Health Care for Older Americans with Multiple Chronic Conditions: A Research Agenda

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In response to the substantial and increasing healthcare requirements of older adults with multiple chronic conditions and acknowledgment of major gaps in knowledge and funding, two expert meetings were convened to identify a research agenda addressing the needs of this population. Research priorities are to develop and evaluate more-effective models of health care, develop and evaluate management practices and organizational structures that lead to improved long-term care, develop and implement relevant and effective preventive health strategies, determine the most effective interventions in patients who have concurrent cognitive or emotional impairments, and determine how interventions during and after hospitalization affect the outcomes of hospitalized patients. **J Am Geriatr Soc 56:149–159, 2008.**

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The prevalence of chronic diseases increases with age, and as a result, the prevalence of concurrent chronic conditions also increases; four of every five older Americans live with at least one chronic condition,[1] and 48% of Medicare beneficiaries aged 65 and older have three or more chronic conditions and 21% have five or more.[2] The co-occurrence of chronic conditions may lead to faster disease progression, problems diagnosing new conditions, and treatment interactions causing adverse outcomes or altered responses and may also contribute to the complexity of patient care across settings and among care providers. The presence of multiple chronic conditions (MCCs) has important effects on prognosis, disability, quality of life, mortality, and healthcare utilization.[3] There is evidence that care focused on a single disease can lead to inadequate attention to other coexisting conditions.[4]

There are major gaps in the knowledge necessary for the optimal health care of the large and increasing population of older adults with MCCs, as well as lack of widespread translation and implementation of interventions shown to be effective. Funding for research applicable to persons with MCCs is frequently ignored in the agendas of private and public funding agencies. Funders often have a disease- or condition-focused approach to setting research priorities,[5] and research questions focusing on MCCs are more difficult to formulate and address with traditional scientific approaches than are questions focusing on single conditions because of the interactions between the multiple diseases and treatment effects.

The concepts of disease, disability, and frailty have recently been posited to be distinct, although overlapping, concepts.[6,7] Diseases can be viewed as intermediate conditions between the physiological and pathological processes of aging (e.g., inflammation, oxidative stress) and outcomes (e.g., mortality, functional status, quality of life).[8] Although not all patients with MCCs are frail or disabled, MCCs can contribute to frailty, evident as an excess vulnerability to stressors with a reduced ability to maintain homeostasis after a destabilizing event.[7] Disability can also result from MCCs or frailty.[9] Conversely, the vast majority of older persons who are frail or disabled have MCCs.

In response to the substantial and increasing healthcare requirements of older adults with MCCs and the major gaps in knowledge and funding, the Agency for Healthcare Research and Quality (AHRQ), the Society of General Internal Medicine, and the John A. Hartford Foundation

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sponsored two meetings that led to the development of a research agenda to address the needs of this population. Three objectives were addressed at these meetings: to reach consensus on research priorities that need to be addressed to optimize health care of older adults with MCCs, to explore the role of research networks in implementing this research agenda, and to identify potential sources of funding for implementing and sustaining the agenda. The focus of this article is the first objective.

The planning committee members (listed at the end of this paper) selected seven topic areas for discussion: healthcare systems, pharmacotherapy, prevention, palliative and end-of-life care, long-term care, inpatient care, and mental health. These topic areas were felt to represent the areas of highest priority to healthcare providers and decision-makers who are experts in the care of older adults with MCCs and are consistent with Priority Areas for National Action established by the Institute of Medicine.[10] Meeting participants, numbering approximately 50 and representing a broad array of expertise, participated in one of the seven topic groups; each group worked to achieve the three meeting objectives listed above for their topic area.

Each topic group was asked to prioritize its list of research questions by a consensus process within the group using criteria from the Priority Areas for National Action.[10] These criteria included impact (the extent of the burden (disability, mortality, and economic costs) imposed by a condition, including effects on patients, families, communities, and societies); improvability (the extent of the gap between current practice and best practice and the likelihood that this gap can be closed); inclusiveness (the relevance of a research area to a broad range of individuals with regard to age, sex, socioeconomic status, and race or ethnicity); and feasibility (the extent to which the topic and priority areas could be addressed using current or achievable methods and a reasonable quantity of resources). This article presents the compilation of the research priorities identified through this process.

Research Priorities in All Topic Areas

The seven topic groups presented their priorities to all meeting participants for discussion, and all participants were asked to indicate their top five priorities across all seven topic areas. These votes were tallied to yield the overall research priorities provided in Table 1.

