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## Identifying Landmark Articles for Advancing the Practice of Geriatrics

Camille P. Vaughan, MD, MS<sup>\*,†</sup>, Rachel Fowler, BA<sup>‡</sup>, Richard A. Goodman, MD, JD, MPH<sup>†,§</sup>, Taylor R. Graves, MD, MHS<sup>†</sup>, Jonathan M. Flacker, MD<sup>†</sup>, Theodore M. Johnson II, MD, MPH<sup>\*,†</sup>

<sup>\*</sup>Department of Veterans Affairs, Birmingham/Atlanta Geriatric Research Education and Clinical Center, Decatur, Georgia

<sup>†</sup>Division of General Medicine and Geriatrics, Department of Medicine, Emory University, Atlanta, Georgia

<sup>‡</sup>College of Medicine, Florida Atlantic University, Boca Raton, Florida

<sup>§</sup>National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia.

### Abstract

Landmark articles from the peer-reviewed literature can be used to teach the fundamental principles of geriatric medicine. Three approaches were used in sequential combination to identify landmark articles as a resource for geriatricians and other healthcare practitioners. Candidate articles were identified first through a literature review and expert opinion survey of geriatric medicine faculty. Candidate articles in a winnowed list (n = 30) were then included in a bibliometric analysis that incorporated the journal impact factor and average monthly citation index. Finally, a consensus panel reviewed articles to assess each manuscript's clinical relevance. For each article, a final score was determined by averaging, with equal weight, the opinion survey, bibliometric analysis, and consensus panel review. This process ultimately resulted in the identification of 27 landmark articles. Overall, there was weak correlation between articles that the expert opinion survey and bibliometric analysis both rated highly. This process demonstrates a feasible method combining subjective and objective measures that can be used to identify landmark papers in geriatric medicine for the enhancement of geriatrics education and practice.

### Keywords

education; geriatrics; landmark

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Address correspondence to Camille P. Vaughan, Wesley Woods Health Center, 1841 Clifton Road, NE, Room 532, Atlanta, GA 30329., [camille.vaughan@emory.edu](mailto:camille.vaughan@emory.edu).

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The rapid expansion of the older adult population, coupled with attrition of the current workforce of geriatricians, is intensifying pressures for the education and training of physicians and allied providers in principles of geriatric medicine.<sup>1</sup> Critical to this imperative for education and training is the need for a rich literature in geriatrics, including the identification of peer-reviewed foundational articles that have helped to shape the contemporary practice of geriatric medicine.

The process of identifying such foundational—or landmark—articles is not well defined and depends on the purpose of the user. For example, a research funding agency may use the number of citations an article has received or the impact factor of the publishing journal to assess importance. If the impact on a particular field of research is a primary outcome, involving expert opinion is important, but these purposes are not necessarily complementary, because expert opinion and bibliometric analysis involving citation report or journal impact factor do not always correlate well.<sup>2</sup>

To optimize the identification of landmark articles that have helped to advance the practice of geriatrics, an assessment was conducted using a combination of approaches, including literature review coupled with expert opinion survey, bibliometric analysis, and consensus panel review of clinical relevance. A set of 27 articles was identified that have helped to shape the practice of geriatric medicine by introducing paradigm shifts in the approach to care for older adults and evidence that has improved understanding of the aging process and best practices for quality care. This set of landmark articles represents a resource for educators, practitioners, trainees, and others for improving the practice of geriatrics. To the knowledge of the authors of the current article, the process used to develop such a list is unique in the geriatric medicine literature and provides a methodological framework for considering future additions.

## METHODS

### Literature Review and Expert Opinion Survey

An initial list of potential landmark articles was generated through literature review and expert opinion survey. The literature review searched for highly cited articles ( 1,000 citations) in peer-reviewed journals using Web of Science (Thomson Reuters) and the following terms: geriatric, gerontology, and aging. More recently published articles were identified by reviewing slides available to attendees of the 2010–11 American Geriatrics Society Annual Scientific Meeting session, Geriatric Literature Updates, presented by Dr. William J. Hall. A recent book highlighting classic papers in geriatric medicine was also referenced to identify candidate articles.<sup>3</sup> Members of two university-based faculty cohorts and the American Geriatrics Society Teachers Section (total number of participants n = 98) were surveyed to determine whether each article should be included on a landmark list. Faculty members also were invited to write in articles that they considered essential to the practice of geriatric medicine. Articles receiving positive ratings from more than 50% of faculty survey participants were included in bibliometric analysis and subsequent consensus panel review to assess clinical relevance. Articles were assigned a score from 1 to 3 based on the proportion of faculty who agreed that the article was a landmark article. Those receiving

50% to 65% positive votes were given a score of 1, 66% to 80% received a score of 2, and greater than 80% received a score of 3.

### **Bibliometric Analysis**

Bibliometric analysis involved development of a bibliometric index score, which was a function of the journal impact factor during the year of publication (for those published from 1997 through 2011) or during 1997 (earliest available) for older articles and the average number of times the article had been cited each year until July 2012 (bibliometric index score = impact factor  $\times$  average number of citations annually). Web of Science was used to determine the journal impact factor (measure of the average number of citations received per paper published in the selected journal during the preceding 2 years) and generate citation reports for each article. Bibliometric index scores were divided into quartiles based on the overall distribution of index scores for articles on the faculty survey list.

