was 14%. Prevalence rose with increasing age, from 7% in those aged 60-69 years to 65% in those aged 90 or over. Frailty occurred more frequently in women than in men (16% versus 12%).<sup>8</sup>

A national US study estimated that 15% of older people living at home are frail and 45% are pre-frail. Frailty was more prevalent in those who were very old, women, minority ethnic groups, those in care homes and people with lower incomes.<sup>9</sup>

However, research suggests that epidemiological surveys may substantially underestimate the levels of frailty amongst older people in the general population due to non-response by the most frail and the most elderly.<sup>10</sup>

The health issues of frail people are characterised by multiple diagnoses, complex medication routines, frequent doctor visits and hospitalisations, impaired activities of daily living, cognitive decline and reliance on a caregiver for support. Some articles estimate that the care needed by a frail older person increases in cost by about £30,000 every year. Frail people may also suffer from isolation and depression, which compounds their physical health problems and may influence non-adherence to prescribed medical regimes.<sup>11</sup>

NHS England promotes safe, compassionate care for frail people across the care continuum.

*“We need to look across the whole health and social care economy and ensure that the right skills and services are in the right place at the right time; that we genuinely involve older people and their carers in designing services; that all agencies sign up to a shared vision and collaborate effectively; and that we build in meaningful outcome measures.”*

12

There are unique challenges in designing safer care for frail people. The Eastern Academic Health Science Network is supporting a quality improvement collaborative to improve safety for frail people. The collaborative is focusing on improving medicines safety, improving transfers of care and identifying and addressing deterioration.

This rapid research review compiles empirical evidence about improving medicines safety, improving transfers of care and identifying and addressing deterioration to help the Eastern Academic Health Science Network quality improvement collaborative identify worthwhile approaches. In line with the focus of the collaborative, the review explored three key areas of safety:

1. **Medicines safety:** this includes maximising the benefits and minimising the risk associated with medicines in all settings, including both over-the-counter medicines and prescription medicines.
2. **Transfers in care:** this includes discharge from hospital, handover of care between clinical specialities in the same sector, handover of clinical responsibility from one health care sector to another and handover of clinical care from health to social care or vice versa.
3. **Identifying and responding to deterioration:** this includes identifying frailty or multiple co-morbidities, identifying clinical decline, onset of sudden acute episodes and responses to the above.

## REVIEWING EVIDENCE

The review was undertaken by an independent organisation. All of the information was identified and analysed systematically, but the aim was not to include all studies ever published about improving safety in the care of frail people. Instead the focus was on rapidly compiling available research to draw out key themes about the most commonly tested interventions and their impacts.

To be eligible for inclusion in the review, studies had to:

- contain information about improving medicines safety, transfers of care or identifying or addressing deterioration in frail people
- include empirical data
- be published in a print or online journal or be available via a grey literature database
- be released from database inception through to 15 March 2016
- be available in the English language

Studies from any developed country were eligible for inclusion.

To identify relevant research, two reviewers searched 20 bibliographic databases for studies of any design. The searches were undertaken independently and cross matched to ensure a robust search process. The databases comprised Academic Search, BDNEF, CHBD, CINAHL, Cochrane Library and Controlled Trials Register, EMBASE, ERIC, Global Health, Google Scholar, HMIC, Ingenta, Jurn, Mendeley, New York Academy of Medicine Grey Literature, Open Grey, PsychInfo, Pubmed/Medline, Scopus, Social Policy and Practice and Web of Science.

Search terms included combinations of frail, frailty, geriatric, elderly, elders, older people, aging, safety, risk, harm, transitions, transfers, care pathway, handover, discharge, deterioration, decline, co-morbidity, identification, early warning scores, medicines, medication, pharmacy, polypharmacy, healthcare, social care, care homes, nursing homes, acute, primary care and similes.



The journals *Age and Aging* and *The Gerontologist* were hand searched from 2005 to March 2016. Ten researchers that had published about safer care for frail people, identified through preliminary searches, were contacted for suggestions about additional published and unpublished studies.

In total, 5,722 potentially relevant articles were identified based on titles and abstracts. The full text of these studies was read independently by two reviewers and studies that met the inclusion criteria were retained. Where easily identifiable, studies already included in systematic reviews were not included again to avoid duplication of analysis.

No quality grading scale was used to score and exclude studies based on methodological quality. This is because the aim was to understand the quality and quantity of available research rather than selecting only studies that had the most robust designs.

Overall, 131 studies were deemed relevant and included in the review. Additional narrative material was used to provide context.

The reason that most of the full text articles were not included in the review was that they did not focus predominantly on frail people (39%), did not contain empirical information (21%), they examined specific medicines (13%) or they focused on describing safety issues but not examining how to tackle them (27%).

Some studies focused on elderly people. Where 'elderly' was used as a simile for frail or where a significant proportion of people in the study were likely to be frail, these studies were included in the review. However, studies merely conducted in older people without a specific focus on frailty were excluded.

Key themes from all selected studies were extracted using a narrative review process, linking back to the review questions. The focus was on drawing out overarching themes. Short descriptions of a number of individual studies were used to highlight key points and give a flavour of the research.

The report is organised in sections related to medicines safety, care transfers and deterioration. Within each section, interventions are described according to the setting(s) in which they have been tested.

## EVIDENCE INCLUDED

Of the 131 studies included in the review, 18% focused mainly on initiatives to improve medicines safety in frail people, 13% focused mainly on transfers of care and 69% focused on interventions to prevent, identify and address deterioration (see Table 2).

Most studies were published in the past five years (64%).

Studies were primarily conducted in North America (48%), although research was also available from the UK and Ireland (11%), other parts of Europe (22%), Asia and the Middle East (10%) and other countries such as Australia (9%).

The most common research designs were cross-sectional studies, describing the outcomes of an intervention at one point in time or analysing statistical data (40%). Next most common were studies comparing changes over time, before and after an intervention was introduced (28%). Randomised controlled trials (14%), systematic reviews (11%) and survey / interview studies (8%) were less common (see Table 3). This means that, based on traditional hierarchies of evidence, the majority of studies were not of the highest quality for assessing causality and drawing conclusions about the most effective interventions.

The majority of studies examined ways to improve safety in a hospital context (35%) or when providing care in people's homes (22%). Other contexts included care homes (12%), primary care (11%), services in the community / outpatients (5%) and transitions between care services (14%). Throughout the review the term 'care home' is used to refer to both nursing homes and residential care homes.

The most commonly studied interventions included ways to identify risk (33%), technology and tools (16%), staff roles (15%) and targeting specific care to address identified needs, such as exercise programmes to reduce the risk of falls (12%, see Table 4).

**Table 2: Main topic of focus of studies included in the review**

	UK and Ireland	Other Europe	North America	Asia and Middle East	Other	Total
Medicines	1 (4%)	7 (29%)	8 (33%)	4 (17%)	4 (17%)	24 (100%)
Transfers	4 (24%)	2 (12%)	8 (47%)	0	3 (18%)	17 (100%)
Deterioration	9 (10%)	20 (22%)	47 (52%)	9 (10%)	5 (6%)	90 (100%)
<b>Total</b>	14 (11%)	29 (22%)	63 (48%)	13 (10%)	12 (9%)	131 (100%)

Note: Some studies focused on more than one topic. The primary topic is included in the table above.

**Table 3: Types of research designs included in the review**

	Review	Trial	Before and after studies	Survey / interview	Other eg data analysis	Total
2011-16	10 (67%)	8 (44%)	22 (59%)	7 (70%)	37 (70%)	84 (64%)
2006-10	5 (33%)	4 (22%)	8 (22%)	1 (10%)	9 (17%)	27 (21%)
2001-05	0	4 (22%)	7 (19%)	1 (10%)	4 (8%)	16 (12%)
2000 or before	0	2 (11%)	0	1 (10%)	3 (6%)	4 (3%)
<b>Total</b>	15 (100%)	18 (100%)	37 (100%)	10 (100%)	53 (100%)	131 (100%)

**Table 4: Main types of interventions included in the review**

Interventions	Home	Primary care	Community services	Care homes	Hospital care	Transitions	Total
Identifying risk	11 (38%)	7 (47%)	2 (29%)	4 (25%)	18 (39%)	1 (6%)	43 (33%)
Prevention initiatives	5 (17%)	0	0	2 (12%)	1 (2%)	0	8 (6%)
Education	2 (7%)	2 (13%)	0	4 (25%)	5 (11%)	2 (11%)	15 (11%)
Teamwork and roles	3 (10%)	2 (13%)	0	2 (12%)	11 (24%)	2 (11%)	20 (15%)
Targeted care	3 (10%)	2 (13%)	5 (71%)	0	4 (9%)	2 (11%)	16 (12%)
Pathways	0	0	0	1 (6%)	0	3 (17%)	4 (3%)
Technology and tools	5 (17%)	2 (13%)	0	2 (12%)	6 (13%)	6 (33%)	21 (16%)
Environment	0	0	0	1 (6%)	1 (2%)	2 (11%)	4 (3%)
<b>Total</b>	29 (100%)	15 (100%)	7 (100%)	16 (100%)	46 (100%)	18 (100%)	131 (100%)

Note: A number of studies included more than one type of intervention. The main topic is included above.

# MEDICINES SAFETY

---

## KEY POINTS

Medicines safety relates to maximising the benefits and minimising the risks associated with medicines in all settings. A great deal has been published about ways to improve medicines safety across primary care, hospital care and in care homes but very little of this research focuses explicitly on people who are frail.

The review identified 24 studies that focused primarily on improving medicines safety for frail people. Most of these were from North America (33%) and Asia and the Middle East (17%). Only 4% of studies about this topic were from the UK and Ireland (one study).

The most commonly researched initiatives to improve medicines safety for frail people included:

- educating prescribers
- checklists and tools for identifying potentially inappropriate medications
- audit and feedback
- computerised decision support systems and alerts
- including pharmacists as part of care teams to undertake cross checks and medicines reconciliation
- educational and behavioural interventions for patients

A number of studies have examined the safety of various types of medication or the value of substituting some medicines for others.<sup>13</sup> Studies about specific medications are not summarised in this review because the focus was on management and improvement initiatives that could be undertaken to support safer care rather than on specific drugs.

## CARE AT HOME

### TEAMWORK AND ROLES

Whilst many studies are available about medication safety at home, these do not tend to focus explicitly on frail people.

An exception is a study in China whereby **volunteers** coached elderly people living in rural areas about medication safety. Participants received information from a coach and reminders by trained volunteers, plus three home visits and five telephone calls over a two-month period. A randomised trial found that the programme was associated with improved knowledge of medication safety and some improved medication safety behaviours. Using instructions with pictorial aids was found to be particularly useful.<sup>14</sup>

### TECHNOLOGY AND TOOLS

Another study from China tested an online cloud medication safety support system. This included a personalised medication safety **app for mobile phones** that issued reminders for medication and helped keep medication records. The system was well accepted by elderly people with complex needs, but benefits regarding medication adherence and adverse effects were not reported.<sup>15</sup>

## PRIMARY CARE

### IDENTIFYING RISK

More has been published about improving medicines safety for frail people in primary care.

A common focus is avoidance of medications that are considered to be inappropriate. A number of tools and **explicit criteria** have been tested to identify potentially inappropriate medications; that is drugs in which the risk of an adverse event outweighs its clinical benefit, particularly when there is evidence of a safer or more effective alternative therapy. 'Beers criteria' have been the most frequently studied, but there is some evidence that such criteria cannot easily be applied in European countries because several drugs listed in the Beers criteria are rarely prescribed or not available in Europe. Another set of criteria is the START/STOPP criteria. Various criteria and checklists have been used across primary, community and secondary care. There is no evidence that one set of criteria is more effective than others.<sup>16</sup>

A systematic review of 13 studies examined how medication use was assessed in older people. A range of methods were used, including surveys, inspecting medications brought to a clinic interview, interviewing people in their home and looking at administrative data. Using multiple methods was found to be more effective than using single methods.<sup>17</sup>

### INFORMATION AND EDUCATION

A variety of approaches have been undertaken to provide education, training and support to primary care professionals in order to raise awareness of appropriate and inappropriate prescribing for frail people.