Research Priorities for Each Topic Area

Priority foci for research for each of the seven topic areas, along with examples of specific research questions, are presented in Table 2.

Healthcare Systems

Over the past decade, models of care have been developed for persons with chronic conditions,[11] and improved patient outcomes in populations with a single disease[12] or for a single outcome (e.g., falls[13]) have been demonstrated, but there is concern that disease-specific or condition-specific management approaches and guidelines may not be appropriate for older persons with MCCs.[5,14] Effective systems of care have been developed for older persons with MCCs

Table 1. Research Priorities for Older Adults with Multiple Chronic Conditions

1	To develop and evaluate more-effective models of health care for disease treatment in the primary and specialty care outpatient settings
2	To develop and evaluate management practices and organizational structures that lead to more-effective, more-efficient long-term care
3	To develop, evaluate, implement, and disseminate relevant and effective primary, secondary, and tertiary preventive health strategies
4	To determine the most effective and most cost-effective interventions in those who have concurrent cognitive or emotional impairments
5	To determine how interventions during and after hospitalization affect the outcomes of hospitalized patients

The entire group of attendees identified these five topic areas as the overall priority areas for research relevant to older adults with multiple chronic conditions.

in specific healthcare settings,[15–19] but adoption of these innovations outside research settings has been slow. For example, successful models of outpatient geriatrics consultation,[20] temporary management by a geriatrics team,[21] and hospital at home[22] have demonstrated benefits and cost-effectiveness, but there has been little dissemination into mainstream health care.

The measurement of quality of care and patient outcomes is currently problematic when considering older populations with MCCs. Available quality measures tend to focus on processes of care and on outcomes that may be irrelevant to some older populations (e.g., lipid concentrations in elderly persons with limited life expectancy) or insufficiently validated in older adults or that do not reflect the effect of the interactions between chronic conditions on outcomes. Patient preferences are rarely considered when assessing outcomes. The available measurement instruments may not capture or be particularly responsive to changes in everyday function and quality of life that older adults and their families value.

Randomized, controlled trials may be infeasible or inadequate to assess the effect of interventions on older persons with MCCs. This population is often excluded from clinical trials, and studies that include older persons most often focus on single diseases and on short-term or intermediate outcomes.

Research Priorities. The first research priority related to healthcare systems is to develop and test new models of health care to address the needs of older adults with MCCs. Current best practices should be identified, described, evaluated in detail, incorporated into new models, and then reevaluated in the new context. These models must be comprehensive (across diseases, providers, and settings) and longitudinal, with linkages across sites of care and between medical and social services provided outside the healthcare system. Models must encompass the behavioral aspects of health and health care, including empowerment and support of informal caregivers.

Models of care must incorporate patient-defined goals into the routine provision of care and into the healthcare system more broadly. As much as possible, these models should strive for concordance between the goals of the patient, caregivers and family, healthcare providers, and the healthcare system.

Table 2. Research Foci and Examples of Research Questions

Within each of the seven topic areas, priority research foci are presented along with examples of research questions. All questions relate specifically to older adults with multiple chronic conditions (MCCs).

1. Healthcare systems

  a. Develop and test new models of health care

- What models of care can facilitate continuity of care as patients move across multiple settings?
- How can systems approaches be implemented in small group practices where the majority of care of older persons is delivered?
- How can information technology be implemented to facilitate care of older adults with MCCs?
- What resources are necessary to design care for persons around a medical home with a continuous healing relationship?
- What are the costs and benefits of having a medical home?
- What effectiveness measures (including but not limited to cost-effectiveness) are needed to demonstrate the value of a medical home to payers?

  b. Develop and validate relevant outcome measures

- What structures and approaches can help patients with shared decision-making?
- What new measures of quality of care are needed, including those that capture concordance between patient and physician and between patients' desired and received care?
- How can goal attainment scaling be expanded to capture additional perspectives (e.g., providers and the healthcare system)?

  c. Develop and facilitate the use of alternative, valid research study designs to examine intervention effectiveness

- Can new approaches to using observational data be developed that better predict the findings of clinical trials?
- How can nonrandomized study designs with comparison groups minimize selection and other biases?

  d. Promote the diffusion and translation of effective interventions

- Which published interventions are worthy of dissemination, and what steps are needed to facilitate widespread adoption?
- What are the financial (e.g., gaps in coverage) and nonfinancial barriers to adoption of successful models of geriatric care?
- Can existing theoretical models be used to facilitate adoption of geriatric care innovations?

