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GERIATRIC EMERGENCY MEDICINE

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The American Geriatric Society (AGS) project "Increasing Geriatric Expertise in Surgical and Related Medical Specialties" sponsored an effort to summarize the existing evidence and to identify priorities for future research in geriatrics aspects of several surgical and related medical fields. Ultimately, each specialty's research agenda was disseminated in a book (hereinafter referred to as *New Frontiers*) [1] and a Web site (http://www.frycomm.com/ags/rasp), and many were also disseminated in professional journals, as was, for example, the agenda for emergency medicine. [2] In 2005, the AGS initiated a review of each specialty's recommendations to analyze any progress made and evaluate whether any agenda items should be discarded or new ones added.

This chapter summarizes the findings of our follow-up review for the field of emergency medicine. Overall, little progress has been made on most of the research questions in the time since publication of *New Frontiers*. Therefore, we did not change any of the agenda items. However, new developments have prompted us to add four new topics to the agenda—models of care, driving safety, stroke, and elder abuse and neglect—and to add new agenda items under some of the topics covered in the original agenda. (For discussions of the new topics and all the new agenda items, see the New Horizons in Geriatric Emergency Medicine section at the end of the chapter.)

The Key Questions for geriatrics-oriented research in emergency medicine remain the same, as specified in *New Frontiers*:

EmergMed KQ1: **Can alterations in the process of emergency department care, such as those found to be beneficial elsewhere (ie, geriatric specialty inpatient units), improve the outcomes of older emergency department patients?**

EmergMed KQ2: **What diagnostic and therapeutic interventions can improve outcomes in older emergency department patients with high-risk common complaints, such as abdominal pain and acute coronary syndromes?**

EmergMed KQ3: **In older blunt multiple trauma patients, does early invasive monitoring and aggressive resuscitation result in improved outcomes?**

METHODS

The methods used to locate the evidence in the current review differ somewhat from those used for *New Frontiers*. RAND librarians conducted a PubMed search in July 2005 using the MeSH headings *emergency medicine*, *emergency treatment*, and *emergency service*,

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hospital. These headings were combined with the following MeSH terms: *age, geriatric assessment, aged, aged 80 and over, frail elderly, longevity,* and *geriatrics*. The following limits were placed on all searches: over age 65, English language, humans, years 2000–2005. This PubMed search was repeated in December 2005. Additionally, relevant journals (published between January 2004 and December 2005) were hand searched for topics specific to the overlap between geriatrics and emergency medicine. The hand-searched journals were the following: *Journal of the American Geriatrics Society, Journal of Gerontological Sciences, Age Ageing, Journal of Emergency Medicine, Annals of Emergency Medicine, Academic Emergency Medicine, American Journal of Emergency Medicine, Annals of Internal Medicine, New England Journal of Medicine,* and *JAMA*. Bibliographies of selected studies were also reviewed. Finally, a cited reference search using the Web of Science was conducted for each of those studies referenced in the chapter on geriatric emergency medicine in *New Frontiers*.

The content expert (CRC) reviewed the titles and abstracts derived from the search to identify those that were germane to the goals of research in the emergency care of older patients. These goals were to improve patient care through optimum medical management, disease and injury prevention, and maintenance of well-functioning individuals. The content expert and the senior writing group member (LWG) drafted a paper that synthesized the current literature and suggested areas for further research. This paper was reviewed by a panel consisting of experienced investigators who were AGS members and emergency physicians with expertise in geriatrics. Each new research question was assigned a level, using the rating system developed for *New Frontiers* (see pp. 6–7 for definitions of levels A through D).

The search of PubMed yielded 69 articles using *emergency medicine*, 1276 articles using *emergency treatment*, and 825 articles using *emergency service, hospital*. The search of PubMed and Web of Science, with the addition of the hand search of selected journals, resulted in a list of 2223 articles. Following review of titles and abstracts, 221 articles were obtained for inspection.

PROGRESS IN GERIATRIC EMERGENCY MEDICINE

GENERAL GERIATRIC EMERGENCY CARE

Patterns of Emergency Department Use

See *New Frontiers,* p. 54.

EmergMed 1 (Level D): **Observational and analytic studies on emergency department use should continue to come from large databases or national samples (such as the National Hospital Ambulatory Medical Care Survey database) so that the results can be generalized.**

New Research Addressing This Question: The patterns of emergency department (ED) use among older adults have been well described by single-hospital and multicenter studies. Elder ED patients have distinct patterns of use and disease presentation. Recent studies demonstrated that older patients represent 12% to 21% of all ED encounters. Older

adults are consistently over-represented in the ED in comparison with their proportions in the general population in their geographic vicinity, and the numbers of older patients are steadily increasing. [3] One third to one half of elder ED presentations result in a hospital admission. The atypical presentations and time-consuming evaluation of older patients often result in under-triage, delayed dispositions, and inaccurate diagnoses. [4,5] Several systematic reviews have evaluated predictors of ED use by older patients, intervention effectiveness, and outcomes. [6–8]

Modification of This Question in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original question. (For new agenda items on this topic, see the subsection on patterns of ED use in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Physician Training and Comfort

See *New Frontiers,* p. 55.

