

A Systematic Review and Qualitative Analysis to Inform the Development of a New Emergency Department-Based Geriatric Case Management Model

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Study objective: We inform the future development of a new geriatric emergency management practice model. We perform a systematic review of the existing evidence for emergency department (ED)-based case management models designed to improve the health, social, and health service utilization outcomes for noninstitutionalized older patients within the context of an index ED visit.

Methods: This was a systematic review of English-language articles indexed in MEDLINE and CINAHL (1966 to 2010), describing ED-based case management models for older adults. Bibliographies of the retrieved articles were reviewed to identify additional references. A systematic qualitative case study analytic approach was used to identify the core operational components and outcome measures of the described clinical interventions. The authors of the included studies were also invited to verify our interpretations of their work. The determined patterns of component adherence were then used to postulate the relative importance and effect of the presence or absence of a particular component in influencing the overall effectiveness of their respective interventions.

Results: Eighteen of 352 studies (reported in 20 articles) met study criteria. Qualitative analyses identified 28 outcome measures and 8 distinct model characteristic components that included having an evidence-based practice model, nursing clinical involvement or leadership, high-risk screening processes, focused geriatric assessments, the initiation of care and disposition planning in the ED, interprofessional and capacity-building work practices, post-ED discharge follow-up with patients, and evaluation and monitoring processes. Of the 15 positive study results, 6 had all 8 characteristic components and 9 were found to be lacking at least 1 component. Two studies with positive results lacked 2 characteristic components and none lacked more than 2 components. Of the 3 studies with negative results demonstrating no positive effects based on any outcome tested, one lacked 2, one lacked 3, and one lacked 4 of the 8 model components.

Conclusion: Successful models of ED-based case management models for older adults share certain key characteristics. This study builds on the emerging literature in this area and leverages the differences in these models and their associated outcomes to support the development of an evidence-based normative and effective geriatric emergency management practice model designed to address the special care needs and thereby improve the health and health service utilization outcomes of older patients. [Ann Emerg Med. 2011;57:672-682.]

Please see page 673 for the Editor's Capsule Summary of this article.

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0196-0644/\$-see front matter

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doi:10.1016/j.annemergmed.2011.01.021

INTRODUCTION

Studies of emergency department (ED) utilization in the United States find that older adults, especially those older than 75 years, have among the highest visitation rates of any segment of the population¹ and that the burden of visitations will increase as the

population ages. Older adults are also more likely than others to present to EDs with urgent or critical issues¹ and are at least twice as likely to be admitted to the hospital from the ED, although most are still treated and discharged back into the community.²

The clinical heterogeneity of older patients contributes to the clinical challenges that emergency physicians and nurses face in

Editor's Capsule Summary

What is already known on this topic

The proportion of older patients visiting emergency departments (EDs) is increasing; these patients have greater needs and unique postdischarge problems.

What question this study addressed

This study reviewed existing literature on management of geriatric patients in emergency care and synthesized a set of process, component, and outcome measures composing a geriatric emergency practice model.

What this study adds to our knowledge

A set of 8 characteristic components were derived from the 18 studies that met inclusion criteria. Programs having more of these components tended to produce better outcomes.

How this study is relevant to clinical practice

It characterizes current efforts to improve the ED management of geriatric patients.

providing their care. It has long been recognized that within this population, common diseases more often present atypically; comorbidities can confound standard approaches, including the interpretation of common diagnostic tests; polypharmacy is ubiquitous; depleted physiologic reserves and impaired cognition must be anticipated; and traditional social support systems may be compromised.³ It is no wonder that such patients are more difficult and time-consuming to assess and manage in the ED compared with younger patients.^{4,5} Furthermore, although older patients tend to receive the most resource-intensive care of any age group within EDs, their problems are less likely to be accurately diagnosed, partly because the actualization of many of the earlier listed long-established principles related to working with older patients into current routine practices has been slow. Consequently, they are more likely to be discharged from EDs with unrecognized and untreated problems.⁶⁻⁸

Other factors contribute to suboptimal care delivery. Providing optimal assessment and discharge planning tends to be more complicated for older patients in ED settings, where time pressures and the need to maintain rapid patient throughput are considered essential.⁹ A relative lack of knowledge among ED professional staff in geriatric principles of care and practice may compound the strain of trying to adequately address the often complex and interrelated health and social care needs of older patients.⁵ All these factors may help account for the higher rates of adverse outcomes, including ED revisitation, hospitalization, functional decline, and death, that are experienced by older adults compared with others within months of an index ED visit.²

The need for better ED care and management of older patients has been recognized by several investigators, who have developed and evaluated ED-based interventions designed to enhance care and reduce adverse outcomes. These interventions have been previously reviewed and demonstrate mixed results at the patient or systems level.^{2,10-12} Hickman et al¹³ attributed the disparate results of these studies as evidence of a lack of provider understanding of the key characteristics of effective ED-based care models. Additionally, the variability in model implementation and evaluation criteria and methodology has hindered more effective comparisons, as well as the broader development, acceptance, and dissemination of a common model.