2. Pharmacotherapy

  a. Head-to-head comparisons of the safety and effectiveness of active drugs

- What is the comparative effectiveness and safety of multidrug and combination treatment regimens and of longitudinal treatment strategies?

  b. Medicare adherence

- What are the most appropriate methods and metrics with which to measure adherence?
- What are the health consequences of varying levels of nonadherence?
- What are the behavioral and health effects of interventions designed to improve adherence?
- How can health information about drugs be optimally communicated to patients and caregivers?

  c. Healthcare delivery

- What are the effects of the of the "donut hole" in coverage and the effects of Medication Therapy Management Programs under the Medicare Prescription Drug, Improvement, and Modernization Act of 2003?[27]
- What are effective uses for computerized clinical decision support for pharmacotherapy interventions?[28]
- How can medications best be coordinated across healthcare and community settings?

3. Prevention

  a. Develop a conceptual framework and general principles that facilitate specific and targeted recommendations for preventive services

- How would these principles be implemented at various levels (individual patient, practice, community)?
- How would organizations reorganize themselves to deliver particular interventions?
- What approaches are available to identify the most effective strategies that people will engage in?
- How can preventive interventions that improve health of older adults with MCCs be developed?

  b. Research to develop and rigorously evaluate new prevention strategies that specifically target older persons with MCCs

- Can a structured physical activity program prevent or delay the onset of major mobility disability, and hence maintain independence, in older adults with MCCs,[76] and can these benefits be maintained over time?
- Under what circumstances should a referral to a physical therapist take precedence over aggressive blood pressure management in an older adult with MCCs who presents with a fall?

4. Palliative and end-of-life care

  a. Defining optimal care

- How can the onset of advanced illness and the related care needs be identified?
- How can these needs be categorized in a manner that is useful for the healthcare provider and system?
- What are the characteristics, spectrum, and triggers (physiological, behavioral, and social) of advanced illness?
- What are the sentinel events, and how can they be anticipated, identified, created, and planned for?
- What is the trajectory (or trajectories) of the person's and caregiver's experiences?
- What are better and worse courses of care?
- To what extent is there small area variation in care experiences?

Table 2. (Contd.)

b. Evaluation of clinical interventions that address unmet physical and psychosocial needs
- What is the effect of having conversations about, and using tools for, end-of-life planning on health outcomes, costs, and health-related quality of life?
- Can better treatments (pharmacological and nonpharmacological) be developed to manage symptoms?
- How can effective diffusion and translation of best practices in palliative and end-of-life care be evaluated and promoted?
- How can community-based participatory research inform these processes?

c. Workforce issues
- What are the current and future workforce needs?
- What is the experience of formal and informal professional and family caregivers?
- How could these roles be defined and refined relative to the needs of older adults at different points in their illness trajectory?
- What formal and informal caregiver expertise is needed and when?
- Are there innovative models of patient-centered care that address the identified trajectory of needs?
- How do current workforce models compare (including international examples)?
- What are the roles of public agencies and the family in current models of care? How should these roles evolve?
- What is the role of community-based organizations?
- What is the role of technology in addressing workforce shortages?
- What are the key characteristics of an effective workforce? Characteristics that could be examined include reliability (someone who is there when needed), compassion, competency, and continuity.
- What are the effects of caregiving on the caregiver, including economic effects and health outcomes?

5. Long-term care (LTC)

a. Organizational structures and practices
- What LTC innovations lead to high-performing organizations—organizations with improved outcomes and patient-centered care?
- How can effective models be adopted and sustained?
- What are the models of care that improve outcomes for patients transitioning across settings of care?
- How does the use of alternative pharmacy delivery systems (e.g., systems for recording and administration of medications) affect the quality of care?

b. The human resource potential needed for the delivery of high-quality LTC
- What are the innovations in staff models that lead to effective and efficient person-centered care?
- Do new caregiving paradigms that integrate and support formal and informal care-giving improve outcomes?
- Do patient outcomes improve when direct care workers are given consistent assignments? Are these models cost neutral? Do they improve staff retention?
- What tangible and intangible incentives affect care?