> ***EmergMed 2 (Level A)***: **Randomized controlled trials are needed to assess the effectiveness of interventions (eg, educational models, standardized protocols) for improving quality of care of older emergency department patients.**

New Research Addressing This Question: On the basis of narrowly focused research questions posed to emergency medicine residency directors over a decade ago, the majority of emergency physicians believe that insufficient time is spent on geriatrics issues in residency and that ongoing research is lacking. [9] More recent efforts to describe baseline knowledge and integrate geriatrics principles into medical student educational programs during elective rotations have met with moderate success, [10,11] but no research has evaluated residency or postresidency training in evolving concepts of emergency care for older adults. [12–14] Another survey over 10 years ago of 971 practicing emergency physicians with a 44% response rate reported that these clinicians said they had more difficulty in managing abdominal pain, altered mental status, dizziness, and trauma in older than in younger patients. [15] Although textbooks in general medical geriatrics have incorporated principles of evidence-based medicine in devising clinically relevant questions, assessing the quantity and quality of available evidence to answer these questions, incorporating patient differences and preferences to the available data, and moving from evidence to action, the available textbooks and other learning tools in emergency medicine have not yet incorporated this 21st-century extension of clinical epidemiology. [16,17]

Modification of This Question in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original question. (For new agenda items on this topic, see the subsection on physician training and comfort in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Environment

See *New Frontiers,* p. 55.

> ***EmergMed 3 (Level B)***: **Large studies are needed to confirm the results of patient surveys and focus group interviews. Studies to identify characteristics of the micro-environment that affect outcomes in**

elderly patients (communication, emergency department environment) are needed to identify target areas for improvement.

EmergMed 4 (Level A): **Following evidence-based identification of target areas for improvement, controlled studies of the effect of alterations in the micro-environment on outcomes for older emergency department patients should be performed. Such studies likely cannot be based on random assignments of individuals to interventions; rather, whole micro-environments will have to be compared.**

New Research Addressing These Questions: One prospective study of urban older ED patients identified three variables which ED staff can influence: the patient's perception of time spent in the ED, how well physicians and nurses shared information with the patient and included the patient in decision making, and pain management. [18] Recent reviews have summarized the available patient satisfaction literature [19] and the Institute of Medicine's six quality domains: effective, timely, efficient, safe, patient-centered, and equitable care. [20] One randomized trial of replacing uncomfortable gurneys with reclining chairs found that doing so improved pain and satisfaction scores. [21]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions. (For new agenda items on this topic, see the subsection on ED environment in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Prehospital Care

See *New Frontiers,* p. 56.

EmergMed 5 (Level B): **Cohort studies should be performed to describe the ability of prehospital care providers to assess older patients in their home environments. Areas where this may be particularly beneficial include the assessment of the home environment of patients with falls and functional decline, and the assessment of potential abuse. This research should focus on whether information about home environment provided by prehospital care providers affects patient outcomes.**

New Research Addressing This Question: The AGS and the National Council of State Emergency Medical Services Training Coordinators developed a textbook and instructional program to train prehospital professionals to deliver state-of-the-art care to older adults (online at http://www.gemssite.com/). No reports of educational or outcomes-based results of these ongoing courses have yet been published. One survey noted that 70% of out-of-hospital providers believe that primary injury prevention should be a routine part of their professional mission, yet only 33% routinely educated their patients on injury prevention behaviors. [22]

Modification of This Question in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original question. (For new agenda items relevant to aspects of this question, see the subsection on abuse and neglect under Trauma in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Cognitive Impairment

See *New Frontiers,* pp. 57–58.

***EmergMed 6 (Level B)*: Screening tests for cognitive dysfunction for use in the emergency department should be validated against gold-standard assessment, and efforts should be made to determine if new, shorter screening approaches would be effective.**

***EmergMed 7 (Level B)*: Prospective cohort studies such as larger-scale longitudinal outcome studies of older patients with impaired cognition are necessary to confirm the finding that patients with undiagnosed delirium have worse outcomes than do those without delirium or with diagnosed and treated delirium.**

***EmergMed 8 (Level A)*: If research (EmergMed 7) confirms that older patients with delirium that is not diagnosed in the emergency department ultimately have worse outcomes than do those either without delirium or with recognized and treated delirium, interventional trials should be designed to determine the effect on outcomes of better screening and management of cognitive impairment in older emergency department patients.**

New Research Addressing These Questions: Cognitive impairment, including delirium and dementia, is prevalent among older ED patients. [23,24] A recent prospective observational study demonstrated that although 26% of patients at one tertiary care ED had impairment, less than one third of them had documentation of the delirium or cognitive deficit by the emergency physician. [25] Furthermore, when the treating emergency physicians were notified of the impairment, the knowledge did not affect their management decisions on a single patient. [26] Multiple studies have since demonstrated an association between delirium with increased mortality [27–29] and diminished functional outcomes. [30] Other ED-based prospective studies have verified the poor recognition of cognitive impairments among senior patients. [24,31] Several rapid, ED-accessible screening tests for dementia and delirium have been developed. [32–37] Delirium intervention models have not been initiated from the ED in current study settings, [38,39] even though emergency medicine has been called upon to take a more active role in the evaluation and disposition of these patients. [40,41]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions.

