



Do current discharge arrangements from inpatient hospital care for the elderly reduce readmission rates, the length of inpatient stay or mortality, or improve health status?

September 2005

## ABSTRACT

Hospital discharge arrangements are a key issue in ensuring the safe and effective transfer of older people between inpatient hospital care, and community-based home care. This Health Evidence Network (HEN) report includes evidence on four main types of intervention: comprehensive geriatric assessment, discharge planning, discharge support and education.

The evidence presented here shows that effective and safe interventions, delivered across the hospital-community interface and associated with a reduction in the rate of readmission to hospital include:

- multidisciplinary teams using the principles of comprehensive geriatric assessment;
- discharge co-ordinators (usually a specialist or advanced practice nurse) using defined protocols;
- patient empowerment using educational approaches.

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## Summary

### The issue

In the developed world, older people make up an increasing proportion of the population, and this demographic transition also affects some developing countries. In general, older people are at increased risk of disease, disability and financial and social deprivation compared to younger people in the same populations. For many older people, admission to an acute hospital is associated with a decline in physical functioning, which is not always recovered at the time of discharge, or even soon. Iatrogenic deterioration is not uncommon and, with extended stays, both informal and formal patterns of support at home may be disrupted and make a return to independent living extremely difficult. Thus, hospital discharge arrangements are a key issue in ensuring the safe and effective transfer of older people between inpatient hospital care, and community-based home care.

### Findings

In a previous literature review in 2002, readmission was cited as a key undesirable outcome, and working across the health and social care interface as an important factor in reducing readmission rates after discharge from inpatient hospital care. This review updated searches for randomized controlled trials to January 2004, selecting studies that specifically considered discharge arrangements across the hospital-community divide, and reported readmission outcomes.

Evidence from 18 randomized controlled trials identified four main types of intervention: comprehensive geriatric assessment, discharge planning, discharge support and education. The conclusion is that discharge arrangements across the hospital–community interface are safe (not associated with increased mortality or other adverse outcomes) and that they reduce hospital readmission rates by about 20%. This is a worthwhile gain, particularly for older people at risk of repeated hospital admission. It can be achieved through the adoption of discharge practices spanning the hospital–community divide, based on the general models of care identified in this review.

### Policy considerations

Key issues for the health, well-being and quality of life of older people include population based strategies for healthy ageing, the organization and delivery of primary care services, hospital-based care, alternatives to acute hospital admission and effective transfers of care between inpatient and community settings. Effective cooperation between health and social, hospital and community care systems is important, particularly where there is a risk of adverse outcomes from prolonged and unnecessary hospitalization. The organization and delivery of effective arrangements for discharging older people from inpatient hospital care is of central concern. The evidence presented here shows that effective and safe interventions, delivered across the hospital–community interface and associated with a reduction in the rate of readmission to hospital include:

- multidisciplinary teams using the principles of comprehensive geriatric assessment;
- discharge co-ordinators (usually a specialist or advanced practice nurse) using defined protocols;
- patient empowerment using educational approaches.

It should be noted that the evidence supporting these statements comes almost entirely from trials conducted in North America and Europe. Therefore, before deciding to introduce a specific form of discharge arrangement, the structure and organization of the local health and social care system needs to be carefully considered.

### Type of evidence

The types of evidence used in this review comprised randomized controlled trials and meta-analyses.

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## **Introduction**

Among high-income countries, older people (age 65+) now make up a large (15%–20%) and increasing proportion of the population. The demographic transition is now well established and population “greying” is also becoming a significant issue in many developing countries. In general, older people are at increased risk of disease, disability and financial and social deprivation compared to younger people in the same populations.

Older people are frequently admitted to acute hospital care. For example, in the United States the over 65s account for 36% of hospital admissions and almost 50% of hospital expenditure (1). For many older people, admission to an acute hospital is associated with a decline in physical functioning, which is not always recovered by the time of discharge, or even after discharge from inpatient hospital care (2). Iatrogenic deterioration is not uncommon (3) and, with extended stays, both informal and formal patterns of support at home may be so disrupted as to make a return to independent living extremely difficult.

Readmission to hospital and the experience of multiple hospital admissions is an important contributor to the overall use of hospital beds. For example, in the United Kingdom in 1987–1988, patients with a history of two or more hospital admissions experienced a more than 20-fold increase in the risk of unplanned hospital admission, accounting for 38% of all admissions (4). There is considerable variation in hospital readmission rates between regions and bed use by patients with multiple hospital admissions accounts for a significant proportion of the total. For example, in United Kingdom acute hospitals in 2002–2003 the rate of emergency readmission within 28 days of discharge among adults varied between 5% and 11% (5).

This review describes evidence for interventions that may reduce hospital readmission rates by about 17% overall. To put this in context, in England in 1997–1998 people 65 years old and over experienced 7.7 million hospital admissions with an average 2.5 bed days per year per patient, a total of 19 million bed days. About 227,000 (2.9%) of the 7.7 million admissions were accounted for by patients with two or more emergency admissions. These patients used an average of 29.6 bed days per year, a total of 6.7 million bed days, or 35% of the bed use for this age group.

Hospital discharge arrangements are an important factor in ensuring the safe and effective transfer of older people between inpatient hospital care, and community-based home care and may be capable of playing a key role in the prevention of subsequent (re)admission. A previous literature review (6) identified readmission as a key undesirable outcome and working across the health and social care boundary as an important factor in reducing post-inpatient discharge readmission rates. The present review has therefore focused on discharge arrangements from inpatient hospital care organized across the hospital—community interface in order to find if they reduce readmission rates, the length of inpatient stay or mortality, or improve health status.