c. The use of emerging technologies to promote independence, self-care, and quality of care in home, community-based, and residential care settings
- How should unified medical record and associated regional health information organizations be designed to improve patient outcomes, including those across settings of care?
- What organizational and practice models lead to implementation of best practice to improve patient outcomes?
- How can emerging technology (e.g., assistive technology, telemedicine) be used to promote independence and self-care in the home and in residential settings?
- What are the incentives and barriers (the business case) for LTC providers to use these technologies?

d. Preparation of older adults and their families to anticipate LTC needs
- How can older adults with MCCs age in their own residence?
- How should community-based service delivery systems (including primary care) be designed to promote independence and self-care?
- What are the functional changes that predispose a person to LTC use?

e. Data systems and measurement techniques
- What complementary measurement techniques can be used to offset the "floor" or "ceiling" effects noted in measurement of outcomes in the elderly?[77,78]
- How is function (physical, cognitive, behavioral) best measured?
- Are there different measures for different patient needs?
- How do we implement valid measures (e.g., of cognitive function or depression) in the medical record and have these tools used effectively across all settings of care?
- How can information derived from observational studies or best practices be integrated into day-to-day care in LTC facilities?

6. Inpatient care

a. Effectiveness of interventions during and after hospitalization
- In hospitalized older adults with MCCs, how effective are interventions (e.g., coronary revascularization for acute cardiac syndrome) that have been shown to be effective in other populations?
- What are the effects of interventions (e.g., exercise or congregate dining) designed specifically to promote cognitive, physical, and social function in hospitalized patients?
- How does communication, or lack of communication, between multiple providers involved in an episode of hospital care affect patient outcomes?
- How can the quality of prescription practices to hospitalized older adults with MCCs be measured?

Table 2. (Contd.)

- Does medication reconciliation during transitions in care prevent adverse effects and improve patient outcomes?
- How can the risk of deterioration in function be identified and what can be done to prevent it?

b. Organizational factors and outcomes of hospitalization

- How are the outcomes of acutely ill patients affected by hospitalization compared with those in alternative sites of care (e.g., the "home hospital")?
- How do financial considerations influence decisions to hospitalize and when to discharge?
- What aspects of transitions in care (e.g., leaving the hospital) affect subsequent outcomes, and how can transitions be changed to improve patient outcomes?

c. Methods for determining the effects of hospitalization and hospital interventions

- What hospitalizations predictably do not improve patient health or comfort?
- How can inpatient clinical trials be designed to include older adults with MCCs?
- How should the validity of observational studies be assessed?
- How can the results of trials of complex interventions be extended to other sites over time?
- How should clinical decisions be made when evidence is deficient?
- What roles do patients and their proxies play in decisions made during the hospitalization?

7. Mental health

a. Health and quality of life

- How do older adults and their significant others value emotional well-being (e.g., being free of depression and anxiety) and cognitive function?
- How can preventive and therapeutic interventions focused on maintaining and improving cognitive, emotional, and physical function in late-life be prioritized?

b. Interactions between cognitive or emotional impairment and chronic medical illness and their effect on health outcomes and care delivery

- What patterns or clusters of cognitive and emotional disorders have the most significant effects on health outcomes?
- How does emotional or cognitive impairment affect the ability to initiate, participate, and respond to treatment for MCCs?
- How do impairments in executive function common in dementia and depression affect a patient's ability to provide complex self-care for chronic medical illnesses such as diabetes mellitus?

c. Intervention effectiveness

- What are the most effective and most cost-effective interventions for older adults with cognitive and emotional impairment and MCCs?
- How can evidence-based biological and psychosocial interventions for cognitive and emotional disorders be applied most effectively in older adults?
- Under what circumstances and in what settings is collaborative care management in which primary care providers work together with mental health specialists to care for depression and other common mental disorders effective and cost-effective for older adults with MCCs?
- What medication management strategies for depression, anxiety disorders, and cognitive disorders maximize benefit and minimize harm?
- How can family members and caregivers be effectively involved in care for patients with cognitive and emotional impairments?
- How are effective interventions for older adults with common mental disorders such as depression or dementia best disseminated and implemented in diverse care settings?

The role of the medical home (primary health care that is accessible, family centered, coordinated, comprehensive, continuous[23]) for persons with MCCs needs to be defined and evaluated. Such models likely need to be adapted for individuals with special needs, such as cognitive impairment, social isolation, and frailty and for settings such as the nursing home.

