Effects of hospital-wide interventions to improve care for frail older inpatients: a systematic review

Order of authors
Franka C Bakker, MSc[1] Sarah HM Robben, MD[1] and Marcel GM OldeRikkert, MD, PhD[1]

[1] *Radboud University Nijmegen Medical Centre, Department of Geriatrics, Nijmegen, the Netherlands*

Email addresses of (co-)authors:

Franka C. Bakker, MSc:	f.bakker@ger.umcn.nl
Sarah H.M. Robben, MD:	s.robben@ger.umcn.nl
Marcel G.M. Olde Rikkert, MD, PhD:	m.olde-rikkert@ger.umcn.nl

Key words: hospitals; frail elderly; intervention; quality of care; systematic review

ABSTRACT

Background: Although it is widely recognized that frail older persons need adaptation of healthcare services, it is unclear how hospital care in general can best be tailored to their frailty.

Objective: To systematically review the evidence for hospital-wide interventions for older patients.

Methods: *Pubmed, Cochrane CENTRAL, Cinahl*, and reference lists of included articles (1980-2009) were searched. Papers describing 1) randomized controlled trials, controlled clinical trials, controlled before-after studies or interrupted time-series, 2) patients ≥65 years admitted to hospital, 3) hospital-wide organizational interventions, and 4) patient-related outcomes, quality of care, patient safety, resource use, or costs were included. Two reviewers extracted data and assessed risk of bias independently, according to *Cochrane Effective Practice and Organization of Care Review Group* guidelines.

Results: We included 20 articles out of 1175. Mean age of study populations ranged from 74.2 to 85.8 years. Interventions included multidisciplinary (consultative) teams, nursing care models, structural changes in physical environment and/or changes in site of service delivery. Small or no effects were found on patient-related outcomes such as functional performance, length of stay, discharge destination, resource use and costs compared with usual care. Methodological quality evaluation showed data incompleteness and contamination as main sources of bias.

Conclusions: No single best hospital-wide intervention could be identified using strict methodological criteria. However, several interventions had positive results, and may be used in hospital practice. Since strict methodological designs are not optimal for evaluating highly complex interventions and settings, we recommend studying hospital-wide interventions for older persons using adapted quality and research criteria.

INTRODUCTION

The quickly growing number of frail older surgical and non-surgical inpatients emphasizes the need to develop hospital-wide interventions to improve outcomes of hospital care.[1] Hospital-wide interventions are system interventions, not restricted to medical specialties or departments, that are available for all older hospitalized patients. Comprehensive geriatric assessment (CGA) has been introduced and further developed to maintain or improve functioning in frail older patients, and has been proven to be effective when implemented ward-based (as opposed to inpatient geriatric consultation service).[2-4] CGA is a multidimensional, interdisciplinary diagnostic instrument designed to determine the medical, psychosocial and functional capabilities and limitations of elderly patients in order to develop a coordinated and integrated plan for treatment and long-term follow-up.[3] However, having only one geriatric ward cannot improve care for all frail hospitalized older patients, since persons older than 65 years currently form the largest proportion of all inpatients. In addition, despite the development of CGA, there is still a high risk of poor functional outcomes and dependency during[5] or after[6] hospitalization. Delirium and falls are examples of major and often preventable adverse events[7, 8], which quickly increase with age.[9]

Thus, enforced by healthcare reforms, interest in effective and efficient care models for older patients, next to existing geriatric specialized wards, is increasing.[10] Therefore, the primary objective of this article is to systematically review the evidence for hospital-wide interventions for frail older patients.

METHODS

Data Sources

We performed a search of *Pubmed, Cochrane CENTRAL*, and *Cinahl,* from 1 January 1980 to 15 May 2009, including only articles written in English. For *Pubmed* a comprehensive search strategy was developed (Appendix A), which was adapted for the other databases (Appendices B and C). Methodological search filters for *Medline* (for *Pubmed*) and *Cinahl* were used as described by the *Cochrane Effective Practice and Organization of Care Group* (EPOC).(www.epoc.cochrane.org) The snowball method was used to manually identify relevant references from the reference lists of included articles.

Study Selection

We explicitly searched for interventions that were developed to be implementable on a hospital-wide basis and therefore available for all hospitalized older patients. We defined hospital-wide interventions as integrated practices throughout the hospital system of care delivery for older patients, which are not restricted to medical departments or –specialties (e.g. geriatric departments as the only place providing special attention to older patients and therefore available only for the, clearly visible, frailest patients). The term 'frailty' was primarily used as a term to retrieve studies of interest, but not as an in- or exclusion criterion, since there is still much debate on its definition. Studies were considered for inclusion when they: 1) included patients 65 years or older and acutely admitted to hospital, 2) described an organizational intervention designed and piloted or implemented to improve hospital-wide quality, safety or effectiveness of care for (frail) inpatients ≥65 years, 3) reported outcomes related to either quality of care, patient safety, patient-related outcomes, resource use or costs, and 4) were a randomized controlled trial (RCT), controlled clinical trial (CCT), controlled before-after study (CBA) or interrupted time-series (ITT). Studies describing 1) medical

specialty-, disease- or disability-specific interventions, 2) pre- or post-hospital interventions (e.g. improvement of transfers), 3) specialized hospitals (e.g. rehabilitation, long-term, intermediate care), or 4) single-component interventions (e.g. use of falls prevention protocol) were excluded. The first and fourth exclusion criteria were chosen as we are looking for interventions which serve, in concordance to CGA, all frail older patients with their complex and heterogeneous health problems.

Data Extraction & Quality Assessment

Two researchers (FB and SR) conducted the initial search by independently examining each title and available abstract. Retrieved full-text studies were independently reassessed (FB and SR). A third researcher (MOR) was consulted in case of disagreement. Data were collected based on the checklist of the *Cochrane EPOC Review Group*, and abstracted using a modified version of the EPOC data extraction form (Appendix D).(www.epoc.cochrane.org) Data collected included details of the intervention, patients and providers, setting, and primary outcomes. Quality assessment was included by using the most recent 2009 EPOC form, which includes nine standard criteria to assess the risk of bias: randomization, allocation concealment, baseline comparability, incomplete outcome data, blinding of participants, providers or outcome assessors, selective outcome reporting, or other risks of bias. A consensus-based risk of bias table was constructed.

Data Synthesis & Analysis

Conducting a meta-analysis was not feasible. Results of included studies were therefore analyzed by making qualitative, descriptive summaries. We show results as presented by original studies. Additionally, effect sizes (*Cohen's d*) were calculated (d of 0.20 judged as

small, 0.50 as medium, and 0.80 as large), when standard deviations and means were presented in the original article (further details: Appendix F).

RESULTS

Included Studies

The search strategy identified 1175 citations of which 11 articles could be included for analysis. The snowball method yielded an additional 9 articles. Figure 1 details the results of the steps in the search strategy. The 20 included articles represent results of 17 studies (12 RCT's and 5 CCT's).

Study Characteristics

Characteristics of included studies are shown in Table 1. More detailed information is available in Appendix Table 1. The mean age of the population varied from 74.2 to 85.8 years across studies. Whereas most studies used age to select a frail population or selected frail patients during the intervention, seven of the included studies used additional criteria to select frail inpatients.[11-18] As for the location of the intervention, one study described an intervention starting in the Emergency Department[17], whereas the other studies describe interventions initiated at general medical wards. All but two studies set up multidisciplinary teams; these two studies only made structural changes in physical environment and/or site of service delivery.[14, 17] Four studies initiated, in addition to a multidisciplinary team, an intervention including modifications of the physical environment.[14, 19-21] In seven studies the main providers of the intervention were nurses.[14, 17, 19-23] In one study the main providers of care were rehabilitation staff.[24] In the other studies (geriatric) physicians were the responsible professionals and/or main providers of the intervention. Interventions (I) were compared to controlled usual care (C) as provided throughout the hospital, prior or next to the interventions.

Risk of bias

On average, we found two main sources of potential bias (Table 2). For 14 articles, it was unclear whether or not the incomplete outcome data had been addressed adequately (i.e. it was not specified whether missing outcome measures potentially biased the results as presented in the article). Contamination was inadequately addressed or not described in 19 articles.

Effectiveness of Interventions

Primary outcomes were functional performance, length of stay, mortality, discharge destination, readmission, complications, resource use and costs (Table 1; further details: Appendix Table 2).

Functional outcomes

Fourteen studies presented results on functional patient outcomes. Of these, five studies (four Geriatric Consultation Teams (GCT)[11, 13, 15, 22], one dayroom[14]) showed significant effects for patients in the intervention group on mental health, emotional or cognitive status. Three studies (two GCT[12, 16], one *Acute Care for Elders* unit[20]) demonstrated significant improvements in physical outcomes.

Mortality

Of five studies having mortality as one of the primary outcome measures, two (GCT[12, 25]) revealed positive significant results on survival or mortality at 6 months follow-up.

Length of Stay

Of nine studies studying length of stay (LOS), one (primary nursing model of care[19]) had a significant shorter LOS in one of the two experimental sites.

Discharge Destination

Eight studies focused on discharge destination. Of these, one (primary nursing model of care[19]) showed a statistically significantly higher nursing homes admission rate and one (GCT[18]) had a significant lower number of nursing home admissions at 12 months.

Resource Use

Two studies studied in-hospital resource use, of which one (GCT[11]) showed a significant higher rate of referral to rehabilitation services. Six studies measured post-discharge resource use. Three (two GCT[18, 11], one geriatric-based ward[26]) showed a significant lower average number of nursing home days per patients at 12 months, higher mean number of referrals to community services, or a higher number of outpatients visits per patients to a physical or occupational therapist up to three months follow-up.

Readmission

One[25] of five studies (four GCT[12, 13, 25-27], one geriatric-based ward[25]) presenting data on rehospitalization showed fewer readmissions per patient, at 6 months follow-up.

Complications

A primary nursing model of care and a GCT registering hospital-acquired complications showed no statistically significant results.[19, 28]

Economic Variables

Four studies evaluated costs of the intervention.[18, 19, 22, 26] Two (primary nursing model of care[19], GCT[18]) demonstrated lower costs.

DISCUSSION

This systematic review assessing the effects of interventions to improve hospital-wide care for older inpatients showed that no single best evidence-based practice can be described, that improves quality of care, safety and effectiveness. Different forms of geriatric consultation teams were partly effective in improving patient-related outcomes and process quality measures. Additionally, nursing models of care, wards admitting all older patients and environmental adaptations were found, with heterogeneous effects in different settings. The designs are methodologically not sufficiently strict and the studies too heterogeneously described to allow summary statistics or a *Cochrane* high-quality evidence rating.

The heterogeneity in the studies can be explained in several ways. First, hospitals differ from site to site in catchment area and associated demographic and sociocultural setting, referral practice, specialization, staff, and overall quality and safety of care. Consequently, care interventions highly differ, even if they are based on a similar model of care.[19] In addition, positive effects across studies were found on different outcomes and positive outcomes only showed moderate or small effects (effect sizes ranged from .16 to .37). Ten studies introduced an intervention including GCT's principles, of which four studies demonstrated no significant effects on their primary outcomes. Three showed small effects in mental status or mood.[11, 13, 22] One of these ten showed positive effects on the *Barthel* score and survival[12], and one in survival and readmission rates.[25] Four studies which introduced an intervention with nurses as main providers, found no or small effects, which they ascribed to limited availability of resources and thus limited intensity of the intervention. Of the two ACE unit studies which intended to be implemented hospital-wide eventually, one had positive results on functional outcomes.[20] The other explains improvements in usual care as the main cause for the lack of significant results.[21] It is also possible that usual care was contaminated

by the intervention in the majority of studies, which may have influenced the ability to show positive effects.

However, although effects are small, positive results are definitely important in such a frail population. About 22 percent of persons older than 80 years who are admitted to a hospital die within one year after discharge[29], and the average time for partial or full recovery after hospitalization is 18 months[30]. Therefore, each step forward is important in effectiveness of hospital care, such as stabilization of functional performance, and is an important positive result. Studies showing no significant improvement of overall functional status, mortality or readmissions, but which do show a tendency towards less functional decline[11, 13, 15, 21, 25, 31], mortality[24], or readmission[12, 26] are therefore very valuable.

Comparison with published literature

As far as we know we are the first to review hospital-wide interventions, though there are articles describing intervention studies included here. Landefeld et al. summarized lessons to be learned from *Geriatric Evaluation and Management* (GEM) departments, ACE units, and the HELP set-up.[32] Similarly, Palmisano-Mills identified the implementation of different versions of four models of integrated care for older patients (including HELP, ACE units, NICHE, and a *Model of Transitional Care*) in 24 hospitals in Connecticut. She found that few hospitals have implemented the original models, but that the majority successfully implemented key components of the care models as well as their own innovative protocols.[33] However, the success of these implementation projects was never substantiated in an RCT.