## **Sources for this review**

The present review builds on a systematic literature review of discharge arrangements for older people (6). It used a very broad approach to literature searching including the grey literature, hand searching and citation searching, and provided a synthesis of evidence from randomized controlled trials in English. Seventy-one trials were reviewed and the interventions were classified into five main types: comprehensive discharge planning, comprehensive geriatric assessment, discharge support arrangements and education interventions. The overall analysis showed that the interventions were safe (there was no excess mortality in the intervention groups), and while there was no consistent impact on length of inpatient stay, the interventions as a whole were significantly more likely to be associated with reduced rates of readmission to inpatient care. The analysis was performed by intervention type and across intervention types by the key intervention characteristics of “team working” and “working across the hospital/ community interface”. An important finding was that of all the intervention

characteristics studied, provision across the hospital-community interface was associated with a statistically significant effect on readmission rates. The same was not true for interventions that were provided entirely on the hospital site or exclusively in the community.

The present review updates the literature searches to January 2004. Selection of studies for inclusion was confined to those examining interventions in transfers from inpatient hospital care provided across the hospital/community interface and reported readmission as an outcome. Trials identified in this way were added to the 15 trials previously identified and the data from these studies form the primary source for this review. (The synthesis methods are described in more detail in Annex 1).

## Definitions

For the purposes of this review *discharge arrangements* are the arrangements made by health care professionals in partnership with the patient, resulting in the patient's transfer from inpatient hospital care back into the community. *Inpatient hospital care* is health care provided in an acute hospital setting. An *acute hospital* is one capable of providing high-technology inpatient care and catering to admissions with acute medical and surgical problems; nursing homes, rehabilitation and community hospitals not providing high technology care are not included in this definition. *Older people* are people aged 65 years or over. *Interventions provided across the hospital-community interface* are interventions delivered in both the hospital and community settings to the same patient during the process of discharge from inpatient hospital care. For example, a community-based practitioner or team may visit and assess the patient in hospital (in-reach), a hospital based practitioner or team responsible for the patient's inpatient care may follow up in the community after discharge (out-reach) or the hospital and community-based personnel may cooperate on discharge arrangements. The key issue is that the intervention is not delivered in one setting in isolation from the other.

## Findings from research and other evidence

### Comprehensive geriatric assessment

Six trials reported the results of interventions based on the principles of comprehensive geriatric assessment (CGA) (Table 1). In these trials 1464 subjects were randomised to receive either CGA (n=629) or usual care (n=835). CGA describes a set of approaches to service provision in the care of older people. The models can be used in a variety of settings, including hospital inpatients (7–9), ambulatory care and nursing home care (10–12). The majority of the evaluative literature on the topic comes from the United States, although the approaches are recognizably derived from the multidisciplinary models of assessment and rehabilitation first described in the United Kingdom (13–15). In CGA programmes the multidisciplinary, multidimensional nature of health assessment, rehabilitation and social care needs is formalized, often using standardized assessment instruments. The results of these formal assessments are then either used to inform or prompt treatment and management recommendations. These interventions are usually provided by a multidisciplinary team of health and social care professionals, and in the studies selected here for review, these teams provided the intervention in both the hospital and the home setting, working effectively across the hospital-community divide.

**Table 1.** Interventions based on the principles of comprehensive geriatric assessment, usually delivered by a multidisciplinary team

Trial	Country	Intervention type	Setting	Condition
Rubenstein, 1984 (7)	USA	inpatient geriatric assessment unit	veterans medical centre	persistent medical functional or psychosocial problems interfering with discharge
Saltz, 1988 (16-18)	USA	inpatient geriatric consultation team	veterans medical centre - teaching hospital	medical, psychiatric and surgical patients (75+)
Siu, 1996 (19)	USA	pre- and post-discharge geriatric assessment	university hospital	medical/surgical admission aged 65+
Thorsten, 1999 (20)	Germany	inpatient CGA plus home rehab and support team vs. CGA (consultation service) vs. usual care	university hospital geriatric centre	multiple chronic conditions, functional deterioration or at risk of nursing home placement
Avlund, 2002 (21)	Denmark	visits by geriatric team member and relevant community medical nursing and therapy staff, CGA and follow up after discharge and at home on days 2 and 4 and weeks 2, 4 and 6 after discharge	7 of 12 municipalities in the northern part of the Størstrøm County, Denmark	patients >60 with geriatric problems discharged from three county hospitals
Thomas, 1993 (22)	not stated	inpatient geriatric consultation team	non-academic community hospital	inpatients

## Comprehensive discharge planning

Six trials reported the results of interventions that utilized comprehensive discharge planning processes (Table 2). In these trials 2735 subjects were randomised to receive either a comprehensive discharge planning process (n=1382) or usual care (n=1371). A comprehensive approach to discharge planning includes a pre-discharge assessment of the patient and carer; the development of a patient-specific discharge plan, and the maintenance of communication with the patient's hospital team. A comprehensive approach can improve the operational and economic effectiveness of an inpatient stay (23, 24), by improving hospital bed utilization, reducing bed blocking (25, 26), and reducing health care charges for older people (27). These interventions are often provided by a coordinator (often an advanced practice or specialist nurse) working according to a defined protocol or care pathway and organizing services through the transition from hospital to home care.



**Table 2.** Interventions utilizing comprehensive discharge planning processes, usually associated with specialist or advanced practice nurse support

Trial	Country	Intervention type)	Setting	Condition
Naylor, 1990 (23)	USA	comprehensive discharge protocol implemented by a specialist nurse	urban hospital /medical centre	medical and surgical patients > 70 years old
Naylor, 1994 (27)	USA	comprehensive discharge planning protocol	university hospital	selected elderly (> 70 years) medical and surgical DRGs including heart failure, myocardial infarction CABG and cardiac valve replacement.
Naylor, 1999 (28)	USA	comprehensive discharge planning implemented by a nurse with four-week follow up support	university hospital and medical centre	elderly (> 65 years) patients at risk of poor discharge outcomes in a number of specific DRGs including MI, CABG, bowel surgery, heart failure.
Kennedy, 1987 (29,30)	USA	comprehensive discharge protocol implemented by a nurse specialist	acute teaching hospital	elderly patients admitted to non- intensive care units.
Weinberger, 1996 (31)	USA	intensive primary care assessment by primary care nurse/routine care - /usual care	nine veteran medical centres/hospitals	patients to be discharged at risk of readmission e.g., with diabetes, COPD or CCF
Lim, 2003 (32)	Australia	post-acute care coordinator, discharge planning with telephone outreach	4 university-affiliated metropolitan general hospitals	patients likely to have a mobility or self care problem, > 65 years old, living alone, being a carer or community services user