The best models of care for older ED patients have not been defined.¹⁴ Therefore, to inform the future development of a new geriatric emergency management practice model we performed a systematic review of the existing evidence for ED-based case management models designed to improve the health, social, and health service utilization outcomes for noninstitutionalized older patients within the context of an index ED visit. To our knowledge, this review is unique in its use of a systematic qualitative case study analytic approach to identify the core operational components and outcome measures of the described clinical interventions. This methodology further uses adherence analysis to facilitate the identification of specific model characteristics that may be associated with clinical effectiveness. We propose and describe the recommended components and processes for the geriatric emergency management practice model, as well as a set of standard research outcome measures for use in ongoing research, development, and dissemination of this innovative care model.

MATERIALS AND METHODS

Study Design

This systematic review, conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses¹⁵ criteria, examined articles indexed in MEDLINE and CINAHL. A MEDLINE search (from 1966 to January 2010) was conducted for English-language articles containing the key words "geriatric," "older adults," or "seniors," or Medical Subject Heading (MeSH) terms "Geriatrics" or "Health Services for the Aged" AND key word "emergency," or MeSH terms "Emergencies," "Emergency Service, Hospital," or "Emergency Treatment" AND key word "assessment." The same search was performed in CINAHL with subject headings "Emergency Service" AND "Aged." Bibliographies of the retrieved articles were reviewed to identify additional references.

Articles were included if they constituted descriptions of clinical interventions, with clearly defined assessment and management components, undertaken to improve outcomes for older adults within the context of an index ED visit. Therefore, program descriptions, observational studies, and clinical trials were included. We excluded articles that did not report sufficient quantitative information to judge outcomes (eg, referred to achieving a decreased hospitalization rate but did not

quantify this), those whose only purpose was to describe or test risk screening instruments, and those describing an ED-based intervention limited to patients with a single diagnosis (eg, falls, delirium). Finally, we excluded articles that did not meet Cochrane evaluation criteria for randomized controlled trials and nonrandomized controlled trials¹⁶ or Meta-analysis of Observations Studies in Epidemiology evaluation criteria for observational studies.¹⁷

Data Collection and Processing

Each study was reviewed by one of the authors (S.K.S.) in detail and abstracted for the following data: setting, location and country of intervention, study design, characteristics of intervention and delivery method, participant and provider characteristics, patient inclusion and exclusion criteria, desired outcomes, outcome measures used, and results, including both primary and secondary outcomes.

Primary Data Analysis

One author (S.K.S.) reviewed each article to focus specifically on identifying the core operational components of their described clinical interventions. Such components include both structures and processes. This was accomplished by using a systematic qualitative case study analytic approach outlined by Huberman and Miles.¹⁸ This approach starts with listing all model components identified within each intervention. Further effort was then made to determine whether individual studies were using the same terms to describe different components or different terms to describe the same components. This process ultimately enabled a set of categories, ie, “high-risk screening” or “post-ED discharge follow-up with patients,” to be conceptually specified either inductively or deductively.¹⁸

After a comprehensive list of identified characteristic components had been determined, each described clinical intervention was then identified by one of the authors (S.K.S.) as either adhering or not to a particular characteristic component. This was done by incorporating methodological rules for evaluating criteria adherence, similar to those Hedrick and Inui¹⁹ and others^{20,21} have used in adherence analyses. Adherence was largely determined by whether written evidence of such adherence existed. For example, a study report that alluded to the selection of higher-risk older patients but did not actually describe the screening procedure used for selection would have been listed as nonadherent with using a “high-risk screening” selection process.