This review only included RCT's and CCT's, which has led to exclusion of studies with lower methodological quality. However, as Table 2 shows, none of the included studies still is without serious risk of bias, only one study showing protection against contamination. This evokes the question whether these studies are methodologically flawed, but could have

been performed better, or whether systematic review techniques applying strict methodological *Cochrane* criteria are less appropriate in selecting these complex evaluations of service delivery and organization of care.[34] As such, Harari and colleagues evaluated a hospital-wide intervention in which an *Older Persons' Assessment and Liaison* (OPAL) team improved processes of care. Although the study design did not meet our inclusion criteria, results of this study are promising in terms of effectiveness and efficiency.[35] The same conclusion may be drawn for the *Older Adult Services Inpatient Strategies* (OASIS) program, which aims for improvement of care for older patients throughout the hospital.[36]

Additionally, we only found one study on the hospital-wide *Hospital Elder Life Program* (HELP), which could be included in our review.[23] The others were excluded due to the study design or e.g. a focus on delirium in a specific patient group. Not including such studies based on design criteria is debatable, as such studies seem to support the evidence-based practice of implementation of HELP and subsequently prevent cognitive and functional decline.[37, 38](http://elderlife.med.yale.edu) This also applies for the *Nurses Improving Care for Health System Elders* (NICHE) program, which has evolved into a national USA/Canadian geriatric nursing program.(http://hartfordign.org) Our Cochrane review criteria yielded only two studies implementing a program based on NICHE.[39, 39, 40] A third intervention of which we could only include two articles is the *Acute Care for Elders Unit* (ACE)[20, 21], which is mentioned as the state-of-the-art care model to improve hospital-wide care for older adults. Also other studies support the evidence that development of ACE units can improve health and functioning of older persons, without increasing health care costs.[41, 42]

Limitations

It should be noted that our snowball method has favored older studies. However, recently a non RCT study of a proactive geriatrics consultation model was published[43], indicating that

hospitals are still using similar models of care to improve care for frail older patients. The same accounts for the ACE unit, which was developed in the early 1990s, where efforts are still made to get (adapted versions of) this model of care disseminated throughout hospitals.[44]

Future directions

The key message for hospital practice is that one should investigate what works best in a specific hospital, preferably by piloting an intervention that uses effective and innovative intervention components, and incorporates the barriers and facilitators of implementation as well (Appendix Table 3). This stepwise procedure is proposed by the *Medical Research Council's* framework for complex interventions.[45] Dynamic and complex healthcare organizations, such as modern hospitals, require innovative interventions as well as innovative research designs that are flexible enough to allow changes to be made during the intervention (e.g. time series analyses, before-after studies).[46] For innovative hospital reform interventions, this can be realized by transition management, which adapt interventions with regard to the facilitators and barriers met during the implementation process. For evaluation, apart from more flexible options than RCTs, we suggest to use quality indicators (QI's) to monitor effects on the major health problems that are targeted. For example, the *Assessing Care of Vulnerable Elders (ACOVE)* indicators are objective and comprehensive measures, which are a useful starting point for developing site-specific QI's.[47, 48] In addition, to be able to compare outcomes in older patients within and between studies, methods for incorporating key descriptors like cognitive and physical functioning to adjust for different case-mixes should be introduced into routine clinical practice.[49] Another innovative and promising evaluation of health care reform by complex interventions is to follow the framework that has recently been proposed by Porter et al.[50] This framework defines *value measures* as outcomes in evaluating healthcare practices. Porter provides a framework through which this value (or:

performance) of an intervention can be identified, using multilevel patient-oriented outcomes related to their full costs. For both scientific and societal evaluation, it would be an important step forward to be able to continuously monitor the value of an intervention for a specific inpatient group like frail older patients.

Conclusion

The current aging of the population and developments in hospital care explicitly call for comprehensive interventions aimed to improve care for all frail older patients throughout the hospital. While implementing evidence-based practices is stimulated, only a few hospital-wide intervention RCT studies could be identified. It is urgently needed to study alternative approaches and to set adjusted scientific standards to gain firm evidence-based improvements in hospital-wide care for frail older patients.

ACKNOWLEDGEMENTS

We thank Maurits van Tulder, PhD, and Marieke Perry, MD, for their support and comments on the review.

Contributors: All authors contributed to the study design, selection of articles, data extraction, analysis and interpretation, and writing of the manuscript.

Competing interests: none declared

Funding: The work was made possible by grant 60-6190-098-272 and grant 60-61900-98-129 of the National Programme for Elderly Care, coordinated and sponsored by ZonMw, The Netherlands, organization for health research and development. The funding source did not participate in the literature search, data analysis, or interpretation of results.

Table 1. Characteristics and results on primary outcomes in the 20 studies included

STUDY	DESIGN	PATIENTS	INTERVENTION	CONTROL	PRIMARY OUTCOMES*	RESULTS †
Campion[27], 1983 *general teaching hospital, USA*	CCT, pilot study *Median follow-up 10.5 months*	All patients ≥75 years admitted to teaching medical wards *I/C‡: 46/86*	GCT§ *(a/b/c/d/e/f/g/h/i)* provided CGA, consultation and in-patient follow-up to all admitted patients, with the attending physician being responsible for implementation of written or verbally communicated recommendations.	Two similar wards, GCT not available	Rehospitalization LOS Discharge destination Resource use in-hospital	u u u u
Collard[19], 1985 *2 community hospitals, USA*	RCT *Follow-up 6 months*	All medical/surgical patients ≥65 years *I/C: 218/477*	10 bed Geriatric Special Care Unit in an existing space adopting a primary nursing model of care available for all randomly admitted patients.	Task-oriented model of care *(c/k)*	Complications LOS Discharge destination Use of restraints Costs	ns/NS ns/+ ns/+ ns/ns ns/+
Becker[28]‖, 1987 *VA Medical Center, USA*	RCT *No follow-up*	All patients ≥75 years admitted to medical, psychiatric and surgical wards *I/C: 92/89*	GCT *(a/b/c/l)* placed specific prioritized list of recommendations in charts, discussed it directly with ward staff, and provided in-hospital follow-up for all admitted patients.	GCT placed only problem list in charts	Hospital-acquired complications	NS
Saltz[51]‖, 1988	*Follow-up 6 months*	*“*	“		Discharge destination	NS
McVey[31]‖, 1989	*No follow-up*	*I/C: 88/90*	“		Functional outcomes	NS

Table 1. Characteristics and results on primary outcomes in the 20 studies included

STUDY	DESIGN	PATIENTS	INTERVENTION	CONTROL	PRIMARY OUTCOMES*	RESULTS †
Gayton[24], 1987 *teaching hospital, Canada*	CCT *Follow-up 6 months*	All patients ≥70 years directly admitted to (4) general medical wards from ED *I/C: 222/182*	GCT *(a/b/c/d/e)* provided consultation, suggestions and in-hospital follow-up to randomly assigned patients after informal contacts with ward staff and weekly ward rounds.	Usual care	Functional outcomes LOS Discharge destination Resource use post-discharge	u u u u
Hogan[11], 1987 *general hospital, Canada*	RCT *Follow-up 12 months*	All patients ≥75 years with one of specified geriatric syndromes, admitted to the Department of Medicine on an emergency basis *I/C: 57/56*	GCT *(a/b/d)* provided consultation, recommendations to attending staff and in-hospital follow-up for all eligible patients.	Usual care	Functional outcomes ▪ change mental score *(scale not specified)* ▪ change Barthel Index score LOS Discharge destination Resource use in-hospital ▪ c & f & h ▪ d ▪ e Resource use post-discharge Prescribed oral medications ▪ number decrease	 + ns ns ns ns + + + +

Table 1. Characteristics and results on primary outcomes in the 20 studies included

STUDY	DESIGN	PATIENTS	INTERVENTION	CONTROL	PRIMARY OUTCOMES*	RESULTS †
Fretwell[22], 1990 *general hospital, USA*	RCT *Follow-up 6 months*	All patients ≥75 years *I/C: 221/215*	18 bed Senior Care Unit where a GCT *(a/b/c/d/h/m)* provided assessment, recommendations in chart, in-hospital and post-discharge follow-up to all randomized patients, with a focus on functional assessment by nurses within routine admission evaluations, and the attending physician being the main responsible.	Usual care at traditional medical and surgical wards *(consult geriatrician possible)*	Functional outcomes ▪ functional; ADL ▪ mental; MMSE ▪ emotional; SDS LOS Costs	 ns ns + ns ns
Hogan[12], 1990 *general hospital, Canada*	CCT *Follow-up 12 months*	All patients ≥75 years admitted to the Department of Medicine on an emergency basis, with Geriatric Status categories 3, 4, 5 *I/C: 66/66*	GCT *(a/b/c/d/e/ h/n)* provided assessment, in-hospital follow-up and post-hospital follow-up for all patients through initial contact by physician-to-physician consultation, involvement of other members as required.	Usual care *(geriatric services available in hospital)*	Functional outcomes ▪ 3 months ▪ 6 months ▪ 12 months Discharge destination Mortality ▪ in-hospital ▪ 6 months ▪ 12 months Rehospitalization	 ns ns + ns ns + ns ns
Inouye[23], 1993 *teaching hospital, USA*	CCT *No follow-up*	All patients ≥70 years admitted to one of 5 general medical units *I/C: (42+43)/131*	Introducing the Yale Geriatric Care Program, a nursing-centered model of care at 2 acute medical units (1 nurse-only, 1 geriatrician-nurse), where a care team *(a/b)* screened all patients for frailty, provided in-hospital follow-up for all frail patients, and educated all nurses.	Usual care, 3 medical units	Functional outcomes	ns

Table 1. Characteristics and results on primary outcomes in the 20 studies included

STUDY	DESIGN	PATIENTS	INTERVENTION	CONTROL	PRIMARY OUTCOMES*	RESULTS †
Thomas[25], 1993 *community hospital, USA*	RCT *Follow-up 6 months*	All patients ≥70 years *I/C: 62/58*	GCT *(b/c/d/h/j/m/o)* provided assessment, recommendations in charts with copies to attending physician's office, and in-hospital follow-up for all inpatients.	No recommend-dations, no subsequent visits	Functional outcomes Rehospitalization Mortality ▪ 6 months ▪ 12 months LOS Discharge destination Resource use post-discharge ▪ community services ▪ outpatient visits	NS + + NS NS u NS NS
Winograd[13], 1993 *VA Medical Center, tertiary care teaching hospital, USA*	RCT *Follow-up 12 months*	All male patients ≥65 years admitted to acute medical and surgical wards, and functionally impaired with one of proxy criteria for frailty *I/C: 99/98*	GCT *(a/b/c/l/p)* provided assessment and in-hospital follow-up for all inpatients screened as frail, placed recommendations in charts, discussed them with the primary care team, and provided in-service education when needed.	Usual care, not evaluated by GCT	Functional outcomes ▪ IADL ▪ MMSE ▪ PSMS Mortality LOS Discharge destination Resource use post-discharge	 NS + NS NS NS NS NS

Table 1. Characteristics and results on primary outcomes in the 20 studies included

STUDY	DESIGN	PATIENTS	INTERVENTION	CONTROL	PRIMARY OUTCOMES*	RESULTS †
Clark[14], 1995 *teaching hospital, USA*	CCT *No follow-up*	All patients ≥65 years, at risk of falls, mental status changes or associated diagnoses *I/C: 40/40*	Dayroom (hospital room with special features and activities) on a medical nursing unit, staffed by existing nurses, available for 4 selected patients at a time.	Usual care in hospital rooms	Functional outcomes ▪ ADL ▪ SPMSQ score LOS Resource use in-hospital	 u - u +
Landefeld[20], 1995 *teaching hospital, USA*	RCT *Follow-up 3 months*	All patients ≥70 years acutely admitted for general medical care *I/C: 327/324*	14 bed Acute Care for Elders unit, consisting of a specially designed environment, patient-centered care, discharge planning, and medical review, with the primary nurse being the key provider in providing care for all inpatients.	Usual care in another general medical ward	Functional outcomes	+
Reuben[15], 1995 *HMO: 4 medical centers, USA*	Multi-site RCT *Follow-up 12 months*	All patients ≥65 years with ≥1 of 13 screening criteria *I/C: 1337/1016*	GCT *(a/b/c)* provided written recommendations to attending physician and primary care physician (with the geriatrician being able to order small therapies directly), in-hospital follow-up, and post-discharge follow-up to all eligible patients.	Usual care	Functional outcomes ▪ ADL ▪ Social activities ▪ Mental health o 3 months o 12 months ▪ Health perceptions o 3 months o 12 months Mortality	 ns ns + ns ns + ns

Table 1. Characteristics and results on primary outcomes in the 20 studies included

STUDY	DESIGN	PATIENTS	INTERVENTION	CONTROL	PRIMARY OUTCOMES*	RESULTS †
Asplund[26], 2000 *university hospital, Sweden*	RCT *Follow-up 3 months*	All patients ≥70 years admitted acutely from ED to general medical wards *I/C: 190/223*	11 bed geriatrics-based ward, comprised of a care team *(a/d/e/h/p)* who provide assessment, early rehabilitation, and intense discharge planning for all unselected randomized patients, and an internist having main responsibility during the acute phase.	Usual care on 2 existing general medical wards, each 30 beds *(c)*	Functional outcomes Rehospitalization Costs Resource use post-discharge ▪ Physician ▪ Nurse ▪ Physio-/occupational	u ns ns ns ns +
Counsell[21], 2000 *community teaching hospital, USA*	RCT *Follow-up 12 months*	All patients ≥70 years admitted acutely to medicine or family practice *I/C: 767/764*	34 beds Acute Care for Elders unit, consisting of a specially designed environment, patient-centered care, early discharge planning and medical review, with nurses having a key role in providing care for all inpatients.	Usual care *(GCT already available in hospital)*	Functional outcomes	NS
Cohen[16¶], 2002 *VA: 11 medical centers, USA*	Multi-site RCT *Follow-up 12 months*	All frail patients ≥65 years admitted to medical or surgical wards *I/C: 348/348*	Geriatric Evaluation and Management including a team *(a/b/c)* who provided assessment, a care plan, and coordinated preventive and management services for all eligible patients.	Usual care	Mortality Health-related QoL ▪ physical functioning ▪ physical limitations ▪ emotional limitations ▪ bodily pain ▪ energy ▪ mental health ▪ social activity ▪ general health	ns NS NS NS + NS NS NS NS

Table 1. Characteristics and results on primary outcomes in the 20 studies included

STUDY	DESIGN	PATIENTS	INTERVENTION	CONTROL	PRIMARY OUTCOMES*	RESULTS †
Phibbs[18¶], 2006					Resource use post-discharge Costs ▪ index hospitalization ▪ after discharge	+ + -
Basic[17], 2005 *tertiary referral hospital, Australia*	RCT *No follow-up*	All older patients (78.7 ± 6.4 years) presenting to the ED with ≥1 screening criteria *I/C: 114/110*	Aged Care Nurse in the Emergency Department assisted in care of eligible patients by early assessment, referral of patients and placing recommendations in the medical file.	Usual process *(geriatric specialty present in hospital)*	Functional outcomes Hospital admission LOS	ns ns ns

Abbreviations: VA = Veteran Affairs; HMO = Health Maintenance Organization; LOS = length of stay; ADL = Activities of Daily Living; MMSE = Mini-Mental State Examination; SDS=Self Rating Depression Scale; IADL= Instrumental Activities of Daily Living; PSMS = Physical Self-Maintenance Scale; SPMSQ = Short Portable Mental Status Questionnaire Score; (HR)QoL= (Health-Related) Quality of Life; CGA = Comprehensive Geriatric Assessment

*Outcomes are the primary outcomes as described in the article.