Functional Assessment

See *New Frontiers,* pp. 58–59.

***EmergMed 9 (Level B)*: Development and testing of measures for functional assessment that are feasible and valid in elderly emergency department patients are needed.**

***EmergMed 10 (Level B)*: Case-control or cohort studies are needed to determine whether older emergency department patients with func-**

tional impairments have worse outcomes than do those without impairment.

***EmergMed 11 (Level A)*: Controlled intervention trials are needed to determine whether the detection and management of functional impairment in older emergency department patients have an effect on these outcomes.**

New Research Addressing These Questions: No new research addressing these questions was found.

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions.

Medication Use

See *New Frontiers*, pp. 59–60.

***EmergMed 12 (Level B)*: Large, long-term studies of the outcomes when older patients are prescribed potentially inappropriate medications are needed.**

***EmergMed 13 (Level A)*: Interventional trials (randomized or by comparison of micro-environments) are needed of methods to reduce prescription of potentially inappropriate medications for older patients, such as educational sessions or computer-assisted decision support systems integrated into emergency department discharge instructions.**

New Research Addressing These Questions: The Beers criteria for potentially inappropriate medication use in older adults was updated in 2003. [42] Although these criteria have not been validated for use in ED settings, they have been used to characterize medication use problems. Using the older 1997 Beers criteria, a review of the 2000 National Hospital Ambulatory Medical Care Survey demonstrated "inappropriate" medication administration in 12.6% of ED visits by elderly persons from 1992 to 2000. The number of ED medications was found to be the strongest predictor of inappropriate prescribing. [43] Additionally, 25% of patients aged 60 or over at one institution were noted to have pre-existing drug interactions before any medications were prescribed by the emergency physician. [44] Another retrospective study noted that recognized adverse drug-related events were the reason for over 10% of all ED visits. [45] Older ED patients are able to correctly identify only 43% of their prescription medications, [46] and only 39% of community-dwelling older adults bring a medication list with them to the ED, and 34% of those lists are inaccurate. [47]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions. (For new agenda items relevant to this topic, see the subsection on medication use in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

SCREENING AND COMPREHENSIVE GERIATRIC ASSESSMENT IN THE ED

General Geriatric Assessment Tools

See *New Frontiers,* pp. 60–62.

EmergMed 14 (Level B): **Comprehensive emergency department screening of older patients is feasible and inexpensive; however, outcomes have not been affected, possibly because of low compliance with recommendations and follow-up. Potential interventions to improve compliance with recommendations and follow-up, including direct referral to geriatrics teams, should be prospectively evaluated.**

EmergMed 15 (Level B): **The Identification of Seniors at Risk tool should be employed at independent sites to determine its value in selecting high-risk elderly patients for interventional trials of geriatric assessment.**

New Research Addressing These Questions: The deficiencies in the care of older ED patients include a failure to identify high-risk conditions or refer to available community resources. Multiple brief ED screening tools and multidisciplinary interventional teams have been evaluated: Triage Risk Screening Tool, [48] Identification of Seniors at Risk, [49] and the Domain Management Model. [50] Questions of time and resource availability may limit the widespread implementation of these systems in the majority of EDs. The Discharge of Elderly from the Emergency Department (DEED II) study was a prospective randomized controlled trial of a comprehensive geriatric assessment, which was found to lower in-hospital resource consumption without affecting nursing home admission or mortality. [51] Like the DEED II trial, all successful ED interventional trials have included a home assessment component. Most interventional studies used a specialized nurse practitioner to identify and follow elderly patients. [38,51–55]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions. (For new agenda items relevant to this topic, see the subsection on general geriatric assessment tools in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Screening for Specific Conditions

See *New Frontiers,* pp. 63–64.

EmergMed 16 (Level B): **Studies are needed to develop brief screening instruments for specific conditions for use with older patients in the emergency department.**

EmergMed 17 (Level A): **Screening for asymptomatic conditions in older patients in the emergency department should be done only if detection of the abnormality results in treatment of the disorder and this treatment results in improvement in outcomes. Randomized interventional trials are needed to assess short- and long-term out-**

comes of patients who have screening and treatment for these conditions.

