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[Intervention Review]

Care home versus hospital and own home environments for rehabilitation of older people

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ABSTRACT

Background

Rehabilitation for older people has acquired an increasingly important profile for both policy-makers and service providers within health and social care agencies. This has generated an increased interest in the use of alternative care environments including care home environments. Yet, there appears to be limited evidence on which to base decisions.

This review is the first update of the Cochrane review which was published in 2003.

Objectives

To compare the effects of care home environments (e.g. nursing home, residential care home and nursing facilities) versus hospital environments and own home environments in the rehabilitation of older people.

Search methods

We searched the Cochrane Effective Practice and Organisation of Care Specialised Register and Pending Folder, MEDLINE (1950 to March Week 3 2007), EMBASE (1980 to 2007 Week 13), CINAHL (1982 to March, Week 4, 2007), other databases and reference lists of relevant review articles were additionally reviewed. Date of most recent search: March 2007.

Selection criteria

Randomised controlled trials (RCTs), controlled clinical trials (CCTs), controlled before and after studies (CBAs) and interrupted time series (ITS) that compared rehabilitation outcomes for persons 60 years or older who received rehabilitation whilst residing in a care home with those who received rehabilitation in hospital or own home environments.

Data collection and analysis

Two review authors independently assessed trial quality and extracted data.

Main results

In this update, 8365 references were retrieved. Of these, 339 abstracts were independently assessed by 2 review authors, and 56 studies and 5 review articles were subsequently obtained. Full text papers were independently assessed by two or three review authors and none of these met inclusion criteria.

Authors' conclusions

There is insufficient evidence to compare the effects of care home environments versus hospital environments or own home environments on older persons rehabilitation outcomes. Although the authors acknowledge that absence of effect is not no effect. There are three main reasons; the first is that the description and specification of the environment is often not clear; secondly, the components of the rehabilitation system within the given environments are not adequately specified and; thirdly, when the components are clearly specified they demonstrate that the control and intervention sites are not comparable with respect to the methodological criteria specified by Cochrane EPOC group. The combined effect of these factors resulted in the comparability between intervention and control groups being very weak.

PLAIN LANGUAGE SUMMARY**Location of rehabilitation services for the elderly**

For a number of reasons, there has been an increased interest in providing elderly people with appropriate rehabilitation services. Not only are there more elderly people, but the importance of 'rehab' after a stroke, hip fracture, or an illness in general, has been recognised.

With this, is the increasing pressure to use health care resources efficiently, ensure hospital beds are available to people who need acute hospital care and that rehab facilities and community services are in place.

To ensure that elderly people can receive rehabilitation services, different ways of providing rehab have been developed. An important difference in the services is where the rehab takes place. Some services take place in care home environments, such as nursing homes, residential care homes and nursing facilities, while other services can take place in the hospital or at home.

To determine and compare the effects of the different places for rehab on elderly people, a review was conducted. After searching for all possible relevant studies, no studies were found. Studies are needed.

BACKGROUND

Rehabilitation for older people has acquired an increasingly important profile for both policy-makers and service providers within health and social care agencies. Several reports and professional bodies identified a number of factors that have contributed to this position. Concerns relating to demographic patterns, an increasing awareness of the need to ensure resources were used cost-effectively, an articulated desire to reduce length of stay in acute hospital beds, recognition of the pivotal role of rehabilitation in elderly care, and cost-containment initiatives represent some of these factors (Audit Comm' 2000; Haffey 1995; Henwood 1995; Joseph 1993; Nocon 1998).

The growing demand for rehabilitation services has generated an increased interest in the use of alternative care environments for older persons' rehabilitation. This development is not specific to the United Kingdom. Growing demographic and fiscal pressures are impacting on a number of health care systems world-wide. The use of alternative care settings for rehabilitation is under examination in many countries. Research examining the prevalence of therapy (physical and occupational) in nursing homes reported that the prevalence of nursing home residents receiving therapy was 31% (Iceland), 30% (Japan), 23% (Denmark), 14% (Italy) and 11% (USA), (Berg 1997). More recently it was reported that 68% of those in residential homes in Finland are in receipt of some form of rehabilitation (Vähäkangas 2006). Within the Netherlands, some 40% of all nursing home admissions are for rehabilitation and nursing homes are developing initiatives with hospitals in relation to rehabilitation for patients with hip fractures and stroke (Ribbe 1999).