### **Consensus Panel Review**

Consensus panel review involved four geriatricians with different areas of academic focus: a clinician–investigator, two clinician–educators, and a public health and policy expert. Panel members rated each article from the faculty survey based on its clinical relevance using a Likert scale ranging from 1 (very low relevance to the practice of geriatrics) to 5 (very high relevance to the practice of geriatrics). Using a modified Delphi method, the panel then reviewed the individual ratings for each article and reached consensus such that all ratings were within 1 point of the other ratings. An average of the four ratings was then calculated.

### **Final Overall Score and Classification of Articles**

For each article, a final overall score was determined by averaging scores from the three different assessment components (the literature review and expert opinion survey, bibliometric analysis, and consensus panel review; maximum final score = 4). The relationship between the expert opinion survey and bibliometric analysis was examined using correlation analysis. All analyses were conducted using Excel 2010 (Microsoft Corp., Redmond, WA). Once the final list was determined, a classification schema was proposed to categorize articles according to their content.

## **RESULTS**

The literature review and expert opinion survey identified 32 candidate articles, 26 of which more than 50% of the faculty expert opinion survey participants rated positively. The faculty experts also suggested four articles as write-in candidates. The resulting 30 articles were included in the bibliometric and consensus panel process.

Of the 30 articles, only five had been cited more than 1,000 times.<sup>4–8</sup> The consensus panel review of relevance to clinical practice assessed only one article<sup>8</sup> as being of “neutral or low relevance to the practice of geriatrics.” The mean  $\pm$  standard deviation of the final scores, which averaged all assessment methods, was  $2.9 \pm 0.7$ . Articles with an average final score of less than one standard deviation from the mean (final score  $<2.2$ ) were removed from the list, yielding a final total of 27 landmark articles (Table 1). Eighty-five percent were

published in two journals, the *New England Journal of Medicine* (n = 14, 52%) and *JAMA* (n = 9, 33%). Overall, there was weak correlation between articles classified as positive according to the expert opinion survey and those with high scores on bibliometric analysis (Pearson correlation coefficient = -0.18).

The 27 articles were sorted into categories of primary focus as follows: randomized controlled trials of single-modality interventions (typically behavioral or drug) (n = 5), process-of-care trials that represented studies of multicomponent interventions within systems of care (n = 7), manuscripts reporting phenomena related to the epidemiology of aging (n = 7), opinion pieces (paradigm pieces) that represented articles with great influence on the field (n = 6), and manuscripts describing principles of high-quality geriatric care (n = 2).

## DISCUSSION

As the field of geriatric medicine continues to mature, a systematically identified list of landmark articles would be a useful resource for educating healthcare practitioners about major concepts in providing high-quality care to older adults. Thus, this list of landmark papers is offered as a resource for use across the educational continuum—by medical students, residents, fellows, faculty, and practitioners—to enrich practice and understanding of geriatrics and to provide deeper understanding of the specialty's history and evolution. The current study has demonstrated a systematic process for identifying and periodically updating this list through bibliometric analysis and an assessment of clinical importance by expert faculty survey and consensus panel review.

As noted, there was poor correlation between faculty opinion regarding the importance of an article and bibliometric analysis. A contributing explanation for this is that the increase in journals available through open access or online may lead to reductions in citation frequency because researchers may not access a wide range of publications for citation;<sup>9</sup> countering this explanation is the view that online access increases efficiency and has little effect on citation frequency.<sup>10</sup> In addition, despite the projected increase in the number of older adults, the number of researchers in geriatrics and gerontology is still small.<sup>11</sup> An effect of this workforce shortage could be a reduction in the number of citations for articles related to the practice of geriatrics. This reduced research workforce further compounds the time necessary for articles advancing a new concept to gain acceptance in the scientific community.<sup>12</sup> Few of the articles identified as landmark in geriatrics had received more than 1,000 citations, a metric some institutions use to assess influence.<sup>13</sup>

Many of the articles determined to be landmark described findings from interventional trials, although a significant proportion of the articles were “thought pieces” or what were classified as “paradigm pieces.” These manuscripts provide a summary of available evidence along with expert opinion to challenge current standards of care and propose new approaches to the care of older adults. Although these articles are not traditional systematic reviews because they do not necessarily meet the criteria for these types of analyses,<sup>14</sup> it is likely that they have significant influence in distinguishing the practice of geriatrics from other primary care fields.

A list of landmark articles has the potential for multiple uses in geriatric education and training. Review and discussion of the methodology and influence of these articles could readily become a regular “journal club” series and provide an opportunity for continuing medical education credit. At teaching institutions, the opportunity to develop a journal club review of the evidence pertaining to a clinical topic also becomes an opportunity for graduate and postdoctoral trainees to learn presentation skills.<sup>15,16</sup> Professional organizations that convene expert review groups at periodic (e.g., every 5 years) intervals could update this or related lists of landmark papers.