New Research Addressing These Questions: Conditions such as correctable undetected visual acuity deficit, hearing deficit, malnutrition, depression, dementia, delirium, substance abuse, and elder mistreatment have high ED prevalence, validated screening tools, and effective interventions. Nevertheless, case-finding for these conditions is not commonly done in the ED. Depression, for example, affects up to one third of elderly ED patients and one half of hospitalized and homebound elderly patients. Depressed patients use the ED more often than those who are not depressed and have longer lengths of stay when admitted. Brief screening tools, such as a three-question instrument, have been developed to replace the cumbersome Geriatric Depression Scale and the modified Koenig Scale, but they have yet to undergo multicenter validation. [56,57]

No study has addressed the optimal screening test for alcohol abuse in ED older persons, although several relatively brief screens exist: CAGE, Alcohol Use Disorders Identification Test (AUDIT), Michigan Alcoholism Screening Test (MAST-Geriatric Version), and the Alcohol-Related Problems Survey (ARPS). A systematic review of self-reported alcohol screening instruments assessed the CAGE, MAST, and AUDIT screening tools, but did not assess the ARPS. [58] Another study of 574 patients aged 65 or over found the ARPS to be more sensitive than the CAGE, AUDIT, or MAST. [59] The ARPS was specifically designed to assess older adults who are at risk of experiencing problems because of their alcohol consumption alone or in conjunction with their underlying comorbidities, functional status, and medication use. The ARPS is much longer than the AUDIT or CAGE screening tools, though. [60–62]

Brief screening tools for malnutrition (DETERMINE [63] and Subjective Global Assessment [64]), visual acuity, [65] and hearing loss exist, but they are probably underused and have not been evaluated in ED settings. [66] Screening tools for elder mistreatment and cognitive deficiencies are discussed elsewhere in this article.

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions.

SPECIFIC CLINICAL SYNDROMES

Abdominal Pain

See *New Frontiers,* p. 65.

EmergMed 18 (Level B): **Prospective longitudinal cohort or case-control studies of elderly emergency department patients with abdominal pain are necessary to adequately define which patients with abdominal pain have serious disease and which have benign disease.**

EmergMed 19 (Level B): **The value of history and physical examination findings, laboratory examination, and imaging studies in older emergency department patients should be prospectively evaluated.**

New Research Addressing These Questions: One prospective multicenter study demonstrated a 58% admission rate for adults aged 60 or over who were evaluated for acute,

nontraumatic abdominal pain; 18% subsequently required surgery or an invasive procedure and 11% returned to the ED within 2 weeks. [67] In another study EM physicians were found to have used computerized tomography (CT) imaging in 37% of patients, with a diagnostic accuracy of 57% for all patients and 75% for surgical patients. [68] A third study found that EM physicians relied heavily on CT to alter admission decisions in 26% of cases and improve diagnostic certainty. [69]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions. (For a new agenda item for this topic, see the subsection on abdominal pain in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Falls

See *New Frontiers,* p. 66.

> ***EmergMed 20 (Level A)***: **Randomized controlled trials are necessary to assess the value of a falls prevention program in reducing subsequent falls by elderly patients presenting to the emergency department with a fall.**

New Research Addressing This Question: Older adults who present to the ED with a fall often do not receive current guideline care, [70] although ED-initiated home modifications, [71] vestibular assessment, [72] and multidisciplinary falls prevention programs [73] have identified some high-risk fall populations, and subsequent preventive measures have been found to reduce the incidence of subsequent falls. [74,75] A meta–analysis of 40 randomized controlled trials to prevent falls in older adults, mostly outpatient, demonstrated effectiveness in reducing the rate of falling; the most efficacious intervention consisted of multifactorial falls risk assessment and management. [76] The cost-effectiveness of multidisciplinary interventional programs is being assessed in a randomized controlled trial. [77]

Modification of This Question in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original question. (For new agenda items on this topic, see the subsection on falls in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Infectious Disease

See *New Frontiers,* pp. 66–67.

> ***EmergMed 21 (Level B)***: **Up to now, studies of fever and infectious disease in older emergency department patients have been observational and analytic retrospective studies. Prospective observational cohort studies, including longitudinal studies of outcomes and predictors of outcomes, are needed.**
>
> ***EmergMed 22 (Level A)***: **Descriptive studies of emergency-department based immunization programs have found them to be feasible. Intervention trials for older persons are necessary to determine if such programs are beneficial (because they access an underserved**

population) and whether they provide more cost-effective care and reduce adverse outcomes in comparison with usual care.

New Research Addressing These Questions: Fever remains a common and ominous presenting complaint among older ED patients. Identification of afebrile septic patients or febrile patients at increased risk of adverse outcome remains challenging. ED and non-ED studies have been limited to retrospective analyses with often contradictory findings. [78–80] In the United States, 58% of sepsis occurs among patients aged 65 or over. [81] The Surviving Sepsis Campaign guidelines include source control and rapid reduction of broad-spectrum antimicrobial coverage to monotherapy active against the causative organism, particularly among elderly patients with increased likelihood of repeat antibiotic exposures resulting in the accumulation of multi-drug–resistant microbes. [82,83] In an initial trial, early goal-directed therapy was randomized to patients with a mean age of 67,with a 16% absolute reduction in mortality without significantly increased adverse events associated with increasing age. [84]

A review of the National Hospital Ambulatory Medical Care Survey (NHAMCS) for all ED vaccinations between 1992 and 2000 described over 27 million ED vaccinations, although 93% were against tetanus. [85] ED patients are rarely vaccinated against influenza or pneumococcus, despite the increased frequency with which EM physicians manage the complications associated with these infections. [85,86] One single-center ED study noted that only 9% of adults aged 65 or over received an appropriate pneumococcal vaccination, despite the 90% goal set by Healthy People 2010. [87,88] When ED patients are referred to their primary care physician for pneumococcal vaccination, only 10% compliance is observed. [89] Tetanus immunity wanes to 59% in persons aged 70 or over, and 8.3% lack an appropriate rise in antitoxin titers in response to a tetanus booster. [90]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions. (For new agenda items on this topic, see the subsection on infectious disease in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Acute Coronary Syndromes

See *New Frontiers,* pp. 67–69.