†Results: + = statistically significant in favor of the experimental group with p<.05; - = statistically significant in favor of the control group with p<.05; NS = not significant; ns = described as not significant, but no p-value given; u = unknown/no statistical analyses performed. More detailed information is presented in Appendix table 2.

‡I/C = Intervention Group/Control Group

§GCT = Geriatric Consultation Team; the disciplines composing the GCT are noted as: a = geriatrician, b = (geriatric) nurse (consultant/specialist/coordinator/practitioner/discharge planning), c = social worker, d = physical therapist, e = occupational therapist, f = speech therapist, g = recreational therapist, h = dietitian, i = geropsychiatrist, j = physician, k = medical director, l = fellow in geriatrics, m = (clinical) pharmacist, n = pastoral carer, o = home health nurse, p = internist/internal medicine house officer

‖same study

¶same study

Table 2. Summary assessment of potential sources of bias

	Adequate sequence generation	Allocation concealment	Similar baseline outcome measures	Similar baseline characteristics	Incomplete outcome data addressed	Prevention knowledge allocated interventions	Adequate protection against contamination	Free of selective reporting	Free of other bias
Campion, 1983, CCT	-	-	-	+	?	?	-	?	-
Collard, 1985, RCT	?	?	+	-	-	?	-	-	-
Becker[*], 1987, RCT	+	+	+	+	?	+	-	+	-
Saltz[*], 1988, RCT	+	+	?	?	?	+	-	+	-
McVey[*], 1989, RCT	+	+	+	+	+	+	-	+	-
Gayton, 1987, CCT	-	-	+	+	?	+	-	-	+
Hogan, 1987, RCT	+	?	+	+	?	+	-	-	+
Fretwell, 1990, RCT	?	?	+	+	?	?	+	?	+
Hogan, 1990, CCT	-	?	?	?	?	-	-	-	+
Inouye, 1993, CCT	-	+	+	-	+	+	?	+	+
Thomas, 1993, RCT	+	+	+	+	?	?	-	?	+
Winograd, 1993, RCT	+	+	+	+	+	+	-	-	+
Clark, 1995, CCT	-	-	-	-	?	-	?	-	-
Landefeld, 1995, RCT	+	+	-	+	?	-	-	?	+
Reuben, 1995, RCT	+	?	+	+	?	?	-	+	+
Asplund, 2000, RCT	+	+	+	+	?	-	-	?	-
Counsell, 2000, RCT	+	+	+	-	+	-	-	+	+
Cohen[†], 2002, RCT	+	+	+	+	?	+	-	+	+
Phibbs[†], 2006, RCT	+	+	+	+	?	+	-	+	+
Basic, 2005, RCT	+	+	+	-	+	+	?	+	+

Note: + = yes; - = no; ? = unclear/not reported

[*]same study; [†]same study

Reference List

(1) Podrazik PM, Whelan CT. Acute Hospital Care for the Elderly Patient: Its Impact on Clinical and Hospital Systems of Care. *Med Clin North Am* 2008 March;92(2):387-406.

(2) Van Craen K, Braes T, Wellens N et al. The effectiveness of inpatient geriatric evaluation and management units: a systematic review and meta-analysis. *J Am Geriatr Soc* 2010 January;58(1):83-92.

(3) Ellis G, Langhorne P. Comprehensive geriatric assessment for older hospital patients. *Br Med Bull* 2005;71(1):45-59.

(4) Baztan JJ, Suarez-Garcia FM, Lopez-Arrieta J, Rodriguez-Manas L, Rodriguez-Artalejo F. Effectiveness of acute geriatric units on functional decline, living at home, and case fatality among older patients admitted to hospital for acute medical disorders: meta-analysis. *BMJ* 2009 January 22;338:b50.

(5) Covinsky KE, Palmer RM, Fortinsky RH et al. Loss of Independence in Activities of Daily Living in Older Adults Hospitalized with Medical Illnesses: Increased Vulnerability with Age. *J Am Geriatr Soc* 2003 March 26;51(4):451-8.

(6) Boyd CM, Landefeld CS, Counsell SR et al. Revovery of Activities of Daily Living in Older Adults After Hospitalization for Acute Medical Illness. *J Am Geriatr Soc* 2008 November 20;56(12):2171-9.

(7) Inouye SK, Schlesinger MJ, Lydon TJ. Delirium: a symptom of how hospital care is failing older persons and a window to improve quality of hospital care. *Am J Med* 1999 May;106(5):565-73.

(8) Healey F, Scobie S, Oliver D, Pryce A, Thomson R, Glampson B. Falls in English and Welsh hospitals: a national observational study based on retrospective analysis of 12 months of patient safety incident reports. *Qual Saf Health Care* 2008 December;17(6):424-30.

(9) Zeegers M, De Bruijne MC, Wagner C et al. Adverse events and potentially preventable deaths in Dutch hospitals: results of a retrospective patient record review study. *Qual Saf Health Care* 2009 June 14;18:297-302.

(10) Hofmarcher MM, Oxley H, Rusticelli E. Improving Health System Performance Through Better Care Coordination. OECD; 2007 Dec 12. Report No.: 30.

(11) Hogan DB, Fox RA, Badley BW, Mann OE. Effect of a geriatric consultation service on management of patients in an acute care hospital. *CMAJ* 1987 April 1;136(7):713-7.

(12) Hogan DB, Fox RA. A Prospective Controlled Trial of a Geriatric Consultation Team in an Acute-care Hospital. *Age Ageing* 1990 March;19(2):107-13.

(13) Winograd CH, Gerety MB, Lai NA. A Negative Trial of Inpatient Geriatric Consultation: Lessons Learned and Recommendations for Future Research. *Arch Intern Med* 1993 September 13;153(17):2017-23.

(14) Clark LR, Fraaza V, Schroeder S, Maddens ME. Alternative Nursing Environments: Do They Affect Hospital Outcomes? *J Gerontol Nurs* 1995 November;21(11):32-8.

(15) Reuben DB, Borok GM, Wolde-Tsadik G et al. A Randomized Trial of Comprehensive Geriatric Assessment in the Care of Hospitalized Patients. *N Engl J Med* 1995 May 18;332(20):1345-50.

(16) Cohen HJ, Feussner JR, Weinberger M et al. A Controlled Trial of Inpatient and Outpatient Geriatric Evaluation and Management. *N Engl J Med* 2002 March 21;346(12):905-12.

(17) Basic D, Conforti DA. A prospective, randomised controlled trial of an aged care nurse intervention within the Emergency Department. *Aust Health Rev* 2005 February;29(1):51-9.

(18) Phibbs CS, Holty JE, Goldstein MKM et al. The Effect of Geriatrics Evaluation and Management on Nursing Home Use and Health Care Costs: Results From a Randomized Trial. *Med Care* 2006 January;44(1):91-5.

(19) Collard AF, Bachman SS, Beatrice DF. Acute Care Delivery for the Geriatric Patient: An Innovative Approach. *QRB Qual Rev Bull* 1985 June;11(6):180-5.

(20) Landefeld CS, Palmer RM, Kresevic DM, Fortinsky RH, Kowal J. A Randomized Trial of Care in a Hospital Medical Unit Especially Designed to Improve the Functional Outcomes of Acutely Ill Older Patients. *N Engl J Med* 1995 May 18;332(20):1338-44.

(21) Counsell SR, Holder CM, Liebenauer LL et al. Effects of a Multicomponent Intervention on Functional Outcomes and Process of Care in Hospitalized Older Patients: A Randomized Controlled Trial of Acute Care for Elders (ACE) in a Community Hospital. *J Am Geriatr Soc* 2000 December;48(12):1572-81.

(22) Fretwell MD, Raymond PM, McGarvey ST et al. The Senior Care Study. A Controlled Trial of a Consultative/Unit-Based Geriatric Assessment Program in Acute Care. *J Am Geriatr Soc* 1990 October;38(10):1073-81.

(23) Inouye SK, Wagner R, Acampora D, Horwitz RI, Cooney LM, Tinetii ME. A Controlled Trial of a Nursing-Centered Intervention in Hospitalized Elderly Medical Patients: The Yale Geriatric Care Program. *J Am Geriatr Soc* 1993 December;41(12):1353-60.

(24) Gayton D, Wood-Dauphinee S, de Lorimer M, Tousignant P, Hanley J. Trial of a Geriatric Consultation Team in an Acute Care Hospital. *J Am Geriatr Soc* 1987 August;35(8):726-36.

(25) Thomas DR, Brahan R, Haywood BP. Inpatient Community-Based Geriatric Assessment Reduces Subsequent Mortality. *J Am Geriatr Soc* 1993 February;41(2):101-4.

(26) Asplund K, Gustafson Y, Jacobsson C et al. Geriatric-Based versus General Ward for Older Acute Medical Patients: a Randomized Comparison of Outcomes and Use of Resources. *J Am Geriatr Soc* 2000 November;48(11):1381-8.

(27) Campion EW, Jette A, Berkman B. An Interdisciplinary Geriatric Consultation Service: A Controlled Trial. *J Am Geriatr Soc* 1983 December;31(12):792-6.

(28) Becker PM, McVey LJ, Saltz CC, Feussner JR, Cohen HJ. Hospital-Acquired Complications in a Randomized Controlled Clinical Trial of a Geriatric Consultation Team. *JAMA* 1987 May 1;257(17):2313-7.

(29) Centraal Bureau voor de Statistiek. Sterfte na 1e ziekenhuisopname, naar geslacht, leeftijd en Beldo-diagnose. 26-2-2008. Den Haag/Heerlen, CBS.

(30) Boyd CM, Ricks M, Fried LP et al. Functional Decline and Recovery of Activities of Daily Living in Hospitalized, Disabled Older Women: The Women's Health and Aging Study I. *J Am Geriatr Soc* 2009 October;57(10):1757-66.

(31) McVey LJ, Becker PM, Saltz CC, Feussner JR, Cohen HJ. Effect of a Geriatric Consultation Team on Functional Status of Elderly Hospitalized Patients. A Randomized, Controlled Clinical Trial. *Ann Intern Med* 1989 January 1;110(1):79-84.

(32) Landefeld CS. Improving health care for older persons. *Ann Intern Med* 2003 September 2;139:421-4.

(33) Palmisano-Mills C. Common Problems in Hospitalized Older Adults. *J Gerontol Nurs* 2007 January;33(1):48-54.

(34) Parker G, Bhakta P, Katbamna S et al. Best place of care for older people after acute and during subacute illness: a systematic review. *J Health Serv Res Policy* 2000 July;5(3):176-89.

(35) Harari D, Martin FC, Buttery A, O'Neill S, Hopper A. The older persons' assessment and liaison team 'OPAL': evaluation of comprehensive geriatric assessment in acute medical inpatients. *Age Ageing* 2007 July 26;36:670-5.

(36) Tucker D, Bechtel G, Quartana C et al. The OASIS Program: Redesigning Hospital Care for Older Adults. *Geriatr Nurs* 2003 March;27(2):112-7.

(37) Inouye SK, Bogardus ST Jr, Baker DI, Leo-Summers L, Cooney LM Jr. The Hospital Elder Life Program: a model of care to prevent cognitive and functional decline in older hospitalized patients. Hospital Elder Life Program. *J Am Geriatr Soc* 2000 December;48(12):1697-706.

(38) Rubin FH, Williams JT, Lescisin DA, Mook WJ, Hassan S, Inouye SK. Replicating the Hospital Elder Life Program in a Community Hospital and Demonstrating Effectiveness Using Quality Improvement Methodology. *J Am Geriatr Soc* 2006;54:969-74.

(39) Guthrie PF, Edinger G, Schumacher S. TWICE: A NICHE program at North Memorial Health Care. *Geriatr Nurs* 2002 May;23(3):133-8.

(40) Lyons DL, Blum T, Curtin PM, Rimley SM. Improving care of the older adult. *Medsurg Nurs* 2006 June;15(3):176-7-181.

(41) Jayadevappa R, Bloom BS, Raziano DB, Lavizzo-Mourey R. Dissemination and Characteristics of Acute Care for Elders (ACE) Units in the United States. *Int J Technol Assess Health Care* 2003;19(1):220-7.

(42) Covinsky KE, Palmer RM, Kresevic DM et al. Improving Functional Outcomes in Older Patients: Lessons from an Acute Care for Elders Unit. *Jt Comm J Qual Improv* 1998 February;24(2):63-76.

(43) Sennour Y, Counsell S, Jones J, Weiner M. Development and Implementation of a Proactive Geriatrics Consultation Model in Collaboration with Hospitalists. *J Am Geriatr Soc* 2009 November;57(11):2139-45.