The second priority is to develop and validate relevant outcome measures that incorporate the preferences, goals of care, and values of patients and their caregivers; are sensitive to meaningful changes; and can be used for clinical and policy-related decision-making. For example, goal attainment scaling[24] has been used in rehabilitation and some geriatric settings and considers the perspectives of the patient and caregiver, as well as those of the clinician.

The third priority is to develop and facilitate the use of alternative, valid research study designs to examine the effectiveness of interventions in older adults, particularly with MCCs, who are excluded or cannot participate in studies using conventional designs. Additional research is needed on approaches to risk assessment of older populations such as propensity scores and instrumental variables to adequately capture risk in individuals and minimize confounding and bias that threaten the validity of research findings.

The fourth research priority is to promote the diffusion and translation of effective interventions into the fabric of health care to ensure that older adults derive the benefits of research advances. One theoretical framework for such research is Rogers' model of diffusion, which examines the characteristics of innovations, the decision to adopt, and the rates and patterns of spread.[25]

Pharmacotherapy

Prescription medication use is exceedingly common in older adults,[26] and the use of multiple medications is the norm, particularly in persons with MCCs; 51% of those aged 65 to 74 and 60% of those aged 75 and older used two or more prescription drugs in the previous month.[26]

There are striking gaps in the knowledge needed to make informed risk—benefit drug-therapy decisions in older persons. Many of these gaps are due in part to limitations in testing drugs before they are approved for use. For example, little is known about the comparative effectiveness of drugs, because most drugs are tested against inactive placebos rather than therapeutic alternatives.

Other characteristics of pre-approval testing that contribute to knowledge gaps include the modest number of older persons included in clinical trials, the atypical nature of the older adult in clinical trials who may have only one chronic condition and use no or few medications, the limited duration of pre-approval studies, and the reliance on surrogate markers rather than clinically important outcome measures. In addition, the behavioral and healthcare delivery factors surrounding pharmacotherapy, such as nonadherence and systems intended to improve medication use, are not the focus of pre-approval testing. As a result, many important questions about pharmacotherapy remain unanswered.

Research Priorities. Research priorities in pharmacotherapy for older adults with MCCs are related to biology, behavior, and healthcare delivery. The priority research areas related to the biological aspects of pharmacotherapy include the need for head-to-head comparisons of the safety and effectiveness of active drugs, as well as information on the comparative effects of multidrug and combination treatment regimens and of longitudinal treatment strategies.

From a behavioral perspective, important research priorities concern medication adherence, the most appropriate methods and metrics with which to measure adherence, health consequences of varying levels of nonadherence, and the behavioral and health effects of interventions designed to improve adherence. Research is also needed to identify the best ways to communicate health information to patients and caregivers, especially the information needed to make informed treatment decisions.

Knowledge gaps concerning healthcare delivery also need to be addressed. The prescription drug benefit enacted as part of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003[27] has many features and components that need to be better understood. These include the effects of the "donut hole" in coverage and the effects of Medication Therapy Management Programs. Finally, with the increasing opportunity to affect pharmacotherapy through computerized clinical decision support,[28] the best application of such technology is an important research area.

Prevention

Primary prevention (preventing disease in persons without known disease), secondary prevention (the identification and management of people who are in an early stage of the disease),[29] and tertiary prevention (the treatment of established disease) are often implemented in ways that do not reflect the underlying prognosis or most relevant goals and values of older adults with MCCs.[30] In the setting of MCCs, prognosis is often diminished.[6] Although several programs of tertiary prevention have been shown to be effective in forestalling functional decline, disability, and falls in older adults,[31] significant organizational and financial barriers have precluded their widespread implementation.

Generic guidelines based on evidence from middle-aged or highly selected populations with a single disease usually drive prevention in older persons with MCCs,[14] but the increasing prominence of quality assurance initiatives and their link to pay-for-performance have brought about critical scrutiny of the application of these guidelines to older

adults with MCCs.[5,14] Strict adherence to these guidelines can potentially produce more harm than benefit in the older adult with MCCs.[14,32,33]

Research Priorities. The group presented one overarching research priority area: to develop, evaluate, and implement effective preventive strategies for older persons with MCCs. First, a conceptual framework, based on the principles of geriatric medicine, would be helpful in developing recommendations for specific preventive interventions targeted toward older persons with particular comorbidities. Such a framework would define general principles; encompass screening, evaluation, and outcomes; and address the continuum of primary to tertiary prevention.