### **Discharge support arrangements**

Three trials reported the results of interventions designed to support older people at home after discharge from inpatient hospital care (Table 3). In these trials 1158 subjects were randomised to receive either a discharge support arrangement (n=603) or usual care (n=555). Discharge support arrangements are generally delivered in the home setting and while there have been many studies under this broad category (6), the synthesis' criteria of providing the intervention across the hospital–community interface, working in both the hospital and community setting, and reporting readmission rates precluded most of them from inclusion.

**Table 3.** Discharge support arrangements

	Country	Intervention type	Setting	Condition
Hui, 1995 (33)	China	early discharge with day hospital rehabilitation after stroke	acute hospital neurology unit	Stroke
Fitzgerald, 1994 (34)	USA	case management	university-affiliated medical centre	no specific condition -medical patients
McInnes, 1999 (35)	Australia	GP pre-discharge visit/usual care	hospital/community	not stated

### Educational interventions

Three trials reported the results of educational interventions (Table 4). In these trials 1250 subjects were randomised to receive either an educational intervention (n=619) or usual care (n=631). These interventions are intended to improve patients' ability to manage aspects of their care after discharge, by providing information or more active education. They are generally targeted at improving medication use. Studies were included in the review if education was described as the principal method used to improve discharge. Two of the studies, however, used multifaceted interventions, including both educational approaches and discharge planning and community follow up arrangements. We excluded studies that were solely concerned with improving adherence to medication.

**Table 4.** Education interventions, generally targeted at medication use

	Country	Model of care/compared with (intervention type)	Setting	Condition
Cline, 1998 (36)	Sweden	Education and information for patients with heart failure	University hospital	congestive cardiac failure
Rich, 1996 (37-40)	USA	Multifaceted intervention with patient education, medication review, early discharge planning and enhanced home follow-up / usual care by attending physician	Teaching hospital	congestive heart failure
Stewart, 1998 (41-44)	Australia	Home based intervention — counselling before discharge on medications and signs of clinical deterioration; home visit at one week post discharge by nurse and pharmacist to check medication use, advise caregiver, improve liaison with community services	440 bed hospital	All admissions to medical and surgical units

### Readmission rates

Experience from published randomized controlled trials favours interventions spanning the hospital–community interface, and suggests that such interventions produce significant worthwhile effects on subsequent hospital admission rates. The previous review showed a significant effect on readmission rates for interventions delivered both in the hospital and in the community. In these 15 trials 5330 people were randomized to receive a multi-site intervention (n = 2682) or usual care (n = 2648).

The multi-site intervention reduced readmission by about 17%. Updated searches identified three additional randomized controlled trials, in which a further 1292 people were randomized to receive either a multi-site intervention (n = 551) or single site care (n = 741). The rate ratio for readmission in these three studies was very similar (Table 5).

**Table 5.** Readmissions to hospital - Number of episodes in intervention and control groups \*\*

Study	Follow up period	Baseline sample		Readmissions			
		Study group	Control group	Study group	Control group	Study group	Control group
	months			n/sample	Per 100 per month	n/sample	Per 100 per month
Saltz, 1988 (16)	6	86	87	36	7.0	26	5.0
Kennedy, 1987 (29,30)	2	39	41	29	37.2	35	42.7
Naylor, 1990 (23)	3	20	20	1	4.7	13	21.6
Rich, 1996 (37-40)	3	142	140	18	4.2	22	5.2
Weinberger, 1996 (31)	6	695	701	343	8.2	310	7.4
Siu, 1996 (19)	2	178	176	43	12.1	37	10.5
Hui, 1995 (33)	6	59	61	11	3.1	17	4.6
Fitzgerald, 1994 (34)	12	339	335	126	3.0	144	3.6
Naylor, 1994 (27)	3	140	136	18	4.3	11	2.7
Thomas, 1993 (22)	6	62	56	21	5.7	35	10.1
Rubenstein, 1984 (7)	12	63	60	22	2.9	30	4.2
Naylor, 1999 (28)	6	177	185	49	4.6	107	9.6
Stewart, 1999 (43)	6	381	381	154	6.7	197	8.6
Cline, 1998 (36)	12	96	110	22	1.9	43	3.3
McInnes, 1999 (35)	6	205	159	61	5.0	40	4.2
Nikolaus, 1999 (45)	12	181	364	59	2.7	129	3.0
Lim, 2003 (32)	6	311	287	124	6.7	143	8.3
Avlund, 2002 (21)	3	59	90	13	7.3	19	7.0

(\*\* For comparison of readmission rates, the readmissions have been normalized to the number of admissions per 100 study participants per month of follow up.)

## Mortality

Mortality was reported at up to three months (19,22,27,29,42), at six months (16,22,27,32,42) and at 12 months (7,20,31,34,36) (Table 6). There is a trend toward reduced early mortality that reaches statistical significance at six months but is not sustained by one year of follow up. It is clear from these data that discharge arrangements across the hospital-community interface are at least as safe as usual care alternatives.