In the USA, skilled nursing facilities and traditional nursing homes have increasingly been viewed as care environments in which rehabilitation for older people can be undertaken (Joseph 1993; Keith 1995; Kochersberger 1994; Kramer 1999(a); Murray 1999). This shift has seen increasing levels of restorative rehabilitation provision within these facilities (Horowitz 2002). This has led to a growing body of research examining the provision of rehabilitation in such care settings and, in some cases, comparing outcomes between settings. However, the findings from this research appear equivocal (Kane 1996; Keith 1995; Kramer 1997; Murray 1999).

Within the United Kingdom, the emergence of the Intermediate Care agenda added additional momentum to the debate. Intermediate Care is seen by the United Kingdom government as being a core element in its programme for improving services for older people (DoH 2001; DoH 2004). The definition of Intermediate Care has evolved since the term emerged during the late 1990s with much debate as to the merits of each emerging definition. The United Kingdom government noted that Intermediate Care should be regarded as describing services that meet a number of specific criteria, for example 'are targeted at people who would otherwise face unnecessarily prolonged hospital stays or inappropriate admission to acute in-patient care, long-term residential care or continuing NHS in-patient care' (DoH 2001). Carpenter et al (Carpenter 2002) note alternatives to hospital care that focus on hospital avoidance, supported discharge and 'novel models of community care' and that bridge the acute and primary care sectors may be collectively known as Intermediate Care. Stevenson (Stevenson 2002) suggests that most authorities 'would agree that intermediate care is a short-term intervention

to preserve the independence of people who might otherwise face unnecessarily prolonged hospital stays or inappropriate admission to hospital or residential care. The care is person-centred, focused on rehabilitation and delivered by a combination of professional groups'.

Similarly, the National Bed Inquiry contributed to the debate by reporting that the health and social needs of the elderly population were not being met. It identified insufficient community alternatives to hospital care, inappropriate use of hospital beds, and delays in hospital discharges as key factors (DoH 2000). The British Geriatrics Society bed-blocking surveys (1996 to 98) contributed to this debate by reporting that patients awaiting admission to a rehabilitation facility blocked some five to six per cent of geriatric/general medical beds (Lubel 1998).

The recognition that insufficient rehabilitation services were an integral component in the 'vicious circle' model also informed the discussion. This model describes the inter-relationship between pressure on hospital beds, early discharge, insufficient rehabilitation services, increased use of expensive residential and nursing home care, less finance available for preventative services and, ultimately, more frequent re-admissions to hospital (Audit Comm' 1997; Audit Comm' 2000). As part of the response to these issues, authorities in England have been guided to ensure that rehabilitation services, in a variety of settings, are in place to assist older persons in hospital regain optimum levels of independence and to return home (Audit Comm' 2000). The possibility of using alternative care settings, in particular, nursing home environments, for the delivery of rehabilitative interventions for older persons has been identified (IHCA 2000; Nazarko 1994; Nazarko 1999). In the service provision arena, health and social care purchasers are funding schemes that use a variety of care settings, including 'care home environments', as the venue for older persons' rehabilitation (King's Fund 2000; Parker 1999; Vaughan 1999; Ward 2002).

At a time when there is pressure for policy decision-makers and service providers to explore the use of alternative care settings for the provision of rehabilitation for older people there appears to be no distillation of evidence, concerning the optimum environment, on which to base decisions. This review sets out to evaluate the effectiveness of different environmental settings in rehabilitation for older people.

This review is the first update of the Cochrane review (Ward 2003) which was published in 2003. The previously published Cochrane review found no studies that matched the inclusion criteria and recommended that further research be undertaken to answer this question.

OBJECTIVES

To compare the effects of care home environments (e.g. nursing home, residential care home and nursing facilities) versus hospital environments and own home environments in the rehabilitation of older people.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs), controlled clinical trials (CCTs), controlled before and after studies (CBAs) and interrupted time series (ITS) studies.

In this update, we have utilised EPOC's revised criteria for CBAs; to be included in the review a CBA must have incorporated at least two intervention groups and two control groups.

Types of participants

Persons 60 years or older who are in receipt of rehabilitation whilst residing in either care home, hospital or own home environments. This population will be sub-grouped as follows:

- Persons aged 60 or over with stroke;
- Persons aged 60 or over with fracture of neck of femur; and
- Persons aged 60 or over, other.

These subgroups have been identified based on the following rationale:

Clinically these groups are large groups of conditions that are commonly found in rehabilitation for older persons. Many services are condition-specific and thus there may be sufficient numbers in these domains for sub-group analysis. These conditions have been the subject of previous Cochrane systematic reviews and therefore our study would contribute to a condition-based knowledge.