Because component adherence served as the basis of our qualitative analysis, we surveyed the investigators of each of the involved studies to primarily assess their level of agreement with our interpretations of their study’s component adherence. These investigators were also asked to list any other distinct model characteristics related to their interventions that we may not have considered and to list any other studies that we may have overlooked. We successfully contacted 11 of the 18 authors. All authors agreed with the components that we identified and the literature we surveyed. No additional suggestions were made

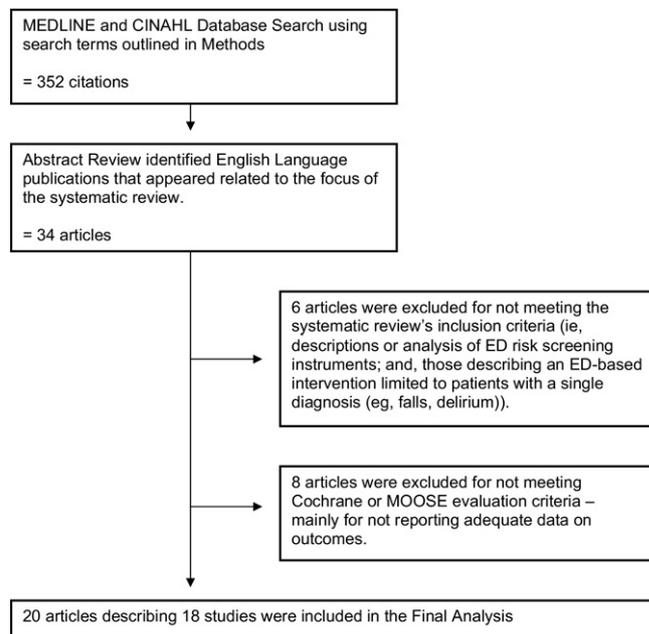


Figure 1. Criteria used to define the final studies included in this review.

identifying components or literature that we may have overlooked. Two authors^{22,23} did provide us additional information not published in their articles that demonstrated that they did use high-risk screening tools in their interventions. Any uncertainty in adherence assignment was arbitrated by discussion among the investigators (S.K.S. and B.L.).

The determined patterns of component adherence were then used to postulate the relative importance and effect of the presence or absence of a particular component in influencing the overall effectiveness of their respective interventions. The various outcome measures that were used to evaluate the effectiveness of the described interventions included in this review were further determined.

The heterogeneity in trial design, interventions, and outcome measures did not completely preclude our ability to use traditional meta-analytic techniques around certain outcome measures. However, we believed that meta-analysis was not appropriate to the aims of this study.

RESULTS

The database search yielded a total of 352 citations, from which 34 articles were selected for further examination according to an abstract review. Of these 34, 6 did not meet the inclusion criteria, and an additional 8 articles were excluded for not reporting adequate data on outcomes. Overall, 20 articles describing 18 studies were included in the final analysis (Figure 1). These articles represented 7 randomized controlled trials, 8 nonrandomized clinical trials, and 3 observational studies or program descriptions, with a mean sample size of 890 patients (range 12 to 3,977). The key descriptive features and findings from these studies were abstracted and are summarized in the Table.

Table. ED geriatric assessment and management interventions.

Author, Year, Reference, and Country	Design and Sample Size	Study Population	Exclusions	Intervention	Duration	Outcome Measures (Figure 3) and Results	Comments	Core Characteristic Component (Figure 2) Adherence							
								C1	C2	C3	C4	C5	C6	C7	C8
Basic and Conforti, 2005, ¹⁴ Australia*	RCT, N=224	High risk, age ≥65 y	Medically unstable, NH, unable to speak English.	Nurse-led CGA based in ED, liaising with home caregivers and health care providers, organizing postdischarge referrals for out-of-hospital assessment and support services for those going home from the ED and documents suggestions for assessment and referral for those admitted to the hospital	One-time	1, [†] 3, [†] 19 [†]	Poor overall compliance by inpatient teams with nurse's recommendations were observed	Yes	Yes	No	Yes	Yes	No	No	Yes
Brazil et al, 1998, ²⁴ Canada	PD/OS, N=123	Age ≥65 y	Not specified	Nurse CM conducts assessment in ED and coordinates services to transport medically stable patients home and support them with the necessary professional and support services for up to 5 days	5 days, with reassessment within 72 hours of initial assessment	2, [†] 14, [†] 27, [†] 28 [†]		Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Brookoff and Minniti-Hill, 1994, ²⁵ United States	PD/OS, N=670	Adult patients	NH, hospitalized	Nurse DC planning coordinators in the ED liaise with home caregivers and health care providers, coordinate the rapid deployment of home care services to facilitate discharges home and avoid hospital admissions, and organize postdischarge referrals for out-of-hospital assessment	One-time	2, [†] 9 [†]	A net financial gain was achieved because net billings to third-party payers for home care services exceeded intervention costs	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Brooks and Ertl, 2000, ²⁶ United States	PP, N=12	High risk, age ≥65 y, with ≥6 ED visits in the preceding year	Not specified	Social worker conducts home visits in consultation with MD and organizes referrals for out-of-hospital assessment and support services	12 months	3, [†] 4, [†] 6, [†] 11, [†] 12, [†] 14 [†]	Decrease in ED and inpatient costs but not in OP costs because increased number of OP visits	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Caplan et al, 2004, ²⁷ Australia	RCT, N=739	Age ≥75; discharged home	NH, hospitalized	Nurse-led CGA performed at home within 24 hours of index ED visit. After a discussion with PCP, the nurse formulates care plan, initiates urgent interventions and referrals, and reviews patient at weekly interdisciplinary meeting, at which further interventions or referrals could be ordered for up to 28 days in total.	28 days, with ongoing follow-up after initial home assessment	4, ^{†§} 5, ^{†§} 6, ^{†§} 8, [†] 13, [†] 19, [†] 20 [†]	Lower rate of ED revisitations observed up to 18 months	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Corbett et al, 2005, ²⁸ Australia	PP, N=3,977	Adult patients potentially at risk	Not specified	Multidisciplinary care coordination team provides case management to facilitate discharge and ensure necessary community supports and linkages are in place	Initial assessment and follow-up as necessary	1, ^{†§} 4, [†] 14, ^{†§} 23, ^{†§} 27 ^{†§}		Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