**Table 6.** Meta analysis for mortality

	Number of subjects	Mortality odds ratio (95% CI)	P
Up to 3 months	1 709	0.60 (0.29 to 1.23)	0.163
6 months	2 040	0.61 (0.37 to 0.99)	0.044
12 months	2 747	0.95 (0.65 to 1.4)	0.769

## **Index length of stay**

Surprisingly few of the studies (six trials) reported the impact of interventions on the index length of stay (16,20,23,27,29,35). In one, (27) length of stay was reported separately for medical and surgical diagnosis-related groups. None of the trials reported statistically significant differences between intervention and control groups. Meta analysis, which included data from 1693 cases, revealed a standard difference of 0.17 days. It is tempting to speculate that these interventions were not designed primarily to reduce the length of inpatients' stay, but to enhance the experience of discharge, by ensuring that patients recently discharged from inpatient hospital care were supported through the transition back into the community and (in many cases) empowered to prevent readmission.

## **Physical functioning**

Four studies reported changes in physical functioning in 2019 subjects. One reported this outcome at 60 days, measured using the SF36 physical summary score (19). The other three studies reported physical function outcomes at three months (33), six months (33) and 12 months (21,31) using the Barthel index. None reported significant differences in physical functioning. Even taking the liberty of combining results from studies that reported Barthel index scores at different durations of follow up did not reveal any significant difference between treated and control subjects.

## **Mental health**

Mental health outcomes, including patient and carer acceptability, satisfaction and views about these services were recorded in only three of the published studies (840 subjects) (7,19,28). They were reported at different intervals (from 60 days to 12 months) and used different instruments, measuring different concepts. None of the studies showed statistically significant differences in any of these parameters.

## **Quality of life**

Seven trials recorded the impact of the intervention on patient's quality of life in 3984 subjects (7,19,20,31,32,36,42). All the studies used different measures and periods of follow up, so the data cannot be reliably combined. Only one trial reported a statistically significant difference between intervention and control groups using a self-perceived health score.

## **Impact on carers**

Only one trial (545 subjects) reported the impact of the intervention on carers in any health or economic domain (20), showing no impact on carer strain. This is a major gap in the available research on this topic.

## **Service use**

Five studies reported use of services by 2468 patients (7,20,34,35,42). These studies appear to report a tendency toward reduced use of hospital services and increased use of community services, as might be expected. This result should be interpreted with caution, given the paucity of data, which were reported in a way that precluded meta-analysis.

## **Costs**

Ten of the studies (3344 subjects) reported costs to service providers in some way (7,20,23,27,32–34,36,42). None of the trials found savings from introducing hospital discharge arrangements that span the hospital–community interface. Some demonstrated redistribution in costs between hospital and community services, indicating different patterns of resource use between intervention and control groups. For example, Rubenstein et al. (7) found a clear redistribution of resources between acute

hospital and nursing home use in the control group in comparison with those receiving the intervention. Overall, however, there was little difference in costs between the groups.

Given that there is limited cost data available from these trials from many different countries, it is not possible to generalize the results to a specific health and social care economy. Economic modelling would be needed to inform decision-making regarding the cost implications of organizing discharge across the hospital–community divide in different settings.

## **Discussion**

In health care systems around the world, there is an increasing awareness that the introduction of health technologies must be based on scientific evidence (46,47). The randomized controlled trial (RCT) is often cited as the "gold standard" (46,48,49). However, RCTs are not always possible either economically, organizationally or ethically (50). The National Institutes of Health (NIH) in the United States has estimated that only about 20% of currently used health technologies have been evaluated by means of randomized controlled trials (51). Against this background, meta-analysis (the quantitative synthesis of effects from a number of similar studies) has grown in popularity (52), providing the basis for what is currently termed evidence-based medicine (53). This approach can enhance precision and answer questions that single trials may be underpowered, or not designed to answer. However, meta-analysis is subject to its own range of limitations, which may be present despite methodological rigour. For example negative trials are often not reported, there is often considerable heterogeneity among trials, and on occasions large randomized controlled trials have been shown to disagree with prior meta analyses (54,55).

This review has attempted to synthesise the evidence from randomized controlled trials of complex interventions in the discharge of older people from inpatient hospital care. We identified a reliable source of evidence (a previous systematic review, updated by the retrieval of trial reports from the literature databases), selected studies for review against explicit criteria, and defined quality criteria for studies selected for data synthesis. Where appropriate, the data from individual studies were combined using meta-analytic techniques, to provide a quantitative, as well as a qualitative overview of the research evidence.

It is clear that the evidence supporting specific interventions in discharging older people from inpatient hospital care is quite heterogeneous. It includes interventions based on the principles of comprehensive geriatric assessment which are generally delivered by a multidisciplinary team of health care professionals, where effective coordination of discharge across the hospital–community interface is part of a package of care including assessment and care recommendation in multiple domains. It includes interventions tightly focused on achieving high quality discharge outcomes, which generally involve a single individual (often a specialist or advanced practice nurse) coordinating a comprehensive, defined discharge process across the hospital–community interface, including the delivery of community-based services in support of the discharge arrangement. It also includes education interventions, which generally aim to empower older people to manage their own health and medications by providing information or more detailed education targeted at specific disease management.

For the purpose of this review we ignored recent evidence arising from disease-specific interventions like heart disease management (56–59), stroke (59–65), fractured neck of femur (66–67) and chronic obstructive pulmonary disease (68,69). It is possible that careful analysis of these studies will provide further insights into effective intervention in discharging older people from inpatient hospital care which are not included in this report.

Acute hospital units and their discharge processes are only one element in a complex system serving the needs of older people in their homes, including community health and social services, primary care, rehabilitation, residential and nursing home care, voluntary organizations, and the care of family and friends. Differences in the availability of community services (for example, residential care beds) can have a marked and enduring impact on the capacity of acute units to discharge elderly patients (70). Consequently, the effectiveness of interventions to improve the speed and quality of discharge will depend to a large extent on the broader service context in which they take place. Interventions that are shown to work well in areas with well-resourced and efficient community support services may have little or no impact where these services are inadequate or lacking.

Moreover, within a particular area, the intervention itself may have an impact on the availability of services to the control patients, either through the diffusion of practice change or by restricting their access to resources. These and other factors will need to be carefully considered before deciding to introduce a specific form of discharge arrangement in to a local health and social care community.