In terms of definition of rehabilitation it is the review authors' intentions to accept the implicit or explicit definition provided by the study authors. The reason for this is threefold. Firstly, experience shows that very few researchers define it in the sense of their own transformation process. Secondly, the review authors would not wish to exclude a trial if the definition was different from that which we preferred and finally, it is generally agreed that there is no universally accepted single definition of rehabilitation. For the purpose of this review, rehabilitation will be defined as:

'A process aiming to restore personal autonomy in those aspects of the daily living considered most relevant by patients or service users, and their family carers' (Sinclair 1998).

Types of interventions

We reviewed studies in which patients received rehabilitation in one of three environments:

Care home environments where rehabilitation interventions occur versus hospital and own home environments where rehabilitation interventions occur.

A care home environment is a facility that meets the following criteria:

- Provides communal living facilities for long-term care;
- Provides overnight accommodation;
- Provides nursing or personal care; and
- Provides for people with illness, disability or dependence.

A hospital environment is a facility that meets the following criteria:

- Provides communal care where there is an expectation that this care is time limited;
- Provides overnight accommodation;
- Provides nursing and personal care; and
- Provides for people with illness and disability.

An own home environment is:

- A facility for a person living on their own or with a family group for an indefinite period.

Skilled Nursing Facility (SNF) environments may be similar to either a hospital environment or a care home environment. To address this possibility we first studied the description of the SNF in each paper and decided, based upon our explicit environment definitions, if the SNF described in that paper should be analysed in the care home or the hospital arm. If, however, there was insufficient detail to enable this we would conduct a sensitivity analysis, first analysing our data with all unclassifiable SNF's included in the care home arm and then with them included in the hospital arm.

Intervention exclusion criteria:

Care environments offering rehabilitation interventions to people who experience two or more environments in any 24-hour period e.g. day hospitals and day centres. In addition, any environment that was not classifiable in terms of the environmental definitions detailed previously was excluded.

Types of outcome measures

Primary outcomes

Functional outcomes using activities of daily living measurement (both personal and instrumental).

Secondary outcomes

Subjective health status, quality of life measures;
 Return to place of usual residency;
 All cause mortality;
 Adverse effects;
 Readmission to an acute care facility;
 Patient and carer satisfaction;
 Number of days in facility;
 Number of days receiving rehabilitation.

A simple cost analysis would have been undertaken if there were sufficient data. This was to be reviewed as the review progresses and if the included studies provided sufficient data a more comprehensive economic analysis would have been undertaken.

Search methods for identification of studies

We undertook electronic and non-electronic searching. The review authors believed that due to the multi-disciplinary nature of the intervention under study, a wide range of databases would need to be used. We searched the Cochrane Effective Practice and Organisation of Care Group (EPOC) specialised register using the search terms 'rehabilitation' or 'elderly' or 'geriatric' and restricted to those studies where the intervention includes a change of setting or site of service delivery. The EPOC pending folder was also searched using the same search terms. To identify possible additional studies, a strategy for MEDLINE (1966 to 2000) was developed using relevant MeSH terms and text words that had

not been used in the EPOC MEDLINE search strategy. This strategy was adapted for the other databases that were searched. These were the Cochrane Controlled Trials Register (CCTR); Cochrane Rehabilitation and Related Therapies Field Database; EMBASE (1980 to 2000), Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982 to 2000); Science Citation Index (1982 to 2000); Social Science Citation Index (1982 to 2000); Best Evidence (1991 to 2000); HMIC (1979 to 2000); PsycINFO (1967 to 2000); ASSIA (1987 to 2000); Ageline (1978 to 2000); AgeInfo (1971 to 2000); Sociological Abstracts (1963 to 2000); System for Information on Grey Literature (SIGLE) (1980 to 2000); UK National Research Registers Project Database (Issue 1 2001); Architecture Publication Index (1977 to 2000).

One review author (DW) also handsearched the following Journals: Disability and Rehabilitation (1992 to 2000); Disability and Society (1986 to 2000); Archives of Physical Medicine and Rehabilitation (1985 to 2000); Journal of the American Geriatric Society (1980 to 2000); International Journal of Rehabilitation Research (1980 to 2000); American Journal of Physical Medicine and Rehabilitation (1980 to 2000) and: Clinical Rehabilitation (1992 to 2000). The review authors also consulted a number of subject area experts (summer 2001) and obtained full text review articles and forward tracked any references from these.