For instance, a programme in 99 primary care practices in the US sought to reduce the use of potentially inappropriate medications in the frail and elderly. Over a four-year period practices received quarterly **performance reports** about the use of always inappropriate and rarely appropriate medications in the elderly. Some practices also received twice yearly site visits and took part in annual network meetings for performance review and improvement planning. The proportions of patients with a prescription for an always inappropriate medication or a rarely appropriate medication decreased.<sup>18</sup>

In Australia, a government scheme used **audit with patient-specific feedback** to improve medicines safety. Doctors received feedback supported by educational material and a national call centre. Patients who met criteria also received educational brochures. Checklists and audit feedback that aimed to increase medicine use was effective. There were mixed results when trying to reduce inappropriate medicine use. Very specific information was found to be most effective, with for example a 14% decline in the use of antipsychotics in dementia. Information targeting combinations of medicines and potentially inappropriate medicines in the elderly was not associated with changes in practice. The researchers suggested that specific messages focusing on single medicines were required to maximise effect.<sup>19</sup>

Direct **educational initiatives** have also been tried. A quality improvement programme in US primary care focused on improving medication reconciliation documentation, improving the accuracy of medication lists, reducing inappropriate medication use and minimising duplicate therapy. Interventions focused on educating providers, staff and patients about medication management and using checklists. Before and after analysis found that there were improvements in medication reconciliation and patients bringing medications to primary care clinics. There was a reduction in the use of specific medications and duplicate therapy.<sup>20</sup>

A limited number of studies have explored education targeting patients and carers. **Behavioural interventions** have been found to improve medication adherence in older and frail adults more effectively than educational interventions.<sup>21</sup>

## TEAMWORK AND ROLES

Some research in primary care suggests that **involving pharmacists** or multidisciplinary teams in medicines safety initiatives has been associated with benefits, though the level of detail about outcomes is sparse.<sup>22</sup>

## TECHNOLOGY AND TOOLS

**Computerised decision-making support systems** have been found to be modestly effective in reducing inappropriate prescribing and adverse drug events across healthcare settings.<sup>23</sup>

However, the findings are not always universally positive. A before and after study in the US found that computerised reminders with age-specific alerts were not associated with a reduction in the proportion of new potentially inappropriate medication orders out of total new prescriptions, but there was a reduction in the rate of the top ten most common newly prescribed potentially inappropriate medications.<sup>24</sup>

A review found that computerised systems may work best when combined with other interventions. For people with multiple conditions and polypharmacy, interventions with evidence of effectiveness included structured medication review, medication regimen simplification, administration aids and medication reminders.<sup>25</sup>

## OTHER INITIATIVES

In Japan a **one-dose package of medication** was made up by a pharmacist for frail and elderly people. This was well received and medication adherence improved.<sup>26</sup>

## COMMUNITY CARE

### TARGETED CARE

Few studies have examined medication safety initiatives in community health services. An exception comes from China, where medication safety review clinics were implemented for older people prescribed eight or more medications. The reviews took place at two hospital outpatient / community clinics. Prescribers were contacted with proposed interventions and people were asked to return to the clinic after 12 weeks. Over a 24-week follow-up period, the number of medications per patient and drug-related events decreased. Patient self-reported health increased.<sup>27</sup>

### TECHNOLOGY AND TOOLS

In the US, a **medication discrepancy checklist** was tested for use by multiple practitioners across the continuum of care following discharge. The aim was to compare the medications people were prescribed upon discharge with what they actually took when they returned to the community. The tool was used by home healthcare nurses, pharmacists and doctors. The tool worked well to capture transition-related medication discrepancies.<sup>28</sup>

## CARE HOMES

### TEAMWORK AND ROLES

In care homes, the main medication safety initiatives for frail people have focused on teamwork. A review of initiatives to improve medication safety standards in UK care homes found that more collaborative work is needed, with medical input. The reviewers stated that the NHS has a restricted role and that more priority needs to be placed on health and social care **implementing initiatives jointly**.<sup>29</sup>

In the US, a large care home identified all patients receiving nine or more medications. Geriatric medicine fellows were taught to systematically collect medication data, generate medication recommendations based on expert criteria or drug-drug interaction lists, discuss recommendations with attending doctors and implement approved recommendations. The programme was associated with decreased potentially inappropriate medications, contraindicated medications and medication costs. The researchers suggested that it was necessary to run the programme for several years to accrue benefits.<sup>30</sup>

## HOSPITAL CARE

### IDENTIFYING RISK

The most empirical evidence about medication safety for frail people has been undertaken in a hospital context.

Some studies have focused on identifying risk or auditing records in order to identify priority areas for intervention. For instance, a UK study identified frail people who had preventable medication-related hospital admissions and retraced their care to identify issues. Problems emerged due to decision-making, information provision and communications among staff members and between staff, patients and carers. The researchers argued that new ways of working driven by the ethos of productivity are disrupting traditional intraprofessional and interprofessional roles and channels of communication. They suggested that improvements in communications technology and protocols would reduce medication safety risks for frail older people.<sup>31</sup>

Medication reconciliation involves verifying medication use and identifying and rectifying discrepancies in medical records. A study in Canada found that medication discrepancies were common in elderly people admitted to hospital, including over-the-counter medication discrepancies. A substantial proportion of the prescription medication discrepancies identified using checklists were associated with potential harm.<sup>32</sup>

### INFORMATION AND EDUCATION

As in primary care, a number of initiatives have been tested relating to educating hospital teams about safer medicines management.

In Germany, **direct communications** are sent to doctors to update them about significant newly discovered drug risks and ways to reduce these risks. An analysis of data from more than 50 hospitals offering inpatient care for frail people examined the discharge medication of 76,568 patients. Comparing before and after the release of new drug warnings showed that there was a reduction in a number of prescriptions no longer recommended in elderly people. However co-prescription of certain drugs remained unchanged. The researchers concluded that official drug warnings can help to implement simple changes, such as reducing maximum daily doses, but are not so effective for complicated information regarding contraindicated co-medication.<sup>33</sup>

In addition to educating staff, hospitals have provided **education to support self-administration** of medications amongst frail and elderly people after discharge. Such programmes may also help to identify people who may have difficulty adhering to medication regimes.

For instance, a hospital in Australia asked people on an elderly care ward to request their medications from nursing staff when due, then select and administer them under supervision. Barriers to adherence were observed and addressed. About seven out of ten people could self-administer without any interventions to address adherence barriers (69%), 11% could self-administer after an intervention and 19% required full assistance with medication management after discharge. Barriers to medication adherence included inability to open containers and inability to request medications without prompting. Around one third of people experienced these barriers (31%).<sup>34</sup>

## TEAMWORK AND ROLES

It is estimated that incomplete medication histories obtained on hospital admission are responsible for more than one quarter of prescribing errors in hospital. In Denmark **pharmacy technicians** performed medication reconciliation and prescribing reviews at the time of admission to the geriatric ward at one hospital. An average of three discrepancies were detected per patient. Medication omission was the most frequently detected discrepancy (46%). About 45% of the prescribing discrepancies were accepted and corrected by doctors. An average of one prescribing error was detected per prescribing review. Almost all of the detected prescription errors were accepted or corrected by doctors. Dosage and time interval errors were the most frequently detected error (48%). Not only did the use of pharmacy technicians improve medication safety, but the time used by nurses for administration of medicines was also reduced.<sup>35</sup>

In Belgium, a hospital tested using a **clinical pharmacist** to obtain frail older people's medication histories and reconcile these with medical records and medication orders. Clinical pharmacists identified significantly more preadmission drugs compared with doctors, including over-the-counter as well as prescription medications. Other medication discrepancies were noted, mainly related to erroneous drug identification and incorrect drug dose. Clinical pharmacists identified medication discrepancies in 24% of cases, of which half were judged clinically relevant.<sup>36</sup>

Another hospital in Belgium compared clinical decision support systems and interventions by clinical pharmacists to reduce drug-drug interactions on a geriatric ward. Clinical decision support alerts were compared with drug interactions identified by clinical pharmacists. Clinical pharmacists identified more drug interactions than the electronic system and more of their recommendations were accepted by doctors compared to the electronic alerts. Clinical pharmacists performed better mainly because the system screened only for high level drug interactions and the alerts had low specificity.<sup>37</sup>

## TECHNOLOGY AND TOOLS

Hospitals have tested a variety of technology and tools to improve medication safety in frail people. A systematic review of five studies found that medication discrepancies occurred in three quarters of transfers from hospital to care homes. Interventions that were found useful to support medication safety across sectors included a paper-and-pencil adherence checklist in pharmacy and a computer-generated **decision support tool** in the accident and emergency department (A&E).<sup>38</sup>

In New Zealand a simple **medication guide** was tested to reduce the number of regular medications taken by older people following hospital admission. Not everyone in the study was frail. The medication guide reduced the number of regular medications prescribed to older people in hospital without affecting safety.<sup>39</sup>

A US hospital tested whether a bundled intervention could increase detection of delirium and facilitate safer use of high-risk medications. The bundle comprised using a **checklist** promoting delirium prevention, recognition and management and modifying the computerised provider order entry system to provide care focused on elderly adults. Comparing before and after the bundle was implemented, the new approach resulted in more guideline-adherent medication use. People who received the bundle were more likely to be discharged home than to extended care facilities.<sup>40</sup>

In the US an electronic tool was developed to assist clinical pharmacists with reviewing potentially inappropriate medications in hospitalised elderly people. A **computerised dashboard** flagged people with at least one potentially inappropriate medication and displayed 48-hour cumulative narcotic and benzodiazepine administration. Patients were ranked based on estimated risk of an adverse event. A clinical pharmacist reviewed the flagged records and discussed high priority issues with the treating doctor via telephone or text message. Doctors followed through on 78% of pharmacist recommendations. The researchers concluded that using an electronic dashboard was an efficient method to help clinical pharmacists rapidly screen the medication regimens of hospitalised frail people and deliver a timely point-of-care intervention.<sup>41</sup>



## SUMMARY

Table 4 summarises the evidence available about improving medicines safety for frail older people. The three areas where there is most evidence are:

- **checklists**, dashboards and other tools to reduce potentially inappropriate medications (tested in primary care and hospital)
- **alerts** for prescribers (tested in primary care and hospital)
- **pharmacists** undertaking medicine reconciliation (tested in primary care and hospital)

It is difficult to quantify the extent of effect of these interventions because the evidence is sparse. There is little evidence comparing one type of intervention with another. Thus, whilst these interventions have the most positive evidence available about them, it is not possible to say that they are the most effective interventions for improving medicines safety for frail people.

**Table 4: Summary of evidence about improving medicines safety for frail people**

Intervention	Context where tested	Findings	Evidence quality
<b>Targeting patients and carers</b>			
Mobile phone app	Home	Feasible but no outcomes data	Limited quality and quantity
Volunteer coaches	Home	Some improvement in adherence	Limited quality and quantity
Patient education	Hospital	Some improvement in adherence	Limited quality and quantity
Behavioural interventions	Primary care	May improve medication adherence	Limited quality and quantity
One dose medication package	Primary care	May improve medication adherence	Limited quality and quantity
<b>Targeting professionals</b>			
Written and group education	Primary care, hospital	Can improve care processes and prescribing behaviours for simple / single drugs, but not co-medication	Medium quality, limited quantity
Audit and feedback	Primary care	Can improve prescribing patterns, particularly when aiming to increase prescribing. Limited impact on reducing prescribing	Medium quality, limited quantity
Computerised decision support and alerts	Primary care, hospital	Mixed evidence of effect	Medium quality and quantity
Criteria for identifying inappropriate medications	Primary care	Can help identify areas of risk, no most effective criteria found	Limited quality and quantity
Checklists and guides	Primary care Hospital	Can improve guideline adherence care and reduce prescriptions	Limited quality and quantity
Involving pharmacists and technicians	Primary care, hospital	Can improve prescribing	Medium quality and quantity
Involving clinicians in care homes	Care homes	Can reduce potentially inappropriate medications	Limited quality and quantity
Medication review clinics	Community care	Can improve prescribing	Limited quality and quantity

# SAFER CARE TRANSFERS

---

## KEY POINTS

Transfers in care include transitions to and from hospital, handover of care between clinical specialities in the same sector or organisation, handover of clinical responsibility from one health care sector to another, and handover of clinical care from health to social care or vice versa.

The review identified 17 studies focused primarily on safer transfers of care in frail people. These were largely from North America (47%) and the UK and Ireland (24%).

There are a number of challenges to transfers in care, including information access, coordination and communication / teamwork.<sup>42</sup>

The main interventions studied to increase safety in transfers of care included:

- education for professionals
- direct admission to elderly care wards which provide more focused care and support smoother transitions
- discharge plans, care pathways and protocols
- discharge planners or flow managers
- follow-up of patients after hospital discharge

## TRANSFER TO HOSPITAL

A variety of studies have looked at how to improve transfers to hospital, including transitions from home and from care homes. This is important because a systematic review found that care home residents transferred to hospital in an emergency tended to have poor outcomes. In-hospital complications included pressure ulcers (19%) and delirium (38%), with up to 80% experiencing potentially invasive interventions. Mortality was high, with up to 34% dying in hospital. The reviewers concluded that it was not clear whether the benefits of hospital emergency care outweigh potential adverse complications of transfer.<sup>43</sup>

Medication errors are common when elderly people are transferred between primary and secondary care. Improved documentation and transferring data about medications could reduce these errors. A study in Sweden found that on average, there were two medication errors each time a frail patient was transferred between primary and secondary care. The most common error when patients were transferred to the hospital was inadvertent withdrawal of drugs. When patients left the hospital the most common error was that drugs were erroneously added.<sup>44</sup>

Research suggests the importance of considering care options in advance of when people may need them. For instance older people and their relatives could have discussions about care homes and hospital discharge plans before people deteriorate or are hospitalised.<sup>45</sup>

## TEAMWORK AND ROLES

Literature suggests that transitions to hospitals can be improved by promoting clear communication, managing medications, encouraging appropriate use of formal advance directives, providing timely access to care to reduce the risk of potentially avoidable hospitalisation and promoting an interdisciplinary resident-centred approach in geriatrics education.<sup>46</sup>

A UK hospital tested having a **consultant geriatrician** in A&E to facilitate safe admission prevention amongst frail people. The role was associated with prevented admission for 64% of patients. Direct admission to elderly care wards was facilitated in 57% of cases where admission was necessary. The geriatrician was also able to support discharge from the A&E for over half of potential 30-day readmissions seen.<sup>47</sup>

## TECHNOLOGY AND TOOLS

Some studies suggest that about 85% of the time important information is not available when frail people are transferred to A&E from care homes. Information gaps include the reason for transfer, usual cognitive function and communication ability, vital signs, advance directives, medication, activities of daily living and mobility. Standardised transfer forms can reduce information gaps, but such forms are not always completed well.<sup>48</sup>

A study in Canada tested a transitions tracking tool to improve care for people transferred between care homes and A&E departments. The electronic tool contained information about resident characteristics, reasons for transfer, advance directives, family involvement and healthcare services provided. It was feasible to collect detailed data from the beginning to end of a transition across multiple settings.<sup>49</sup>

## TARGETED CARE

In Israel, nursing home residents were transferred directly to an acute-care geriatric department rather than A&E. Compared to those admitted through A&E, there was no difference in length of stay, mortality or discharge disposition. The researchers concluded that admitting people to a hospital geriatric care unit directly from care homes is feasible and no less safe than traditional routes.<sup>50</sup>

## IN-HOSPITAL TRANSFERS

A more limited amount of research is available about transfers within hospital, such as between A&E and wards.