***EmergMed 23 (Level B)*: Studies of techniques to improve recognition and appropriate treatment of acute coronary syndromes in older emergency department patients should be performed.**

***EmergMed 24 (Level A)*: Older patients should be included in randomized controlled trials of acute coronary syndromes treatment.**

New Research Addressing These Questions: Older patients, especially the oldest old (aged 85 and over) and women, present atypically with acute coronary syndromes. Although older patients represent 37% of acute myocardial infarctions (AMIs), they consisted of only 2% of study populations from 1960 to 1992 and only 9% from 1992 to 2000. [91] Regardless of the under-representation of seniors in these studies, several large randomized controlled trials have consistently demonstrated the efficacy of thrombolytic therapy in older AMI patients, with diminished relative risk countered by substantial absolute mortality reductions, although several recent observational studies have questioned

these results. [92–96] Additionally, several studies have indicated that the older patients most likely to receive the greatest benefit from guideline-based therapy (aspirin, β-blockers, angiotensin-converting enzyme inhibitors) are the least likely to receive them. [97–101] Older age is consistently associated with symptom-to-treatment time delays exceeding 12 hours, with reperfusion therapy efficacy diminished beyond this therapeutic window. [102,103] Although discrepant data exist, randomized trials of percutaneous intervention versus thrombolytics in the elderly patient generally favor percutaneous intervention. [104–112]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions.

Cardiopulmonary Arrest

See *New Frontiers,* pp. 69–70.

> ***EmergMed 25 (Level B)***: **Cohort or case-control studies are necessary to determine in which patients resuscitation for out-of-hospital arrest is futile. However, it appears that age alone should not be used to make this decision.**
>
> ***EmergMed 26 (Level B)***: **Prospective multicenter longitudinal studies on the clinical course of older emergency department patients with important conditions (abdominal pain, fever, acute coronary syndromes) are needed. (See also the Key Questions, at the beginning of the chapter.)**

New Research Addressing These Questions: Multiple prospective and retrospective studies on the outcome of cardiopulmonary arrest in older patients have recently been the subject of a systematic review. [113] Although the results vary, the majority of studies indicate that age is not an independent predictor of cardiac arrest mortality. [114–116] Instead, premorbid health, performance status, duration of cardiopulmonary arrest, delayed defibrillation, and initial rhythm are predictors of outcome. Patients with unwitnessed arrests and those with asystole have poorer outcomes at any age. Increased availability of cardiopulmonary resuscitation [117,118] and rapid access to automated external defibrillators [114] may improve survival of elderly cardiac arrest victims.

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions. (For a new agenda item on this topic, see the subsection on cardiopulmonary arrest in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

TRAUMA

See *New Frontiers,* pp. 70–74.

Triage and Mortality

> ***EmergMed 27 (Level B)***: **Research on older trauma patients would benefit from standardization of outcomes, including short- and long-term survival and also functional outcome.**

***EmergMed 28 (Level B)*: Valid and accurate ways to predict outcomes in older trauma patients must be developed on the basis of cohort or case-control studies that can identify risk factors for bad outcomes.**

New Research Addressing These Questions: Increasing age is associated with increased morbidity and mortality in geriatric trauma patients, [119–123] but good outcomes can be achieved when appropriate trauma care is provided to those individuals with survivable injuries. [124–128] Guidelines have sought to summarize the available data and provide a basis for standardization of care while outlining future research initiatives, though existing evidence is of varying quality and heterogeneous design. [129] Therefore, most of the recommendations are based upon Level III evidence. Among the guideline assertions are that all other factors being equal, age alone is not predictive of poor outcomes after trauma and patients aged 55 or over are under-triaged to trauma centers. Some have agreed and called for early trauma team activation using age as a criterion, [130] although others have noted increasing volumes at Level I trauma centers and suggested consideration of the mechanism of injury and comorbidities before deciding to transfer to a tertiary medical center. [131] The EAST guidelines also note extremely high mortality rates for patients aged 55 or over, with base deficits < -6 and for those aged 65 or over with a presenting Glasgow Coma Scale < 8, trauma score < 7, or a respiratory rate < 10. Pre-existing comorbidities independently affect outcomes for older trauma patients adversely. [132,133] Mild traumatic brain injury, either in isolation or in combination with multisystem trauma, is associated with increased mortality and worse functional outcomes. [134–137]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions. (For new agenda items on this topic, see the subsection on triage and mortality in New Horizons in Geriatric Emergency Medicine, at the end of the chapter.)

Resuscitation

See *New Frontiers*, pp. 74–75.