It is tempting to speculate, given the marked heterogeneity of types of intervention included in this review, that the key factor determining effectiveness in reducing readmission rates might be other than the specific intervention type. For example, it may be that the organization of care through multidisciplinary assessment, discharge co-ordination and education focuses on the needs of the individual patient rather than the specific organization or agency. However, this conclusion arises obliquely from the evidence rather than directly, so should be treated with some caution.

These findings have emerged from a review of the literature on discharge arrangements for older people, which largely excluded disease-specific interventions, and has included interventions applied to older people in hospital with a range of medical and surgical conditions. Generalizability is therefore not restricted by disease specificity of the interventions. However the likelihood that we can regard the results as potentially generalizable (always bearing in mind the challenges of transferring research results into local practice), is tempered by the realization that the intervention characteristics differ widely among studies. Therefore a key issue in implementation will be understanding the local health and social care context. Further, most of the evidence represented in these trials has been produced in the United States and northern Europe. There is no reason to believe that the results of these studies would be directly transferable to other health care systems. Therefore, it is important that local research and development precedes widespread implementation in other parts of the world.

This review has only considered interventions provided across the hospital–community interface. It has therefore not considered models of care about which there is much current interest and debate, which are either provided entirely in community settings, or are not yet supported by evidence from high quality randomized controlled trials. Community-based schemes aiming to reduce hospital admission rates and targeted specifically at frail older people, such as Evercare (71) or the United Kingdom models of intermediate care (72), have not been considered. Similarly, disease-specific chronic disease management programmes (73), which aim to reduce hospital admission rates with educational and supportive community-based care, have also not been considered.

Health economic analysis of cost-effectiveness is not available through the data provided in these reviews, although what data there are hints at resource shifts, rather than savings.

## **Conclusions**

We can state with reasonable confidence that discharge arrangements from inpatient hospital care for older people, provided across the hospital–community interface are associated with reduced readmission rates. They do not appear to be associated with reduced (or increased) mortality, nor have they been found to be associated with shorter length of inpatient stay, or improved health status.



However, our ability to synthesize the data from multiple trials on length of stay and health status is hampered by inconsistency of reporting these outcomes in comparable forms between trials.

Overall, the main conclusion about discharge arrangements across the hospital–community interface from the evidence presented in this review is that they are safe (not associated with increased mortality or other adverse outcomes) and that they are associated with reduction in hospital readmission rates on the order of 20%. This is a worthwhile gain, particularly for older people at risk of repeated hospital admission.

Given this information, it may be worthwhile to assess:

- the hospital readmission rate of elderly patients in a region;
- whether any specific discharge planning or support arrangements are in place in the region, and
- whether, taking account of these two factors, there is any reason to alter existing discharge procedures.

No specific recommendations can be made from the data for specific regions or districts because of the importance of local context, however in general terms it may be appropriate to consider:

- nationally: whether incentives to the performance of health and social care systems encourage or discourage interventions coordinated across the interface between hospital inpatient and community care;
- within local health and social care systems: whether any specific joint discharge planning or support arrangements are in place between health and social care agencies, and
- at the level of the health and social care provider: whether professionals are appropriately supported and given incentives to work effectively in partnership over care pathways which cross the interface between hospital inpatient and community care.

The general models of care described in this review which were arranged across the hospital–community interface included:

- multidisciplinary teams using the principles of comprehensive geriatric assessment;
- discharge coordinators (usually a specialist or advanced practice nurse) working across the hospital–community interface, and
- patient empowerment using educational approaches.

## **Annex 1: Synthesis methods**

### *Search strategy.*

Fifteen trials identified in the original review examined interventions in transfers from inpatient hospital care across the hospital/community interface and reported readmission as an outcome. Of the 71 trials included in this review 63 (89%) were identified by searching Medline, Embase and CINAHL in English.

For the update to January 2004 we used the same search strategy as the original review, searching Medline (1996–November, 2003), EMBASE (1996–end of 2003), CINAHL (1982– December, 2003), the Cochrane database of systematic reviews (2003–2004) and The NHS Centre for Reviews and Dissemination and Clinical Evidence (Issue 10).

### *Population*

Patients aged 65 years or over experiencing discharge from inpatient hospital settings (teaching or district general hospitals, community hospitals). Studies describing discharge from inpatient facilities not providing high technology care (such as nursing homes) or ambulatory care settings such as day hospitals and outpatient departments were excluded.

### *Intervention*

To be included, a trial had to evaluate an intervention intended to modify discharge from inpatient hospital care and be provided across the hospital–community interface. That is, included trials tested interventions with elements provided both in the inpatient setting before discharge and in the community after discharge. Trials were excluded if they were drug- or disease-specific unless they tested a potentially generalizable intervention. The development and application of this approach has been described in detail elsewhere (6). To illustrate, an intervention that tested the effectiveness of a specific drug in patients receiving inpatient treatment for heart failure would be excluded; a trial testing the effectiveness of a home visit by a specialist nurse after discharge from inpatient care in patients with heart failure would be included. Trials that did not include patients over the age of 65 years were excluded.

### *Study designs*

Randomized controlled trials only were included. The methods for assessing studies for relevance and quality have been previously described in detail (6), and were reproduced for the updated literature search as closely as possible.

### *Data extraction*

For those studies included in the original review, data were extracted independently by two "blind" reviewers. However, the reviewers were not blinded to authors, journal or institutions for the updated literature search and final data extraction. The synthesis on the additional studies identified by this search was performed by the author, without cross-checking by other reviewers.

### *Outcomes*

Studies were eligible for inclusion if they described the effect of the intervention on the readmission rate. The following outcomes were recorded for each eligible study (where reported): mortality, length of stay and patient outcome as health status or level of physical functioning. Included studies generally compared a complex intervention with usual care for the locality in which the trial was performed.