A hospital in Italy tested changes to the physical layout of the environment to improve transfers in care for frail and elderly people. A 106-bed internal medicine area organised by intensity of care was dedicated to elderly people. The unit was partitioned into smaller wards, each with a specific intensity level of care, including a rapid-turnover ward (average length of stay less than four days) that admitted acutely ill people from A&E, a subacute care ward for chronic critically ill people and a nurse-managed ward for stable patients who could not be discharged due to social or economic reasons. A very-rapid-turnover ("come 'n' go") ward was set up to manage sudden A&E overflows. A 'flow manager' role was used to support continuity and safety of care. Personalised discharge plans were used and LEAN methodology principles were applied. Compared to other units at the hospital and units at neighbouring hospitals, this approach had better performance, efficacy and effectiveness and allowed more capacity for supporting frail and elderly people visiting A&E.<sup>51</sup>

## TRANSFER FROM HOSPITAL

### INFORMATION AND EDUCATION

Interventions have also been tested to improve the safety and efficiency of transfers from hospital to the community or care homes. Whilst a great deal of work has been undertaken in this area generally, little focuses specifically on people who are frail.

Various **educational initiatives** have been tested to support safer transfers of care. In the US a 'Hospital to Home' educational programme for internal medicine registrars helped to promote more timely and smoother discharges.<sup>52</sup>

A 20-year analysis examined the benefits of setting up a **forum** for educational and process improvement purposes regarding transfers from hospitals to care homes in one US region. The forum was open to anyone involved with the care of older people in the community. The forum considered whether there were problems occurring with transfers and made process changes. There was an improvement in efficiency of transfers, patient safety and the quality of medical care. Readmission rates were low compared to the national average.<sup>53</sup>

### TEAMWORK AND ROLES

Some interventions have examined the roles that junior doctors, nurses and occupational therapists can play in safer transfers out of hospital.

In the UK, doctors at one hospital routinely typed an electronic discharge advice note for elderly people, but it took an average of 138 minutes to complete, thus delaying discharge. To improve the efficiency of discharge, a number of interventions were tested, led by junior doctors. Interventions included a **daily discharge briefing** to recap discharges and help junior doctors prioritise workload. The average time to complete discharge advice notes reduced by over an hour and discharge medication was dispensed earlier in the day.<sup>54</sup>

Studies to improve how people are prepared for discharge have been undertaken but results are not always positive. For instance, a randomised trial in the US tested whether a nurse-led intervention around the time of hospital discharge decreased A&E visits and readmissions amongst ethnically and linguistically diverse older people. The intervention comprised in-hospital, one-to-one, **self-management education provided by a nurse** plus telephone follow-up after discharge from a nurse practitioner. There was no difference between groups in A&E visits or readmissions.<sup>55</sup>

In Sweden occupational therapists visited the homes of frail and elderly people with patients before they were discharged from hospital. At the visits, issues and planned occupational therapy interventions at home were documented. After discharge, therapists conducted a follow-up home visit to check whether interventions were being implemented. There was a strong focus on physical disability, environmental issues and assistive devices. Older people valued the visits but were dissatisfied when there was significant delay in the delivery of home modifications or devices.<sup>56</sup>

### TECHNOLOGY AND TOOLS

Discharge planning can improve the safety and appropriateness of discharge from hospital and can reduce the length of stay.<sup>57</sup>

**Checklists** have been tested to improve the completeness of handovers at hospital discharge. These checklists or protocols aim to standardise elements of the discharge process to smooth transfers of care. A variety of tools exist and most focus on medication safety, patient education and follow-up plans.<sup>58</sup>

In Canada a **discharge summary** was adapted to the needs of the frail elderly to ensure transfer of relevant information from hospitals to community settings. The tool included a medical discharge summary (22 items) and a discharge prescription (14 items).<sup>59</sup>

In the US a rapid two-stage screening protocol was developed to improve referral for palliative care needs among the frail elderly in A&E. The **triage tool** included assessment of activities of daily living, performance, functional staging, symptom burden and caregiver distress. Stage one identified people meeting the criteria for life-limiting conditions. Stage two referred patients with significantly reduced activities of daily living, high symptom burden and caregiver distress to palliative care or hospice. It was feasible to use the screening tool to support referrals and transitions.<sup>60</sup>

People transferring to a care home after hospital admission may experience delays in medication administration. In the US an **expedited discharge protocol** was developed in collaboration with hospital doctors, hospital discharge planners, care home managers and care home nurses. The intervention included education of healthcare professionals and implementation of the expedited protocol to ensure that medication orders were transmitted before the patient's arrival at the care home. However, in practice, none of the medication orders were transmitted to the pharmacy before the patient's arrival at the care home. All patients transferring from hospital experienced a 12-hour or more delay in medication administration and the average number of missed doses was three or more.<sup>61</sup>

Novel approaches have been tested to follow-up people after they leave hospital. In Canada an **interactive voice response system** was tested to improve transitioning from hospital to home. Not all of the participants were frail. Participants received an automated call 48 hours after discharge and responded using their touch tone phone. Patients who said they had new health issues were telephoned by a nurse to clarify and address the problem. The automated calls were answered by 58% of participants. One quarter indicated new or worsening symptoms, problems with their medications or asked to talk to a nurse (26%). It was estimated that in 13% of cases the system made a difference to people's health outcomes.<sup>62</sup>

## TARGETED CARE

A systematic review of interventions to improve safety in transfers of care from hospital to home found that frail older people with complex health issues are particularly at risk for adverse events during transitions across health providers. The studies included in the review focused on interventions to improve **communication** to promote safer transitional care. Intervention types included professional-oriented interventions such as education and training, organisational/culture interventions (such as transfer nurses, discharge protocols, discharge planning, medication reconciliation, standardised discharge letters and electronic tools) or patient and carer oriented interventions (such as patient awareness and empowerment education and discharge support). The reviewers concluded that frail people discharged from hospital to the community benefit from targeted interventions aiming to improve transfer across healthcare settings. Combining more than one intervention may be most effective.<sup>63</sup>

In Norway, older people were transferred to **intermediate care in a care home** shortly after hospital admission. The maximum allowable stay was three weeks. At one-year follow-up, a randomised trial with 376 patients found no significant differences between groups in the number of days living at home after discharge or days in hospital. The intervention group spent less time in a care home and were more likely to live independently without home health care services. For orthopaedic patients, mortality was higher in the intervention group (25% versus 10% controls,  $p = 0.049$ ). There were no significant differences in one-year mortality for medical patients or the total study population. The researchers concluded that rapid transfer to intermediate care reduced demand for care homes and home health care services.<sup>64</sup>

## SUMMARY

Table 5 summarises the evidence about interventions to improve the safety of care transfers for frail people.

The interventions where there is most positive evidence comprise:

- **standardised transfer forms** and tools, including tools when transferring to and from hospital (tested in primary care, care homes and hospitals)
- **specific wards for elderly people**, and allowing direct transfers to those wards rather than A&E acting as a gatekeeper (tested in hospitals)
- **written or group education for professionals** (tested in primary care, care homes, community care and hospitals)

It is difficult to quantify the effectiveness of these interventions because the evidence is sparse. Furthermore, there is little evidence comparing one type of intervention with another. Thus, whilst these interventions have the most positive evidence available, it is not possible to say that they are the most effective interventions for improving safety in care transfers for frail people.

Research suggests that system-wide approaches may be needed rather than interventions solely at one site of care.<sup>65</sup>

**Table 5: Summary of evidence about safer care transfers for frail people**

<b>Intervention</b>	<b>Context tested</b>	<b>Findings</b>	<b>Evidence quality</b>
<b>Targeting patients</b>			
<b>Advance directives</b>	Care homes	Mixed evidence, may improve transitions	Limited quality and quantity
<b>Education by a nurse</b>	Hospital	No evidence of reduced A&E visits or readmissions	Limited quality and quantity
<b>Occupational therapist home visits prior to discharge</b>	Hospital	Value may be diminished by delays in sourcing equipment and modifications	Limited quality and quantity
<b>Automated calls after discharge</b>	Home	May help to identify issues promptly after discharge	Limited quality and quantity
<b>Targeting professionals</b>			
<b>Geriatrician in A&amp;E</b>	Hospital	May reduce the need for admission	Limited quality and quantity
<b>Flow manager role / discharge planners / transfer nurses</b>	Hospital	May enhance efficiency of transfers within hospital	Limited quality and quantity
<b>Written or group education</b>	Care homes, hospital	Mixed evidence, may enhance efficiency of transfers out of hospital	Medium quality and quantity
<b>Daily discharge briefing</b>	Hospital	May enhance efficiency of transfers out of hospital	Limited quality and quantity
<b>Targeting organisations</b>			
<b>Elderly care wards</b>	Hospital	May increase capacity	Limited quality and quantity
<b>Targeting systems</b>			
<b>Direct admission to elderly care wards</b>	Hospital	Found to be safe and feasible	Limited quality and quantity
<b>Standardised transfer forms and systems</b>	Care homes, hospital	Mixed evidence, not usually well completed	Limited quality and quantity
<b>Discharge planning checklists</b>	Hospital	Mixed evidence, can improve smooth transitions	Limited quality and quantity
<b>Intermediate care</b>	Care homes	May help people stay more independent	Limited quality and quantity

# DETERIORATION

---

## KEY POINTS

The largest quantity of evidence about improving the safety of care for frail older people focuses on initiatives related to deterioration. Identifying and responding to deterioration includes identifying clinical decline, identifying frailty or multiple co-morbidities, identifying decline in physical health, onset of sudden acute episodes and responses to these issues. Much of the research available about deterioration focused on either identifying risks or undertaking preventive activities to reduce decline, such as exercise training to prevent falls.

Policy and literature emphasises the importance of prevention, health promotion and supporting people to guard against or reduce deterioration and decline.

*“Frail people should not be perceived as a problem to the system but, rather, clinicians should support people with living with frailty to maintain their own health for as long as possible.”<sup>66</sup>*

The review identified 90 studies about ways to prevent, identify and respond to deterioration in frail people. Most of these studies came from North America (52%) or Europe (22%). Ten percent of studies in this area were from the UK and Ireland (nine studies). The most commonly studied initiatives to identify or respond to deterioration were:

- risk identification and assessment tools
- falls prevention strategies such as exercise
- telehealth and assistive technologies
- nurse visits
- multiprofessional teams

## CARE AT HOME

### IDENTIFYING RISK

A number of studies have explored ways to identify whether people living in their own homes are at risk of deterioration. Some of these studies have involved novel partnerships. For example, in the UK the Fire and Rescue Service worked with the NHS to test a community fire safety **link worker** for those at high risk of fires in their homes. This included frail elderly people. An evaluation found that the Fire and Rescue Service and the NHS developed trusting relationships and that there was high client satisfaction. The pilot was estimated to save 4.4 fires, equivalent to £286 per person. It cost an average of £55 per person to deliver the service, giving net savings of £231 per client.<sup>67</sup> Whilst this study was not focused on clinical deterioration, it is one of the few UK studies available about partnership approaches to identifying and addressing areas of risk for those at high risk of harm in the community.

Many tools have been tested to predict and help reduce the risk of falls.<sup>68</sup> For instance the Home Falls and Accidents Screening Tool was found to be useful when administered by an occupational therapist in people’s homes.<sup>69</sup>

A variety of other assessment tools are described in the section about ‘community care’ as these tools have been applied in a number of contexts.



## INFORMATION AND EDUCATION

A novel educational approach involves using **virtual worlds for training**. A US study found that virtual worlds could be used to train medical students about home safety assessments for the elderly.<sup>70</sup>

## TEAMWORK AND ROLES

A number of studies have examined nurse-led home visits to identify or respond to deterioration and other safety issues for frail people.

A review of 60 studies found that **nurse home visit** programmes for older people were associated with lower overall healthcare costs with either improved or no change in clinical outcomes.<sup>71</sup>

However, a randomised trial in Canada found that preventive home visits by a nurse to frail elderly people living in the community did not improve health service use or reduce the combined rate of deaths and admissions to an institution. Those visited were more likely to receive influenza vaccinations.<sup>72</sup>

In Sweden, health promotion was used to reduce deterioration and frailty. A preventive nurse home visit was compared with **multiprofessional group meetings** of older people. A randomised trial included 459 people aged 80 or older, living at home. Both interventions helped to postpone the progression of frailty as measured by tiredness in daily activities.<sup>73</sup>

A US study examined community-based **social service support** for frail people who were newly housebound. Initiatives were associated with improved physical functioning.<sup>74</sup>

## TECHNOLOGY AND TOOLS

Research has investigated the use of assistive devices and **telehealth to monitor deterioration**. A systematic review of home telecare for frail elderly people and people with long-term conditions included studies that examined the effects of using telecommunications technology to (a) monitor vital signs or safety and security in the home, or (b) provide information and support. The review included 68 randomised trials and 30 observational studies with 80 or more participants. The most effective telecare interventions were automated vital signs monitoring (for reducing health service use) and telephone follow-up by nurses (for improving clinical indicators and reducing health service use). The cost-effectiveness of these interventions remains uncertain.<sup>75</sup>

Other studies have also emphasised the value of telehealth vital signs monitoring as a way of detecting and addressing deterioration in frail people at home.<sup>76</sup> For instance, monitoring has been used to identify movement in order to reduce falls. This includes using automated cameras to monitor movement and detect falls.<sup>77</sup>

Another systematic review examined 46 studies about **assistive technology** for community-dwelling elderly people with dementia. Devices that had an individual approach and were affordable and unobtrusive were the most highly valued to help identify and address deterioration.<sup>78</sup>

## TARGETED CARE

A number of studies have examined targeted care and prevention aiming to build strength and reduce signs of deterioration such as falls and pressure ulcers. For instance, **home-based exercise programmes** have been found to be effective for preventing both physical and mental decline.<sup>79</sup>

A randomised trial in the US tested a home-based intervention amongst elderly people. **Occupational therapy and physical therapy** sessions helped people learn about home modifications, home safety, fall recovery techniques and balance and muscle strength exercises. The programme was found to reduce functional decline and mortality rates after two years (6% versus 13% in the control group,  $p = 0.02$ ). People at moderate mortality risk gained the most.<sup>80</sup>

In Australia falls prevention strategies delivered in people's homes were trialled with 252 older people. Strategies included education and awareness-raising, exercise, home modifications and medical assessment. The home assessment group was significantly more likely to modify their home environment and there was a trend towards a lower incidence of falls and falls-related injuries.<sup>81</sup>