The electronic search was first completed June 2001, the handsearch, by September 2001. No language restrictions were placed on the search strategy.

In this first update, the trial search co-ordinator (DS) utilised revised search strategies to search the following databases: The Cochrane Effective Practice and Organisation of Care Specialised Register and Pending Folder; MEDLINE (1950 to March Week 3 2007); Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982 to March, Week 4, 2007); and EMBASE (1980 to 2007 Week 13). In addition, we reviewed reference lists of relevant review articles.

Revised MEDLINE search strategy:

- 1 exp Rehabilitation/
- 2 "recovery of function"/
- 3 Rehabilitation Nursing/
- 4 convalescence/
- 5 rehabilitat\$.tw.
- 6 (function\$ adj recovery).tw.
- 7 Geriatric Assessment/
- 8 ((geriatric or elder\$) adj1 (assessment? or evaluation?)).tw.
- 9 or/1-8
- 10 exp Hospitals/
- 11 Inpatients/
- 12 hospital units/
- 13 Residential Facilities/
- 14 Homes for the Aged/
- 15 exp Nursing Homes/
- 16 Rehabilitation Centers/
- 17 Long-Term Care/
- 18 Health Services for the Aged/
- 19 (home? adj1 (nursing or care or residential or environment?)).tw.
- 20 *Aftercare/
- 21 (aftercare or after-care).tw.
- 22 ((unit? or ward? or facilit\$ or centre? or center?) adj (hospital or care or rehabilitation)).tw.
- 23 community-based.tw.

- 24 (community adj1 care).tw.
- 25 Residence Characteristics/
- 26 (residential adj (care or facilit\$ or setting?)).tw.
- 27 or/10-26
- 28 exp Aged/
- 29 (geriatr\$ or aged or elderly or gerontol\$).tw.
- 30 28 or 29
- 31 9 and 27 and 30
- 32 randomized controlled trial.pt.
- 33 controlled clinical trial.pt.
- 34 intervention studies/
- 35 experiment\$.tw.
- 36 (time adj series).tw.
- 37 (pre test or pretest or post test or posttest).tw.
- 38 random allocation/
- 39 impact.tw.
- 40 intervention?.tw.
- 41 chang\$.tw.
- 42 evaluation studies/
- 43 evaluat\$.tw.
- 44 effect?.tw.
- 45 comparative study.pt.
- 46 or/32-45
- 47 animal/
- 48 human/
- 49 47 not (47 and 48)
- 50 46 not 49
- 51 31 and 50
- 52 limit 51 to review
- 53 51 not 52
- 54 meta-analysis.pt.
- 55 53 not 54
- 56 limit 55 to yr="2001 - 2007"

Additional search strategies are included in [Appendix 1](#) and [Appendix 2](#).

Data collection and analysis

One review author (DW) completed the initial search strategy. The abstracts of the possible studies identified were then independently assessed for relevance to the issue and their eligibility evaluated using a criteria of 'hit' (could be eligible), 'unsure' (probably not eligible) and 'reject' (not to be assessed further) by two review authors (DW and MS). Full text (English and non-English) papers were then obtained for the 'hits' and the 'unsures'. Full text papers were obtained when the abstract suggested that the participants were people aged 60 or over, that there was a rehabilitation component to the care described and there was a comparison between a care home environment and a hospital or own home environment.

As this stage, study design and methodological quality criteria were not applied. It was felt necessary to obtain full text papers for the unsures as it was often unclear from the abstracts as to the exact nature of the interventions being reported, for example, was there a rehabilitation component to the care being offered? In addition, it was also necessary to ascertain from the paper the characteristics of the environments in which the rehabilitation occurred and to identify the study design as this was often not clear from the abstracts. Any disagreement with regard to eligibility was resolved through discussion between review authors (DW/MS/TD/NB).

Those papers that were assessed as meeting the intervention criteria were then independently scrutinised by four reviewers (DW/MS/TD/NB) for study design and methodological quality. The design and quality of the studies were assessed using the criteria described by the EPOC group.

In this update the trial search co-ordinator (DS) completed the revised searches, and two review authors (AD/DG) independently identified potential papers for inclusion, and assessed the abstracts and full articles for eligibility. DW acted as an independent third review author for full articles where necessary.