The updated searches identified 2153 potentially relevant titles. Of these, 309 were screened as potentially relevant studies for which abstracts were obtained. After reviewing the abstracts, 41 papers were selected for detailed quality and relevance checks. Of these 15 studies were excluded on relevance criteria (74–88). A further 15 trials satisfied criteria of relevance to discharge arrangements from inpatient hospital care provided across the hospital community interface, but were excluded from



further consideration because the interventions were disease-specific. These included four studies in patients with heart disease (56–59), 6 studies in patients with stroke (60–65), two in hip fracture (66, 67) and two in chronic obstructive pulmonary disease (68,69). Five systematic reviews were identified, four of which were excluded on relevance criteria (89–92) and the remaining systematic review (93) was excluded because although it focused on the issue of supporting discharge from hospital to home, the interventions considered were all delivered after discharge from inpatient hospital care in the home setting, rather than in both the hospital and inpatient settings. Three of the trial reports (28,35,94) were already included in the previous systematic review of discharge arrangements. This left three trial reports (20,21,32), which have been considered together with the 15 trials from the previous systematic review, reported in 26 publications (7,16-19,22,23,27,29-31,33,34,36-44).

## References

1. Landefeld CS. Improving health care for older persons. *Annals of Internal Medicine*, 2003, 139:421–424.
2. Covinsky KE et al. Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: increased vulnerability with age. *Journal of the American Geriatric Society*, 2003, 51:451–458.
3. Thomas EJ, Brennan TA. Incidence and types of preventable adverse events in elderly patients: population based review of medical records. *BMJ*, 2000, 320:741–744.
4. Roland M, et al. Follow up of people aged 65 and over with a history of emergency admissions: analysis of routine admission data. *BMJ*, 2005, 330:289–292.
5. <http://ratings2004.healthcarecommission.org.uk/Trust/results/indicatorResults.asp?indicatorId=1403>, accessed 15 September 2005.
6. Parker SG et al. A systematic review of discharge arrangements for older people. *Health Technology Assessment*, 2002, 6(4).
7. Rubenstein LZ et al. Effectiveness of a geriatric evaluation unit: a randomized controlled trial. *New England Journal of Medicine*, 1984, 311:1664–1670.
8. Rubenstein LZ et al. Impacts of geriatric evaluation and management programs on defined outcomes: overview of the evidence. *Journal of the American Geriatric Society*, 1991, 39 (suppl):8–16.
9. Stuck AE et al. Comprehensive geriatric assessment: a meta-analysis of controlled trials. *The Lancet*, 1993, 342:1032–1036.
10. Melin AI, Byrgeb LO. Efficacy of the rehabilitation of elderly primary health care patients after short-stay hospital treatment. *Medical Care*, 1992, 30:1004–1015.
11. Epstein AM et al. Consultative geriatric assessment for ambulatory patients: A randomized trial in a health maintenance organization. *JAMA, Journal of the American Medical Association*, 1990, 263:8–44.
12. Stuck AE et al. A trial of annual in-home comprehensive geriatric assessments for elderly people living in the community. *New England Journal of Medicine*, 1995, 333:1184–1189.
13. Warren MW. Care of the chronic aged sick. *The Lancet*, 1946, i:841–843.
14. Warren MW. Rehabilitation of the elderly patient. *Annals of Physical Medicine*, 1960, 5:170.
15. Exton-Smith AN, Crockett GS. The chronic sick under new management – experiences starting a geriatric unit. *The Lancet*, 1949, i:1016–1018.
16. Saltz CC et al. Impact of a geriatric consultation team on discharge placement and repeat hospitalization. *Gerontologist*, 1988, 28 (3):344–350.

17. Allen CM et al. A randomized, controlled clinical trial of a geriatric consultation team. Compliance with recommendations. *JAMA, Journal of the American Medical Association*, 1986, 255 (19):2617–2621.
18. McVey LJ et al. Effect of a geriatric consultation team on functional status of elderly hospitalized patients. A randomized, controlled clinical trial. *Annals of Internal Medicine*, 1989, 110 (1):79–84.
19. Siu AL et al. Postdischarge geriatric assessment of hospitalized frail elderly patients [see comments]. *Archives of Internal Medicine*, 1996, 156 (1):76–81.
20. Thorsten N et al. A randomized trial of comprehensive geriatric assessment and home intervention in the care of hospitalized patients. *Age and Ageing*, 1999, 28:543–550.
21. Avlund K et al. Effects of comprehensive follow up home visits after hospitalization on functional ability and readmissions among older patients. A randomized controlled study. *Scandinavian Journal of Occupational Therapy*, 2002, 9:17–22.
22. Thomas DR, Brahan R, Haywood BP. Inpatient community-based geriatric assessment reduces subsequent mortality. *Journal of the American Geriatric Society*, 1993, 41 (2):101–104.
23. Naylor MD. Comprehensive discharge planning for hospitalized elderly: A pilot study. *Nursing Research*, 1990, 39 (3):156–161.
24. Williams EI, Fitton F. Factors affecting early unplanned readmission of elderly patients to hospital. *BMJ*, 1988, 297:784–787.
25. Styrborn K. Early discharge planning for elderly patients in acute hospitals. *Scandinavian Journal of Social Medicine*, 1995, 23:273–285
26. Farren EA. Effects of early discharge planning on length of hospital stay. *Nursing Economics*, 1991, 9:25–20, 63.
27. Naylor M et al. Comprehensive discharge planning for the hospitalized elderly – a randomized clinical trial. *Annals of International Medicine*, 1994, (12):999–1006.
28. Naylor MD et al. Comprehensive discharge planning and home follow-up of hospitalized elders: A randomized clinical trial [see comments]. *JAMA, Journal of the American Medical Association, Journal of the American Medical Association*, 1999, 281 (7):613–620.
29. Kennedy L, Neidlinger S, Scroggins K. Effective comprehensive discharge planning for hospitalized elderly. *Gerontologist*, 1987, 27 (5):577–580.
30. Neidlinger SH, Scroggins K, Kennedy LM. Cost evaluation of discharge planning for hospitalized elderly: The efficacy of a clinical nurse specialist. *Nursing Economics*, 1987, 5 (5):225–230.
31. Weinberger M, Oddone EZ, Henderson WG. Does increased access to primary care reduce hospital readmissions? Veterans Affairs Cooperative Study Group on Primary Care and Hospital Readmission [see comments]. *New England Journal of Medicine*, 1996, 334 (22):1441–1447.
32. Lim WK, Lambert SF, Gray LC. Effectiveness of case management and post acute services in older people after hospital discharge. *Medical Journal of Australia*, 2003, 178:262–266.