This approach of identifying landmark articles is subject to at least two limitations. Broad concepts related to the practice of geriatric medicine were focused on instead of a comprehensive review related to a specific geriatric syndrome or condition. A small percentage of faculty members in geriatrics was surveyed, although by incorporating the American Geriatrics Society Teachers Section, a nationally representative group of geriatric education experts was targeted. Previously published lists of landmark articles in different disciplines have often relied on the expert opinion of a few individuals.<sup>17,18</sup>

## CONCLUSION

A list of landmark articles that represent foundational contributions to the practice of geriatric medicine is proposed. This list provides another resource for educating healthcare providers and promoting high-quality care for older adults. The development of this resource also demonstrates a selection process that incorporates objective measures and expert opinion, enabling consideration of new additions. Foundations and societies with a focus on enhancing geriatric education across disciplines could adapt this type of process for use.

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Table 1.

## Landmark Articles for the Practice of Geriatric Medicine

Title	Citation	Final Composite Score	Category
Treatment of hypertension in patients 80 years of age or older	Beckett NS et al. NEJM, May 2008	3.9	RCT
Effectiveness of atypical antipsychotic drugs in patients with Alzheimer's disease	Schneider LS et al. NEJM, Oct 2006.	3.9	RCT
The clinical course of advanced dementia	Mitchell SL et al. NEJM, Oct 2009	3.9	Epidemiology
Rehospitalizations among patients in the Medicare fee-for-service program	Jencks SF et al. NEJM, Apr 2009	3.9	Epidemiology
A multicomponent intervention to prevent delirium in hospitalized older patients	Inouye SK et al. NEJM, Mar 1999	3.7	Process-of-care trial
Clinical practice guidelines and quality of care for older patients with multiple comorbid diseases—implications for pay for performance	Boyd CM et al. JAMA, Aug 2005	3.7	Principles of clinical practice
A multicomponent intervention to reduce the risk of falling among elderly people living in the community	Tinetti ME et al. NEJM, Sept 1994	3.6	Process-of-care trial
A randomized trial of care in a hospital medical unit especially designed to improve functional outcomes of acutely ill older patients	Landefeld CS et al. NEJM, May 1995	3.3	Process-of-care trial
Emergency hospitalization for adverse drug events in older Americans	Budnitz DS et al. NEJM, Nov 2011	3.3	Epidemiology
Updating the Beers criteria for potentially inappropriate medication use in older adults—results of a U.S. consensus panel of experts <sup>a</sup>	Fick DM et al. Arch Int Med, Dec 2003	3.3	Principles of clinical practice
Gait speed and survival in older adults	Studenski S et al. JAMA, Jan 2011	3.2	Epidemiology
A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure	Rich MW et al. NEJM, Nov 1995	3.2	Process-of-care trial
Exercise training and nutritional supplementation for physical frailty in very elderly people	Fiatarone MA et al. NEJM, Jun 1994	3.2	RCT
A controlled trial of inpatient and outpatient geriatric evaluation and management	Cohen HJ et al. NEJM, Mar 2002	2.9	Process-of-care trial
Hazards of hospitalization of the elderly	Creditor MC. Ann Int Med. Feb 1993	2.9	Paradigm piece
Trajectories of disability in the last year of life	Gill TM et al. NEJM, Apr 2010	2.9	Epidemiology
The care transitions intervention—results of a randomized controlled trial	Coleman EA et al. Arch Int Med, Sept 2006	2.8	Process-of-care trial
Tube feeding in patients with advanced dementia—a review of the evidence	Finucane TE et al. JAMA, Oct 1999	2.8	Paradigm piece
Appropriate use of artificial nutrition and hydration—fundamental principles and recommendations	Casarett D et al. NEJM, Dec 2005	2.8	Paradigm piece
Cancer screening in elderly patients—a framework for individualized decision making	Walter LC & Covinsky KE. JAMA, Jun 2001	2.6	Paradigm piece
Aging, natural death, and the compression of morbidity	Fries JF. NEJM 1980	2.6	Paradigm piece
Frailty in older adults: evidence for a phenotype	Fried LP et al. J Gerontol, Mar 2001	2.6	Epidemiology
Change in disability after hospitalization or restricted activity in older persons	Gill TM et al. JAMA, Nov 2010	2.4	Epidemiology
Geriatric care management for low-income seniors—a randomized controlled trial	Counsell SR et al. JAMA, Dec 2007	2.3	Process-of-care trial

Title	Citation	Final Composite Score	Category
Behavioral training with and without biofeedback in the treatment of urge incontinence in older women—a randomized controlled trial	Burgio KL et al. JAMA, Nov 2002	2.3	RCT
Long-term effects of cognitive training on everyday functional outcomes in older adults	Willis SL et al. JAMA, Dec 2006	2.3	RCT
Shared risk factors for falls, incontinence, and functional dependence: unifying the approach to geriatrics syndromes	Tinetti ME et al. JAMA, May 1995	2.3	Paradigm piece

<sup>a</sup>2012 update published after faculty survey was initiated.

RCT = randomized controlled trial.