(44) Malone M, Vollbrecht M, Stephenson J, Burke L, Pagel P, Goodwin J. Acute Care for Elders (ACE) tracker and e-Geriatrician: methods to disseminate ACE concepts to hospitals with no geriatricians on staff. *J Am Geriatr Soc* 2010 January;58(1):161-7.

(45) Craig P, Dieppe P, Macintyre S, Mitchie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ* 2008 October 25;337:979-83.

(46) McDaniel RR, Lanham HJ, Anderson RA. Implications of complex adaptive systems theory for the design of research on health care organizations. *Health Care Manage Rev* 2009;34(2):191-9.

(47) Wenger NS, Shekelle PG, ACOVE Investigators. Quality Indicators for Assessing Care of Vulnerable Elders: Assessing Care of Vulnerable Elders: ACOVE Project Overview. *Ann Intern Med* 2001 October 16;135(8):642-6.

(48) Arora VM, Johnson M, Olson J et al. Using assessing care of vulnerable elders quality indicators to measure quality of hospital care for vulnerable elders. *J Am Geriatr Soc* 2007 November;55(11):1705-11.

(49) Campbell S, Seymour D, Primrose W, ACMEPLUS Project. A systematic literature review of factors affecting outcome in older medical patients admitted to hospital. *Age Ageing* 2004 March;33(2):110-5.

(50) Porter ME. What Is Value in Health Care? *New England Journal of Medicine* 2010 December 8;363(26):2477-81.

(51) Saltz CC, McVey LJ, Becker PM, Feussner JR, Cohen HJ. Impact of a Geriatric Consultation Team on Discharge Placement and Repeat Hospitalization. *Gerontologist* 1988 June;28(3):344-50.

SUPPLEMENTARY ONLINE CONTENT

"Effects of hospital-wide interventions to improve care for frail older inpatients: a systematic review"

Appendix A *Search strategy Pubmed*

Search strategy:	created by FB
Date search:	15 May 2009
Limits:	English, Dutch
	1980-2009
Hits:	800
Initial selection:	69 by FB & SR

Search Strategy:

1. aged [mesh]
2. frail [tiab]
3. geriatric [tiab]
4. elderly [tiab]
5. elder [tiab]
6. older [tiab]
7. OR/1-7
8. hospital* [tw]
9. "health services for the aged" [tw]
10. "delivery of health care, integrated" [tw]
11. "comprehensive health care" [tw]
12. "patient-centered care" [tw]
13. "geriatric assessment" [tw]
14. "geriatric care" [tiab]
15. OR/9-14
16. "quality Assurance, health care" [tw]
17. "total quality management" [tw]
18. "outcome and process assessment (health care)" [mesh]
19. "health services research" [mesh]
20. "program development" [tw]
21. "program evaluation" [tw]
22. "organizational innovation" [tw]
23. benchmarking [tw]
24. OR/16-23
25. "randomized controlled trial" [pt]
26. random* [tw]
27. control* [tw]
28. intervention? [tw]
29. evaluat* [tw]
30. OR/25-29
31. animal/
32. human/
33. 31 NOT (31 AND 32)
34. 30 NOT 33
35. 7 AND 8 AND 15 AND 24 AND 34 *Limits: Publication Date from 1980, English, Dutch*

Appendix B *Search Strategy Cochrane Library*

Search strategy:	created by FB
Date search:	19 May 2009
Limits:	1980-2009
Hits:	193
Initial selection:	21 by FB & SR
Not in Pubmed:	4

Search Strategy:

1. MeSH descriptor Aged explode all trees
2. (frail OR geriatric OR elderly OR elder OR older): ti,ab,kw, from 1980 to 2009
3. OR/1-2
4. MeSH descriptor Hospitals explode all trees
5. hospital*: ti,ab,kw, from 1980 to 2009
6. OR/4-5
7. MeSH descriptor Health Services for the Aged explode all trees
8. MeSH descriptor Delivery of Health Care, Integrated, this term only
9. MeSH descriptor Comprehensive Health Care, this term only
10. MeSH descriptor Patient-Centered Care, this term only
11. MeSH descriptor Geriatric Assessment, this term only
12. "geriatric assessment": ti,ab,kw, from 1980 to 2009
13. "integrated care": ti,ab,kw, from 1980 to 2009
14. "integrated services": ti,ab,kw, from 1980 to 2009
15. OR/7-14
16. MeSH descriptor Quality Assurance, Health Care, this term only
17. MeSH descriptor Total Quality Management, this term only
18. MeSH descriptor Outcome and Process Assessment (Health Care) explode all trees
19. MeSH descriptor Health Services Research explode all trees
20. MeSH descriptor Program Evaluation explode all trees
21. MeSH descriptor Program Development explode all trees
22. MeSH descriptor Organizational Innovation explode all trees
23. "program development": ti,ab,kw, from 1980 to 2009
24. "program evaluation": ti,ab,kw, from 1980 to 2009
25. "program AND innovation": ti,ab,kw, from 1980 to 2009
26. "organi*ation AND innovation": ti,ab,kw, from 1980 to 2009
27. OR/16-26
28. #3 AND #6 AND #15 AND #27, from 1980 to 2009

Appendix C *Search Strategy CINAHL*

Search strategy:	created by FB
Date search:	19 May 2009
Limits:	English, Dutch 1980-2009
Hits:	182
Initial selection:	16 by FB & SR
Not in Pubmed or Cochrane:	6

Search Strategy

1. MH "Aged+"
2. TI frail OR AB frail
3. TI geriatric OR AB geriatric
4. TI elderly OR AB elderly
5. TI elder OR AB elder
6. Ti older OR AB older
7. OR/1-6
8. MH "Hospitals+"
9. TI hospital* OR AB hospital*
10. OR/8-9
11. MH "Health Services for the Aged"
12. MH "Health Care Delivery, Integrated"
13. MH "Patient Centered Care"
14. MH "Geriatric Assessment"
15. MH "Geriatrics")
16. TI "geriatric assessment" OR AB "geriatric assessment"
17. MH "Gerontologic Care"
18. OR/11-17
19. MH "Quality Improvement"
20. MH "Benchmarking"
21. MH "Outcome Assessment"
22. MH "Process Assessment (Health Care)"
23. MH "Program Development"
24. MH "Program Evaluation"
25. MH "Health Services Research+"
26. AB innovation
27. AB benchmarking
28. (AB hospital AND AB program AND AB development)
29. (AB hospital AND AB program AND AB evaluation)
30. OR/19-29
31. MH "Clinical Trials"
32. TX control*
33. TX random*
34. MH "Comparative Studies"
35. TX experiment*
36. TX (time N5 series)
37. TX impact
38. TX intervention*
39. TX evaluat*
40. TX effect?
41. MH "Pretest-Posttest Design+"
42. MH "Quasi-Experimental Studies+"
43. OR/31-42
44. JN "cochrane database of systematic reviews"
45. 43 NOT 44
46. 7 AND 10 AND 18 AND 30 AND 45: Limiters – Published Date from: 1980-01/2009-12; Language Dutch, English

Appendix D ***Data Abstraction Form***

Cochrane Effective Practice and Organisation of Care Group (EPOC)

Data Abstraction Form

This form can be used to record the results of data extraction and is intended for use in conjunction with the EPOC Data Collection Checklist. EPOC scope: The effect(s) of a behavioural/educational, financial, organisational or regulatory intervention(s) is evaluated.

Data collection

Name of reviewer:
Date:
Study reference:

Inclusion criteria specifically for this review

1) **Population** **YES/NO**
- Age 65 or older:
- Inpatient:
- ((Assessment of) frailty:...

2) **Setting** **YES/NO**
- Hospital:

3) **Intervention** **YES/NO**
- Hospital wide:
- Aim to improve either quality, efficiency or (cost-)effectiveness of care for frail inpatients aged 65 or more:
- Organisational *(structure or process)*

4) **Outcome** *(at least one of the following)* **YES/NO**
- Quality of care
- Patient safety
- Patient/proxy related outcomes
- Resource use
- Costs

1. Inclusion criteria

1.1 Study design

☐ **1.1.1 RCT designs**

☐ **1.1.2 CCT designs**

☐ **1.1.3 CBA designs**

a) Contemporaneous data collection

☐ DONE

☐ NOT CLEAR → *contact editor ……*

☐ NOT DONE

b) Appropriate choice of control site/activity

☐ DONE

☐ NOT CLEAR → *contact editor ……*

☐ NOT DONE

c) Number of sites: Studies using second site as controls

☐ DONE

☐ NOT DONE

☐ **1.1.4 ITS designs**

a) Clearly defined point in time when the intervention occurred

☐ DONE

☐ NOT CLEAR → *contact editor ……*

☐ NOT DONE

b) At least 3 data points before and 3 after the intervention

☐ DONE

☐ NOT CLEAR → *contact editor ……*

☐ NOT DONE

1.2 Methodological inclusion criteria

a) The objective measurement of performance/provider behaviour or health/patient outcomes in a clinical not test situation

☐ DONE

☐ NOT CLEAR → *contact editor ……*

☐ NOT DONE

b) Relevant and interpretable data presented or obtainable

☐ DONE

☐ NOT CLEAR → *contact editor ……*

☐ NOT DONE

N.B. A study must meet the minimum criteria for EPOC scope, design, and methodology for inclusion in EPOC reviews. If it does not, COLLECT NO FURTHER DATA.

INCLUSION ☐ consensus: YES/NO

EXCLUSION ☐ reason:

2. Interventions

2.1 Type of intervention

(state all interventions for each comparison/study group)

☐ **Provider orientated**

- ☐ Revision of professional roles
- ☐ Clinical multidisciplinary teams
- ☐ Formal integration of services
- ☐ Skill mix changes (changes in numbers, types or qualifications of staff)
- ☐ Continuity of care (arrangements for follow-up, case management)
- ☐ Satisfaction of providers with the conditions of work and the material and psychic rewards (e.g. interventions to 'boost morale')
- ☐ Communication and case discussion between health professionals
- ☐ Other ……

☐ **Structural**

- ☐ Changes to the setting/site of service delivery
- ☐ Changes in physical structure, facilities and equipment
- ☐ Changes in medical records system
- ☐ Changes in scope and nature of benefits and services
- ☐ Presence and organisation of quality monitoring mechanisms
- ☐ Ownership, accreditation, and affiliation status of hospitals
- ☐ Staff organisation
- ☐ Other ……

Group 1:

Group 2:

Group 3:

Group 4:

2.2 Control(s)

☐ no intervention control group
☐ standard practice control group (if different to (a) above)
☐ untargeted activity
☐ other (e.g. another intervention);

.....

3. Type of Targeted Behaviour

(state more than one where appropriate)

☐ clinical prevention services
☐ test ordering
☐ procedures
☐ general management of a problem
☐ professional-patient communication
☐ financial (resource use)
☐ patient outcome
☐ other (e.g. another intervention);

.....

☐ diagnosis
☐ referrals
☐ prescribing
☐ patient education/advice
☐ record keeping
☐ discharge planning
☐ NOT CLEAR

4. Participants

4.1 Characteristics of Participating Providers

4.1.1 Profession(s)

☐	physicians	☐	nurses
☐	pharmacists	☐	dentists
☐	psychologists	☐	NOT CLEAR
☐	mixed;	☐	other provider;
	.....		.....

4.1.3 Clinical specialty

☐ .....
☐ Emergency Department
☐ NOT APPLICABLE
☐ NOT CLEAR

4.2 Characteristics of Participating Patients

4.2.1 Clinical problem *(State the area(s) that the intervention targets)*

☐ ……
☐ NOT CLEAR

4.2.2 Other patient characteristics

a) **Age** *(mean & range)*

☐ Intervention group: ……

☐ Comparison group: ……

☐ NOT CLEAR

b) **Gender** *(distribution)*

☐ Intervention group: ……

☐ Comparison group: ……

☐ NOT CLEAR

***c*)** **Admission**

☐ Emergency Department
☐ Acute but no representation in ED
☐ Planned
☐ NOT CLEAR

***d*)** **Other** *(specify: e.g. frailty, multimorbidity, first hospital admission)*

☐ ……

4.2.3 Number of patients included in the study

a) **Episodes of care**

☐ ……
☐ NOT CLEAR

b) **Patients** *(intervention & control)*

☐ Intervention group: ……

☐ Comparison group: ……

☐ NOT CLEAR

c) **Hospitals**

☐ ……
☐ NOT CLEAR

5. Setting

5.1 Reimbursement system

☐ fee for service
☐ prospective payment
☐ mixed
☐ NOT CLEAR
☐ global budget
☐ capitation
☐ other:
……

5.2 Location of Care

☐ Inpatient only
☐ Mixed (in- & outpatient care)

5.3 Academic status

☐ University based/Teaching hospital
☐ Non-teaching hospital
☐ NOT CLEAR

5.4 Country

☐ ……
☐ NOT CLEAR

5.5 Proportion of eligible providers (or allocation units)

☐ ……
☐ NOT CLEAR

6. Methods

6.1 Unit of allocation *(i.e. who or what was allocated to study groups)*

☐ ……
☐ NOT CLEAR

6.2 Unit of analysis *(i.e. results analysed as events per practice)*

☐ ……
☐ NOT CLEAR

6.3 Power calculation *(reporting power, clinical significance, statistical significance and N)*

☐ DONE

☐ NOT CLEAR

☐ NOT DONE

6.4 Quality criteria → = risk of bias DRAFT 2009

6.4.1 Risk of bias for studies with a separate control group

(RCTs, CCTs, CBAs)

a) **Was the allocation sequence adequately generated?**
☐ YES

☐ NO

☐ UNCLEAR

b) Was the allocation adequately concealed?
☐ YES

☐ NO

☐ UNCLEAR

c) Were baseline outcome measures similar?*
☐ YES

☐ NO

☐ UNCLEAR

d) Were baseline characteristics similar?
☐ DONE

☐ NOT CLEAR

☐ NOT DONE

e) Were incomplete outcome data adequately addressed?*
☐ YES

☐ NO

☐ UNCLEAR

f) Was knowledge of the allocated interventions adequately prevented during the study?*
☐ YES

☐ NO

☐ UNCLEAR

g) Was the study adequately protected against contamination?
☐ YES

☐ NO

☐ UNCLEAR

h) Was the study free from selective outcome reporting?
☐ YES

☐ NO

☐ UNCLEAR

i) Was the study free from other risks of bias?
☐ YES

☐ NO

6.4.2 Risk of bias for interrupted time series studies

a) Was the intervention independent of other changes?