In the US a preventive home-based physical therapy programme was tested to prevent and reduce deterioration in physically frail people living at home. A randomised trial tested physical activity interventions supported by a therapist during home visits. Although it was feasible to implement the programme, most participants did not progress on to higher-level balance exercises. There was no difference between groups in adverse effects.<sup>82</sup>

Targeted support has also been tested for people with cognitive decline. A randomised trial in the US examined whether a **dementia care coordination** intervention delayed time to transition from home and reduced unmet needs in older people with memory disorders. The intervention ran for 18 months and involved individualised care planning, referral and linkage to services, provision of dementia education, skill-building and care monitoring by an interdisciplinary team. The intervention was delivered by non-clinical community workers trained and overseen by geriatric clinicians. Compared to a control group, those taking part remained more independent, were 37% more likely to stay at home and reported improved quality of life.<sup>83</sup>

## PRIMARY CARE

### IDENTIFYING RISK

As with studies conducted in people's homes, screening tools have been used to identify those at risk of deterioration in primary care. Some studies suggest that these tools are of limited value for predicting functional status and quality of life amongst some groups. In Belgium, various risk assessment tools were applied in primary care, including an abbreviated comprehensive geriatric assessment. All screening tools helped to predict functional decline after one year, but only in people without cancer.<sup>84</sup>

## TEAMWORK AND ROLES

Various role changes or teamwork initiatives have been tested to improve the prevention or identification of frailty in primary care. For example, in the US geriatricians held clinics for frail people in two primary care practices. Patients received comprehensive assessment and a problem-solving intervention to enhance self-management and promote physical activity. Compared to other primary care practices, over an average follow-up period of 1.3 years, the intervention was associated with a reduced rate of hospital admissions. Total healthcare costs were 26% lower than for those not receiving the intervention. The researchers suggested that outpatient appointments that emphasise collaboration between geriatricians and GPs, self-management and physical activity may reduce the risk of admission and healthcare costs among frail older people.<sup>85</sup>

Elsewhere in the US, **doctor delegation** of care for frail and older people to nurse practitioners, physician assistants, registered nurses, medical assistants and licensed vocational nurses was associated with higher quality of care in community practices.<sup>86</sup>

A systematic review of 20 studies examined the effects of **pharmacist care** for older people in the US. Most studies were conducted in ambulatory care clinics or hospital settings. Most focused on people with multiple conditions. Pharmacist activities varied widely, with technical interventions implemented most often. Pharmacist interventions were associated with improved processes of care, safety and medication adherence and reduced admissions.<sup>87</sup>

## TECHNOLOGY AND TOOLS

A number of indicators have been developed regarding the quality of primary care for frail and vulnerable older people. Many of these indicators have been constructed in the US, but they have also been tested in Europe and the UK. Up to half of the US indicators were discarded in studies from the UK and Europe due to lack of evidence or differences in professional opinion.<sup>88,89</sup>

## COMMUNITY CARE

### IDENTIFYING RISK

Various measures of frailty are available and have been used across a variety of care settings, including the community, home, primary care, care homes and hospitals. One study found that prevalence estimates of frailty in the same population varied from 2% to 49% depending on the measures used.<sup>90</sup>

Examples of frailty and deterioration screening tools include: <sup>91,92,93,94,95,96,97,98,99,100</sup>

- Clinical Frailty Scale
- Comprehensive geriatric assessment
- Edmonton Frail Scale
- Five-item FRAIL tool
- FRAILSafe
- Frailty Index of Accumulative Deficits
- Frailty Risk Index
- Fried's Cardiovascular Health Study index
- G-8 screening tool
- Gait and balance assessment
- Katz Score of Activities of Daily Living
- Mini Nutritional Assessment
- Risk Instrument for Screening in the Community (RISC)
- Study of Osteoporotic Fractures index
- Vulnerable Elders Survey Score

Many other scoring systems have been tested. Tools are also available to assess quality of life, falls and related issues.<sup>101,102</sup> It is outside the scope of the review to detail each individual tool, but there is no evidence that one tool is consistently more effective or appropriate than others.

A frequently researched screening and assessment strategy is **comprehensive geriatric assessment**. This is a holistic assessment model, designed to examine an older person's physical and mental health status and functional, social and environmental issues as well as helping to develop an integrated plan for treatment and follow-up.<sup>103</sup> It is often undertaken by nurses and has been found to enable individualised planning to prevent deterioration and smooth transitions of care.<sup>104</sup>

Comprehensive geriatric assessment has been used in a range of different settings, including people's homes, care homes, community settings and hospital.<sup>105</sup>

A randomised trial of comprehensive geriatric assessment in community-dwelling elderly people in China found assessment and subsequent interventions were associated with lower risk of deterioration.<sup>106</sup>

Research in the US found that frail people tended to comply with comprehensive geriatric assessment recommendations to complete a prior directive for healthcare (81%) and to wear a medic-alert bracelet (58%), but did not adhere with recommendations to change a living situation (36%).<sup>107</sup>

Assessing frailty can be difficult because many factors must be considered. In Spain, a **centralised system** was tested to conduct frailty assessments using mobile phone features such as accelerometer sensors, wireless communication capabilities and processing capacities. The assessment drew on gait activity as the main predictor of functional disorders and studying frailty risk factors in patient records. The tool helped to determine the degree of frailty of a specific patient in relation to other patients in an elderly population and could monitor deterioration over time.<sup>108</sup>

## INFORMATION AND EDUCATION

A small number of studies have examined **educating community teams** to prevent, identify or respond to deterioration in frail people. For instance, in the US multiprofessional training of community teams was used to enhance collaborative practice for falls prevention. The training focused on implementing evidence-based practice guidelines. The training was associated with increased knowledge, confidence and team commitment to change practice patterns.<sup>109</sup>

A randomised trial in the UK tested the value of educating 64 nurses, care assistants and social workers about elder abuse. One group took part in a course and another group received printed educational material. The course was associated with improved knowledge, especially amongst those who knew least.<sup>110</sup>

## TEAMWORK AND ROLES

A hospital in Spain set up a community outpatient programme run by a **multidisciplinary team**. The programme was associated with a trend towards improved psychological health and social relationships. Using a multidisciplinary team for assessment helped to detect previously unknown clinical and social issues which may influence deterioration. Participants also benefitted socially from taking part in group activities with peers. Overall quality of life improved.<sup>111</sup>

Similarly, a geriatric assessment clinic was set up in Thailand comprising a multidisciplinary team of geriatricians, nurses, clinical pharmacists, social workers and clinical psychologists. The clinic helped to identify issues that had not been identified previously in primary care, including physical and mental health issues, caregiver burden and elderly abuse. Patients and carers were highly satisfied with the clinic. GPs felt that this provided a holistic approach to primary care, but did not believe they gained knowledge from the clinic.<sup>112</sup>

## TARGETED CARE

A variety of targeted programmes have attempted to prevent or respond to deterioration in the community. For instance, in the US, two nurses led group sessions to reduce the risk of deterioration in frail people. The programme included walking, strength and balance training, home safety improvements and mental practice. Participants set their own goals for exercising to accommodate differing functional abilities.<sup>113</sup>

Researchers from Hong Kong undertook a randomised trial to examine the effectiveness of an **exercise programme** for frail older people. One group took part in a 12-week exercise programme whilst a comparison group participated in a newspaper reading programme with the same duration and frequency. The exercise programme was associated with improvements in functional measurements, perceived physical health, activities of daily living and overall health status.<sup>114</sup>

In China, frail people were randomised to exercise and nutrition, problem solving therapy or usual care alone. The exercise and nutrition group received nutrition consultation and a three times per week exercise-training programme. The problem solving therapy group attended six sessions over a three-month period. The exercise and nutrition group had reduced frailty within three months and there was a long-term effect on bone mineral density and serum vitamin D concentration.<sup>115</sup>

In Germany, a randomised trial in an outpatient geriatric rehabilitation unit tested the value of exercise training for preventing further decline in people who had experienced a fall. The programme involved exercise three times per week for three months. Compared to a control group, the initiative was associated with increased strength, functional motor performance and balance and reduced fear of falling.<sup>116</sup>

However not all findings have been positive. Researchers from the Netherlands tested whether a multifactorial **falls prevention programme** was more effective than usual geriatric care in preventing falls and reducing fear of falling in frail community-dwelling older people with and without cognitive impairment. In a randomised trial, one group took part in 10 twice-weekly, two-hour sessions with physical and psychological components and a booster session. The other group received usual care. Immediately after the intervention and six months later there was no significant difference between groups in the rate of falls or subjective caregiver burden. Fear of falling was higher in the intervention group. The researchers concluded that it may be better to focus on implementing evidence-based geriatric care principles for all older people rather than developing more complex interventions for the frailest people.<sup>117</sup>

## CARE HOMES

### INFORMATION AND EDUCATION

Various protocols have been tested to help team members assess safety risks for frail older people, including tools and protocols in care homes.<sup>118,119</sup>

In the US a national programme aimed to reduce catheter-associated urinary tract infections in care homes. The programme included **staff education** about catheter use, catheter care and maintenance and antimicrobial stewardship as well as promoting patient safety culture, team building and leadership engagement. Combining technical and socio-adaptive principles was found to be important.<sup>120</sup>

In Germany, care home nursing staff were trained in geriatric care principles and moving and handling. Courses ran for four days with an additional follow-up day four months later. Staff had increased confidence in working with deteriorating residents.<sup>121</sup>

Two care homes in the UK developed strategies to promote quality end-of-life care. Reflective **debriefing groups** were used for staff following a resident's death, led by a specialist palliative care nurse. The groups helped staff develop new knowledge and feel supported and valued.<sup>122</sup>

## TEAMWORK AND ROLES

Some initiatives in care homes focus on team development. Researchers from Sweden examined a **team-based risk assessment** method for improving safety in care homes. Action plans and interventions were developed for each resident with identified risk. Using a team-based approach was valued by staff who felt engaged in the process.<sup>123</sup>

Case managers have been used in care homes to support falls prevention and other programmes aiming to reduce the risk of deterioration. Using an interdisciplinary team approach alongside a case manager for assessment and implementing changes has been associated with positive preventive outcomes.<sup>124</sup>

## TECHNOLOGY AND TOOLS

Evidence is also available about record systems in care homes. A guided menu-driven **incident reporting system** was implemented in US care homes to help document initiatives after falls. The system improved documentation in the homes. Ways to prevent deterioration and falling included adequate neurological assessment and incontinence-related interventions.<sup>125</sup>

## TARGETED CARE

Injuries from bed rails can lead to complications and deterioration in the frail elderly. A US study examined a quality improvement programme to decrease the use of bed rails in three care home nursing units. The programme involved individualised patient assessment, selection of appropriate alternatives for residents, compliance monitoring, training and monitoring of patient outcomes, including falls. The intervention was associated with reduced bed rail injuries.<sup>126</sup>

A number of studies have examined falls as a component of deterioration, including in care homes.<sup>127</sup> For instance, an evaluation in US care homes found that a **multifaceted programme** combining multiple personalised interventions was effective in reducing the falls rate of frail residents. Muscle-strengthening interventions were found to be particularly useful for minimising deterioration.<sup>128</sup>

Care homes in the US implemented three initiatives to reduce the risk of falls in frail people. These comprised an **environmental initiative** (room furniture was repositioned), staffing (an additional staff member was added at times when the incidence of falls was highest) and a restorative activity program. There was a 38% reduction in the number of falls and a 50% reduction in the number of fractures.<sup>129</sup>

In China, three nursing homes adopted an **end-of-life protocol** to help identify and address deterioration in people who were terminally ill. Whilst deterioration in physical health continued, there was improvement in social quality of life, including individuality and relationships.<sup>130</sup>

## HOSPITAL CARE

### IDENTIFYING RISK

Frailty is associated with increased complications in hospital, longer hospital stays and higher 30-day readmission rates.<sup>131</sup> Frail people are particularly vulnerable to hospital-associated complications such as falls, pressure ulcers, functional decline and delirium. Such deterioration can contribute to prolonged hospital stay, readmission and nursing home placement. People's vulnerabilities may be exacerbated if hospital practices and the physical environment are not mindful of the needs of frail individuals. A relatively large amount of evidence has been published about identifying and addressing deterioration in hospital.