33. Hui E et al. Outcomes of elderly stroke patients. Day hospital versus conventional medical management. *Stroke*, 1995, 26 (9):1616–1619.
34. Fitzgerald JF et al. A case manager intervention to reduce readmissions [see comments]. *Archives of Internal Medicine*, 1994, 154 (15):1721–1729.
35. McInnes E et al. Can GP input into discharge planning result in better outcomes for the frail aged? Results from a randomized controlled trial. *Family Practice*, 1999, 16:289–293.
36. Cline CMJ et al. Cost effective management programme for heart failure reduces hospitalization. *Heart*, 1998, 80 (5):442–446.
37. Rich MW et al. Effect of a multidisciplinary intervention on medication compliance in elderly patients with congestive heart failure. *American Journal of Medicine*, 1996, 101 (3):270–276.
38. Rich MW et al. Prevention of readmission in elderly patients with congestive heart failure: results of a prospective, randomized pilot study. *Journal of General Internal Medicine*, 1993, 8 (11):585–590.
39. Rich MW et al. Repetitive hospital admissions for congestive heart failure in the elderly. *American Journal of Geriatric Cardiology*, 1996, 5 (3):32–36.
40. Rich MW et al. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. *New England Journal of Medicine*, 1995, 333 (18):1190–1195.
41. Stewart S et al. Effects of home-based intervention on unplanned readmissions and out-of-hospital deaths. *Journal of the American Geriatrics Society*, 1998, 46 (2):174–80.
42. Stewart S, Pearson S, Horowitz JD. Effects of a home-based intervention among patients with congestive heart failure discharged from acute hospital care. *Archives of Internal Medicine*, 1998, 158 (10):1067–1072.
43. Stewart S et al. Prolonged beneficial effects of a home-based intervention on unplanned readmissions and mortality among patients with congestive heart failure. *Archives of Internal Medicine*, 1999, 159 (3):257–261.
44. Stewart S, Pearson S, Horowitz JD. Effects of a home-based intervention among patients with congestive heart failure discharged from acute hospital care. *Archives of Internal Medicine*, 1998, 158(10):1067–1072.
45. Nikolaus T et al. A randomized trial of comprehensive geriatric assessment and home intervention in the care of hospitalized patients. *Age and Ageing*, 1999, 28 (6):543–550.
46. National Health Service Management Executive. *Assessing the Effects of Health Technologies*. London, Her Majesty's Stationery Office, 1992.
47. Rosenberg W, Donald A. Evidence based medicine: an approach to clinical problem solving. *BMJ*, 1995, 310:1122–1126.
48. Peto R. Why do we need systematic overviews of randomized trials? *Statistics in Medicine*, 1987, 6:233–240.
49. Peto R, Collins R, Gray R. Large-scale randomized evidence: large, simple trials and overviews of trials. *Journal of Clinical Epidemiology*, 1995, 48:23–40.

50. Smyth JF et al. Conducting clinical research in the new NHS: the model of cancer. United Kingdom Coordinating Committee on Cancer Research. *BMJ*, 1994, 309:457–461.
51. Dubinsky M, Ferguson JH. Analysis of the national institutes of health medicare coverage assessment. *International Journal of Technology Assessment in Health Care*, 1990, 6:480–488.
52. Sacks HS et al. Meta-analysis of randomized controlled trials. *New England Journal of Medicine*, 1987, 316:450–455.
53. Rosenberg W, Donald A. Evidence based medicine: an approach to clinical problem solving. *BMJ*, 1995, 310:1122–1126.
54. Teo KK et al. Effect of intravenous magnesium in suspected myocardial infarction: Overview of randomized trials. *BMJ*, 1991, 303:1499–1503.
55. Woods KL et al. Intravenous magnesium sulphate in suspected acute myocardial infarction: Results of the second Leicester Intravenous Magnesium Intervention Trial (LIMIT-2). *The Lancet*, 1992, 339:1553–1558.
56. Hartford K et al. Randomized controlled trial of a telephone intervention by nurses to provide information and support to patients and their partners after elective coronary artery bypass graft surgery: Effects of anxiety. *Heart & Lung: Journal of Acute and Critical Care*, 2002, 31 (3):199–206.
57. Penque S et al. Early discharge with home health care in the coronary artery bypass patient. *Dimensions of Critical Care Nursing*, 1999, 18 (6):40–48.
58. Harrison MB et al. Quality of life of individuals with heart failure: a randomized trial of the effectiveness of two models of hospital-to-home transition. *Medical Care*, 2002, 40 (4):271–282.
59. Jerant AF, Azari R, Nesbitt TS. Reducing the cost of frequent hospital admissions for congestive heart failure: a randomized trial of a home telecare intervention. *Medical Care*, 2001, 39 (11):1234–1245.
60. von Koch L et al. Randomized controlled trial of rehabilitation at home after stroke: one-year follow-up of patient outcome, resource use and cost. *Cerebrovascular Diseases*, 2001, 12 (2):131–138.
61. Teng J et al. Costs and caregiver consequences of early supported discharge for stroke patients. *Stroke*, 2003, 34 (2):528–536.
62. Fjaertoft H, Indredavik B, Lydersen S. Stroke unit care combined with early supported discharge: Long-term follow-up of a randomized controlled trial. *Stroke*, 2003, 34 (11):2687–2691.
63. Bautz-Holter E et al. Early supported discharge of patients with acute stroke: A randomized controlled trial. *Disability and Rehabilitation*, 2002, 24 (7):348–355.
64. Anderson C et al. Home or hospital for stroke rehabilitation? Results of a randomized controlled trial. I: Health outcomes at 6 months. *Stroke*, 2000 (31), 5:1024–1031.
65. Mayo NE et al. There's no place like home : an evaluation of early supported discharge for stroke. *Stroke*, 2000 31 (5):1016–1023.