☐ YES

☐ NO

b) Was the shape of the intervention effect pre-specified?

☐ YES

☐ NO

c) Was the intervention unlikely to affect data collection?

☐ YES

☐ NO

d) Was knowledge of the allocated interventions adequately prevented during the study?***

☐ YES

☐ NO

☐ UNCLEAR

e) Were incomplete outcome data adequately addressed?***

☐ YES

☐ NO

☐ UNCLEAR

f) Was the study free from selective outcome reporting?

☐ YES

☐ NO

☐ UNCLEAR

g) Was the study free from other risks of bias?

☐ YES

☐ NO

6.4.4 Consumer involvement

☐ DONE

☐ NOT CLEAR

☐ NOT DONE

7. Prospective identification by investigators of barriers to change

(Identification of specific barriers to change in the target population, which were addressed by the intervention, e.g. information management, clinical uncertainty, sense of competence, patient expectations, standards of practice, financial disincentives, administrative constraints, etc.)

☐ DONE: ……

☐ NOT DONE

☐ NOT CLEAR

8. Intervention

8.1 Characteristics of the intervention

a) Evidence base of recommendation

☐ DONE

☐ NOT CLEAR

☐ NOT DONE

b) Purpose of recommendations

☐ Appropriate management

☐ Cost containment

☐ Other .....

☐ NOT CLEAR

8.4 Source

☐ ……

☐ NOT CLEAR

8.5 Intervention based upon implementation of clinical practice guidelines *(i.e. based upon clear recommendations for practice)*

☐ DONE

☐ NOT CLEAR

☐ NOT DONE

8.7 Recipient

☐ Individual

☐ Group

☐ NOT CLEAR

8.8 Deliverer *(e.g. pharmacist, local expert, research worker, management representative, computer)*

☐ ……

☐ NOT CLEAR

8.9 Timing

a) Proximity to clinical decision-making

☐ ……

☐ NOT CLEAR

b) Frequency/number of intervention events

☐ ……

☐ NOT CLEAR

c) Duration of intervention

☐ ……

☐ NOT CLEAR

d) **Start intervention** *(e.g. Emergency Department, within 24 hours, etc.)*

☐ ……

☐ NOT CLEAR

e) **Time interval intervention** *(from … to …))*

☐ ……

☐ NOT CLEAR

8.11 Source of funding

☐ ……
☐ NOT CLEAR

8.12 Ethical approval

☐ DONE
☐ NOT CLEAR

9. Outcomes

9.1 Description of the main outcome measure(s).

a) Health professional outcomes/process measures

☐ ……
☐ NOT CLEAR

b) Patient outcomes

☐ ……
☐ NOT CLEAR

c) Economic variables

- Costs of the intervention

☐ DONE: ……

☐ NOT DONE

- Changes in direct health care costs as a result of the intervention

☐ DONE: ……

☐ NOT DONE

- Changes in non-health care costs as a result of the intervention

☐ DONE: ……

☐ NOT DONE

- Costs associated with the intervention are linked with provider or patient outcomes in an economic evaluation

☐ DONE: ……

☐ NOT CLEAR

☐ NOT DONE

9.2 Length of time during which outcomes were measured after initiation of the intervention.

☐ ……
☐ NOT CLEAR

9.3 Length of post- intervention follow-up period.

☐ DONE: ……

☐ NOT CLEAR

☐ NOT DONE

9.4 Identify a possible ceiling effect:

a) Identified by investigator

☐ Yes
☐ No
☐ NOT CLEAR

b) Identified by reviewer

☐ Yes
☐ No
☐ NOT CLEAR

10. Results

State the results as they will be entered in the review, and describe how these were calculated.

Check the data collection checklist for RCTs, CCTs, CBAs & ITSs items to be considered.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

11. Additional

Key conclusions of the study authors: .....

.....

Points of discussion by study author: .....

.....

Points of discussion by review author: .....

.....

References to other relevant studies: .....

.....

Correspondence required: .....

Citation and contact details: .....

.....

.....

In case of exclusion, note reason: .....

APPENDIX E *Results Effectiveness of Interventions*

Effectiveness of Interventions

Primary outcomes were functional performance, length of stay, mortality, discharge destination, readmission, complications, resource use and costs (further details: Appendix Table 2).

Functional outcomes

Fourteen studies presented results on functional patient outcomes. Of these, five studies showed significant effects for patients in the intervention group in mental health, emotional or cognitive status. A geriatric consultation team (GCT) for all patients ≥75 years hospital-wide resulted in a larger improvement in mental health status (scale 0-10, measure not further specified) at discharge (I vs C: 1.5 vs 0.8, p≤.01, d=.25).[1] A GCT throughout the hospital including only frail males ≥65 years resulted in a higher *Mini-Mental State Examination* (MMSE) score at one year follow-up (I vs C: 24.3 vs 21.4, p=.02, d=.35).[2] A GCT in a *Health Maintenance Organization* (HMO) including frail patients ≥65 years resulted in a higher mental health index score at 3 months follow-up (I vs C: 71.6 (95%CI 70.3-72.9) vs 69.5 (95%CI 68.0-71.0), p=.04; scale details: Appendix Table 2), and a higher score on a current health perceptions scale at 12 months follow-up (I vs C: 50.1 (95%CI 48.1-52.1) vs 46.3 (95%CI 44.0-48.6), p=.01).[3, 4] A GCT attached to a hospital ward for all patients ≥75 years resulted in a higher change in emotional status from baseline to six weeks following discharge for the intervention group (Self Rating Depression Scale, p=.045).[4] A dayroom for patients ≥65 years and at risk of falls and mental status changes resulted in a higher mean mental status score (more mentally impaired) at discharge (I vs C: Short Portable Mental Status Questionnaire score 5.65 vs 3.42, p<.05).[5]

Three studies demonstrated significant improvements in physical outcomes. An *Acute Care for Elders* (ACE) unit meant for all older patients resulted in greater improvements in ability to perform *Activities of Daily Living* (ADL) from admission to discharge (*Katz index* scale I vs C: p=.009).[6] A hospital-wide GCT for frail patients ≥75 years showed greater improvement in physical functioning at 12 months follow-up (I vs C: increased *Barthel index* 75% vs 44%, p<.01).[7] A GCT throughout the hospital for frail (male) patients ≥65 years showed a higher mean (positive) change in score in bodily pain at 12 months follow-up (I vs C: 24.0 vs 20.0, on the *Medical Outcomes Study 36-Item Short-Form General Health Survey* (SF-36); p=.01).[8]

Mortality

Five studies had mortality as one of the primary outcome measures, of which one study introducing a GCT for frail patients ≥75 years throughout the hospital revealed positive results on survival at 6 months follow-up ($p<.02$)[7], and one study introducing a hospital-wide GCT for patients ≥70 years showed a lower mortality rate at 6 months follow-up (I vs C: 6% vs 21%, $p=.01$)[9].

Length of Stay

Of nine studies studying length of stay (LOS), one study which adopted a primary nursing model of care in a ward for all randomized patients ≥65 years had a shorter LOS in one of the two experimental sites (I vs C: 8.7 days vs 10.8 days, $p\leq.01$).[10]

Discharge Destination

Eight studies focused on discharge destination. Of these, one which adopted a primary nursing model of care in a ward for all patients ≥65 years showed a statistically significantly higher nursing homes admission rate for one of the two experimental sites (I vs C: 19% vs 17%, $p\leq.05$).[10] The other study introducing a GCT throughout the hospital for frail (male) patients ≥65 years had a lower number of nursing home admissions at 12 months (I vs C: 127 vs 177, $p=.001$, OR=.65).[11]

Resource Use

Two studies studied in-hospital resource use, of which one introducing a GCT for all patients ≥75 years throughout the hospital showed a higher rate of referral to rehabilitation services such as physical therapy and occupational therapy (I vs C: 44% vs 21%, $p<.025$; 18% vs 0%, $p<.005$, respectively).[1]

Six studies measured post-discharge resource use. A GCT throughout the hospital for frail (male) patients ≥65 years showed a lower average number of nursing home days per patient at 12 months (I vs C: 21.2 vs 28.4, $p=.003$, $d=-.16$).[11] A GCT for all patients ≥75 years hospital-wide showed a higher mean number of referrals to community services (I vs C: 1.3 vs 0.9, $p<.005$. $d=.098$).[1] One study including a geriatric-based ward for patients ≥70 years resulted in a higher number of outpatient visits per patient to a physical or occupational therapist up to three months follow-up (I vs C: 0.9 vs 0.2, $p=.02$).[12]

Readmission

Four studies, including three GCT interventions and one geriatric-based ward, presenting outcomes on rehospitalization showed no significant differences.[2, 7, 12, 13] One study including a GCT throughout the hospital for all patients ≥70 years showed fewer readmissions per patient at 6 months follow-up (I vs C: 0.3 vs 0.6, p=.02, d=.37).[9]

Complications

A primary nursing model of care and a GCT registering hospital-acquired complications showed no statistically significant results.[10, 14]

Economic Variables

Four studies evaluated costs of the intervention.[4, 10-12] Of these, one study which adopted a primary nursing model of care in a ward for all patients ≥65 years demonstrated lower costs per day admitted at one experimental site (I vs C: $364.76 vs $399.53, p≤.5) and lower total hospital costs at the other experimental site (I vs C: $3591.42 vs $4155.54, p≤.05).[10] Another study introducing a GCT throughout the hospital for frail (male) patients ≥65 years showed higher total costs of the index hospitalization (I vs C: $13449 vs $10758, p=.0001), lower costs after the initial hospital discharge (I vs C: $22816 vs $26533, p=.03) and lower nursing home costs at 12 months follow-up (I vs C: $5853 vs $7828, p=.002).[11]

Appendix F

Table 1. Characteristics of interventions of included studies

Study	Intervention type	Type targeted behavior	Characteristics providers	Characteristics patients; clinical problem	Excluded patients	Notes & secondary outcomes*
Campion	Provider orientated; clinical multidisciplinary team	Providing more effective medical care/improving quality of medical care, teaching of geriatrics/increase awareness of special needs of elderly patients	All GCT members had a major professional interest and special training in the care of the elderly Main providers: geriatrician and geropsychiatrist	Consultation for all patients in one ward	Patients previously cared for by a private physician and those admitted to the neurologic intensive care unit	Study describes structure and function of GCT
Collard	Provider orientated; clinical multidisciplinary teams & revision of professional roles. Structural; modified and remodeled communal dining area	High-quality cost-effective care for elderly population	Staff selected from existing staff and trained to participate in the project. Main provider: (primary) nurse	Emphasizing maximum patient independence; maintain or enhance health status of elderly patients in Geriatric Special Care Unit	LOS < 48h Transferred from other wards than IC	Study describes the program and its implementation

Table 1. Characteristics of interventions of included studies (cont.)						
Study	**Intervention type**	**Type targeted behavior**	**Characteristics providers**	**Characteristics patients; clinical problem**	**Excluded patients**	**Notes & secondary outcomes[a]**
Becker	Provider orientated; clinical multidisciplinary team	Reduce occurrence of hospital-acquired complications	Specialized in geriatrics or special interest in geriatrics	All patients in one of three wards (medical, surgical, psychiatric)	Admitted to IC, LOS < 48h; previously care from geriatric service	-
Saltz	"	Optimize patient's ability to return home and reduce likelihood of rehospitalization or placement in an institutional setting, by (in-hospital) follow-up, arranging ancillary LTC-services intense discharge planning.	"	"	"	-
McVey	"	Improving functional performance and preventing functional decline, by interdisciplinary treatment and rehabilitation.	"	"	"	-
Gayton	Provider orientated; clinical multidisciplinary team	Skilled, comprehensive & coordinated assessment, treatment, rehabilitation and discharge planning; provide information and support for the families; family involvement in care process.	Geriatrics, rehabilitation, roles of specialist and nurses purely consultative. Main providers, most hours with patients: rehabilitation staff	All patients in two of four wards (but not everyone assessed?)	Transfers from other floors Elective admissions Accepted for social reasons	- Care process: u

Table 1. Characteristics of interventions of included studies (cont.)