Table. Continued.

Author, Year, Reference, and Country	Design and Sample Size	Study Population	Exclusions	Intervention	Duration	Outcome Measures (Figure 3) and Results	Comments	Core Characteristic Component (Figure 2) Adherence								
								C1	C2	C3	C4	C5	C6	C7	C8	
Freeman, 1994, ²⁹ Canada	PD, N=874	Age ≥60 y	Not specified	Nurse case manager conducts assessment and coordinates services to transport patients home and support them with the necessary professional and support services for up to 5 days	5 days, with reassessment within 72 hours of initial assessment	2, 7, [†] 14, [†] 27, [†] 28 [†]		Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Gagnon et al, 1999 ²² Canada*	RCT, N=427	Age ≥70 y, functional impairment with risk of admission	CI, NH, hospitalized	Nurse CM in consultation with MD for patients discharged from the ED during the previous 12 months; minimum of a monthly telephone call and home visit every 6 weeks for 10 months	10 months	3, [†] 4, ^{†§} 6, [†] 14, [†] 19, [†] 23 [†]	A slight increase in the ED revisit rate was observed in the intervention group	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Guttman et al, 2004, ³⁰ Canada	PP, N=1724	Age ≥75 y	CI, NH, hospitalized	Nurse DC planning coordinators in the ED liaise with home caregivers and health care providers, coordinate the rapid deployment of home care services to facilitate discharges home and avoid hospital admissions, and organize postdischarge referrals for out-of-hospital assessment	Telephone follow-up 24 hours post-DC and RN available for telephone for 1 week post-index ED visit	4, ^{†§} 6, ^{††} 15, ^{†§} 16, ^{†§} 17, [†] 23 ^{†§}	The 17% reduction in the subsequent hospital admission rate, because of low numbers for comparison, did not show statistical significance	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Hegney et al, 2006, ³¹ Australia	PP, N=2139	High risk, age ≥70 y	NH, unable to consent, and dialysis, chemotherapy, palliative or psychiatric patients	Nurse DC planning coordinators in the ED risk screen patients, assess eligibility for and organize referrals for community support services and further assessment, and share a copy of risk screening assessment with patients' PCP	One-time	3, [†] 4, ^{†§} 6 ^{†§}	Privacy restrictions made the statistical verification of the LOS reductions not possible	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
McCusker et al, 2001, ⁴⁰ 2003, ³³ 2003, ³⁴ Canada	RCT, N=388 (2001, ⁴⁰ 2003 ³³), N=345 (2003 ³⁴)	High risk, age ≥65 y	NH, hospitalized	Nurses conduct geriatric assessment in ED, liaising with ED and geriatric staff as needed, and organize postdischarge referrals to access further community assessment and support services. PCPs were routinely notified about the visit and the results of the assessment. Limited follow-up was provided after DC to ensure that appointments and services were provided.	One-time with limited telephone follow-up	8, [†] 13, ^{†§} 14, [†] 19, ^{†§} 21, [†] 24, [†] 25, [†] (2001) ⁴⁰ 12, ^{†§} (2003) ³³ 4, ^{†§} 9, ^{†§} 10, ^{†§} 11, [†] (2003) ³⁴	Greater cost-effectiveness shown despite increased rates of referral to PCPs and home care services, and a slight increase in ED revisit rate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Miller et al, 1996, ²³ United States	Cohort, N=770	Age ≥65 y	Acutely ill, <1-hour stay	Nurse-led CGA based in ED on patients identified with case finding, with recommendations made directly to patients, family members, and emergency physician. Helps to suggest postdischarge referrals for out-of-hospital assessment and support services for those admitted or going home from ED and follow-up with admitted patients with identified active geriatric issues.	One-time with telephone follow-up in 7 days if DC or sooner in person if admitted	4 ^{††} (P=.06), 8, [†] 10, [†] 14, [†] 18 [†] (P=.07), 19, [†] 23 [†]	Poor compliance by patients and families with the recommendations of the RN and a minimal uptake in new dental or social services was observed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table. Continued.