***EmergMed 29 (Level B)*: Cohort or case-control studies are needed to determine which older patients are at risk for multiple-organ failure and death after blunt trauma and to construct a predictive model.**

***EmergMed 30 (Level B)*: Exploratory studies are needed to identify new noninvasive ways of determining which older trauma patients might benefit from invasive monitoring and aggressive resuscitation.**

***EmergMed 31 (Level A)*: To determine whether early invasive monitoring and aggressive resuscitation of high-risk older trauma patients result in improved outcomes, large-scale randomized controlled trials should be performed, and outcomes that include not only short-term mortality but also long-term mortality and function should be used. (See also the Key Questions, at the beginning of the chapter.)**

New Research Addressing These Questions: The EAST guidelines generated recommendations based only upon Level II or Level III evidence for management of older trauma patients. Pulmonary artery catheter hemodynamic monitoring on any geriatric patient with a high-risk mechanism, chronic cardiovascular disease, or physiologic compromise was one of their recommendations. Additionally, they recommended maintaining cardiac index above 4 L/min/m^2 and oxygen consumption above 170 mL/min/m^2. [129]

Modification of These Questions in Light of New Research: Since the publication of *New Frontiers* no evidence has emerged to prompt a modification of the original questions.

NEW HORIZONS IN GERIATRIC EMERGENCY MEDICINE

Advancements in other specialties with potential impact upon ED care of older adults have prompted the addition of four new topics for the research agenda in emergency care for older patients: models of care, driving safety, stroke, and abuse or neglect. In addition, several questions have been added to the original topics in *New Frontiers* to address the need for alternative study designs or additional information.

GENERAL GERIATRIC EMERGENCY CARE

Patterns of ED Use

ED professionals have identified problems associated with the transfer of patients from long-term-care facilities. These include transfers that are deemed inappropriate and failure to provide information in a timely and useful manner. This is an area in which quality of patient care can be improved. The following questions should be answered.

EmergMed 32 (Level D): **Prospective studies are needed that identify patterns of emergency department use, risk factors, and interventions among older people living in residential and long-term-care facilities, given their exclusion from most emergency department studies of older adults.**

EmergMed 33 (Level C): **Prospective studies are needed to evaluate communication between the emergency department and primary physician and assess the relation of outcomes to the exchange of information, follow-up interval, and patient satisfaction toward services rendered.**

EmergMed 34 (Level A): **Randomized controlled trials with blinded outcome assessors and controlled interventions are needed to study whether measures to improve clinical outcomes in the emergency department can simultaneously reduce service utilization rates of older adults.**

Physician Training and Comfort

Existing initiatives to improve residency training in the care of elderly patients provide models that could be used in the field of emergency medicine. For example, the AGS, as part of its program to increase expertise in surgical and related medical specialties, established the Geriatrics for Specialty Residents (GSR) program. GSR, through a competitive process, identified and supported training projects.

EmergMed 35 (Level C): **Systematic evaluation of training effectiveness on clinically important outcomes is needed. This evaluation should begin with an assessment of the attitudes, knowledge, and skills of residents who participate in any program to improve emergency care for older adults.**

EmergMed 36 (Level B): **Prospective studies are needed to assess the effectiveness of interventions (eg, educational models, standardized protocols) for improving the quality of care of older emergency department patients.**

EmergMed 37 (Level B): **Systematic reviews and, when possible, meta-analyses are needed to summarize the best available diagnostic, prognostic, and therapeutic evidence with regard to care for older adults presenting to the emergency department. These reviews should follow established protocols, such as the Cochrane review methodology, including planned periodic updates.**

Environment

There is discussion, but no evidence, about the effect of the environment on the older patient's care and well-being. The ED environment includes the physical and social environment. Elements such as architecture, physical configuration, equipment, furnishings, décor, and communication are topics that have been discussed. Studies are needed to quantify the environmental effect on the outcomes of care, to identify areas for improvement, and to evaluate the changes. Evidence from individual studies could be synthesized into guidelines for improving processes of care of older ED patients.

EmergMed 38 (Level C): **Large prospective studies, including surveys of patients, caregivers, and staff, and observational studies of emergency department facilities and procedures should be performed to identify areas for improvement of the emergency department micro-environment. These could assess elements such as physical plant and communication during evaluation and pre-discharge, follow-up phone interviews by ancillary personnel, and assistance with social priorities (transportation, follow-up appointment scheduling, and medication procurement).**

EmergMed 39 (Level B): **Prospective studies, including surveys of patients, caregivers, and staff, should be conducted to describe the effect of changes in the micro-environment on processes of care for older emergency department patients.**

***EmergMed 40 (Level A)*: Randomized trials of the effects of specific modifications of the micro-environment on outcomes for older emergency department patients should be conducted.**

Models of Care

We examined alternative models to hospital care with regard to the decision in the ED to admit the older patient or discharge him or her for care at home. A Cochrane review of "hospital at home" care as an alternative to inpatient management of common admitting diagnoses reviewed 22 trials, with early hospital discharge demonstrating a nonsignificant trend toward decreased mortality for stroke and chronic obstructive pulmonary disease subsets. [138] In the United States, a quasi-randomized trial of community-dwelling elderly patients who required hospital-at-home care for pneumonia, heart failure, cellulitis, or chronic obstructive pulmonary disease demonstrated improved satisfaction scores from patients and family members without a difference in functional status or mortality at 2 weeks. [139] Other researchers have assessed home hospitalization or early hospital discharge after an uncomplicated first ischemic stroke, demonstrating a similar improvement in patient satisfaction in addition to lower rates of depression and nursing home admissions. [140,141]