In Canada, a framework was developed to help hospitals assess areas of risk for frail older people. The framework comprised five interrelated domains: organisational support, processes of care, emotional and behavioural environment, ethics in clinical care and research, and physical environment. All 155 adult hospitals in Ontario undertook self-assessment using the framework. This helped to identify areas of good practice and areas for development. The impact on safety outcomes was not reported.<sup>132</sup>

It has been proposed that **screening for frailty** may improve safety and help to prevent adverse outcomes. Knowing that people are frail can help target them for special care.<sup>133</sup> For instance, a study in Canada found that measuring frailty in A&E can help identify people at risk of deterioration after minor injuries.<sup>134</sup>

Four hospitals in the Netherlands tested a range of screening tools for frailty which examined day-to-day activities, falls, undernutrition and delirium. Patients were followed up to see whether the tools predicted adverse outcomes. It was found that screening tools could identify older people at risk of adverse outcomes, but the researchers emphasised that it is important to weigh costs and benefits of screening in clinical practice given the relatively low-predictive power of screening instruments.<sup>135</sup>

A meta-analysis of 22 randomised trials examined comprehensive geriatric assessment undertaken by mobile teams or in designated wards for elderly people with unplanned hospital admissions. Not all of the participants were frail. People who underwent comprehensive geriatric assessment were more likely to be alive and in their own homes at follow-up and less likely to experience deterioration. **Wards designated for comprehensive geriatric assessment** were associated with better outcomes than mobile assessment teams.<sup>136</sup>

Examples of tools to help identify deterioration in hospital include the **Modified Early Warning Score (MEWS)** and the **VitalPac Early Warning Score (VIEWS)**. Both have been found to be easy to use and to predict admission and in-hospital mortality in geriatric A&E department patients.<sup>137</sup>

In the US, early warning scores were used to identify deteriorating patients in hospital, some of whom were frail. The scores were used to personalise thresholds for rapid response team activation based on frailty and admission type.<sup>138</sup>

Early warning scores were originally derived as bedside tools for alerting medical staff to deterioration but they have also been used as decision rules or checklists when admitting patients. Researchers in Italy applied the Modified Early Warning Score (MEWS) to identify people at risk of deterioration who might benefit from an increased level of attention during hospitalisation. On admission, the attending doctor measured five physiological parameters (systolic blood pressure, pulse rate, respiratory rate, body temperature and level of consciousness) and calculated the MEWS. The scores predicted worse in-hospital outcomes.<sup>139</sup>

**Goal Attainment Scaling** is an individualised goal-setting and measurement approach, aiming to improve wellbeing and guard against deterioration. Six geriatric day hospitals in Canada tested this approach, helping people create goals surrounding mobility, community reintegration, activities of daily living, medical issues, communication and home safety. It took between 15 and 44 minutes to develop each goal plan. The approach was valued by older people though staff found it difficult to implement.<sup>140</sup>

During hospital stays frail people may become deconditioned, even if there is no new neurologic or motor deficit. Tools have been tested to **assess mobility independence** in hospital, prior to discharge. Such tools include a quick series of bedside mobility requests so people can demonstrate they can move independently. These can be facilitated by nurses or junior doctors.<sup>141</sup>

In Spain, the **Global Trigger Tool** was used in an acute geriatric hospital to detect adverse events, including medication issues. Six years of data were analysed. There were 29 physical injuries per 100 admissions. Two thirds of harms were deemed preventable (66%). Factors associated with reduced adverse events included new beds with variable height, pressure ulcer prevention, the introduction of clinical electronic records, staff training on hand washing, surgical checklists, correct patient identification and surveys about patient safety culture.<sup>142</sup>

## INFORMATION AND EDUCATION

A limited amount of research has examined the benefits of education about deterioration in hospital. For example, in the US nurse faculty from pre-registration programmes in 19 States were provided with education about aging and teaching effectiveness to prepare student nurses to provide safer care for older adults. The initiative included a **workshop** to increase basic knowledge of aging, common geriatric syndromes and evidence-based teaching strategies plus one year of mentoring to support implementation. Self-rated teaching effectiveness improved significantly and nursing schools implemented educational projects about aging.<sup>143</sup>

In the UK, 89 medical trainees in geriatrics were offered **simulation training** to support safer care for the elderly. Simulation techniques used included high-fidelity patient manikins, actors and role-play exercises. Twelve similar courses were run over a two year period. Simulation was seen as a useful tool, with benefits for both technical and non-technical skills. This helped to address curriculum areas rarely taught formally, including continence assessment, end-of-life decisions and multidisciplinary situations. There was an improvement in trainees' self-reported confidence in managing care for the frail and elderly.<sup>144</sup>



## TEAMWORK AND ROLES

Some studies have explored how teamwork and alternative roles can be used to respond to deterioration of the frail elderly in hospital. In Australia, elderly patients assessed as being at high risk of falls were accommodated in a room staffed by **volunteer companion-observers**. The volunteers engaged people in conversation, played card games, opened meals and used the call bell to summon nurses if patients attempted to move from the bed or chair without assistance. The volunteers did not physically assist patients. The falls rate in the acute aged care ward decreased by 44%. No-one fell in the observation room when volunteers were present. The researchers concluded that using volunteers was feasible and worthwhile, but that other strategies were also needed because volunteers are not present around the clock and older patients could become confused and fall during the night.<sup>145</sup>

Elsewhere in Australia, a randomised trial examined early geriatric assessment from an **aged care nurse based in A&E**. The nurse undertook risk assessments and liaised with the patients' carers and healthcare providers, organised referrals for out-of-hospital assessment and support and made suggestions for assessment and referral amongst those admitted. The intervention had no significant effect on admission, length of stay or functional decline during hospitalisation.<sup>146</sup>

Around 40% of people older than 70 years with acute medical admissions have dementia, but only half of these patients have been diagnosed. People with dementia have poorer health outcomes, longer hospital stays and higher rates of readmissions and institutionalisation. A review found that hospitals implementing a **multi-skilled team** to undertake comprehensive assessment of a person's physical and psychological wellbeing had reduced lengths of stay and readmission rates.<sup>147</sup>

**Rapid response teams** have been tested in hospital to respond to deteriorating patients on wards. Whilst a number of studies are available about rapid response teams in general, few focus specifically on outcomes for frail people.<sup>148</sup>

## TECHNOLOGY AND TOOLS

A number of tools have been tested to prevent deterioration or reduce adverse events more generally in hospital. For instance, tools designed to help prevent falls and fall-related injuries include hip protectors, wheelchair/scooter safety features, intelligent walkers, fall alarms and environmental aids.

Bed-rail entrapment can be a serious issue, whereby people are trapped or entangled in beds. Strategies to prevent bed-rail entrapment include new bed designs, height-adjustable low beds, devices to close gaps in legacy beds and bedside floor mats.

Patient-handling risks can be addressed using floor-based lifts, ceiling-mounted patient lifts and improvements in powered standing lifts, new friction-reducing devices and new patient transport technology.

Wandering may affect around two in five cognitively impaired people. Tools tested to prevent adverse events associated with wandering include door alarms and signal-transmitting devices.

Whilst there is literature describing these various types of tools, there is limited empirical evidence about their impacts for frail people and little comparative evidence suggesting that certain tools and strategies are more effective than others.<sup>149</sup>

Using **preventive protocols** has been associated with reduced falls and reduced injuries from falls in hospital.<sup>150</sup>

## TARGETED CARE

A variety of targeted interventions have been tested in hospital to prevent or address deterioration. A systematic review of 20 studies examined hospital-wide interventions aiming to tailor care for frailty. The most commonly studied interventions included **multidisciplinary consultative teams**, nursing care models, structural changes in the physical environment and changes in the site of service delivery. Compared with usual care, most studies found small or no effects on patient-related outcomes such as functional performance, length of stay, discharge destination, resource use and costs. The reviewers concluded that it is not possible to identify a single best hospital-wide intervention to improve care and reduce deterioration amongst frail people.<sup>151</sup>

In the US, **'acute care for the elderly' hospital units** have been associated with decreased length of stay, reduced hospital costs and lower readmission rates. People have been found to return home with increased functional capacity and improved satisfaction with their hospital stay. The units focus on providing targeted support. A US study investigated whether these units had benefits for frail people, who may be more vulnerable and dependent than other older hospital patients. Data from 1,096 frail people admitted to the acute care for the elderly unit at one hospital were compared to 383 people with similar illness severity admitted before the unit existed. The unit was associated with reduced average length of stay, readmission rates and cost per case.<sup>152</sup> This study focused on economic outcomes rather than indicators of safety for patients.

A study with 29 US hospitals explored the use of quality improvement strategies to reduce deterioration in elderly people with pneumonia. Hospitals that used a **range of interventions** targeting various social, physical and environmental factors had improved care processes.<sup>153</sup>

**Exercise training** in hospital has been used as a preventive measure to reduce deterioration in frail older people. A US study found that frail patients recuperating from acute illnesses in hospital could safely participate in and gain improvement in muscle strength from progressive resistance muscle strength training.<sup>154</sup>

Up to 40% of older people attending A&E may have cognitive impairment. A systematic review of seven articles examining ways to improve the care of people with dementia in A&E categorised improvement practices into five themes: assessment of cognitive impairment, dementia communication strategies, avoidance of adverse events, alterations to the physical environment and education of A&E staff.<sup>155</sup>

In the US, a multicomponent hospital-based intervention targeted risk factors for delirium. In a randomised trial, there was no overall improvement in deterioration or outcomes but those at high risk had improved functional outcomes and self-reported health status six months after discharge.<sup>156</sup>

## OTHER INITIATIVES

Falls in hospital account for almost two-fifths of the patient safety incidents reported to the UK National Reporting and Learning System. Falls may be partly a result of deterioration (due to disorientation or functional impairment) or may lead to deterioration as a result of injury. A UK study compared whether there was a higher rate of falls in units with 100% single rooms or **multi-bedded wards**. Single room units had a higher rate of falls (5 versus 16 per 1,000 patient bed days in multi-bedded wards). There was also a higher rate of fractures resulting from falls.<sup>157</sup>

A systematic review examined the effectiveness of **geriatric medical day hospital** attendance. Thirteen trials with 3,007 participants were included. Not all participants were frail. The studies compared day hospitals with comprehensive elderly care (five trials), domiciliary care (five trials), or no comprehensive elderly care (three trials). There were no significant differences between day hospital attendance and alternative care regarding death, requiring institutional care or deterioration in activities of daily living. Attending a day hospital was associated with reduced overall deterioration compared to no comprehensive elderly care.<sup>158</sup>

## SUMMARY

Table 6 summarises the evidence about interventions to identify and respond to deterioration in frail people. Most of the interventions focus on prevention or targeted care.

The interventions where there is most positive evidence include:

- **comprehensive geriatric assessment** (tested in people's homes, in primary care, in the community, in care homes and in hospital)
- **nurse home visits** (tested at home)
- **telehealth monitoring** (tested at home and in care homes)
- **exercise therapy programmes** (tested at home, in the community, in care homes and in hospital)
- **involving pharmacists** (tested in primary care and in hospital)

It is difficult to quantify the effectiveness of these interventions because the evidence is sparse. There is little evidence comparing one type of intervention with another. Thus, whilst these interventions have the most positive evidence available regarding addressing deterioration, it is not possible to say that they are the most effective interventions.

**Table 6: Summary of evidence about identifying and responding to deterioration in frail people**

<b>Intervention</b>	<b>Context tested</b>	<b>Findings</b>	<b>Evidence quality</b>
<b>Targeting patients</b>			
<b>Comprehensive geriatric assessment and frailty screening tools</b>	Home, primary care, community, care homes, hospital	Supports individualised planning to prevent deterioration but patients may not always adhere to recommendations	Medium quality, large quantity
<b>Early warning scores</b>	Hospital	Feasible for identifying deterioration	Limited quality and quantity
<b>Link worker for targeted support</b>	Home	Can help to reduce risk of specific harm	Limited quality and quantity
<b>Nurse home visits or telephone follow-ups</b>	Home	Mixed evidence, may reduce hospital visits and improve clinical indicators	Medium quality, large quantity
<b>Telehealth and devices</b>	Home	Automated vital signs monitoring may reduce health service use	Medium quality, large quantity
<b>Exercise programmes</b>	Home, community, care home, hospital	May help to build strength, reduce deterioration and reduce falls	Medium quality, large quantity
<b>Personalised interventions based on risk</b>	Community, care homes	May reduce deterioration and falls	Limited quality and quantity
<b>Targeting professionals</b>			
<b>Education, including courses and simulation</b>	Home, community, care homes, hospital	Improved staff knowledge, confidence and practice	Limited quality and quantity
<b>Multiprofessional teams</b>	Primary care, community, hospital	Improved identification of risk and quality of care	Limited quality and quantity
<b>Geriatrician clinics</b>	Primary care	Reduced admissions	Limited quality and quantity
<b>Involving pharmacists</b>	Primary care, hospital	Improved processes of care, safety and medication adherence	Medium quality and quantity
<b>Case managers</b>	Care homes	Some evidence to support enhanced care coordination	Limited quality and quantity
<b>Specialist nurse in A&amp;E</b>	Hospital	No effect on deterioration or admissions	Limited quality and quantity
<b>Volunteers</b>	Hospital	Reduced falls	Limited quality and quantity
<b>Targeting organisations</b>			
<b>Framework to identify areas of risk</b>	Hospital	Feasible but unknown impact on outcomes	Limited quality and quantity
<b>Preventive protocols</b>	Care homes, hospitals	Reduced harms such as falls	Limited quality and quantity
<b>Elderly care wards</b>	Hospitals	Reduced readmissions	Limited quality and quantity
<b>Multi-bedded wards</b>	Hospitals	Reduced rate of falls	Limited quality and quantity
<b>Targeting systems</b>			
<b>Quality indicators</b>	Primary care	Varied applicability across health and care systems	Limited quality and quantity
<b>Incident identification tools and reporting</b>	Care homes, hospitals	Improved documentation	Limited quality and quantity

# IMPLICATIONS

## EFFECTIVE INTERVENTIONS

Table 7 summarises the range of interventions tested to improve care safety for frail older people.

This shows that across the three priority areas, the interventions with the most evidence of impact include:

### *Interventions targeting patients and carers*

- tools to identify frailty, screen for risks and plan to address needs
- telehealth monitoring
- nurse home visits and follow-up
- exercise programmes

### *Interventions targeting professionals*

- education
- audit and feedback
- computerised decision support
- involving pharmacists in care teams

These interventions are also those which may be transferable across a range of care settings as they are most likely to have been tested in various contexts.

There may be less evidence about other interventions, particularly those targeting organisations and systems. However, this does not mean that they are not effective, only that less empirical research is available about them. **A lack of evidence about interventions does not indicate a lack of effectiveness.**

It is not possible to easily identify the most effective interventions to improve medicines safety, transfers and deterioration in frail older people or to estimate what proportion of adverse events could be prevented by implementing evidence-based practice. This is because:

- **The evidence is relatively sparse.** Whilst a great deal has been published about medicines safety, for example, very little of this focuses on frailty. Where articles do exist they are often descriptive rather than empirical. Even empirical studies often do not contain outcomes related to patient safety or contain only short-term findings, rather than tracking outcomes over time.
- **There is little comparative evidence available.** Thus studies may have found benefit from a particular intervention, but it is difficult to compare the impacts and costs of one intervention versus another because these types of direct comparisons are rare.