Author, Year, Reference, and Country	Design and Sample Size	Study Population	Exclusions	Intervention	Duration	Outcome Measures (Figure 3) and Results	Comments	Core Characteristic Component (Figure 2) Adherence								
								C1	C2	C3	C4	C5	C6	C7	C8	
Mion et al, 2003, ³⁵ United States	RCT, N=650	High risk, age ≥65 y	NH, hospitalized	Advanced practice nurse-led CGA-based DC; planning in ED and help in organizing postdischarge referrals for community support services. Summary of assessment and DC plan is sent to PCP. Telephone follow-up is provided as necessary until community agency personnel are in contact with patient.	One-time, limited telephone follow-up 7–10 days later	4, [†] 6, [†] 8, ^{†§} 12, [†] 14, ^{†§} 22 [†]	The intervention was more effective for higher-risk elders.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Moss et al, 2002, ³² Australia	PP, N=2532	High risk, age ≥65 y	Not specified	Nurse or allied health care coordinators perform comprehensive DC risk assessments for all high-risk patients, leading to the organization of referrals for further assessment or support services. Consultation with home caregivers and PCPs and patient and family educations is integral to this process.	One-time, telephone follow-up within 7 days to those not referred to a community provider	1, ^{†§} 4, [†] (P=.28), 14, ^{††} 24, ^{††} 27, [†] 28 [†]	A downward but nonsignificant trend in ED revisitation was observed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Roberts et al, 2007, ³⁶ Australia	PP, N=228	Age ≥65 y, high risk for ED revisitation and hospital admission	Not specified	Multidisciplinary case management team based in both community and ED settings performs comprehensive assessments with geriatrician and PCP support as required, coupled with intensive short-term care planning and community support for up to and beyond 12 weeks when necessary	Up to and beyond 12 weeks when necessary	4, ^{†§} 6, ^{†§} 7, ^{†§} 14, ^{††} 24, ^{††} 27 ^{††}		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Runciman et al, 1996, ³⁷ United Kingdom	RCT, N=414	Age ≥75 y	NH, hospitalized	Post-ED discharge home visit by health visitor (nurse) for standardized CGA and arrangement of community services in consultation with PCP	One-time	4, [†] 6, [†] 14, ^{††} 19 ^{†§}	Significantly less IADL dependence at 1 month but no difference in ADL dependence observed	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Warburton, 2005, ³⁸ Canada	Quasi experimental, N=277	High risk, age ≥75 y	Not specified	Nurse-led screening and referral program in the ED for identified at-risk older adults for whom care plans are developed to provide targeted and coordinated interventions	One-time	3, [†] 4, [†] 6 [†]	Cost-benefit analysis shows cost-effectiveness of model	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Weir et al, 1998, ³⁹ Canada*	RCT, N=77	Adults with identified care needs	Not specified	ED-based home care coordinators arrange prompt delivery of in-home services for up to 10 days after an index ED visit for discharged adults with an identified change in care needs	Initially and ongoing for up to 10 days	12, [†] 14, [†] 22, [†] 24, [†] 26 [†]	Sample size and power too small to detect significant differences	Yes	No	No	No	Yes	No	Yes	Yes	Yes

RCT, Randomized controlled trial; NH, nursing home; CGA, comprehensive geriatric assessment; PD, program description; OS, observational study; CM, case manager; DC, discharge; PP, pre- and postintervention design; MD, physician; OP, outpatient; PCP, primary care physician; RN, registered nurse; CI, cognitive impairment; NIH, National Institutes of Health; LOS, length of stay; ADL, activities of daily living; IADL, instrumental activities of daily living.