RESULTS

Description of studies

See: [Characteristics of excluded studies](#)

The initial search generated 19,457 citations. A total of 1247 abstracts were considered to be potentially relevant and were independently scrutinised by two review authors (DW/MS) to assess their eligibility. Ninety-nine papers were considered relevant and were retrieved for further assessment. These were read and considered for inclusion in this review (DW/MS). Eighty-seven were excluded at this stage as they were either discussion papers, editorials, did not directly report study findings, the intervention reported did not include a rehabilitation component to the care, did not report on older persons or did not compare a care home environment with either a hospital or own home environment. Study design and methodological criteria were not rigidly applied at this stage because in some studies identifying the study design was difficult and the reviewers felt it appropriate to assess these papers further. Three of the 87 were considered as potentially relevant studies but could not be assessed for inclusion until additional data and information was obtained (these studies have since been assessed as part of this update).

This process resulted in 12 papers being assessed further for study design and methodological validity. Four of the studies ([Chen 2000/2001](#); [Kane 1996](#); [Kane 1998](#); [Kane 2000](#)) were based on data from one primary study ([Kane 1994](#)). This assessment was undertaken independently by four review authors (DW/MS/TD/NB). The review authors categorised study designs according to the Cochrane EPOC review group's study design classification. This process resulted in extensive discussion between review authors due to the complex nature of the review subject matter and the need to ensure the accuracy of the review authors assessment of the study design and to ensure consistency in the interpretation of the EPOC study design inclusion criteria. Following these discussions, it was unanimously agreed that none of these studies met the review's study design inclusion criteria.

In this update, 8365 references were retrieved and independently assessed by two review authors (AD/DG). Of these, 339 abstracts were independently assessed (AD/DG), and 55 additional studies and 5 review articles ([Chamberlain 2003](#); [Jónsson 2003](#); [Miller 2005](#); [Parker 2000](#); [Turrell 2001](#)) were subsequently obtained. Reference lists of review articles were scrutinised. Three review authors (AD/DG/DW) independently assessed full text papers and none of these met inclusion criteria.

Risk of bias in included studies

The search did not find any studies that met the study design criteria for inclusion in this review. Many of the studies identified were descriptions of service developments. Those that attempted to compare outcomes for older people who received rehabilitation input in different care environments tended to use before and after research design although these were not sufficiently robust enough to meet EPOC controlled before and after inclusion criteria. However, many did use validated instruments to measure differences in outcomes for rehabilitation of older person with different illnesses between various care settings, for example Barthel scores.

As none of the identified studies met the criteria for inclusion, a detailed analysis of the methodological quality was not undertaken.

Effects of interventions

The initial search identified 99 papers that were considered for inclusion in this review. From this, 12 papers met the intervention inclusion criteria and were assessed to see if they met EPOC study design criteria. None of the papers qualified for inclusion in the review.

In this update, 55 additional papers were obtained and considered for inclusion. None of these studies met the review criteria. Many studies had more than one reason for exclusion. As a general overview: 24 were excluded for not investigating care home environments, 6 did not compare two environments, 17 were excluded for not meeting study design criteria, 3 did not investigate rehabilitation, 2 were excluded as patients experienced two or more environments in any 24 hour period, 1 did not investigate older people, 1 did not look at functional outcomes, and 1 was a commentary on another study.

DISCUSSION

The impetus of the intermediate care agenda within the UK ([DoH 2001](#)) and the continued interest within the United States to explore the use of non-acute hospital settings for the delivery of rehabilitation ([Kramer 1999\(b\)](#)) demonstrate the interest, both from policy makers and service providers, into the use of alternative care environments for the rehabilitation of older persons. This interest is generated by a number of issues relating to demographic patterns, an increasing awareness of the need to ensure resources are used cost-effectively, an articulated desire to reduce length of stay in acute hospital beds and, recognition of the pivotal role of rehabilitation in elderly care. It is therefore disappointing that there remains a lack of robust evidence to inform the debate. Whilst it is evident that there are a number of studies that have investigated this area of health care and have provided insights into the factors that may impact on rehabilitation outcomes, the lack of rigorous research design hinders the drawing of conclusions.

Research focusing on the comparisons between systems (services) of care is inherently complex. Rehabilitation services for older persons are complex services that contain several separate, but inter-related, component parts. Rehabilitation is not merely a single intervention, but a transformation process consisting of a number of interventions and can be described as a family of complex services. A rehabilitation service is therefore a system and put concisely, a system is an integrated composite of people,

products and processes that provide a capability to satisfy a stated need or objective (Dept of Defense 2000). A rehabilitation service therefore is a sum of its part and relies heavily on the relationships between the components as on the components themselves (Wade 2001).