Whilst there is no simple checklist of interventions available, the evidence suggests that what is needed is a **multifactorial approach at varying levels**, including at the level of the patient, task, staff, team, environment, organisation and wider context.<sup>159</sup>

**Table 7: Interventions tested to improve medicines safety, transfers and deterioration in frail people**

	Medicines safety	Transfers of care	Deterioration
Interventions targeting patients and carers	<ul style="list-style-type: none"> <li>● Mobile phone apps</li> <li>● Volunteer coaches</li> <li>● Patient education</li> <li>● Behavioural interventions</li> <li>● One dose medication package</li> </ul>	<ul style="list-style-type: none"> <li>● Patient and carer education</li> <li>● Discharge support</li> <li>● Advance directives</li> <li>● Home visits prior to discharge</li> <li>● Automated follow-up calls after discharge</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Comprehensive geriatric assessment and screening</b></li> <li>● Early warning scores</li> <li>● <b>Nurse home visits and follow-up</b></li> <li>● Link worker</li> <li>● <b>Exercise programmes</b></li> <li>● <b>Telehealth monitoring</b></li> <li>● Personalised interventions</li> </ul>
Interventions targeting professionals	<ul style="list-style-type: none"> <li>● <b>Involving pharmacists</b></li> <li>● <b>Education and training</b></li> <li>● <b>Audit and feedback</b></li> <li>● <b>Computerised decision support</b></li> <li>● Checklists and guides</li> <li>● Criteria for identifying inappropriate medications</li> <li>● Clinicians in care homes</li> <li>● Medication review clinics</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Education and training</b></li> <li>● Geriatrician in A&amp;E</li> <li>● Discharge planners / flow managers</li> <li>● Daily discharge briefing</li> </ul>	<ul style="list-style-type: none"> <li>● Education and training</li> <li>● Multiprofessional teams</li> <li>● Geriatrician clinics</li> <li>● <b>Involving pharmacists</b></li> <li>● Case managers</li> <li>● Specialist nurses in A&amp;E</li> <li>● Volunteers</li> </ul>
Interventions targeting organisations		<ul style="list-style-type: none"> <li>● Discharge planning</li> <li>● Electronic tools</li> <li>● Medication reconciliation</li> <li>● Elderly care wards</li> </ul>	<ul style="list-style-type: none"> <li>● Framework to identify areas of risk</li> <li>● Preventive protocols</li> <li>● Elderly care wards</li> <li>● Multi-bedded wards</li> </ul>
Interventions targeting systems		<ul style="list-style-type: none"> <li>● Direct admission to elderly care wards</li> <li>● Discharge protocols and checklists</li> <li>● Standardised discharge letters</li> <li>● Intermediate care</li> </ul>	<ul style="list-style-type: none"> <li>● Quality indicators</li> <li>● Incident identification tools and reporting systems</li> </ul>

Note: Interventions in bold have medium quality evidence of effectiveness.

## KEY SUCCESS FACTORS

The Eastern Academic Health Science Network's quality improvement collaborative for safer frailty care will consider various interventions, testing and adapting initiatives for local use. However, perhaps just as important as the interventions themselves are factors related to the processes and context of the collaborative.

A study in the Netherlands explored the factors that helped and hindered quality improvement efforts for frail older people in hospital. Nineteen hospitals implemented screening instruments and interventions targeting delirium, falls, malnutrition and physical impairment. Interviews with doctors, nurses and members of the improvement team found that barriers to implementation included two process factors (insufficient involvement of clinicians and lack of time), two content factors (divergent objectives and concerns about recommended programme elements) and two contextual factors (lack of knowledge about delirium and limited insight into the purpose of the programme). Facilitating factors included one process factor (leadership), one content factor (flexibility in choosing methods) and two contextual factors (programme guidance and the use of digital patient records).<sup>160</sup>

In the US, an improvement programme was implemented in US hospitals to reduce episodes of delirium, functional decline and long-term nursing home placement. A study at 63 hospitals found that senior management support was key in adoption of the interventions and helped to motivate staff to take part.<sup>161</sup>

Key principles found to facilitate success across a variety of interventions are listed below:

- **Educate and involve the wider team**, including nurses, pharmacists, doctors, healthcare support workers and those working in care homes.
- Provide **very specific and simple information** to clinicians and teams about the changes needed.
- **Involve patients and carers** in their care and seek regular feedback about issues they are facing. Simple pictorial aids can be useful.
- **Combine a range of interventions**, including targeting support at the level of patients and carers, the health and care workforce, organisational level and cross organisation initiatives.
- **Working across health and social care** and across different healthcare sectors may result in more sustained change, though it can take longer for these changes to become apparent.
- Medication safety, transfers of care and deterioration are all **interrelated**. Seeing them as distinct outcomes may lead to more siloed thinking. It is important to consider the 'knock on' impacts of any intervention on other outcomes.
- The exact content of interventions is perhaps less important than **improving culture, attitudes and knowledge**. It may be useful to focus on assessing potential risk and harm, to document adverse events so that they can be studied and to educate patients, carers and staff across the continuum that risks can be minimised with simple interventions.
- The most useful interventions may be **relatively simple**: good documentation and checklists to standardise care, communicating and transferring information routinely and following up on people's status regularly.

# REFERENCES

- 1 The Kings Fund. *The care of frail older people with complex needs: Time for a revolution*. London: Kings Fund, 2012.
- 2 Sari AB, Cracknell A, Sheldon TA. Incidence, preventability and consequences of adverse events in older people: results of a retrospective case-note review. *Age Ageing* 2008;37(3):265-269.
- 3 Thomas EJ, Brennan TA. Incidence and types of preventable adverse events in elderly patients: population based review of medical records. *BMJ* 2000;320(7237):741-744.
- 4 Tsilimingras D, Rosen AK, Berlowitz DR. Patient safety in geriatrics: a call for action. *J Gerontol A Biol Sci Med Sci* 2003;58(9):M813-819.
- 5 Faurot KR, Jonsson Funk M, Pate V, Brookhart MA, Patrick A, Hanson LC, Castillo WC, Stürmer T. Using claims data to predict dependency in activities of daily living as a proxy for frailty. *Pharmacoepidemiol Drug Saf* 2015;24(1):59-66.
- 6 Abbatecola AM, Olivieri F, Corsonello A, Strollo F, Fumagalli A, Lattanzio F. Frailty and safety: the example of diabetes. *Drug Saf* 2012;35 Suppl 1:63-71.
- 7 Lee L, Heckman G, Molnar FJ. Frailty: Identifying elderly patients at high risk of poor outcomes. *Can Fam Physician* 2015;61(3):227-231.
- 8 Gale CR, Cooper C, Sayer AA. Prevalence of frailty and disability: findings from the English Longitudinal Study of Ageing. *Age Ageing* 2015;44(1):162-165.
- 9 Bandeen-Roche K, Seplaki CL, Huang J, Buta B, Kalyani RR, Varadhan R, Xue QL, Walston JD, Kasper JD. Frailty in older adults: a nationally representative profile in the United States. *J Gerontol A Biol Sci Med Sci* 2015;70(11):1427-1434.
- 10 McCaul KA, Almeida OP, Norman PE, Yeap BB, Hankey GJ, Golledge J, Flicker L. How many older people are frail? Using multiple imputation to investigate frailty in the population. *J Am Med Dir Assoc* 2015;16(5):439.e1-7.
- 11 Chess D, Krentzman M, Charde J. Creating a wellness program/safety net for the medically complex and frail patient. *J Ambul Care Manage* 2007;30(1):30-38.
- 12 <https://www.england.nhs.uk/wp-content/uploads/2014/02/safe-comp-care.pdf>
- 13 Franchin A, Corradin ML, Giantin V, Rossi F, Zanatta F, Attanasio F, Toffanello ED, Manzato E. Diabetes in a geriatric ward: efficacy and safety of new insulin analogs in very old inpatients. *Aging Clin Exp Res* 2012;24(3 Suppl):17-19.
- 14 Wang CJ, Fetzer SJ, Yang YC, Wang JJ. The impacts of using community health volunteers to coach medication safety behaviors among rural elders with chronic illnesses. *Geriatr Nurs* 2013;34(2):138-145.
- 15 Tseng MH, Wu HC. A cloud medication safety support system using QR code and web services for elderly outpatients. *Technol Health Care* 2014;22(1):99-113.
- 16 Corsonello A, Onder G, Abbatecola AM, Guffanti EE, Gareri P, Lattanzio F. Explicit criteria for potentially inappropriate medications to reduce the risk of adverse drug reactions in elderly people: from Beers to STOPP/START criteria. *Drug Saf* 2012;35 Suppl 1:21-28.
- 17 Poole SG, Bell JS, Jokanovic N, Kirkpatrick CM, Dooley MJ. A systematic review of medication exposure assessment in prospective cohort studies of community dwelling older Australians. *PLoS One* 2015;10(4):e0124247.
- 18 Wessell AM, Nietert PJ, Jenkins RG, Nemeth LS, Ornstein SM. Inappropriate medication use in the elderly: results from a quality improvement project in 99 primary care practices. *Am J Geriatr Pharmacother* 2008;6(1):21-27.
- 19 Roughead EE, Kalisch Ellett LM, Ramsay EN, Pratt NL, Barratt JD, LeBlanc VT, Ryan P, Peck R, Killer G, Gilbert AL. Bridging evidence-practice gaps: improving use of medicines in elderly Australian veterans. *BMC Health Serv Res* 2013;13:514.
- 20 Vejar MV, Makic MB, Kotthoff-Burrell E. Medication management for elderly patients in an academic primary care setting: a quality improvement project. *J Am Assoc Nurse Pract* 2015;27(2):72-78.



- 21 Topinková E, Baeyens JP, Michel JP, Lang PO. [Evidence-based strategies for the optimization of pharmacotherapy in older people.](#) *Drugs Aging* 2012;29(6):477-494.
- 22 Topinková E, Baeyens JP, Michel JP, Lang PO. [Evidence-based strategies for the optimization of pharmacotherapy in older people.](#) *Drugs Aging* 2012;29(6):477-494.
- 23 Topinková E, Baeyens JP, Michel JP, Lang PO. [Evidence-based strategies for the optimization of pharmacotherapy in older people.](#) *Drugs Aging* 2012;29(6):477-494.
- 24 Vanderman AJ, Moss JM, Bryan WE 3rd, Sloane R, Jackson GL, Hastings SN. [Evaluating the impact of medication safety alerts on prescribing of potentially inappropriate medications for older veterans in an ambulatory care setting.](#) *J Pharm Pract* (Published online ahead of print December 2015).
- 25 Topinková E, Baeyens JP, Michel JP, Lang PO. [Evidence-based strategies for the optimization of pharmacotherapy in older people.](#) *Drugs Aging* 2012;29(6):477-494.
- 26 Nakai K, Yamamoto N, Kamei M, Fujita M. [The effect of one-dose package on medication adherence for the elderly care in Japan.](#) *Pharm Pract* 2009;7(1):59-62.
- 27 Chan DC, Chen JH, Wen CJ, Chiu LS, Wu SC. [Effectiveness of the medication safety review clinics for older adults prescribed multiple medications.](#) *J Formos Med Assoc* 2014;113(2):106-113.
- 28 Smith JD, Coleman EA, Min SJ. [A new tool for identifying discrepancies in postacute medications for community-dwelling older adults.](#) *Am J Geriatr Pharmacother* 2004;2(2):141-147.
- 29 Fahrni ML, Franklin BD, Rawaf S, Majeed A. [Improving medication safety in UK care homes: challenges and current perspective.](#) *JRSM Open* 2014;5(2):2042533313515475.
- 30 Kojima G, Bell CL, Tamura B, Davis J, Inaba M, Lorenzo P, Blanchette PL, Iwasaki W, Masaki K. [Combining quality improvement and geriatrics training: the nursing home polypharmacy outcomes project.](#) *Gerontol Geriatr Educ* 2014;35(4):395-408.
- 31 Rogers S, Martin G, Rai G. [Medicines management support to older people: understanding the context of systems failure.](#) *BMJ Open* 2014;4(7):e005302.
- 32 Villanyi D, Fok M, Wong RY. [Medication reconciliation: identifying medication discrepancies in acutely ill hospitalized older adults.](#) *Am J Geriatr Pharmacother* 2011;9(5):339-344.
- 33 Schächtele S, Tümena T, Gaßmann KG, Fromm MF, Maas R. [Implementation of warnings from Dear Doctor Letters \(Rote-Hand-Briefe\): an analysis of medication data from a large cohort of elderly patients.](#) *Dtsch Arztebl Int* 2014;111(15):255-263.
- 34 Tran T, Elliott RA, Taylor SE, Woodward MC. [A self-administration of medications program to identify and address potential barriers to adherence in elderly patients.](#) *Ann Pharmacother* 2011;45(2):201-206.
- 35 Buck TC, Gronkjaer LS, Duckert ML, Rosholm JU, Aagaard L. [Medication reconciliation and prescribing reviews by pharmacy technicians in a geriatric ward.](#) *J Res Pharm Pract* 2013;2(4):145-150.
- 36 Steurbaut S, Leemans L, Leysen T, De Baere E, Cornu P, Mets T, Dupont AG. [Medication history reconciliation by clinical pharmacists in elderly inpatients admitted from home or a nursing home.](#) *Ann Pharmacother* 2010;44(10):1596-1603.
- 37 Cornu P, Steurbaut S, Soštarić S, Mrhar A, Dupont AG. [Performance of a clinical decision support system and of clinical pharmacists in preventing drug-drug interactions on a geriatric ward.](#) *Int J Clin Pharm* 2014;36(3):519-525.
- 38 Marcum ZA, Handler SM, Boyce R, Gellad W, Hanlon JT. [Medication misadventures in the elderly: a year in review.](#) *Am J Geriatr Pharmacother* 2010;8(1):77-83.
- 39 Chieng JH, Hughes L, Stewart A, Frampton CM, Hanger HC, Jardine DL. [Introduction of the Pill Pruner to acute medical care: a simple medication guide to control polypharmacy.](#) *Australas J Ageing* 2015;34(1):58-61.
- 40 Mattison ML, Catic A, Davis RB, Olveczky D, Moran J, Yang J, Aronson M, Zeidel M, Lipsitz L, Marcantonio ER. [A standardized, bundled approach to providing geriatric-focused acute care.](#) *J Am Geriatr Soc* 2014;62(5):936-942.