Sample sizes: Reported figures represent numbers used in the analysis of outcomes.

*Indicates the study result was negative.

†Results were statistically verified.

†Significant result.

§Statistically significant result.

The determined adherence of each described intervention to the 8 identified characteristic components is summarized in the Table. Every intervention used evidence-based practice models (component 1) and established evaluation and monitoring processes (component 8) to report their outcomes. Seventeen (94%) interventions incorporated focused geriatric assessments (component 4). Sixteen (88%) interventions relied on nursing involvement or leadership to deliver the intervention (component 2) and developed interprofessional and capacity-building work practices (component 6), whereas 15 (83%) initiated care and disposition planning in the ED (component 5) and 13 (72%) provided some form of more immediate post-ED discharge follow-up with patients (component 7). High-risk screening (component 3) was used in only 11 (61%) of the interventions.

Fifteen studies achieved at least 1 positive effect, whereas 9 of the 13 that used statistical analyses also demonstrated a statistically significant positive effect in at least 1 measured outcome. Of the 15 studies with positive results, 6 had all 8 characteristic components and 9 were found to be lacking at least 1 component, of which the failure to use high-risk screening processes (characteristic 3) was the reason in 5 of these studies. Two studies with positive results lacked 2 characteristic components and none lacked more than 2 components.

Three studies with negative results were reported that demonstrated no positive effects according to any outcome tested.^{14,22,39} One lacked 2, one lacked 3, and one lacked 4 of the 8 model components. Two of the studies with negative results did not use high-risk screening processes^{14,39} (characteristic 3), 2 did not actively develop interprofessional and capacity-building work practices^{14,39} (characteristic 6), and 2 did not provide more immediate post-ED discharge follow-up with their patients^{14,22} (characteristic 7). None of the interventions were found to cause measurable harm compared with usual care, although 2 of the 13 studies that examined effects on ED revisitation rates actually demonstrated a small but statistically significant increase in revisitations.^{22,34}

Satisfaction levels were a commonly used outcomes measure for individual patients and their care providers. These interventions demonstrated an ability to garner high patient satisfaction levels,^{22,26,28-30,32,34-37,40} although Gagnon et al²² and McCusker et al⁴⁰ were unable to demonstrate any differences in effect compared with usual care. High home caregiver satisfaction^{32,36,40} was also demonstrated, although again McCusker et al⁴⁰ were unable to demonstrate any effect differences compared with usual care. High hospital staff and community care provider satisfaction^{28,29,32,34,36} was also demonstrated. Only 2 of the 6 studies examining functional outcomes noted an ability to achieve significantly favorable results.^{37,40} Finally, only 2 of the 6 studies that examined their intervention's effect on improving a patient's perceived well-being or quality of life were able to demonstrate an overall improvement.^{28,30}

Figure 2. Core characteristic components common to ED-based geriatric case management models.

The qualitative analysis identified 8 distinct model characteristic components. These components are listed with an accompanying short descriptive explanation in Figure 2.

At a systems level, of the 13 studies examining revisitation rates to EDs, 7 demonstrated reductions in the early post-ED discharge period^{23,26,30-32,36,38} and 1 up to 18 months after an index ED visit.²⁷ Five of the 6 studies that examined the ability of the intervention to immediately obviate inpatient admissions demonstrated success,^{25,28,29,32,34} whereas 6 of the 7 studies that examined their ability to reduce subsequent nonelective hospital admissions demonstrated this as well.^{26,27,30,31,36,38} Decreases in lengths of inpatient stays were achieved by 3 of the 5 interventions examining this.^{26,31,38} The ability to reduce subsequent nursing home admissions was demonstrated in only 1 of the 4 studies examining this outcome.⁴⁰

Figure 3 identifies the 28 outcome variables that the 18 studies collectively measured, representing the obvious heterogeneity in trial design, interventions, and outcome measures that were of interest to the researchers. The main variables measured included ED revisitations in 13 (72%), patient satisfaction in 12 (67%), subsequent hospital admissions in 7 (39%), and functional decline in 6 (33%). Length of inpatient stays and ED and hospital care provider satisfaction were measured in 5 studies; 4 examined costs related to health and social care services utilization, nursing home admissions, home caregiver satisfaction, and the patients' perceived sense of well-being or quality of life; and 3 examined the satisfaction of primary and community care service providers, patient health status, and health and social care utilization. Only studies performed in single-payer health systems such as Canada, Australia, and the US Veterans Affairs network measured hospital admission rates or the number of obviated hospital admissions. According to our qualitative analysis of the 28 outcome variables used, consensus emerged from discussions among the authors, identifying 13 of these outcome measures specifically denoted in Figure 3 that appeared to measure the most significant and relevant patient and systems core outcomes of interest in relation to this model. Although the 13 are included in those mentioned earlier, we also thought that the outcome measure examining patient adherence to follow-up appointments that was examined in only 1 study should warrant treatment as a core measure as well.