***EmergMed 41 (Level B)*: Randomized trials are needed to assess alternatives to inpatient management of selected conditions in appropriate subsets of acutely ill older adults and to assess optimal candidate selection, patient and caregiver satisfaction scores, cost-effectiveness, mortality, and functional outcomes in varying health care settings.**

***EmergMed 42 (Level A)*: Randomized trials based on results of studies in EmergMed 41 should be conducted to evaluate the effectiveness of home care in selected older patients.**

Driving Safety

Motor vehicle crashes are the leading cause of injury-related mortality in the 65-to-74-year age group and are the second leading cause of death for all adults aged 65 or over. Older drivers are more likely to experience medication- and disease-related functional decline. Because current projections indicate increasing numbers of elderly drivers who are driving more miles per year at older ages than ever before, some have predicted a doubling of the number of automobile-related fatalities in the elderly age group by 2030. [142] Though a number of state motor vehicle policies have proven effective with regard to teenaged drivers, with the exception of mandatory seatbelt laws, these results have not been replicated with older drivers. [143] Because assessments of individual patients, family members, and clinicians are poor predictors of potentially hazardous drivers, [144,145] the American Medical Association and the National Highway Safety Administration have published the Physician's Guide to Assessing and Counseling Older Drivers to facilitate physicians' assessment of the older person's driving skills and guidance to change dangerous behaviors to avoid future accidents. [146] No single finding or combination of deficits has been demonstrated to identify individuals at high risk for future motor vehicle accidents, and no validated tool exists with which to screen elderly patients who use the ED. [147,148]

***EmergMed 43 (Level B)*: Prospective validation studies of brief, low-cost screening tools for use in the emergency department to identify impaired older drivers are needed; such tools must be acceptable to patients and staff.**

***EmergMed 44 (Level A)*: Randomized trials are needed to demonstrate that the emergency department identification of chronically impaired elderly drivers can reduce motor vehicle accident mortality and morbidity rates.**

Medication Use

The cross-cutting issues chapter of *New Frontiers* (see pp. 369–419) identified medication misuse, overuse, and underuse as an area of concern. These remain issues for emergency physicians and researchers.

***EmergMed 45 (Level B)*: Prospective studies are needed to validate the use of Beers' criteria to assess medication use by older emergency department patients.**

***EmergMed 46 (Level A)*: Prospective studies are needed to determine the prevalence of clinically meaningful adverse drug events among older emergency department patients.**

***EmergMed 47 (Level A)*: Randomized trials are needed to demonstrate that improved recognition in the emergency department of potential adverse drug events in older patients can reduce the incidence rates of adverse events.**

SCREENING AND COMPREHENSIVE GERIATRIC ASSESSMENT IN THE ED

General Geriatric Assessment Tools

Screening and assessment studies conducted in the ED (see discussion of the Identification of Seniors at Risk [49] and Triage Risk Screening Tool [48] projects in the subsection on general geriatric assessment tools in Progress in Geriatric Emergency Medicine) have primarily been conducted by research personnel and have not been part of normal ED procedures. There has been discussion, but no research, about alternate ways of implementing screening programs.

***EmergMed 48 (Level C)*: Prospective studies are needed to evaluate the cost-effectiveness of interventions by non-nursing, non-physician specialists such as trained "geriatrics technicians."**

***EmergMed 49 (Level B)*: All studies of emergency department interventions should include quality-of-life measures and indicators of health care service delivery quality among the outcomes assessed.**

***EmergMed 50 (Level A)*: Randomized controlled trials of emergency department case-finding interventions should be conducted with**

blinded outcome assessors to measure the effect of these interventions on outcomes of care.

SPECIFIC CLINICAL SYNDROMES

Abdominal Pain

Research published since *New Frontiers* (see descriptions in the subsection on abdominal pain in Progress in Geriatric Emergency Medicine) has cast light on the value of diagnostic testing and imaging in the evaluation of older patients presenting with abdominal pain. However, they do not address the question of whether there is a benefit to the patient with earlier detection.

EmergMed 51 (Level A): **Prospective cohort studies are needed to determine whether the rapid identification of older emergency department abdominal pain patients at high risk for adverse outcomes or need for timely surgical intervention can improve outcomes while lowering overall costs.**

Falls

ED-based and outpatient research published since *New Frontiers* (see descriptions in the subsection on falls in Progress in Geriatric Emergency Medicine) identified successful falls reduction programs. These studies have not created a cost-effective falls prevention strategy for use in the ED.