The available evidence to support recommendations for preventive health strategies in older persons with MCCs must be identified, critically evaluated, and synthesized, and the resulting recommendations must be prioritized. A significant amount of data currently exists that can be used to develop the first generation of preventive care guidelines for older adults with MCCs.[14,31,34,35] There is also a need for further research to develop and rigorously evaluate new prevention strategies that specifically target older persons with MCCs at the patient, healthcare system, and population levels. It is important to determine how to prioritize successful prevention strategies in the context of the complex and multifaceted needs of this population and with the input of patients and their families.

There is a need to move beyond traditional benchmarks for success such as mortality to include other important and patient-centered outcomes such as frailty, functional decline, and disability. Research is needed on how to implement evidence-based prevention strategies, especially those that are shown to be cost-effective,[36] by healthcare systems and at the population level. Changes are needed in health policy and in the physical environment (e.g., to promote physical activity), and partnerships with communities should be developed.

Palliative and End-of-Life Care

Although persons with MCCs may live for years, life expectancy is often limited as a result of progression of one or more of the chronic conditions over time. Inadequately treated physical and emotional distress; fragmented care systems; poor communication among doctors, patients, and families; and enormous strains on family caregiver and support systems often characterize medical care for these patients.[37]

The development of the specialty of palliative medicine has been a critical step in addressing the unmet needs of patients with poor prognosis and their families, although the evidence base to support the basic elements of palliative care clinical practice (i.e., pain and symptom management, communication skills, care coordination, and models of care) is sparse compared with those of more-established medical specialties, and the research infrastructure and numbers of persons actively engaged in palliative care research are insufficient to sustain the field. Funding for palliative care research is inadequate and primarily limited to cancer-related care. Over the past 10 years, a series of reports from the Institute of Medicine, the National Institutes of Health, and the American Academy of Hospice and

Palliative Medicine have called for substantial investment in palliative care research to address these knowledge gaps.[37–41]

Research Priorities. Research priorities in palliative and end-of-life care are related to defining optimal care, evaluating treatment effectiveness, and workforce issues. Given the lack of current knowledge, defining optimal care will first require documenting and empirically validating trajectories of the experiences of persons with noncancer chronic illness common in the patient with MCCs (e.g., frailty, chronic organ failure). To accomplish this, currently available data sets need to be organized, integrated, analyzed, and interpreted, while understanding their limitations. Opportunities to add relevant items (e.g., health and quality-of-life aspects of persons with MCCs and their caregivers) to ongoing or future data collection efforts should be explored, including the Medicare Current Beneficiary Survey, the National Health and Nutrition Examination Survey, and ongoing longitudinal studies. Novel strategies must also be developed to empirically evaluate treatment effectiveness. Currently available, as well as new, potentially effective clinical interventions must be identified and studied in this population.

Workforce needs related to formal and informal caregivers must be assessed and optimal roles defined. Innovative models of patient-centered care must be developed that address the identified trajectory of needs. The key characteristics of an effective workforce should be examined, including reliability (someone who is there when needed), compassion, competency, and continuity.

Long-Term Care

It is estimated that between 5 and 7 million people aged 65 and older need long-term care (LTC) services and support to assist them in life's daily activities.[42,43] The likelihood of using LTC increases substantially with age, and as the "baby boom" generation ages, the demand and cost for these services will grow precipitously.[44] Of elderly Medicare beneficiaries residing in LTC facilities, 73% have two or more chronic conditions.[45,46]

In the 1980s, when the first Institute of Medicine report on LTC was published, LTC was synonymous with nursing home care,[47] but since that time, there has been large growth in LTC provided in other settings, including home care and residential care (often referred to as assisted living).

Research Priorities. The group identified five priority research areas. The first focused on organizational structures and practices that lead to effective, efficient, and patient-centered LTC across the full range of LTC settings. Descriptive, analytical, and longitudinal epidemiological research, as well as evaluation and translational research, are needed, including economic evaluations. Outcomes should be patient and family centered, including quality of life and physical function.

The second priority is research that could help realize the human resource potential that is needed for the delivery of high-quality LTC. The focus here should be broad, including recruitment of staff, training and support, deployment, and reward systems. There must be recognition of the paid and unpaid workforce, especially those providing direct hands-on care (e.g., nursing assistants, personal care workers, family caregivers).

