

Identifying Landmark Articles for Advancing the Practice of Geriatrics

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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. *J Am Geriatr Soc* 62:2159–2162, 2014.

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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

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training of physicians and allied providers in principles of geriatric medicine.¹ 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.²

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 ($\geq 1,000$ 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.³ 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.^{4–8} The consensus panel review of relevance to clinical practice assessed only one article⁸ 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 ± 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;⁹ countering this explanation is

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 ^a | 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 |
| 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 |

^a2012 update published after faculty survey was initiated.
RCT = randomized controlled trial.

the view that online access increases efficiency and has little effect on citation frequency.¹⁰ In addition, despite the projected increase in the number of older adults, the number of researchers in geriatrics and gerontology is still small.¹¹ 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.¹² Few of the articles identified as landmark in

geriatrics had received more than 1,000 citations, a metric some institutions use to assess influence.¹³

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,¹⁴ 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.^{15,16} 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.^{17,18}

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 health-care 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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