Health care represents a special type of system, a 'human activity system' (Checkland 1993). Successful human activity systems have well described component parts. These components can be articulated by different scientific and professional groups using different terms but they share common features. For example, Donabedian's model of quality of care categorises the components broadly into three areas of care: processes of care, structures of care and outcomes of care (Donabedian 1966). The Cochrane EPOC group in their criteria for controlled before and after studies describe them as: dominant reimbursement system, level of care, setting of care, and academic status. Experts using soft systems methodology (Checkland 1999; Wilson 1996) describe them using the mnemonic 'CATWOE'; that is, Customers, Actors, Transformation, Weltanschauung (the world view), Owners and Environmental Constraints (Smyth 1976). Researchers and clinical practitioners critically appraising studies use this knowledge explicitly or implicitly when assessing the internal validity of controlled trials when searching for performance bias. Performance bias being the unequal provision of care apart from the intervention under evaluation (Juni 2001).

Studies scrutinised in this review tended to lack crucial details about these components and their relationships. This inadequate description of the services studied has been viewed as one of the primary limitations in rehabilitation research (Hoenig 2000) and a difficulty in classifying services has been noted by other review authors (Parker 2000). The need for a clear description of a service's component parts will help to ensure that performance bias has been addressed and external validity is enhanced. This will be important if sound conclusions are to be drawn and findings are to be implemented in practice (Glazsiou 2008). Of equal importance, but perhaps of greater difficulty, clear descriptions of the services studied will be necessary in order to explore the inter-relationships between component parts.

In addition, the complexity of the review was exacerbated by several factors, many of which have been recently highlighted in a paper by Greener (Greener 2002). Differing terminology was often used and different definitions used to describe settings of care, the rehabilitation process itself and the outcomes. The same term was used but conveyed differing meanings and conversely, different terms were used to convey the same meaning. This not only occurred between countries but also within countries and also between and within different professional groups. Such issues clearly have implications for both practice and research agendas

AUTHORS' CONCLUSIONS

Implications for practice

More rigorous studies to compare the effects of care home environments (e.g. nursing home, residential care home, and nursing facilities), hospital environments and own home environments in the rehabilitation of older people are required to inform decisions on the appropriateness of undertaking older persons rehabilitation in a variety of health care settings.

Implications for research

Research into older persons rehabilitation services and the potential impact of the environment in which it occurs involves research into complex systems. As noted above, such research can be inherently difficult. To assist the research process it can be argued that studies should attempt to provide clear details of the component parts of the services being compared. The major components that need to be considered include, amongst others, staffing, nature of the rehabilitation, patient characteristics, the care environment, source of reimbursement and the culture of the service. This is not to argue for a reductionalist approach to rehabilitation research. Rather, it may allow for a clearer comparison between different services and their outcomes and permit specific investigation into the role of individual component parts, their inter-relationships with other components within the whole process and arguably more importantly, ensure external validity.

Discussion documents from the MRC Health Services and Public Health Research Board (MRC 2000) provide a possible framework for the development and evaluation of RCTs for complex interventions to improve health. The framework also notes the potentially crucial role that qualitative research methodology has in conjunction with quantitative methods in this area of study. Similarly, others are looking at innovative research methodologies, many from other disciplines, and their potential role in research into health service organisation and delivery (Fulop 2001). Other commentators have also noted that the use of qualitative and descriptive data within a systematic review will be needed if more appropriate methods for undertaking systematic reviews in such areas of research are to be found (Carpenter 2002). Such a framework may prove helpful for future researchers when planning studies to compare the effects of care home environments, hospital environments and own home environments in the rehabilitation of older people.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Andersson 2002	Not a care home intervention.
Arinzon 2005	Not a comparison of environments.
Askim 2004	Not a care home intervention.
Askim 2006	Not a care home intervention.
Barone 2006	Not a care home intervention.
Bautz-Holter 2002	Not a care home intervention.
Belooesky 2002	Study design (observational cohort study).
Boston 2001	Study design (observational cohort study). Not all rehabilitation, participants in conventional services group experienced mixed environments, data inseparable.
Bowling 1991	Participants not undergoing rehabilitation.
Braun 1987	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Bührlen 2002	Not a care home intervention. Participant age.
Chen 2000/2001	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Chiu 1997	Study design (observational cohort).
Chiu 2001	Study design (observational cohort).
Chuang 2005	Study design (observational cohort).
Claesson 2003	Primary intervention not care home; follow-up of care home patients would not meet study design criteria; and follow-up outcome not a functional outcome.