Study	Intervention type	Type targeted behavior	Characteristics providers	Characteristics patients; clinical problem	Excluded patients	Notes & secondary outcomes[a]
Hogan (1987)	Provider orientated; clinical multidisciplinary team	Emphasis on the management of functional problems and discharge planning.	Geriatrician main provider	Patients ≥75 ***and*** confusional state, impaired mobility, falls, urinary in-continence, polypharmacy, living in nursing home, ***or*** admission <3 months	IC, acute cerebrovascular accident	- Resource use in-hospital: + - referrals to community services: +
McVey	Provider orientated; clinical multidisciplinary team	Improving functional performance and preventing functional decline, by interdisciplinary treatment and rehabilitation.	Specialized in geriatrics or special interest in geriatrics	All patients in one of three wards (medical, surgical, psychiatric)	Admitted to IC Previously received care from the geriatric service LOS < 48h	-
Fretwell	Provider orientated; clinical multidisciplinary team. Continuity of care: post-discharge follow-up Integration of a psycho-social and functional orientation to care within traditional model of patient management.	Preventing the decline or improve the older patient 's physical, mental, and emotional functions, by assessment initiated early in patient's stay, utilizing existing personnel, and integration into routine practice of hospital staff.	Physician specializing in geriatrics, who did not treat patients directly. Other team members were directly involved in the patient's care. Main provider: primary nurse. Main responsible: attending physician.	All patients admitted to medical or surgical wards	On protocol treatment Require coronary or intensive care at admission	- Mortality: ns - Discharge destination: u

Table 1. Characteristics of interventions of included studies (cont.)						
Study	**Intervention type**	**Type targeted behavior**	**Characteristics providers**	**Characteristics patients; clinical problem**	**Excluded patients**	**Notes & secondary outcomes[a]**
Hogan (1990)	Provider orientated; clinical multidisciplinary team Continuity of care: post-discharge follow-up	Emphasis was on addressing functional problems and providing post-discharge follow-up.	Only person hired for the intervention was the nurse coordinator. Main provider: geriatrician. Main responsible: attending service.	All patients ≥75 ***and*** classified into one of seven (3, 4 or 5) categories based on a questionnaire developed specifically for the study termed the Geriatric Status Scale	Admitted to IC Stroke consultation team	GCT was a component of a comprehensive geriatric service including a day hospital, inpatient unit, outpatient clinics and home-visiting. - in-hospital resource use: ns - LOS: ns
Inouye	Provider orientated: clinical multidisciplinary teams, skill mix changes. Integrate geriatric nursing expertise as part of standard nursing care.	Prevention functional decline in elderly hospitalized patients	Primary nurses (trained geriatric resource nurses), masters prepared gerontological nurse specials, geriatricians. Key intervention figures: nurses	All patients admitted to one of the wards, identified as frail	Unable to participate in interviews Discharged <24 h	I: renal & pulmonary C: cardiology, oncology, infectious diseases - stratified & matched analyses: + - resource use in-hospital: +
Thomas	Provider orientated: clinical multidisciplinary teams	Patient outcome	GCT	All patients ≥70 as target of frailty	Admitted to IC Terminally ill Renal hemodialysis >50 miles from hospital	-
Winograd	Provider orientated: clinical multidisciplinary teams	Health outcomes	GCT	All functionally impaired patients ≥65 with confusion, ADL dependence, polypharmacy, disabling chronic illness(es), ***or*** a stressed caregiving system	ADL independent Permanent nursing home Terminal illness with life expectancy <6 months	-

Table 1. Characteristics of interventions of included studies (cont.)						
Study	**Intervention type**	**Type targeted behavior**	**Characteristics providers**	**Characteristics patients; clinical problem**	**Excluded patients**	**Notes & secondary outcomes[a]**
Clark	Structural: changes to the setting/site of service delivery, changes in physical structure, facilities and equipment	Prevention or maintenance of functional decline, prevention of complications, facilitate orientation in an unfamiliar environment	Nurses providing care in a dayroom for a certain amount of time each day.	Patients ≥65 years, confused but able to respond to verbal direction, able to participate in activities to maintain or improve self-care skills, or at risk of falls, therefore needing a sitter/ restraints for safety	Patients with disruptive behavior, uncontrollable, infectious disease, draining wounds, anticipated discharge <48h	-
Landefeld	Provider orientated: clinical multidisciplinary teams, skill mix changes (1 fte per year extra), patient-centered care Structural: changes in physical structure, facilities and equipment	Improve overall patient outcomes, emphasizing independence	Primary nurse responsible for assessing patient's specific needs daily & implementing protocols for the prevention of disability and for rehabilitation. Intervention and usual-care units had the same hospital-supported staff-to-patient ratios and hospital-wide support services.	All patients ≥70 years admitted to a general medical ward	Patients admitted to a specialty unit, e.g. IC, cardiology-telemetry, oncology	- Discharge destination: + - Overall health status: + - LOS: NS - Mean hospital charges: NS - ADL at 3 months: NS
Reuben	Provider orientated: clinical multidisciplinary teams	Health status and survival of hospitalized elderly patients	GCT (geriatrician, social worker, nurse practitioner)	All patients ≥65 y with: stroke, immobility, ADL impairment, malnutrition, incontinence, confusion/dementia, prolonged bed rest, falls <3 months, depression, social/family problems, readmission <3 m, new fracture, ***or*** age >80 y	Admitted to hospice or for terminal care Not members of HMO's health plan Admitted from a nursing home Did not speak English	Many of the recommendations were to be implemented after discharge.

Table 1. Characteristics of interventions of included studies (cont.)

Study	Intervention type	Type targeted behavior	Characteristics providers	Characteristics patients; clinical problem	Excluded patients	Notes & secondary outcomes[a]
Asplund	Provider orientated: clinical multidisciplinary teams	Patient outcome	Staff recruited from geriatric, medical and surgical departments. Consultants from both geriatric and medical departments had joint responsibility for medical care on the ward, with the internist having main responsibility for acute diagnosis and treatment.	All patients ≥70 years admitted acutely	Requirement of treatment in specialized units (e.g. IC, coronary care, acute stroke unit, renal unit)	Ward organized solely for the purpose of this study. - Discharge destination: ns - LOS: +
Counsell	Provider orientated: clinical multidisciplinary teams, patient-centered care Structural: changes in physical structure, facilities and equipment	Maintain or achieve independence	GCT, with nurse having key role in providing care.	All patients ≥70 years admitted acutely	Transferred from a nursing facility or another hospital Requiring specialty unit admission (e.g. IC, coronary care, telemetry, oncology) Elective admissions LOS <2 days	- discharge des: NS - mortality: NS - LOS: NS - costs: NS - readmission: NS - resource use: NS - process variables: nursing care plans, discharge planning, social work, physical therapy, physical restraint, high risk medication: +; urinary catheter, bed rest: NS - satisfaction patients and providers: +

Table 1. Characteristics of interventions of included studies (cont.)						
Study	**Intervention type**	**Type targeted behavior**	**Characteristics providers**	**Characteristics patients; clinical problem**	**Excluded patients**	**Notes & secondary outcomes[a]**
Cohen	Provider orientated: clinical multidisciplinary teams	-	Geriatrics	All patients ≥65 years, hospitalized on a medical or surgical ward, expected length of at least two days, and a frail condition (inability ADL, stroke <3 months, prolonged bed rest, incontinence), stable condition	Admitted from nursing home; already receiving care at an outpatient GEM clinic; severe disabling disease or terminal condition or severe dementia; not speaking English; lacked access to a telephone	Study assessed effects of inpatients & outpatient clinics for GEM. - Functional status: NS at 12 months - Resource use: NS - Costs: - - LOS: -
Phibbs	"	-	"	"	"	Study assessed effects of inpatients & outpatient clinics for GEM. Secondary analyses
Basic	Structural: changes tot the site of service delivery; starting in the Emergency Department	Reduce functional decline during hospitalization	Nurse in the Emergency Department	All older patients with: functional impairment, psychosocial disability, social disability, active muli-system disease, **or** discharge from the hospital <14 days	Medically unstable Living in a nursing home Unable to speak English	-

[*] Outcomes are the primary outcomes as described in the article. Results: + = statistically significant in favor of the experimental group with p<.05; - = statistically significant in favor of the control group with p>.05; NS = not significant; ns = described as not significant, but no p-value given; u = unknown/no statistical analyses performed

Appendix G

Table 2. Detailed results of included studies

STUDY	PATIENT OUTCOMES & PROCESS MEASURES				ECONOMIC VARIABLES			
	Outcomes*	interventions	controls	p-value†	outcomes	interventions	controls	p-value
Campion	readmission (%)	43	36/42	u	-			
	LOS (days)	11.2	9.0/11.0	u				
	discharged to (%):							
	- home	41	69/80	u				
	- rehabilitation hospital	26	11/7.5	u				
	- nursing home	20	11/7.5	u				
	- died	13	9/5	u				
	use in-hospital PT (number (nr))	25	9/2	u				
	use in-hospital OT (nr)	13	9/1	u				
	use in-hospital ST (nr)	5	2/2	u				
Collard‡	complications, absence (%)	68/82	64/82	ns / p ≤ .10	charges per day	$364.76/ $445.37	$399.53/ $414.28	p ≤ .05 / ns
	LOS (days)	11.8/8.7	12.4/10.8	ns / p ≤ .01				
	admission nursing home (%)	24/19	12/17	ns / p ≤ .05	total charges	$4015.17/ $3591.42	$4545.13/ $4155.54	ns / p ≤ .05
	restraints:							
	- physical (mean nr)	0.84/1.04	0.92/1.78	ns / p ≤ .10				
	- chemical (mean nr)	0.37/0.36	0.49/0.95	ns / ns				

Table 2. Detailed results of included studies (cont.)

STUDY	PATIENT OUTCOMES & PROCESS MEASURES				ECONOMIC VARIABLES			
	outcomes*	interventions	controls	p-value†	outcomes	interventions	controls	p-value
Becker[§]	complications (%)	33.7	31.5	p ≥ 0.10	-			
Saltz[§]	discharged to (%):			p > .05	-			
	- home	65	69					
	- nursing home	20	20					
	- other hospital	7	2					
	- deceased	8	9					
	at 6 months (%):			p > .05				
	- home	66	66					
	- nursing home	14	8					
	- deceased	20	26					
McVey[§]	Katz score at discharge (%):				-			
	- improved	34	26					
	- no change	38	39					
	- declined	28	36					
	- difference between groups			p = .24				

Table 2. Detailed results of included studies (cont.)								
STUDY	**PATIENT OUTCOMES & PROCESS MEASURES**				**ECONOMIC VARIABLES**			
	outcomes*	**interventions**	**controls**	**p-value†**	**outcomes**	**interventions**	**controls**	**p-value**
Gayton	Barthel index (score 0-100, 6 m)	83.1 *±26.0*	81.7 *±28.5*	u	-			
	PSPMSQ (6 m)	2.9 *±3.2*	2.3 *±2.9*	u				
	LOS (days)	20.6 *±23.4*	20.6 *±25.3*	u				
	discharged to (%):							
	- community	64.9	58.8	u				
	- convalescence	8.6	6.6	u				
	- long-term care	9.5	12	u				
	- died	14.9	19.1	u				
	resource use post-discharge	u	u	u				
Hogan (1987)	Barthel index score (change)	27.5 *±23.3*	19.8 *±19.4*	ns	-			
	mental status score‖ (change)	1.5 *±1.4*	0.8 *±2.1*	p ≤ .01				
	LOS (days)	15.8 *±12.7*	14.2 *±13.3*	ns				
	discharged nursing home (%)	3	10	ns				
	referred in-hospital SW (%)	53	43	ns				
	referred in-hospital PT (%)	44	21	p < .025				
	referred in-hospital OT (%)	18	0	p < .005				
	referred in-hospital ST (%)	0	2	ns				
	referred in-hospital DT (%)	32	21	ns				
	referrals community services	1.3 *±0.6*	0.9 *±0.6*	p < .005				
	prescribed oral medications:							
	- change number	0.04 *±0.27*	0.62 *±1.9*	ns				
	- percentage decrease	47	24	p < .05				

Table 2. Detailed results of included studies (cont.)								
STUDY	**PATIENT OUTCOMES & PROCESS MEASURES**				**ECONOMIC VARIABLES**			
	outcomes*	**interventions**	**controls**	**p-value†**	**outcomes**	**interventions**	**controls**	**p-value**
Fretwell	MMSE baseline – 6 w (%):			ns	Mean hospital charges exceeding DRG reimbursement	$3148 ±*$7210*	$4163 ±*$18406*	ns
	- improved	18.0	15.2					
	- maintained	70.7	70.9					
	- declined	11.4	13.9					
	SDS baseline – 6 w (%):			p = .045				
	- improved	30.8	21.7					
	- maintained	49.8	68.7					
	- declined	19.4	9.5					
	ADL baseline – 6 m (%):			ns				
	- improved	31.8	33.6					
	- maintained	53.0	57.3					
	- declined	15.1	9.1					
	LOS (days)	11.6 ±*12.2*	12.8 ±*15.8*	ns				
Hogan (1990)	Barthel index (%):				-			
	- increase at 3 months	69	52	ns				
	- increase at 6 months	77	69	ns				
	- increase at 12 months	75	44	p < .01				
	discharged nursing home (%)	u	u	ns				
	hospital mortality (nr)	10	10	u				
	survival at 6 months (%)	u	u	p < .02				
	survival at 12 months (%)	75	64	ns				
	readmission (%):							
	- 3 months	18	26	ns				
	- 12 months	41	57	ns				

Table 2. Detailed results of included studies (cont.)								
STUDY	**PATIENT OUTCOMES & PROCESS MEASURES**				**ECONOMIC VARIABLES**			
	outcomes*	**interventions**	**controls**	**p-value†**	**outcomes**	**interventions**	**controls**	**p-value**
Inouye	overall functional decline between baseline and discharge (%)	*42 (95% CI, 27-57) /* 29 *(95% CI, 15-42)*	34 *(95% CI, 25-42)*	u	-			
Thomas	Katz score (change %): - same - worse - better mortality at 6 months (%) mortality at 12 month (%) readmissions (pp, 6m) LOS (days) discharge destination referrals community services post-discharge outpatient physician office visits (nr per patient)	 61 17 22 6 10 0.3 9 u 0.6 3.5	 70 23 7 21 20 0.6 10.1 u 0.4 4.6	p = .17 p = .01 p = .08 p = .02 p = .20 ns p = .10 p = .09	-			
Winograd	IADL score at 12 m¶ MMSE score at 12 m¶ PSMS score at 12 m¶ morale at 12 m¶ survival at 12 m (%) readmissions (nr at 12m) LOS (days) discharged to (%): - community - sheltered living - nursing home - in-hospital mortality hospital days (nr at 12 m) nursing home days (nr 12 m) level of care at discharge level of care at 12 m	4.6 *±2.8* 24.3 *±7.1* 3.6 *±2.0* 14.1 *±2.8* 59 1.0 *±1.3* 24.8 *±22.0* 60 9 16 14 15 *±27* 35.9 *±74.5* 1.1 *±0.4* 1.4 *±0.8*	5.2 *±3.1* 21.4 *±9.2* 4.0 *±2.1* 14.2 *±2.7* 64 1.2 *±1.7* 26.7 *±33.0* 66 10 18 6 20 *±39* 25.8 *±63.1* 1.1 *±0.3* 1.4 *±0.7*	p = .69 p = .02 p = .91 p = .23 p = .43 p = .46 p = .91 p = .34 p = .44 p = .33 p = .34 p = .35	-			