LIMITATIONS

As with any study, ours has several limitations. To the extent that we performed a systematic review, publication bias and the potential for incomplete identification of relevant studies are always considerations. We conducted our search with multiple databases, used bibliographic searches of the reviewed articles, and finally surveyed the authors of the reviewed articles to identify additional studies to minimize this possibility. The heterogeneity in trial design, interventions, and outcome measures did not completely preclude our ability to use traditional meta-analytic techniques around certain outcome measures. However, given the goals of this study, meta-analysis would not have been appropriate.

Using the data from our systematic review, we performed a qualitative analysis and drew inferences about model

Measure 1,* hospital admission rate ^{14,28,32}
Measure 2,* number of hospital admissions avoided ^{24,25,29}
Measure 3,* length of inpatient stays ^{14,22,26,31,38}
Measure 4,* ED revisitation rate ^{22,23,26-28,30-32,34-38}
Measure 5, time to first ED revisitation ²⁷
Measure 6,* subsequent hospital admission rate ^{26,27,30,31,35,36,38}
Measure 7, total acute bed days used ^{29,36}
Measure 8,* nursing home admission rates ^{23,27,35,40}
Measure 9, home care and community service referral rates ^{25,34}
Measure 10, health and social care services utilization ^{23,34,35}
Measure 11, outpatient visits ^{26,34}
Measure 12, cost related to health and social care services utilization ^{26,33,35,39}
Measure 13, mortality at 3 months ^{23,27,40}
Measure 14,* patient satisfaction with service ^{22,24,26,39,28-30,32,35-37,40}
Measure 15, patient satisfaction with clarity of information provided ³⁰
Measure 16, patient adherence to new medications ³⁰
Measure 17,* patient adherence to follow-up appointments ³⁰
Measure 18, presence of advance directives ²³
Measure 19,* ADL, IADL functional decline rates ^{15,22,23,27,37,40}
Measure 20, cognitive decline rates ²⁷
Measure 21, change in depressive symptoms ⁴⁰
Measure 22, patient health status (SF-36) ^{23,35,39}
Measure 23,* patient's perceived well-being/quality of life ^{22,23,28,30}
Measure 24,* home caregiver satisfaction with service ^{32,36,39,40}
Measure 25, home caregiver health status (SF-36) ³⁰
Measure 26, home caregiver burden ³⁹
Measure 27,* ED and hospital care providers' satisfaction with service ^{24,28,29,32,36}
Measure 28,* primary care and community service providers' satisfaction with service ^{24,29,32}

*Denotes proposed core outcome measures.

Figure 3. Identified research outcome measures.

components associated with effectiveness. We acknowledge that the analysis of studies by positive versus negative results can be highly tentative because small studies with large effects might have had negative results, whereas large studies with small effects might have had positive ones. Nevertheless, previous studies have used similar methodologies to inform the development of other clinical models and health services interventions, with useful results.¹⁹ Furthermore, we invited the authors of the included studies to verify our interpretations of their work to improve the quality of our analyses. Evaluating and developing complex multicomponent health and social interventions such as these in randomized clinical trials is problematic, especially when it is difficult to recruit, standardize, blind, and randomize in this setting.^{10,12,41} Berwick⁴² further argues that randomized controlled trials may be impoverished ways to learn and understand interventions when knowledge of mechanisms and context will be integral to understanding outcomes.

DISCUSSION

This systematic review and qualitative analytic approach identifies components and outcome measures that are integral to effective case management models for older patients in the context of an index ED visit. This study builds on the emerging descriptive literature in this area and leverages the differences in these models and their associated outcomes to support the future development of an evidence-based normative and effective geriatric emergency management practice model designed to address the special care needs of older patients and thereby improve their health and health service utilization outcomes.