Study	Reason for exclusion
Cohen 2002	Participants experienced more than one environment in 24 hour period.
Copp 1966	Not a comparison of environments (rehabilitation versus no rehabilitation). Age of participants.
Crotty 2005	Participants in hospital group not undergoing rehabilitation. Transitional care before long term nursing home placement.
Cunliffe 2004	Not a care home intervention.
Degischer 2002	Study design (non-random comparison of different forms of rehabilitation). Unclear environment.
Deshpande 1998	Study design (retrospective case-control study).
Deutsch 2005	Study design (retrospective database study).
Deutsch 2006	Study design (retrospective database study).
Donnelly 2004	Not a care home intervention.
Dubach 1993	Not a care home intervention.
Ellis 2006	Outcome not functional. Economic analysis.
Evans 2002	Not a care home intervention.
Fjærtøft 2003	Not a care home intervention.
Fjærtøft 2004	Not a care home intervention (included Day Clinics).
Fleming 2004	Participants experienced two environments in any 24 hour period (home visits).
Frytak 2001	Not rehabilitation (assisted living as replacement for long-term care). Not a care home intervention (assisted living versus hospital).
Giannini 2007	Not a care home intervention.
Griffiths 2001	Not a care home intervention.
Griffiths 2006	Commentary on Crotty 2005 .
Kalra 2000	Not a care home intervention.
Kane 1994	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Kane 1996	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Kane 1998	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Kane 2000	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Keith 1995	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Kramer 1997	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Kramer 2000	Study design (inception cohort).

Study	Reason for exclusion
Kuisma 2002	Not a care home intervention (hospital versus own home).
Leeds 2004	Study design (observational cohort).
Levi 1997	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Mayo 2000	Not a care home intervention.
Miller 2005	Not a care home intervention.
Munin 2005	Study design (observational cohort).
Philp 1991	Study design (cross-sectional study).
Polder 2003	Study design (before-and-after study with no concurrent control).
Reid 1989	Not care home intervention.
Reimer 2004	Comparison of long-term environments only (no hospital or own home comparison).
Ronning 1998	Randomised controlled trial. Reviewers compared rehabilitation in hospital group with nursing home in-patient rehabilitation sub-group in study control arm (rehabilitation in the municipalities). No randomisation within the control group to either nursing home in-patient rehabilitation or nursing home out-patient rehabilitation. The sub-group comparison of hospital unit versus nursing home in-patient rehabilitation did not meet RCT study design. Reviewers explored controlled before after study design for this sub-group comparison. This failed to meet EPOC CBA study design criteria.
Sanford 2006	Not a care home intervention.
Siggeirsdottir 2005	Not a comparison of environments.
Siu 2004	Participants (age). Not a care home intervention.
Sulter 2003	Not a care home intervention.
Trappes-Lomax 2006	Study design (geographical controls). Controls experienced two environments in any 24 hour period.
van Balen 2003	Study design (before-and-after, no concurrent control).
von Sternberg 1997	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Walsh 2006	Study design (retrospective case-control).
Weiss 2004	Not care home intervention.
Williams 1994	Controlled before and after study design. Failed to meet EPOC CBA study design criteria
Xie 2003	Not a comparison of environments (rehabilitation versus control).
Zhang 2003	Not a comparison of environments.
Åberg 2003	Not a care home intervention.

RCT: Randomised controlled trial
EPOC: the Effective Practice and Organisation group
CBA: Controlled before and after studies

APPENDICES

Appendix 1. EMBASE search strategy

1 exp Rehabilitation/
2 Rehabilitation Nursing/
3 convalescence/
4 (convalescen\$ or rehabilitat\$).tw.
5 (function\$ adj recovery).tw.
6 Geriatric Assessment/
7 ((geriatric or elder\$) adj1 (assessment? or evaluation?)).tw.
8 or/1-7
9 exp Hospital/
10 Hospital Patient/ or Aged Hospital Patient/
11 "Hospital Subdivisions and Components"/
12 Residential Home/
13 exp Elderly Care/
14 Nursing Home/
15 Rehabilitation Center/
16 Long-Term Care/
17 (home? adj1 (nursing or care or residential or environment?)).tw.
18 exp *Aftercare/
19 (aftercare or after-care).tw.
20 ((unit? or ward? or facilit\$ or centre? or center?) adj (hospital or care or rehabilitation)).tw.
21 community-based.tw.
22 (community adj1 care).tw.
23 (residential adj (care or facilit\$ or setting?)).tw.
24 or/9-23
25 exp Aged/
26 (geriatr\$ or aged or elderly or gerontol\$).tw.
27 25 or 26
28 8 and 24 and 27
29 Randomized controlled trial/
30 (randomised or randomized).tw.
31 experiment\$.tw.
32 (time adj series).tw.
33 (pre test or pretest or post test or posttest).tw.
34 impact.tw.
35 intervention?.tw.
36 chang\$.tw.
37 evaluat\$.tw.
38 effect?.tw.
39 compar\$.tw.
40 (controlled adj study).tw.
41 or/29-40
42 Nonhuman/
43 41 not 42
44 28 and 43