Table 2. Detailed results of included studies (cont.)								
STUDY	**PATIENT OUTCOMES & PROCESS MEASURES**				**ECONOMIC VARIABLES**			
	outcomes*	**interventions**	**controls**	**p-value†**	**outcomes**	**interventions**	**controls**	**p-value**
Clark	ADL index score** (mean) ADL index score (% improve) SPMSQ score** (mean) LOS (days) Patient teaching documentation entries (nr)	5.7 48 5.65 9.8 2.5	5.2 40 3.42 11.3 1.4	u u p < .05 u p = .0122	-			
Landefeld	change ability to perform ADL (nr from admission to discharge, %): - much worse - worse - unchanged - better - much better	 9 7 50 13 21	 8 13 54 11 13	 p = .009	-			

Table 2. Detailed results of included studies (cont.)								
STUDY	**PATIENT OUTCOMES & PROCESS MEASURES**				**ECONOMIC VARIABLES**			
	outcomes*	**interventions**	**controls**	**p-value†**	**outcomes**	**interventions**	**controls**	**p-value**
Reuben	basic ADL:††				-			
	- 3 months	80.5 *(95% CI, 78.9-82.0)*	80.2 *(95% CI, 78.4-82.0)*	ns				
	- 12 months	83.4 *(95% CI, 81.9-85.0)*	83.7 *(95% CI, 81.9-85.4)*	ns				
	intermediate ADL:							
	- 3 months	50.7 *(95% CI, 48.5 to 53.0)*	50.2 *(95% CI, 47.6-52.8)*	ns				
	- 12 months	57.1 *(95% CI, 54.7-59.5)*	55.6 *(95% CI, 52.9-58.3)*	ns				
	social activities:							
	- 3 months	63.6 *(95% CI, 61.1-66.1)*	63.0 *(95%, CI, 60.2-65.8)*	ns				
	- 12 months	70.0 *(95% CI, 67.4-72.6)*	67.3 *(95% CI, 64.4-70.3)*	ns				
	mental health indexscore:							
	- 3 months	71.6 *(95% CI, 70.3-72.9)*	69.5 *(95% CI, 68.0-71.0)*	p = .04				
	- 12 months	72.3 *(95% CI, 70.9-73.7)*	70.6 *(95% CI, 69.0-72.3)*	ns				
	current health perception:							
	- 3 months	47.0 *(95% CI, 45.2-48.8)*	45.1 *(95% CI, 43.1-47.2)*	ns				
	- 12 months	50.1 *(95% CI, 48.1-52.1)*	46.3 *(95% CI, 44.0-48.6)*	p = .01				
	survival at 12 months (%)	74.0 *(95% CI, 72.0-76.0)*	75.0 *(95% CI, 72.0-77.0)*	ns				

Table 2. Detailed results of included studies (cont.)

STUDY	PATIENT OUTCOMES & PROCESS MEASURES				ECONOMIC VARIABLES			
	outcomes*	interventions	controls	p-value†	outcomes	interventions	controls	p-value
Asplund	poor global outcome (3 m, %)	37	34	ns *RR 1.06 (95% CI, 0.84-1.34)*	total costs (3 m, SEK)	3600 *(95% CI, 1200-15200)*	3600 *(95% CI, 1200-14600)*	ns
	readmissions (3 m, %)	34	28	ns *RR 1.14 (95% CI, 0.92-1.43)*				
	outpatient medical care (3m, nr visits):							
	- physician	2.1 *(95% CI, 1.8-2.4)*	2.0 *(95% CI, 1.7-2.2)*	ns				
	- nurse	2.6 *(95% CI, 1.9-3.6)*	3.4 *(95% CI, 1.8-5.0*	ns				
	- PT/OT	0.9 *(95% CI, 0.3-1.5)*	0.2 *(95% CI, 0.1-0.3)*	p = .02				
Counsell	change in number of independent ADL two weeks before admission to discharge (%):			p = .33	-			
	- improved	9	10					
	- maintained	61	56					
	- declined	30	34					

Table 2. Detailed results of included studies (cont.)

STUDY	PATIENT OUTCOMES & PROCESS MEASURES				ECONOMIC VARIABLES			
	outcomes*	**interventions**	**controls**	**p-value†**	**outcomes**	**interventions**	**controls**	**p-value**
Cohen‡‡	HRQoL at 12 months:§§				-			
	- physical functioning	6.7	4.5	p = .30				
	- physical limitations	34.0	29.8	p =. 13				
	- emotional limitations	22.0	20.3	p = .58				
	- bodily pain	24.9	20.0	p = .01				
	- energy	4.5	1.8	p = .12				
	- mental health	4.5	2.5	p = .24				
	- social activity	18.3	16.4	p = .48				
	- general health	-5.5	-7.1	p = .32				
	mortality at 12 months (%)	21	21	ns *(OR 0.95, 95% CI 0.6-1.31)*				
Phibbs‡‡	admission nursing home (nr)	127	177	p = .001	nursing home cost	$5853 *(±$665)*	$7828 *(±$741)*	p = .002
	nursing home days (nr)	21.2 *±2.4*	28.4 *±2.7*	p = .003				
					total costs:			
					- index hospital	$13449 *(±$621)*	$10758 *(±$592)*	p = .0001
					- after discharge	$22816 *(±$1080)*	$26533 *(±$1201)*	p = .03
Basic	functional decline during hospitalization			OR 1.26 *(95% CI, 0.48- 3.30)*	-			
	admission to the hospital			OR 0.65 *(95% CI, 0.25-1.70)*				
	LOS			HR 1.06 *(95% CI, 0.74-1.52)*				

Abbreviations: LOS = length of stay; PT = physical-/physiotherapy; OT = occupational therapy; ST = speech therapy; SW = social work/social services; DT = dietitian; (P)SPMSQ = (Pheiffer) Short Portable Mental Status Questionnaire; HRQoL = health related quality of life; ADL = activities of daily living; SDS = Self-Rating Depression Scale; MMSE = Mini-Mental State Examination; SEK = Swedish Krones

** Outcomes measured at discharged, unless stated otherwise (e.g. 6 m = 6 months)*

† ns = described as not significant, but no p-value given; u = unknown/no statistical analyses performed

‡ preliminary results after 5 months

[§] *same study*
[‖] *Mental status score was measured by mental status questionnaire, but was no further specified in article.*
[¶] *IADL: possible scores 0 through 8; lower score, better function.*
MMSE: possible scores 0 through 30; higher score, better function.
Philidelphia Geriatric Center Morale Scale was used to measure morale, possible scores 0 through 18; lower score, better function.
PSMS: possible scores 0 through 18; lower score, better function.
[**] *The index of Activities of Daily Living was used to assess functional status, which resulted in an overall grade. According to de Index, performance was summarized as scores 1(independent) through 7 (dependent).*
SPSMSQ: score >3 = some impairment, score >8 = severely impaired.
[††] *The questionnaire on functional and health status consisted of three scales from the Functional Status Questionnaire concerning basic ADL, intermediate ADL and social activities; the mental health index and current-health-perceptions scale from the Medical Outcomes Study; and items from the Katz index of ADL, modified. All scores were standardized in a rang of 0 to 100, with 100 indicating best function.*
[‡‡] *same study (secondary analyses Phibbs)*
[§§] *HRQoL was assessed on the basis of the Medical Outcomes Study 36-Item Short-Form General Health Survey (SF-36), scale 0 through 100*

Appendix H.

Table 3. Discussion points of included studies*

STUDY	INTERVENTION	DISCUSSION: CONCLUSION	DISCUSSION: IMPLEMENTATION +	DISCUSSION: IMPLEMENTATION -
Campion	GCT	Failed to have impact	Enthusiastic support from nursing, social service and rehabilitation personnel: GCT improved morale, developed teamwork, gave valuable help in defining treatment goals for their most difficult patients. House staff and attending physicians also quite supportive.	Conflict when GCT intervention was perceived as interference in direct medical management, including defining major but sub acute needs. Conflict also arose when the GCT interventions were interpreted as serving to lengthen hospital stays.
Collard	10 bed Geriatric Special Care Unit (GSCU) adopting a primary nursing model of care	Process of care can be implemented at a community hospital. High-quality hospital care can be delivered to the elderly for less money. Differences between the two GSCUs can be explained by differences in patient populations, possible differences in practice patterns of physicians on the two medical staffs, and earlier direct involvement of Symmes Hospital staff in the project.	It is worth noting that the program has been received enthusiastically by patients, families, physicians, nurses, and other staff. Nurses adapted well to their new role, and physicians noted that GSCU nurses under the primary nursing model improved their grasp of patient issues and added substantially to the patient care team.	Problems: 1) availability of limited resources for conflicting institutional priorities (transfers of 'best' staff weakened intervention, no full-time secretarial staff); 2) imposition of a major change in familiar processes; 3) involvement of multiple levels of decision making. Nurses found it difficult to adapt to the primary nursing model, which required them to become active coordinators of an interdisciplinary team.

Table 3. Discussion points of included studies[a] (cont.)				
STUDY	**INTERVENTION**	**DISCUSSION: CONCLUSION**	**DISCUSSION: IMPLEMENTATION +**	**DISCUSSION: IMPLEMENTATION -**
Becker	GCT	GCT not able to reduce frequency of hospital-acquired complications in an unselected population of hospitalized elderly patients.	Compliance 72% (intervention) vs 27% (control)	Possibility that, despite rate of compliance (72%) with recommend-dations, GCT did not enough control over patient care and environment to reduce complications.
Saltz	"	Benefit was not demonstrated with regard to discharge location, either at initial discharge or subsequently upon 6-months follow-up, or rates of hospitalization. This occurred despite excellent compliance with recommendations of the team.	"	Limited options for enhancing discharge to home.
McVey	"	Effect of a GCT on functional status during hospitalization not statistically significant. A consistent trend of less decline in the ability to perform each ADL from admission to discharge was noted. More (not statistical significant) improvement in those activities predicted to be regained first in the course of functional recovery (eating and continence).	-	Possible that the general level of care in facility is of such high quality that the potential for improvement was less than might have initially predicted. Lack of direct clinical control over patient care. The fact that attention was paid to the problem, did not assure the depth or quality of service delivery as desired by the team.
Gayton	GCT	No statistically significant evidence found to demonstrate that patients receiving consultative team input achieved beneficial results, although a definite trend toward better survival was noted. Addition of GCT to medical wards of an acute hospital failed to demonstrate a significant impact on patient outcomes for the elderly population.	Hospital has highly developed and excellent rehabilitation services.	Hospital has highly developed and excellent rehabilitation services.

Table 3. Discussion points of included studies[a] (cont.)

STUDY	INTERVENTION	DISCUSSION: CONCLUSION	DISCUSSION: IMPLEMENTATION +	DISCUSSION: IMPLEMENTATION -
Hogan (1987)	GCT	Appear to show benefit to health of the intervention group and increased use of health care resources. Indication that functional disability is common in elderly patients admitted to hospital, geriatric consultation service can have beneficial effect on their management.	Situation lent itself to such a study. The consultation service was the first formal geriatric program within the institution. Study the effect of an isolated program in new territory. Goodwill of attending staff was abundant.	-
Fretwell	Senior Care Unit, 18 beds, geriatric assessment team (GAT)	Findings confirm that a GCT can be instituted within a nursing unit of a community hospital without increasing LOS or hospital charges. Found no significant differences in discharge destination, or functional and mental status. Only sign. effect was higher rate of improvement in mood of patients who were depressed at admission.	Using existing hospital personnel.	Possible failure of the attending physician to implement the recommendations of the GCT. Contamination. Inclusion of individuals who might not have been able to respond to the interventions. Insufficient intervention. Insensitivity of outcome measures. Lack of control over post-hospital care.
Hogan (1990)	GCT	No statistically significant differences at time of discharge. Follow-up showed beneficial effects extending up to a year. GCT patients showed improved survival, improved functional capabilities and a trend towards decreased reliance on hospital and nursing homes. GCT programs are effective.	Consideration that the main beneficial effects arise from the follow-up care provided to patients, in an area where the GCTs' familiarity with local community resources and how to mobilize them would lead to specific benefits for patients.	Not all recommendations of the GCT were acted upon.