We identified 8 described core characteristic components that appear to be integral to the geriatric emergency management model and drew inferences about how the presence or absence of these core characteristic components may have influenced overall intervention effectiveness. Several themes emerged. Effective geriatric emergency management initiatives use validated risk stratification tools as a routine prelude to initiating an assessment and developing a care plan or referral process in the ED with specialized clinicians. Team composition and leadership strongly influenced model effectiveness, and nurses in particular appeared to be a critical component. We therefore hypothesize that nurses and midlevel clinicians, whose training and experience provide them with broad-based skill sets that span both health and social care domains, can best blend their understanding of emergency care, disease processes, utilization management, payer requirements, and available community resources⁴³ when needed to implement complex and often interrelated health and social interventions that a geriatric emergency management model requires. Although some found a social work–led intervention to be effective,²⁶ others have found that without appropriate nursing support, social workers in general did not have the broader skill set required to work as case managers within the ED.²⁵

Our findings are buttressed by the results of models that were unable to demonstrate any significant effect.^{14,22,39} We hypothesize that lack of effect may relate to a failure to target individuals with greatest need, focus on the development of interprofessional and capacity-building work practices with other ED and hospital care providers, and the absence or limited presence of defined follow-up processes allowing earlier recommendations to be reviewed, revised, or reinforced.

Our data and experience in implementing such models suggest that collaborative working practices and capacity-building efforts can influence and enhance geriatric emergency management initiatives and may also be their most integral component. Similar to what has been observed in other studies examining the implementation of complex health and social interventions,^{44–46} collaborative working practices are critical in model implementation and rely on the interpersonal skill sets of the clinicians delivering those initiatives and their ability to earn the trust and respect of their colleagues within and beyond the

ED. These practices have been underappreciated in previous research, perhaps because their influence is underrecognized and measuring their effects remains challenging. Using former ED nurses in geriatric emergency management roles and embedding geriatric emergency management nurses as ED staff members are 2 ways to possibly facilitate interpersonal, interprofessional, and capacity-building measures to help formalize this new role in a setting in which geriatric care principles are uncommon.

The model we propose is consistent with previous literature. A recent review observed that ED interventions providing geriatric nursing assessment together with community services and primary care linkages seem to be most effective.¹⁰ Furthermore, the use of validated risk-stratification tools has facilitated effective assessment and referral strategies in higher-versus lower-risk older ED attendees.^{35,40} Our systematic review of the literature demonstrates that the model components we identify may be broadly integral to any geriatric case management model because all of the 8 characteristic components we identified appeared to underlie other effective non-ED case management models for at-risk community-dwelling and hospitalized older patients in particular.^{47,48} These and other studies attributed the overall effectiveness of these interventions to their ability to target at-risk older adults who would most likely benefit from them.

The geriatric emergency management practice model we propose offers an evidence-based, nursing-led, interprofessional approach and philosophy of care that aims to improve all aspects of the emergency care that older patients receive. This ED-based model also provides a framework that can inform future research and development of the model. We also propose a set of 13 core outcome measures that, if adopted in future studies of geriatric emergency management programs, can enhance future research efforts to evaluate, monitor, and refine the model. Unlike earlier geriatric ED interventions, this approach is not limited to discharge planning but also emphasizes appropriate assessment and care planning activities, along with patient, home caregiver, community, and hospital staff care provider education and interprofessional capacity building. Furthermore, unlike in traditional geriatric consultation teams, the integration of geriatric emergency management practitioners with strong interpersonal skills as full ED staff members can facilitate capacity building within and beyond these settings. We hope the development of a standard geriatric emergency management nursing practice model will support its broader dissemination and refinement efforts, especially because an increasing number of hospitals are using geriatric nurses and nurse practitioners within their EDs to better address the needs of older patients.

The authors acknowledge the following individuals for contributing to this article by providing its authors feedback on their studies that were reviewed in this article: David Basic, MBBS, MPH, Ken Brazil, PhD, Gideon Caplan, MBBS, Helen Corbett,

MaHSc, Michelle Freeman, MSN, Constance Schein, MSc, Jane McCusker, MD, PhD, Douglas Miller, MD, Lorraine Mion, RN, PhD, Ro Roberts, MSW, Rebecca Warburton, PhD.

Supervising editor: Robert L. Wears, MD, MS

Author contributions: SKS, ESB, NF, and BL conceived the study and designed the review. SKS acquired the data. SKS, ESB, NF, and BL participated in the analysis and interpretation of the data. SKS and BL drafted the article, and all authors contributed substantially to its critical review. BL supervised the study. SKS takes responsibility for the paper as a whole.

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). Dr. Sinha was jointly supported as a fellow of the Erickson and Donald W. Reynolds Foundations.

Publication dates: Received for publication May 5, 2010. Revisions received November 15, 2010, and January 23, 2011. Accepted for publication January 28, 2011.

Reprints not available from the authors.

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