EmergMed 52 (Level B): **Prospective cohort studies to develop a brief, effective screen are needed to identify patients that are most likely to benefit from falls prevention programs.**

EmergMed 53 (Level A): **Randomized controlled trials are needed to assess the efficacy and cost-effectiveness of emergency department–initiated falls prevention interventions for elderly patients at high risk for falls to reduce repeat falls, injurious falls, and subsequent use of health care resources.**

Infectious Disease

Research published since *New Frontiers* identified lack of tetanus immunity and less-than-optimal rates of pneumococcal and influenza vaccination as continuing issues in prevention of infectious disease in older patients. It is not known whether the less-than-optimal rate of tetanus immunity is due to a delayed amnestic response or lack of prior immunization. Pneumococcal and influenza vaccinations are recommended for older adults. The ED is one venue for administering these vaccinations, but it is not clear whether the ED is a cost-effective location for an immunization program.

EmergMed 54 (Level B): **Prospective cohort studies are needed to determine whether older adults' less-than-optimal tetanus immunity is the consequence of a delayed amnestic response to tetanus immunization or a lack of previous immunizations or immunosenescence.**

***EmergMed 55 (Level B)*: Randomized controlled trials of emergency department–based immunization programs for pneumococcus and influenza are needed to determine whether such programs are cost-effective and whether they reduce pneumonia and influenza incidence and death rates.**

Stroke

A Cochrane review of thrombolytics in acute ischemic stroke treated within 3 hours of symptom onset noted a significant decrease in the odds of dependency or death, [149] but with the exception of the National Institute of Neurological Disorders and Stroke trial, all studies specifically excluded those over 80 years of age. [150–152] Therefore, little information is available to confidently assess the safety or efficacy of thrombolysis in this stroke population. A retrospective review of acute ischemic stroke patients aged 80 or over demonstrated an intracranial hemorrhage rate of 10%, with no improvement in overall mortality when compared with historical cohorts. [153] A multicenter retrospective review of those aged 80 or over demonstrated no differences in favorable or poor outcomes, though a nonsignificant tendency for higher in-hospital mortality was noted. [154] Some have proposed stroke-specific Acute Care for Elders (ACE) units, [155] and others have established home care models for managing uncomplicated acute stroke patients. [140,141] Model systems for stroke care begin in the ED and require integration between the ED and other hospital departments.

***EmergMed 56 (Level B)*: Randomized controlled trials evaluating models of care for uncomplicated elderly ischemic stroke patients presenting to the emergency department, including Acute Care for Elders (ACE) units and early discharge to home with supportive care, should be conducted. These trials should assess cost-effectiveness, patient satisfaction, and long-term outcomes, including death and disability.**

***EmergMed 57 (Level A)*: Randomized controlled trials of older acute ischemic stroke patients presenting within 3 hours of symptom onset should be conducted with intravenous tissue plasminogen activator to assess bleeding risk and functional outcomes.**

Cardiopulmonary Arrest

Research published since *New Frontiers* demonstrated the value of automated external defibrillators (see descriptions in the section on cardiopulmonary arrest in Progress in Geriatric Emergency Medicine). The value for aged populations specifically has not been demonstrated.

***EmergMed 58 (Level A)*: Prospective community trials of cardiopulmonary resuscitation training for seniors and rapid access to automated external defibrillators are needed to evaluate the effect of early resuscitation and defibrillation on age-, gender-, and**

disease-matched controls for important outcomes such as death and return to baseline function.

TRAUMA

Triage and Mortality

Research published since *New Frontiers* (see descriptions in the section on triage and mortality in Progress in Geriatric Emergency Medicine) indicates the need for the following additions to the research agenda.

EmergMed 59 (Level B): **All research concerning the older trauma patient should use similar functional outcomes and standardized definitions of what constitutes "elderly" and "pre-existing medical condition."**

EmergMed 60 (Level A): **Prospective trials are needed to evaluate the diagnostic and prognostic value of injury mechanism, age, traumatic brain injury, and injury severity scores in improving outcomes in older emergency department patients with blunt and penetrating trauma.**

Abuse and Neglect

Elder mistreatment includes abuse, neglect, exploitation, and abandonment of an older person. Recognized as a significant problem since the 1970s, elder mistreatment affects an estimated 1.3% to 10% of the elderly age group, with differing results likely related to widely varying definitions of abuse. Although several causative theories have provided the basis upon which screening tools have been developed, little research has tested these competing theories, even though they form the foundation of assessment instruments being used. A variety of screening and intervention tools exist, though some are too time-consuming for routine use in the ED , and many require input from the caregiver, who may or may not be present during the ED evaluation. Few have been validated in ED settings, and the prevalence of elder mistreatment among different demographic subsets of those utilizing the ED has not been studied. [156–161]

EmergMed 61 (Level B): **Screening tests for elder mistreatment suitable for use in the emergency department should be developed and validated against the tests developed for other settings.**

EmergMed 62 (Level B): **Cross-sectional studies are needed to estimate the prevalence of elder mistreatment among older emergency department patients.**

EmergMed 63 (Level A): **If a high prevalence of elder mistreatment is found (see EmergMed 62) and a rapid identification tool is validated (see EmergMed 61), interventional trials of elder mistreatment detection and management in the emergency department should be performed.**

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