66. Crotty M et al. Early discharge and home rehabilitation after hip fracture achieves functional improvements: a randomized controlled trial. *Clinical Rehabilitation*, 2002, 16 (4):406–413.
67. Tinetti ME et al. Home-based multicomponent rehabilitation program for older persons after hip fracture: A randomized trial. *Archives of Physical Medicine and Rehabilitation*, 1999, 80 (8):916–922.
68. Skwarska E et al. Randomised controlled trial of supported discharge in patients with exacerbations of chronic obstructive pulmonary disease. *Thorax*, 2000, 55 (11):907–912.
69. Cotton MM et al. Early discharge for patients with exacerbations of chronic obstructive pulmonary disease: a randomized controlled trial. *Thorax*, 2000, 55 (11):902–906.
70. El-Darzi E et al. A simulation modelling approach to evaluating length of stay, occupancy, emptiness and bed blocking in a hospital geriatric department. *Healthcare Management Science*, 1998, 1 (2):143–149.
71. Kane RL et al. The effect of Evercare on hospital use. *Journal of the American Geriatrics Society*, 2003, 51:1427–1434.
72. Carpenter I et al. Clinical and research challenges of intermediate care. *Age and Ageing*, 2002, 31:97–100.
73. Thea PM, Vlieland V. Managing chronic disease: Evidence-based medicine or patient-centred medicine? *Health Care Analysis*, 2002, 10:289–298.
74. Gilbertson L et al. Domiciliary occupational therapy for patients with stroke discharged from hospital: Randomized controlled trial. *BMJ*, 2000, 320:603–606.
75. Dellasega CA, Zerbe TM. A multimethod study of advanced practice nurse post-discharge care. *Clinical Excellence for Nurse Practitioners*, 2000, 4 (5):286–293.
76. Blue L et al. Randomized controlled trial of specialist nurse intervention in heart failure. *BMJ*, 2001, 323:715–718.
77. Dudas V et al. The impact of follow-up telephone calls to patients after hospitalization. *American Journal of Medicine*, 2001, 111 (9B):26S–30S.
78. Griffiths P et al. Substitution of a nursing-led inpatient unit for acute services: Randomized controlled trial of outcomes and cost of nursing-led intermediate care. *Age and Ageing*, 2001, 30 (6):483–488.
79. Hermiz O et al. Randomized controlled trial of home based care of patients with chronic obstructive pulmonary disease. *BMJ*, 2002, 325:938.
80. Krunholz HL et al. Randomized trial of an education and support intervention to prevent readmission of patients with heart failure. *Journal of the American College of Cardiology*, 2002, 39 (1):83–89.
81. Kuisma R. A randomized, controlled comparison of home versus institutional rehabilitation of patients with hip fracture. *Clinical Rehabilitation*, 2002, 16 (5):553–561.

82. Stewart S, Horowitz JD. Detecting early clinical deterioration in chronic heart failure patients post-acute hospitalization—a critical component of multidisciplinary, home-based intervention? *European Journal of Heart Failure*, 2002, 4 (3):345–351.
83. Stewart S, Marley JE, Horowitz JD. Effects of a multidisciplinary, home-based intervention on unplanned readmissions and survival among patients with chronic congestive heart failure: a randomized controlled study. *The Lancet*, 1999, 354 (9184):1077–1083.
84. Anttila S K et al. Cost effectiveness of an innovative four-year post discharge programme for elderly patients. *Scandinavian Journal of Public Health*, 2000, 28:41–46.
85. McCorkle R et al. A specialized home care intervention improves survival among older post-surgical cancer patients. *Journal of the American Geriatrics Society*, 2000, 48:1707–1713.
86. Mion LC et al. Case finding and referral model for emergency department elders: a randomized clinical trial. *Annals of Emergency Medicine*, 2003, 41 (1):57–68.
87. Caplan G, Timmiss P, Brown A. How can we help older patients after the emergency? A randomized controlled trial of comprehensive geriatric assessment after discharge of elderly from the emergency department – the Deed II study. *Journal of the American Geriatrics Society*, 2000, 48 (8):S8.
88. Bogardus ST et al. The effects of a targeted multicomponent delirium intervention on postdischarge outcomes for hospitalized older adults. *American Journal of Medicine*, 2003, 114 (5):383–390.
89. Richards S, Coast J. Interventions to improve access to health and social care after discharge from hospital: A systematic review. *Journal of Health Services and Research Policy*, 2003, 8 (3):171–179.
90. Cole MG. The impact of geriatric post-discharge services on mental state. *Age and Ageing*, 2001, 30 (5):415–418.
91. Cameron I et al. Geriatric rehabilitation following fractures in older people: A systematic review. *Health Technology Assessment*, 2000, 4(2):i-iv, 1-111.
92. Early Supported Discharge Trialists. Services for reducing duration of hospital care for acute stroke patients. *The Cochrane Library*, 2005, 2:207.
93. Hyde CJ, Robert IE, Sinclair AJ. The effects of supporting discharge from hospital to home in older people. *Age and Ageing*, 2000, 29 (3):271–279.
94. Stewart S, Pearson S, Horowitz JD. Effects of a home-based intervention among patients with congestive heart failure discharged from acute hospital care. *Archives of Internal Medicine*, 1998, 158 (10):1067–1072.