Third, research is needed to evaluate the use of emerging technologies to promote independence, self-care, and quality of care in home, community-based, and residential care settings. Fourth, research is needed on how to best prepare older adults and their families to anticipate LTC needs so that they can do well in the LTC system. Fifth, analyses of data systems and reliable and accurate measurement techniques are needed that focus on patient-centered outcomes.

Inpatient Care

People with chronic conditions make up 81% of total inpatient stays.[2] Inpatient use increases with the number of chronic conditions; annual hospitalization rates are 17% for three conditions and 31% for five or more.[2] The delivery of high-quality, coordinated care is critical for older adults with MCCs. Hospitalizations for ambulatory care—sensitive conditions (conditions for which timely and effective outpatient primary care may help to reduce hospitalizations) increase dramatically with the number of chronic conditions, suggesting that optimal ambulatory care may decrease unnecessary hospitalizations.[2]

Several interventions that facilitate communication between health professionals and optimize care to prevent disability and promote independence have improved health outcomes of hospitalized older adults without increasing healthcare costs.[19] Each of the interventions involved multiple components to reduce iatrogenic complications; promote strength, mobility, and functional independence; and maintain social integration, although there is little information about the relative contributions of individual intervention components, the interaction of the components, or the efficacy of interventions sustained over time or implemented in different sites with comparable benefits. The value of interventions that target patients with specific characteristics has not been determined, and interventions for patients admitted to nonmedical services (e.g., surgery or intensive care) have not been evaluated.

Research Priorities. The group identified three broad research priorities. The first is to determine how interventions during and after hospitalization affect the outcomes of hospitalized older persons with MCCs. Research in this area would lead to the identification of best practices. The second research priority is to determine how organizational factors affect outcomes of hospitalized older patients with MCCs and relate to optimal sites of care for patient-centered outcomes and transitions across care settings.

The third priority is to improve methods for determining the effects of hospitalization and hospital interventions on older persons with MCCs. An examination is needed of hospitalizations that are "wasted" in the sense that they predictably do not improve patient health or comfort. Methodological research focused on complex interventions, the inclusion of older adults with MCCs in clinical trials, the generalizability of interventions effective in specific settings, and biases associated with observational studies is needed.

Mental Health

Almost 20% of older adults experience mental disorders such as depression, anxiety disorders, alcohol and prescription drug misuse, and cognitive impairment such as delir-

ium or dementia.[48] These disorders present a tremendous burden for older adults and their family members and are associated with excess disability, deleterious interactions with poor physical health,[49] mortality[50] (including suicide[51,52]), quality of life,[53] and higher healthcare costs.[54] Mental disorders such as depression and cognitive impairment also interfere with the effective management of chronic medical disorders by affecting executive functioning required for self-management of chronic illnesses[55] and reducing adherence to medications.[56] There is much that can be done for older adults with MCCs to preserve or improve mental health and cognitive function,[48] but few older adults receive effective mental health care from primary care providers or specialty mental health providers.[57,58]

Research Priorities. The first research priority is to determine relevant health and quality-of-life outcomes related to cognitive and emotional health as perceived by patients, caregivers, providers, payers, and other stakeholders. The second research priority examines the interaction between cognitive or emotional impairment and chronic medical illness and their effect on health outcomes and care delivery. Third, the most-effective and most cost-effective interventions for older adults with cognitive and emotional impairment and MCCs must be determined.

Two additional crosscutting, priority concerns were raised. First, what types of research methods, research designs, and data sources are most suitable for understanding the interactions between cognitive and emotional disorders and chronic medical conditions? Second, what is the influence of sex, ethnicity, socioeconomic status, and culture on the presentation, diagnosis, treatment strategies, quality of care, and patient outcomes for cognitive and emotional disorders in adults with MCCs. For example, how can we reduce health disparities in depression treatment for older men, especially men from ethnic minority groups who are at high risk for poor health outcomes associated with MCCs?[59,60]

DISCUSSION

The healthcare needs and the associated societal burden of older adults with MCCs are increasing, and current care strategies, research methods, and funding opportunities do not adequately address these needs. Foremost among the research priorities for this population is the need for novel healthcare system interventions for disease treatment and for primary, secondary, and tertiary prevention. Successful interventions need to bridge providers and settings to focus on patient- and family-centered outcomes valued by this population. Process and outcome measures relevant to older adults with MCCs need to be developed and used; these must be patient-centric, reflecting the goals and values of this population and their families and caregivers. Study designs must incorporate the special needs of the older adult with MCCs. Randomized, controlled trials may be infeasible, so observational designs must be implemented that minimize and adjust for potential biases. Data sets currently available need to be organized, integrated, and analyzed with a focus on MCCs and the relevant outcomes. Transitions of care between providers and healthcare settings were identified as an area for further research across topic groups. The role of information technology needs to be defined for all of the topic areas.