Appendix 2. CINAHL search strategy

1 exp Rehabilitation/
2 Recovery/
3 Rehabilitation Nursing/
4 (convalescen\$ or rehabilitat\$).tw.
5 (function\$ adj recovery).tw.
6 exp Geriatric Assessment/

7 ((geriatric or elder\$) adj1 (assessment? or evaluation?)).tw.
 8 or/1-7
 9 exp Hospitals/
 10 Inpatients/
 11 exp Hospital Units/
 12 exp Residential Facilities/
 13 Rehabilitation Centers/
 14 Long Term Care/
 15 Health Services for the Aged/
 16 (home? adj1 (nursing or care or residential or environment?)).tw.
 17 *After Care/
 18 (aftercare or after-care).tw.
 19 ((unit? or ward? or facilit\$ or centre? or center?) adj (hospital or care or rehabilitation)).tw.
 20 community-based.tw.
 21 (community adj1 care).tw.
 22 Residence Characteristics/
 23 (residential adj (care or facilit\$ or setting?)).tw.
 24 or/9-23
 25 exp Aged/
 26 (geriatr\$ or aged or elderly or gerontol\$).tw.
 27 25 or 26
 28 8 and 24 and 27
 29 clinical trial/
 30 (controlled adj (study or trial)).tw.
 31 (randomised or randomized).tw.
 32 (random\$ adj1 (allocat\$ or assign\$)).tw.
 33 comparative studies/
 34 experiment\$.tw.
 35 (time adj series).tw.
 36 impact.tw.
 37 intervention?.tw.
 38 evaluat\$.tw.
 39 effect?.tw.
 40 exp pretest-posttest design/
 41 exp quasi-experimental studies/
 42 or/29-41
 43 28 and 42

WHAT'S NEW

Date	Event	Description
12 November 2008	Amended	Plain Language summary updated

HISTORY

Protocol first published: Issue 3, 2001

Review first published: Issue 2, 2003

Date	Event	Description
14 August 2008	New search has been performed	New search March 31, 2007, no new studies
11 August 2008	New citation required but conclusions have not changed	Search redone, no new studies.

Date	Event	Description
10 July 2008	Amended	Converted to new review format.
14 February 2003	New citation required and conclusions have changed	Substantive amendment

CONTRIBUTIONS OF AUTHORS

DW developed review content, wrote protocol, developed search strategy, completed all searching, screened all citations, scrutinised all abstracts to identify potential papers, obtained hard copies of potential papers, applied inclusion/exclusion criteria to identified papers and wrote final review manuscript. DW reviewed articles for inclusion in the updated review and contributed to the revised and updated manuscript.

MS developed review content, contributed to writing protocol, contributed to developing search strategy, scrutinised all abstracts to identify potential papers, applied inclusion/exclusion criteria to identified papers and contributed to the writing of the final review manuscript.

TD contributed to writing protocol, commented on search strategy, applied inclusion/exclusion criteria to identified papers and contributed to the writing of the final review manuscript. Provided methodological advice throughout process.

Nicola Brooks contributed to writing protocol, commented on search strategy, contributed to the scrutiny of abstracts to identify potential papers, applied inclusion/exclusion criteria to identified papers and contributed to the writing of the final review manuscript.

AD and DG independently scrutinised all titles, abstracts, and full articles for inclusion in the updated review, and amended the updated review manuscript.

DECLARATIONS OF INTEREST

None known.

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Internal sources

- No sources of support supplied

External sources

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INDEX TERMS

Medical Subject Headings (MeSH)

*Aged; *Health Services for the Aged; *Rehabilitation; Home Nursing; Homes for the Aged; Hospitals; Nursing Homes

MeSH check words

Humans; Middle Aged