- 
- 41 Peterson JF, Kripalani S, Danciu I, Harrell D, Marvanova M, Mixon AS, Rodriguez C, Powers JS. Electronic surveillance and pharmacist intervention for vulnerable older inpatients on high-risk medication regimens. *J Am Geriatr Soc* 2014;62(11):2148-2152.
  - 42 Nasarwanji M, Werner NE, Carl K, Hohl D, Leff B, Gurses AP, Arbaje AI. Identifying challenges associated with the care transition workflow from hospital to skilled home health care: perspectives of home health care agency providers. *Home Health Care Serv Q* 2015;34(3-4):185-203.
  - 43 Dwyer R, Gabbe B, Stoelwinder JU, Lowthian J. A systematic review of outcomes following emergency transfer to hospital for residents of aged care facilities. *Age Ageing* 2014;43(6):759-766.
  - 44 Midlöv P, Bergkvist A, Bondesson A, Eriksson T, Höglund P. Medication errors when transferring elderly patients between primary health care and hospital care. *Pharm World Sci* 2005;27(2):116-120.
  - 45 Denson LA, Winefield HR, Beilby JJ. Discharge-planning for long-term care needs: the values and priorities of older people, their younger relatives and health professionals. *Scand J Caring Sci* 2013;27(1):3-12.
  - 46 Murray LM, Laditka SB. Care transitions by older adults from nursing homes to hospitals: implications for long-term care practice, geriatrics education, and research. *J Am Med Dir Assoc* 2010;11(4):231-238.
  - 47 Jones S, Wallis P. Effectiveness of a geriatrician in the emergency department in facilitating safe admission prevention of older patients. *Clin Med* 2013;13(6):561-564.
  - 48 Cwinn MA, Forster AJ, Cwinn AA, Hebert G, Calder L, Stiell IG. Prevalence of information gaps for seniors transferred from nursing homes to the emergency department. *CJEM* 2009;11(5):462-471.
  - 49 Reid RC, Cummings GE, Cooper SL, Abel SL, Bissell LJ, Estabrooks CA, Rowe BH, Wagg A, Norton PG, Ertel M, Cummings GG. The Older Persons' Transitions in Care (OPTIC) study: pilot testing of the transition tracking tool. *BMC Health Serv Res* 2013;13:515.
  - 50 Aizen E, Swartzman R, Clarfield AM. Hospitalization of nursing home residents in an acute-care geriatric department: direct versus emergency room admission. *Isr Med Assoc J* 2001;3(10):734-738.
  - 51 Meschi T, Ticinesi A, Prati B, Montali A, Ventura A, Nouvenne A, Borghi L. A novel organizational model to face the challenge of multimorbid elderly patients in an internal medicine setting: a case study from Parma Hospital, Italy. *Intern Emerg Med* (Published online ahead of print February 2016).
  - 52 DeCaporale-Ryan LN, Cornell A, McCann RM, McCormick K, Speice J. Hospital to home: a geriatric educational program on effective discharge planning. *Gerontol Geriatr Educ* 2014;35(4):369-379.
  - 53 Sandvik D, Bade P, Dunham A, Hendrickson S. A hospital-to-nursing home transfer process associated with low hospital readmission rates while targeting quality of care, patient safety, and convenience: a 20-year perspective. *J Am Med Dir Assoc* 2013;14(5):367-374.
  - 54 Corrado J, Topley K, Cracknell A. Improving the efficacy of elderly patients' hospital discharge through multi-professional safety briefings and behavioural change. *BMJ Qual Improv Rep* 2015;4. pii: u209431.w3871.
  - 55 Goldman LE, Sarkar U, Kessell E, Guzman D, Schneidermann M, Pierluissi E, Walter B, Vittinghoff E, Critchfield J, Kushel M. Support from hospital to home for elders: a randomized trial. *Ann Intern Med* 2014;161(7):472-481.
  - 56 Nygård L, Grahn U, Rudenhammar A, Hydling S. Reflecting on practice: are home visits prior to discharge worthwhile in geriatric inpatient care? *Scand J Caring Sci* 2004;18(2):193-203.
  - 57 Dainty P, Elizabeth J. Timely discharge of older patients from hospital: improving the process. *Clin Med* 2009;9(4):311-314.
  - 58 Halasyamani L, Kripalani S, Coleman E, Schnipper J, van Walraven C, Nagamine J, Torcson P, Bookwalter T, Budnitz T, Manning D. Transition of care for hospitalized elderly patients--development of a discharge checklist for hospitalists. *J Hosp Med* 2006;1(6):354-360.
  - 59 Kergoat MJ, Latour J, Julien I, Plante MA, Lebel P, Mainville D, Bolduc A, Buckland JA. A discharge summary adapted to the frail elderly to ensure transfer of relevant information from the hospital to community settings: a model. *BMC Geriatr* 2010;10:69.
  - 60 Glajchen M, Lawson R, Homel P, Desandre P, Todd KH. A rapid two-stage screening protocol for palliative care in the emergency department: a quality improvement initiative. *J Pain Symptom Manage* 2011;42(5):657-662.

- 
- 61 Ward KT, Bates-Jensen B, Eslami MS, Whiteman E, Dattoma L, Friedman JL, DeCastro Mariano J, Moore AA. Addressing delays in medication administration for patients transferred from the hospital to the nursing home: a pilot quality improvement project. *Am J Geriatr Pharmacother* 2008;6(4):205-211.
- 62 Forster AJ, van Walraven C. Using an interactive voice response system to improve patient safety following hospital discharge. *J Eval Clin Pract* 2007;13(3):346-351.
- 63 Laugaland K, Aase K, Barach P. Interventions to improve patient safety in transitional care - a review of the evidence. *Work* 2012;41 Suppl 1:2915-2924.
- 64 Herfjord JK, Heggstad T, Erslund H, Ranhoff AH. Intermediate care in nursing home after hospital admission: a randomized controlled trial with one year follow-up. *BMC Res Notes* 2014;7:889.
- 65 Salinas RC, Ramakrishnan K. Patient safety and medical errors: a focus on care transitions of the vulnerable older patient. *J Okla State Med Assoc* 2012;105(2):52-57.
- 66 Clegg A, Young J, Iliffe S, Olde Rikkert M, Rockwood K. Frailty in elderly people. *Lancet* 2013; 381(9): 752-762.
- 67 Craig JA, Creegan S, Tait M, Dolan D. Partnership working between the Fire Service and NHS: delivering a cost-saving service to improve the safety of high-risk people. *BMC Res Notes* 2015;8:146.
- 68 Rodriguez JG, Baughman AL, Sattin RW, DeVito CA, Ragland DL, Bacchelli S, Stevens JA. A standardized instrument to assess hazards for falls in the home of older persons. *Accid Anal Prev* 1995;27(5):625-631.
- 69 Vu TV, Mackenzie L. The inter-rater and test-retest reliability of the Home Falls and Accidents Screening Tool. *Aust Occup Ther J* 2012;59(3):235-242.
- 70 Andrade AD, Cifuentes P, Mintzer MJ, Roos BA, Anam R, Ruiz JG. Simulating geriatric home safety assessments in a three-dimensional virtual world. *Gerontol Geriatr Educ* 2012;33(3):233-252.
- 71 Marek KD, Baker CD. Nurse home visit programs for the elderly. *Annu Rev Nurs Res* 2006;24:157-178.
- 72 Dalby DM, Sellors JW, Fraser FD, Fraser C, van Ineveld C, Howard M. Effect of preventive home visits by a nurse on the outcomes of frail elderly people in the community: a randomized controlled trial. *CMAJ* 2000;162(4):497-500.
- 73 Behm L, Eklund K, Wilhelmson K, Zidén L, Gustafsson S, Falk K, Dahlin-Ivanoff S. Health promotion can postpone frailty: results from the RCT elderly persons in the risk zone. *Public Health Nurs* (Published online ahead of print November 2015).
- 74 Charlson ME, Peterson JC, Syat BL, Briggs WM, Kline R, Dodd M, Murad V, Dionne W. Outcomes of community-based social service interventions in homebound elders. *Int J Geriatr Psychiatry* 2008;23(4):427-432.
- 75 Barlow J, Singh D, Bayer S, Curry R. A systematic review of the benefits of home telecare for frail elderly people and those with long-term conditions. *J Telemed Telecare* 2007;13(4):172-179.
- 76 Grant LA, Rockwood T, Stennes L. Client satisfaction with telehealth in assisted living and homecare. *Telemed J E Health* 2015;21(12):987-991.
- 77 Lee T, Mihailidis A. An intelligent emergency response system: preliminary development and testing of automated fall detection. *J Telemed Telecare* 2005;11(4):194-198.
- 78 Zwijsen SA, Niemeijer AR, Hertogh CM. Ethics of using assistive technology in the care for community-dwelling elderly people: an overview of the literature. *Aging Ment Health* 2011;15(4):419-427.
- 79 Steinberg M, Leoutsakos JM, Podewils LJ, Lyketsos CG. Evaluation of a home-based exercise program in the treatment of Alzheimer's disease: the Maximizing Independence in Dementia (MIND) study. *Int J Geriatr Psychiatry* 2009;24(7):680-685.
- 80 Gitlin LN, Hauck WW, Dennis MP, Winter L, Hodgson N, Schinfeld S. Long-term effect on mortality of a home intervention that reduces functional difficulties in older adults: results from a randomized trial. *J Am Geriatr Soc* 2009;57(3):476-481.
- 81 Peel N, Steinberg M, Williams G. Home safety assessment in the prevention of falls among older people. *Aust N Z J Public Health* 2000;24(5):536-539.

- 82 Gill TM, Baker DI, Gottschalk M, Gahbauer EA, Charpentier PA, de Regt PT, Wallace SJ. A prehabilitation program for physically frail community-living older persons. *Arch Phys Med Rehabil* 2003;84(3):394-404.
- 83 Samus QM, Johnston D, Black BS, Hess E, Lyman C, Vavilikolanu A, Pollutra J, Leoutsakos JM, Gitlin LN, Rabins PV, Lyketsos CG. A multidimensional home-based care coordination intervention for elders with memory disorders: the maximizing independence at home (MIND) pilot randomized trial. *Am J Geriatr Psychiatry* 2014;22(4):398-414.
- 84 Deckx L, van den Akker M, Daniels L, De Jonge ET, Bulens P, Tjan-Heijnen VC, van Abbema DL, Buntinx F. Geriatric screening tools are of limited value to predict decline in functional status and quality of life: results of a cohort study. *BMC Fam Pract* 2015;16:30.
- 85 Fenton JJ, Levine MD, Mahoney LD, Heagerty PJ, Wagner EH. Bringing geriatricians to the front lines: evaluation of a quality improvement intervention in primary care. *J Am Board Fam Med* 2006;19(4):331-339.
- 86 Lichtenstein BJ, Reuben DB, Karlamangla AS, Han W, Roth CP, Wenger NS. Effect of physician delegation to other healthcare providers on the quality of care for geriatric conditions. *J Am Geriatr Soc* 2015;63(10):2164-2170.
- 87 Lee JK, Slack MK, Martin J, Ehrman C, Chisholm-Burns M. Geriatric patient care by U.S. pharmacists in healthcare teams: systematic review and meta-analyses. *J Am Geriatr Soc* 2013;61(7):1119-1127.
- 88 van der Ploeg E, Depla MF, Shekelle P, Rigter H, Mackenbach JP. Developing quality indicators for general practice care for vulnerable elders; transfer from US to The Netherlands. *Qual Saf Health Care* 2008;17(4):291-295.
- 89 Steel N, Melzer D, Shekelle PG, Wenger NS, Forsyth D, McWilliams BC. Developing quality indicators for older adults: transfer from the USA to the UK is feasible. *Qual Saf Health Care* 2004;13(4):260-264.
- 90 Widagdo IS, Pratt N, Russell M, Roughead EE. Predictive performance of four frailty measures in an older Australian population. *Age Ageing* 2015;44(6):967-972.
- 91 Bellera CA, Rainfray M, Mathoulin-Pélissier S, Mertens C, Delva F, Fonck M, Soubeyran PL. Screening older cancer patients: first evaluation of the G-8 geriatric screening tool. *Ann Oncol* 2012;23(8):2166-2172.
- 92 Li Y, Zou Y, Wang S, Li J, Jing X, Yang M, Wang L, Cao L, Yang X, Xu L, Dong B. A pilot study of the FRAIL scale on predicting outcomes in Chinese elderly people with Type 2 diabetes. *J Am Med Dir Assoc* 2015;16(8):714.e7-714.e12.
- 93 Lilamand M, Kelaiditi E, Cesari M, Raynaud-Simon A, Ghisolfi A, Guyonnet S, Vellas B, van Kan GA. Validation of the mini nutritional assessment-short form in a population of frail elders without disability. analysis of the Toulouse frailty platform population in 2013. *J Nutr Health Aging* 2015;19(5):570-574.
- 94 O'Caomh R, Gao Y, Svendrovski A, Healy E, O'Connell E, O'Keeffe G, Cronin U, O'Herlihy E, Cornally N, Molloy WD. Screening for markers of frailty and perceived risk of adverse outcomes using the Risk Instrument for Screening in the Community (RISC). *BMC Geriatr* 2014;14:104.
- 95 Ng TP, Feng L, Nyunt MS, Larbi A, Yap KB. Frailty in older persons: multisystem risk factors and the Frailty Risk Index (FRI). *J Am Med Dir Assoc* 2014;15(9):635-642.
- 96 Dent E, Chapman I, Howell S, Piantadosi C, Visvanathan R. Frailty and functional decline indices predict poor outcomes in hospitalised older people. *Age Ageing* 2014;43(4):477-484.
- 97 [http://www.frailsafe.org.uk/the\\_safety\\_tool](http://www.frailsafe.org.uk/the_safety_tool)
- 98 Thiede R, Toosizadeh N, Mills JL, Zaky M, Mohler J, Najafi B. Gait and balance assessments as early indicators of frailty in patients with known peripheral artery disease. *Clin Biomech* 2016;32:1-7.
- 99 Min LC, Elliott MN, Wenger NS, Saliba D. Higher vulnerable elders survey scores predict death and functional decline in vulnerable older people. *J Am Geriatr Soc* 2006;54(3):507-511.
- 100 Signorile JF, Sandler D, Ma F, Bamel S, Stanziano D, Smith W, Sandals L, Roos BA. The gallon-jug shelf-transfer test: an instrument to evaluate deteriorating function in older adults. *J Aging Phys Act* 2007;15(1):56-74.
- 101 Hirase T, Inokuchi S, Matsusaka N, Nakahara K, Okita M. A modified fall risk assessment tool that is specific to physical function predicts falls in community-dwelling elderly people. *J Geriatr Phys Ther* 2014;37(4):159-165.