Table 3. Discussion points of included studies[a] (cont.)				
STUDY	**INTERVENTION**	**DISCUSSION: CONCLUSION**	**DISCUSSION: IMPLEMENTATION +**	**DISCUSSION: IMPLEMENTATION -**
Inouye	Yale Geriatric Care Program, nursing-centered model of care	Found no effectiveness in overall analyses in preventing functional decline. The Yale Geriatric Care program is a new model of care that can effectively decrease functional decline in high-risk elderly hospitalized medical patients. The intervention appears to be feasible to implement and would serve elderly patients through-out the hospital setting.	Geriatric Resource Nurses were regular staff nurses who underwent special training in geriatric nursing. Intervention staff were readily available and costs of the intervention were minimized.	Lack of bed availability on the medical service, leading to intense pressure on admissions, made it impossible to randomize patients to intervention and usual care units.
Thomas	GCT	Conclude that short-term mortality can be reduced in a community inpatient acute hospital setting by a GCT. Important differences in mortality remain after 1 year of follow-up. Trends towards improved functional status and fewer hospital readmissions favor the intervention group.	Team had recently been introduced. Recommendations from the GCT were rarely ignored. The community setting may have allowed for greater impact on attending physicians. Hospital resources to implement recommendations readily available. Inpatient GCT's enjoy wide distribution throughout the hospital with potential to interact with all specialties, team work is fostered.	-
Winograd	GCT	Found that the GCT did not have an effect on improving discharge disposition, functional status, level of care in the year of follow-up, utilization of hospitals, nursing homes, or other healthcare services. The single positive outcome was an improvement in mental status. Conclude that the trial was negative. In conclusion, cannot say whether GCT is effective or ineffective.	Trial was performed shortly after the service was created.	Direct patient care was provided only when regular ward staff were unable to provide services because of inadequate staffing, primarily social services. Compliance was poorest for recommendations that required staff time, effort, or understanding of geriatric syndromes. Available resources were often unpredictable. Services ordered were often not provided. Rehabilitations services were often delayed for 5-7 days.

Table 3. Discussion points of included studies[a] (cont.)				
STUDY	**INTERVENTION**	**DISCUSSION: CONCLUSION**	**DISCUSSION: IMPLEMENTATION +**	**DISCUSSION: IMPLEMENTATION -**
Clark	Dayroom, nurses	Results of the study indicate that patients who are 85+ years, admitted with mental status change, syncope not specifically cardiac, a fall history or with sepsis or infection, could benefit from care provided in an environment designed to meet their specific needs. Decreased restraint & sitter use, LOS and adverse events in a group who were more impaired at baseline.	No increase in staffing for the program. In-service training and geriatric rounds were provided for unit nurses by the geriatrician for 6 months prior to implementing the dayroom program. Patient outcomes and LOS improved with only limited environmental and staffing changes.	Dayroom could only accommodate 4 patients.
Landefeld	Acute Care for Elders (ACE) unit	This RCT provides evidence that specific changes in the provision of acute hospital care can improve the ability of a heterogeneous group of older patients hospitalized with acute illnesses to perform ADL at the time of discharge, and can reduce the frequency of discharge to institutions for long-term care.	This intervention program may complement disease-specific or treatment-specific efforts to improve patients' outcomes.	-
Reuben	GCT	Overall, found no substantial differences between the groups in functional status at 3 and 12 months or in 1-year survival. On the basis of these findings, reluctant to recommend widespread adoption of the inpatient consultation approach to CGA.	The HMO plan used already provides for coordinated care; physicians are made aware of geriatric care practices in continuing-education programs.	The use of home health care services, rehabilitation units in hospitals and rehabilitation services in nursing homes has increased dramatically over the past decade, therefore, the control patients may have already been receiving a high standard of care. Many of these services duplicate elements of treatment recommended in CGA.

Table 3. Discussion points of included studies[a] (cont.)				
STUDY	**INTERVENTION**	**DISCUSSION: CONCLUSION**	**DISCUSSION: IMPLEMENTATION +**	**DISCUSSION: IMPLEMENTATION -**
Asplund	Geriatrics-based ward, 11 beds, GCT	Neither medical (survival) outcome at 3 months, need for readmissions to the hospital, ADL performance, psychological well-being, nor global outcome was improved. However, there was an important reduction in LOS.	-	A concern raised by the internists before onset of the study was that geriatric-based acute care could compromise the quality of acute medical management. A part-time consultant in internal medicine was, therefore, added to the geriatric team. Although most of the staff had extensive experience of working with acutely ill medical patients, it is possible that a longer period of working together would have been needed to fully take advantage of the multidisciplinary approach.
Counsell	Acute Care for Elders (ACE) unit	Evidence that ACE in a community hospital improved the process of care and patient and provider satisfaction without increasing LOS or costs. The effects of ACE on patient outcomes were potentially beneficial as indicated by a lower frequency of the composite outcome ADL decline or nursing home placement at discharge and during the subsequent year. Indicates that a multicomponent intervention can improve processes of care for hospitalized older people and the satisfaction of these patients and their providers, and possibly prevent ADL decline and/or nursing home placement at discharge without adverse effects or increased costs.	Nursing staff-to-patient ratios were similar on the intervention and usual care units. Several important processes of hospital care that could positively affect functional outcomes were improved by ACE. On the intervention unit, nursing care plans designed to prevent disability and regain premorbid function were implemented more often than in the usual care group.	Improvements in usual care having an established geriatrics program, including an inpatient consultation service. Different organization of attending physicians (limited resident coverage). Providing ACE to a subgroup of patients having a greater likelihood of experiencing benefits in functional outcomes might be a more pragmatic approach for many community hospitals in the face of limited resources, including the shortage of healthcare professionals trained in geriatrics.

Table 3. Discussion points of included studies[a] (cont.)				
STUDY	**INTERVENTION**	**DISCUSSION: CONCLUSION**	**DISCUSSION: IMPLEMENTATION +**	**DISCUSSION: IMPLEMENTATION -**
Cohen	Geriatric Evaluation and Management Unit (GEM)	No significant improvement in survival. Inpatient GEM had a significant positive effect on HRQoL at the time of discharge, specifically for physical functioning and general health, bodily pain, basic ADL and physical performance. GEM effective while patients in the hospital.	-	It is possible that usual care has become progressively more like the programs of previously studied GEM programs.
Phibbs	"	Conclude that there was a significant reduction in the number of nursing home patients among those treated in the impatient geriatric evaluation and management units. Inpatient GEM units did not increase the costs of care.	-	-
Basic	Aged Care Nurse Intervention (in ED)	Intervention failed to reduce admission of elderly patients to the hospital, LOS, or functional decline during hospitalization. No significant effect, indicating that early geriatric assessment and referral alone, without clear mechanisms to implement recommended care, is ineffective within existing models of care and funding.	Multidisciplinary assessment beginning in the ED may be more effective, particularly as many patients have problems that span several health disciplines.	Referral rates were similar in both patient groups, suggesting poor overall compliance with the nurse's recommendations. During regular rounds in the ED, the nurse may have selected patients who looked frail.

Abbreviations: GCT = geriatric consultation team; LOS = length of stay; CGA = comprehensive geriatric assessment; HMO = Health Maintenance Organization; HRQoL = Health-Related Quality of Life

[*]'Discussion: Conclusion' = conclusion as stated in the article.

'Discussion: Implementation +' = discussion of positive characteristics of implementation of the intervention (cited) from the articles.

'Discussion: Implementation –'= discussion of barriers for implementation of the intervention (cited) from the articles.

Reference List

(1) Hogan DB, Fox RA, Badley BW, Mann OE. Effect of a geriatric consultation service on management of patients in an acute care hospital. *CMAJ* 1987 April 1;136(7):713-7.

(2) Winograd CH, Gerety MB, Lai NA. A Negative Trial of Inpatient Geriatric Consultation: Lessons Learned and Recommendations for Future Research. *Arch Intern Med* 1993 September 13;153(17):2017-23.

(3) Reuben DB, Borok GM, Wolde-Tsadik G et al. A Randomized Trial of Comprehensive Geriatric Assessment in the Care of Hospitalized Patients. *N Engl J Med* 1995 May 18;332(20):1345-50.

(4) Fretwell MD, Raymond PM, McGarvey ST et al. The Senior Care Study. A Controlled Trial of a Consultative/Unit-Based Geriatric Assessment Program in Acute Care. *J Am Geriatr Soc* 1990 October;38(10):1073-81.

(5) Clark LR, Fraaza V, Schroeder S, Maddens ME. Alternative Nursing Environments: Do They Affect Hospital Outcomes? *J Gerontol Nurs* 1995 November;21(11):32-8.

(6) Landefeld CS, Palmer RM, Kresevic DM, Fortinsky RH, Kowal J. A Randomized Trial of Care in a Hospital Medical Unit Especially Designed to Improve the Functional Outcomes of Acutely Ill Older Patients. *N Engl J Med* 1995 May 18;332(20):1338-44.

(7) Hogan DB, Fox RA. A Prospective Controlled Trial of a Geriatric Consultation Team in an Acute-care Hospital. *Age Ageing* 1990 March;19(2):107-13.

(8) Cohen HJ, Feussner JR, Weinberger M et al. A Controlled Trial of Inpatient and Outpatient Geriatric Evaluation and Management. *N Engl J Med* 2002 March 21;346(12):905-12.

(9) Thomas DR, Brahan R, Haywood BP. Inpatient Community-Based Geriatric Assessment Reduces Subsequent Mortality. *J Am Geriatr Soc* 1993 February;41(2):101-4.

(10) Collard AF, Bachman SS, Beatrice DF. Acute Care Delivery for the Geriatric Patient: An Innovative Approach. *QRB Qual Rev Bull* 1985 June;11(6):180-5.

(11) Phibbs CS, Holty JE, Goldstein MKM et al. The Effect of Geriatrics Evaluation and Management on Nursing Home Use and Health Care Costs: Results From a Randomized Trial. [Report]. *Med Care* 2006 January;44(1):91-5.

(12) Asplund K, Gustafson Y, Jacobsson C et al. Geriatric-Based versus General Ward for Older Acute Medical Patients: a Randomized Comparison of Outcomes and Use of Resources. *J Am Geriatr Soc* 2000 November;48(11):1381-8.

(13) Campion EW, Jette A, Berkman B. An Interdisciplinary Geriatric Consultation Service: A Controlled Trial. *J Am Geriatr Soc* 1983 December;31(12):792-6.

(14) Becker PM, McVey LJ, Saltz CC, Feussner JR, Cohen HJ. Hospital-Acquired Complications in a Randomized Controlled Clinical Trial of a Geriatric Consultation Team. *JAMA* 1987 May 1;257(17):2313-7.

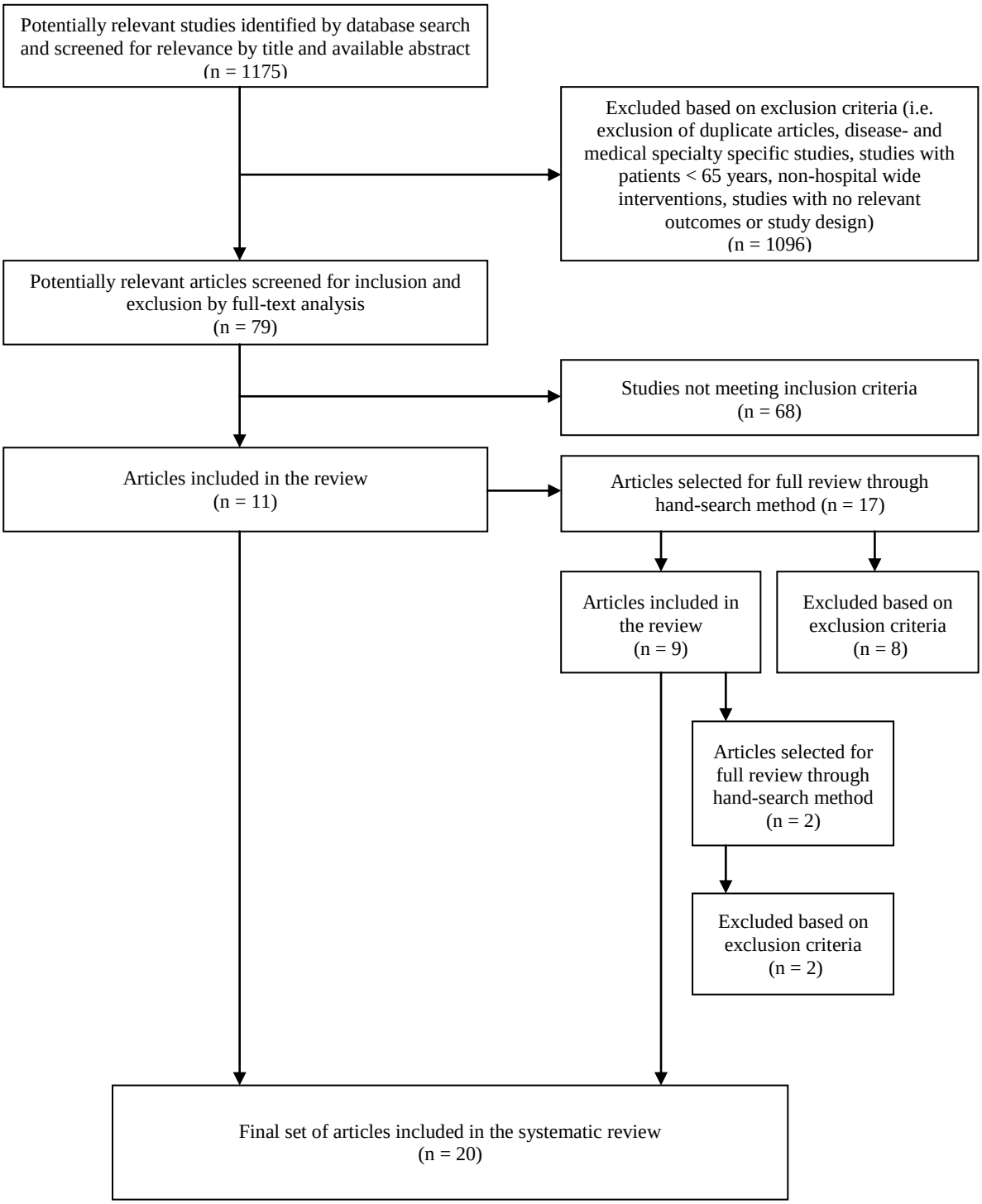

Figure 1. Flow-diagram of the selection of articles included in this systematic review.