There are a large number of potential audiences for this research agenda, including the research community (academia, private industry, and government), government regulatory and policy-setting agencies, patients and their caregivers, healthcare consumer advocacy organizations, politicians, organizations funding research (public and private), professional organizations (e.g., primary care, specialty care, nursing), and research networks. AHRQ released a Special Emphasis Notice for its 2006 research priorities, based in part on the work of this group (http://grants1.nih.gov/grants/guide/notice-files/NOT-HS-06-032.html). We hope that this is only the beginning of an increased recognition of the need for research focused on MCC.

Many organizations, private and public, national and international, have developed agendas for research related to the health and health care of aging populations. These agendas vary widely in their purpose, audience, scope, organizational frameworks and principles, processes for achieving the agenda, and specificity of the research questions.[10,61–67] Most of these agendas were developed using expert opinion guided by an explicit process and criteria for prioritization. These research agendas consist mainly of broad topic areas, for example, brain aging,[64] prevention of mental disorders,[65] and the relationships between population aging and socioeconomic development.[62] The American Geriatrics Society and the John A. Hartford Foundation produced a much more detailed agenda focusing on surgical and related specialties, with specific research questions based on literature reviews and prioritization based on expert opinion.[61]

The process and product of the current agenda differ from these prior products. The goal was to develop specific research topic areas and questions, with input from a broad range of perspectives. It was also desired to identify priority research questions from across all topic areas. Funding organizations were engaged from the outset and each small group was asked to explicitly address potential funding sources for its priority questions. The potential importance of research networks in conducting the identified research was also recognized and each group discussed the potential role of research networks in addressing the priority questions.

This research agenda focused on the delivery of healthcare services. It was necessary to define and narrow the scope in order to identify the appropriate expertise. This in no way implies that other areas of interventional research are any less important to the health and well-being of older Americans. In fact, it is clear that, for the most part, factors other than healthcare services, including the physical, social, cultural, and economic environments of the older person, determine health.

This agenda was based largely on expert opinion. Other approaches were considered. An evidence-based approach would have involved performing systematic reviews on the various topic areas to identify the research gaps that could then have been prioritized. Resource constraints precluded such an approach, which still would have involved expert opinion to delineate the framework and prioritize research areas.

There was variation in specificity of research priorities among the seven groups. Thus, for example, the highest priority of the healthcare systems group was broad (new models of care) and potentially encompassed all other topic areas. Perhaps not surprisingly, this research topic emerged as the highest priority overall. Alternatively, other groups developed more-specific areas and questions (e.g., pharmacotherapy). This variation in specificity made direct comparisons of research questions among groups difficult, although in developing this process, each group was allowed to determine the specificity of its research priorities and questions.

Research networks may prove a valuable approach to addressing the topics in this research agenda. Disease-based research networks have proven to be valuable for advancing medical care and translating research findings into practice.[68,69] Alternatively, practiced-based research networks, such as those supported by AHRQ[70] focus on the translation of new knowledge into clinical practice and health decision-making (addressing "type 2 translational block"[71]).

Using research networks to examine older adults with MCCs is challenging. This population may require special recruitment and retention strategies[72] and differs from younger patients in their motivations for participating in clinical research,[73] and older adults often cross sites of care within the health system and each site may require different recruitment strategies.[74,75] One way to begin studying this population might be to use current research Centers of Excellence in aging (e.g., National Institutes of Health-sponsored Pepper Centers; Veterans Affairs-sponsored Geriatric Research, Education and Clinical Centers) to form a network to investigate common problems, but federal funding for these centers has not focused on interactive cooperation but rather on specific thematic foci of interest to one institution.

Recognition of the personal and societal burden of older adults with MCCs is the first step in an important process. Researchers, advocacy organizations, and organizations funding research must follow with carefully conceived and implemented studies and must appropriate sufficient resources to advance knowledge and optimize the health and quality of life of this increasingly important segment of the population.

Most importantly, the meeting participants provided invaluable contributions to this effort, sharing their perspectives, expertise, insights, and ideas, providing the basis for this article.

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