- 102** Malley JN, Towers AM, Netten AP, Brazier JE, Forder JE, Flynn T. An assessment of the construct validity of the ASCOT measure of social care-related quality of life with older people. *Health Qual Life Outcomes* 2012;10:21.
- 103** Ellis G, Whitehead MA, Robinson D, O'Neill D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. *BMJ* 2011;343:d6553.
- 104** James J. Comprehensive geriatric assessment during emergency admission. *Nurs Older People* 2016;28(2):16-22.
- 105** Reuben DB, Hirsch SH, Chernoff JC, Cheska Y, Drezner M, Engelman B, Frank JC, Schlesinger M, Siegler CF. Project Safety Net: a health screening outreach and assessment program. *Gerontologist* 1993;33(4):557-560.
- 106** Li CM, Chen CY, Li CY, Wang WD, Wu SC. The effectiveness of a comprehensive geriatric assessment intervention program for frailty in community-dwelling older people: a randomized, controlled trial. *Arch Gerontol Geriatr* 2010;50 Suppl 1:S39-42.
- 107** Devor M, Wang A, Renvall M, Feigal D, Ramsdell J. Compliance with social and safety recommendations in an outpatient comprehensive geriatric assessment program. *J Gerontol* 1994;49(4):M168-173.
- 108** Fontecha J, Hervás R, Bravo J, Navarro FJ. A mobile and ubiquitous approach for supporting frailty assessment in elderly people. *J Med Internet Res* 2013;15(9):e197.
- 109** McKenzie G, Lasater K, DeLander GE, Neal MB, Morgove M, Eckstrom E. Falls prevention education: interprofessional training to enhance collaborative practice. *Gerontol Geriatr Educ* (Published online ahead of print February 2016).
- 110** Richardson B, Kitchen G, Livingston G. The effect of education on knowledge and management of elder abuse: a randomized controlled trial. *Age Ageing* 2002;31(5):335-341.
- 111** Tamai SA, Paschoal SM, Litvoc J, Machado AN, Curiati PK, Prada LF, Jacob-Filho W. Impact of a program to promote health and quality of life of elderly. *Einstein* 2011;9(1):8-13.
- 112** Boongird C, Thamakaisorn S, Krairit O. Impact of a geriatric assessment clinic on organizational interventions in primary health-care facilities at a university hospital. *Geriatr Gerontol Int* 2011;11(2):204-210.
- 113** Hornbrook MC, Stevens VJ, Wingfield DJ. Seniors' program for injury control and education. *J Am Geriatr Soc* 1993;41(3):309-314.
- 114** Tsang HW, Lee JL, Au DW, Wong KK, Lai KW. Developing and testing the effectiveness of a novel health qigong for frail elders in Hong Kong: a preliminary study. *Evid Based Complement Alternat Med* 2013;2013:827392.
- 115** Chan DC, Tsou HH, Yang RS, Tsauo JY, Chen CY, Hsiung CA, Kuo KN. A pilot randomized controlled trial to improve geriatric frailty. *BMC Geriatr* 2012;12:58.
- 116** Hauer K, Rost B, Rüttschle K, Opitz H, Specht N, Bärtsch P, Oster P, Schlierf G. Exercise training for rehabilitation and secondary prevention of falls in geriatric patients with a history of injurious falls. *J Am Geriatr Soc* 2001;49(1):10-20.
- 117** Faes MC, Reelick MF, Melis RJ, Borm GF, Esselink RA, Rikkert MG. Multifactorial fall prevention for pairs of frail community-dwelling older fallers and their informal caregivers: a dead end for complex interventions in the frailest fallers. *J Am Med Dir Assoc* 2011;12(6):451-458.
- 118** Schnelle JF, Mac Rae PG, Simmons SF, Uman G, Ouslander JG, Rosenquist LL, Chang B. Safety assessment for the frail elderly: a comparison of restrained and unrestrained nursing home residents. *J Am Geriatr Soc* 1994;42(6):586-592.
- 119** Luo H, Lum TY, Wong GH, Kwan JS, Tang JY, Chi I. Predicting adverse health outcomes in nursing homes: a 9-year longitudinal study and development of the FRAIL-minimum data set (MDS) quick screening tool. *J Am Med Dir Assoc* 2015;16(12):1042-1047.
- 120** Mody L, Meddings J, Edson BS, McNamara SE, Trautner BW, Stone ND, Krein SL, Saint S. Enhancing resident safety by preventing healthcare-associated infection: a national initiative to reduce catheter-associated urinary tract infections in nursing homes. *Clin Infect Dis* 2015;61(1):86-94.
- 121** Betschon E, Brach M, Hantikainen V. Studying feasibility and effects of a two-stage nursing staff training in residential geriatric care using a 30 month mixed-methods design. *BMC Nurs* 2011;10:10.
- 122** Hockley J. Learning, support and communication for staff in care homes: outcomes of reflective debriefing groups in two care homes to enhance end-of-life care. *Int J Older People Nurs* 2014;9(2):118-130.

- 123** Skoglund-Öhman I, Väyrynen S. Team-based risk assessment and action plans as participatory methods for safe patient handling in two Swedish municipal care homes for the elderly. *Int J Occup Saf Ergon* 2013;19(3):463-474.
- 124** Theodos P. Fall prevention in frail elderly nursing home residents: a challenge to case management: part II. *Lippincotts Case Manag* 2004;9(1):32-44.
- 125** Wagner LM, Capezuti E, Clark PC, Parmelee PA, Ouslander JG. Use of a falls incident reporting system to improve care process documentation in nursing homes. *Qual Saf Health Care* 2008;17(2):104-108.
- 126** Hoffman SB, Powell-Cope G, MacClellan L, Bero K. BedSAFE. A bed safety project for frail older adults. *J Gerontol Nurs* 2003;29(11):34-42.
- 127** Berland A, Gundersen D, Bentsen SB. Patient safety and falls: a qualitative study of home care nurses in Norway. *Nurs Health Sci* 2012;14(4):452-457.
- 128** Theodos P. Fall prevention in frail elderly nursing home residents: a challenge to case management: part I. *Lippincotts Case Manag* 2003;8(6):246-251.
- 129** Hofmann MT, Bankes PF, Javed A, Selhat M. Decreasing the incidence of falls in the nursing home in a cost-conscious environment: a pilot study. *J Am Med Dir Assoc* 2003;4(2):95-97.
- 130** Ho AH, Dai AA, Lam SH, Wong SW, Tsui AL, Tang JC, Lou VW. Development and pilot evaluation of a novel dignity-conserving end-of-life (EoL) care model for nursing homes in Chinese societies. *Gerontologist* (Published online ahead of print April 2015).
- 131** Robinson TN, Wu DS, Pointer L, Dunn CL, Cleveland JC Jr, Moss M. Simple frailty score predicts postoperative complications across surgical specialties. *Am J Surg* 2013;206(4):544-550.
- 132** Wong KS, Ryan DP, Liu BA. A system-wide analysis using a senior-friendly hospital framework identifies current practices and opportunities for improvement in the care of hospitalized older adults. *J Am Geriatr Soc* 2014;62(11):2163-2170.
- 133** Kolbe N, Carlin AM, Bakey S, Louwers L, Horst HM, Rubinfeld I. Assessing risk of critical care complications and mortality in the elective bariatric surgery population using a modified frailty index. *Obes Surg* 2015;25(8):1401-1407.
- 134** Sirois MJ, Griffith L, Perry J, Daoust R, Veillette N, Lee J, Pelletier M, Wilding L, Émond M. Measuring frailty can help emergency departments identify independent seniors at risk of functional decline after minor injuries. *J Gerontol A Biol Sci Med Sci* (Published online ahead of print September 2015).
- 135** Heim N, van Fenema EM, Weverling-Rijnsburger AW, Tuijl JP, Jue P, Oleksik AM, Verschuur MJ, Haverkamp JS, Blauw GJ, van der Mast RC, Westendorp RG. Optimal screening for increased risk for adverse outcomes in hospitalised older adults. *Age Ageing* 2015;44(2):239-244.
- 136** Ellis G, Whitehead MA, Robinson D, O'Neill D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. *BMJ* 2011;343:d6553.
- 137** Dundar ZD, Ergin M, Karamercan MA, Ayranci K, Colak T, Tuncar A, Cander B, Gul M. Modified Early Warning Score and VitalPac Early Warning Score in geriatric patients admitted to emergency department. *Eur J Emerg Med* (Published online ahead of print April 2015).
- 138** Capan M, Ivy JS, Rohleder T, Hickman J, Huddleston JM. Individualizing and optimizing the use of early warning scores in acute medical care for deteriorating hospitalized patients. *Resuscitation* 2015;93:107-112.
- 139** Cei M, Bartolomei C, Mumoli N. In-hospital mortality and morbidity of elderly medical patients can be predicted at admission by the Modified Early Warning Score: a prospective study. *Int J Clin Pract* 2009;63(4):591-595.
- 140** Stolee P, Awad M, Byrne K, Deforge R, Clements S, Glenn C. A multi-site study of the feasibility and clinical utility of Goal Attainment Scaling in geriatric day hospitals. *Disabil Rehabil* 2012;34(20):1716-1726.
- 141** Manning DM, Keller AS, Frank DL. Home alone: assessing mobility independence before discharge. *J Hosp Med* 2009;4(4):252-254.
- 142** Suarez C, Menendez MD, Alonso J, Castaño N, Alonso M, Vazquez F. Detection of adverse events in an acute geriatric hospital over a 6-year period using the Global Trigger Tool. *J Am Geriatr Soc* 2014;62(5):896-900.
- 143** Krichbaum K, Kaas MJ, Wyman JF, Van Son CR. Facilitated learning to advance geriatrics: increasing the capacity of nurse faculty to teach students about caring for older adults. *Gerontologist* 2015;55 Suppl 1:S154-164.

- 144** Braude P, Reedy G, Dasgupta D, Dimmock V, Jaye P, Birns J. Evaluation of a simulation training programme for geriatric medicine. *Age Ageing* 2015;44(4):677-682.
- 145** Donoghue J, Graham J, Mitten-Lewis S, Murphy M, Gibbs J. A volunteer companion-observer intervention reduces falls on an acute aged care ward. *Int J Health Care Qual Assur Inc Leadersh Health Serv* 2005;18(1):24-31.
- 146** Basic D, Conforti DA. A prospective, randomised controlled trial of an aged care nurse intervention within the emergency department. *Aust Health Rev* 2005;29(1):51-59.
- 147** Singh I, Ramakrishna S, Williamson K. The Rapid Assessment Interface and Discharge service and its implications for patients with dementia. *Clin Interv Aging* 2013;8:1101-1108.
- 148** Visser P, Dwyer A, Moran J, Britton M, Heland M, Ciavarella F, Schutte S, Jones D. Medical emergency response in a sub-acute hospital: improving the model of care for deteriorating patients. *Aust Health Rev* 2014;38(2):169-176.
- 149** Nelson A, Powell-Cope G, Gavin-Dreschnack D, Quigley P, Bulat T, Baptiste AS, Applegarth S, Friedman Y. Technology to promote safe mobility in the elderly. *Nurs Clin North Am* 2004;39(3):649-671.
- 150** Aydin C, Donaldson N, Aronow HU, Fridman M, Brown DS. Improving hospital patient falls: leveraging staffing characteristics and processes of care. *J Nurs Adm* 2015;45(5):254-262.
- 151** Bakker FC, Robben SH, Olde Rikkert MG. Effects of hospital-wide interventions to improve care for frail older inpatients: a systematic review. *BMJ Qual Saf* 2011;20(8):680-691.
- 152** Ahmed N, Taylor K, McDaniel Y, Dyer CB. The role of an Acute Care for the Elderly unit in achieving hospital quality indicators while caring for frail hospitalized elders. *Popul Health Manag* 2012;15(4):236-240.
- 153** Tu GS, Meehan TP, Fine JM, Wang Y, Holmboe ES, Mohsenifar Z, Weingarten SR. Which strategies facilitate improvement in quality of care for elderly hospitalized pneumonia patients? *Jt Comm J Qual Saf* 2004;30(1):25-35.
- 154** Sullivan DH, Wall PT, Bariola JR, Bopp MM, Frost YM. Progressive resistance muscle strength training of hospitalized frail elderly. *Am J Phys Med Rehabil* 2001;80(7):503-509.
- 155** Clevenger CK, Chu TA, Yang Z, Hepburn KW. Clinical care of persons with dementia in the emergency department: a review of the literature and agenda for research. *J Am Geriatr Soc* 2012;60(9):1742-1748.
- 156** Bogardus ST Jr, Desai MM, Williams CS, Leo-Summers L, Acampora D, Inouye SK. The effects of a targeted multicomponent delirium intervention on postdischarge outcomes for hospitalized older adults. *Am J Med* 2003;114(5):383-390.
- 157** Singh I, Okeke J, Edwards C. Outcome of in-patient falls in hospitals with 100% single rooms and multi-bedded wards. *Age Ageing* 2015;44(6):1032-1035.
- 158** Forster A, Young J, Lambley R, Langhorne P. Medical day hospital care for the elderly versus alternative forms of care. *Cochrane Database Syst Rev* 2008;(4):CD001730.
- 159** George J, Long S, Vincent C. How can we keep patients with dementia safe in our acute hospitals? A review of challenges and solutions. *J R Soc Med* 2013;106(9):355-361.
- 160** Ijckema R, Langelaan M, van de Steeg L, Wagner C. What impedes and what facilitates a quality improvement project for older hospitalized patients? *Int J Qual Health Care* 2014;26(1):41-48.
- 161** Bradley EH, Webster TR, Schlesinger M, Baker D, Inouye SK. The roles of senior management in improving hospital experiences for frail older adults. *J Healthc Manag* 2006;51(5):323-336.