

Trends, Risk Factors, and Prevention of Falls in Older Adults in Wisconsin

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ABSTRACT

Wisconsin's death rate due to falls among adults 65 years and older is more than twice the national average. The hospitalization rate due to falls-related injuries in Wisconsin increased slightly from 1995 to 2002, with an injury rate of 2159 per 100,000 in 1995, and 2263 per 100,000 in 2002. Emergency department (ED) utilization and hospitalization rates for falls-related injury are higher for women than for men in Wisconsin. In 2002, the total statewide charges for hospitalizations and ED visits for falls-related injuries were more than \$96 million. Two thirds of those admitted to the hospital for a falls-related injury were discharged to a nursing home or rehabilitation facility.

Multifactorial intervention strategies have been shown to decrease the rate of falls in randomized, controlled trials. The purpose of this paper is to describe trends in falls-related injury fatalities, hospitalizations, and ED visits in Wisconsin. Also included are cost data related to falls, identification of risk factors, and descriptions of the possible role of physicians and other health care professionals in interdisciplinary, multi-focal programs to prevent falls-related injuries in high-risk older adults.

INTRODUCTION

Falls among adults 65 years and older are a leading cause of injury deaths and non-fatal injuries. Older adults are

at the greatest risk for dying or experiencing an injury from a fall. A fall is defined as an event that results in a person coming to rest inadvertently on the ground or other lower level, other than as a consequence of the following: sustaining a violent blow, loss of consciousness, or sudden onset of paralysis, as in a stroke and an epileptic seizure.¹

In Wisconsin adults 65 years and older, 658 deaths (2003 data), 16,051 hospitalizations (2002 data), and 24,173 emergency department (ED) visits (2002 data) occurred as a result of falls. The Wisconsin state health plan, *Healthiest Wisconsin 2010*, contains 11 health priorities. One of these priorities addresses the prevention of falls-related injury and death across the life span, and specifically addresses a reduction of falls among older adults as one of the outcomes.² This article provides physicians and other health care professionals with trend information on falls-related death and injury rates in the 65 years and older population in Wisconsin and the United States. It also summarizes older adults' risk factors for falls, consensus recommendations regarding prevention of falls among older adults, and recent evidence regarding successful interventions to prevent falls.

METHODS

Wisconsin falls-related death and injury data were obtained through WISH, a Web-based interactive query system.^{3,4} The ICD-9 codes included unintentional hospital and ED causes of injury by falling (E880-E886, E888), and ICD-10 codes included unintentional causes of death by falling (W00-W19). Trends in falls-related deaths and hospitalizations were analyzed from 1995 to 2003 in Wisconsin and the United States using crude rates. Death rates from 1995 to 1998 and 1999 to 2003 were not combined, due to changes from ICD-9 to ICD-10 coding. All rates are reported per 100,000 population.

RESULTS

Fatal Falls

In Wisconsin, unintentional falls are the leading cause

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of injury deaths for adults 65 years and older. In 2002, falls constituted 70% of all injury deaths and 51% of all injury hospitalizations in this age group.^{3,4} The Wisconsin death rate in older adults is ranked among the highest 5 states nationwide, and has been consistently ranked high in recent years. In 2002, the national death rate from falls was 36 per 100,000 adults 65 years and older, compared with Wisconsin's falls death rate of 91.2 per 100,000.⁵ Wisconsin's rate has been at least twice the national rate during 1995-2002 (Figure 1). Although national data for 2003 are not yet available, Wisconsin's falls death rate in 2003 is slightly increased at 92 per 100,000.³

Within specific older-adult age groups, those in the age group ≥ 85 years have the highest falls death rate both in the United States and Wisconsin (Figure 2). Within specific age categories 65 years and older, Wisconsin rates are nearly twice that of the United States'.

Death from unintentional falls tends to be more common in males than in females, both nationwide and in Wisconsin, but this trend is changing in Wisconsin (Figure 3). In 2003, males 65 years and older had a falls death rate of 84.9 per 100,000; females had a rate of 97.1 per 100,000.

Nonfatal Falls

Falls are also the leading cause of nonfatal injuries in older adults and the leading cause of unintentional injury hospitalizations and ED visits. In 1995, the Wisconsin falls-related hospitalization rate was 2159 per 100,000 and has increased to 2263 per 100,000 in 2002 (Figure 4).⁴ Although unintentional injury deaths from falls were more common in males, the reverse is true for injury hospitalizations. From 1995 to 2002, more females than males 65 years and older were hospitalized for falls-related injuries (Figure 5). In 2002, the female injury hospitalization rate for falls was 2712 per 100,000 compared to 1636 per 100,000 for males 65 years and older. For falls-related ED injury visits, females had a rate of 4027 per 100,000 in 2002, compared with males' rate of 2546 per 100,000 (Figure 6).⁶

As the cost of health care continues to rise each year, the cost of hospitalizations for falls-related injuries also continues to rise. In 1995, the total statewide charges for older adults hospitalized for falls-related injuries were \$43,703,516. In 2002, this amount increased to \$81,580,955 (Figure 7),⁴ with the average charge per hospital admission for a falls-related injury being \$12,741, with an average stay of 5.5 days. ED charges for 2002 for fall-related injuries were over \$18 million—an average of approximately \$780 per visit.

In 2002, upon discharge from the hospital, 65.7% of

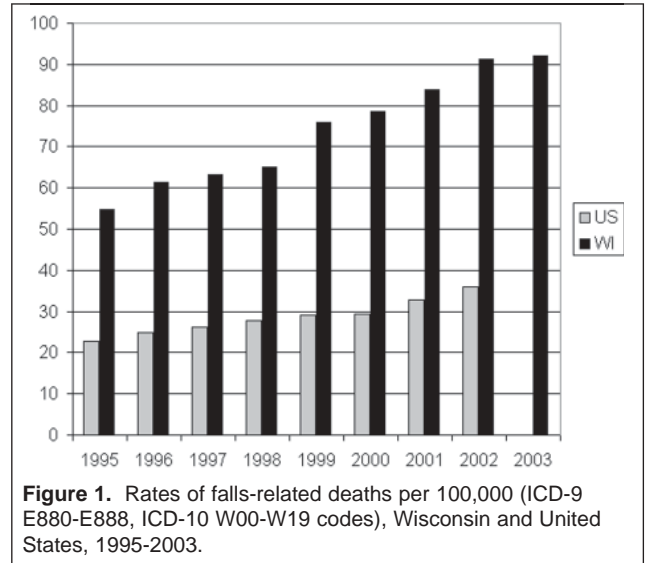


Figure 1. Rates of falls-related deaths per 100,000 (ICD-9 E880-E888, ICD-10 W00-W19 codes), Wisconsin and United States, 1995-2003.

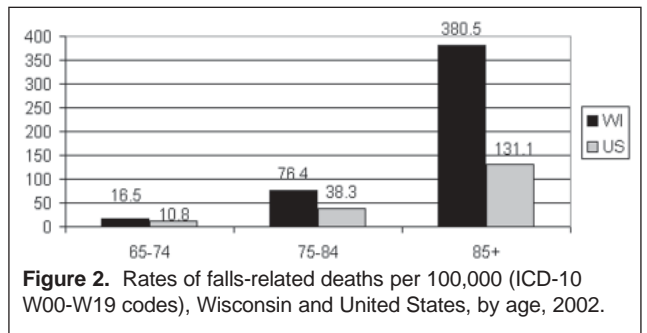


Figure 2. Rates of falls-related deaths per 100,000 (ICD-10 W00-W19 codes), Wisconsin and United States, by age, 2002.

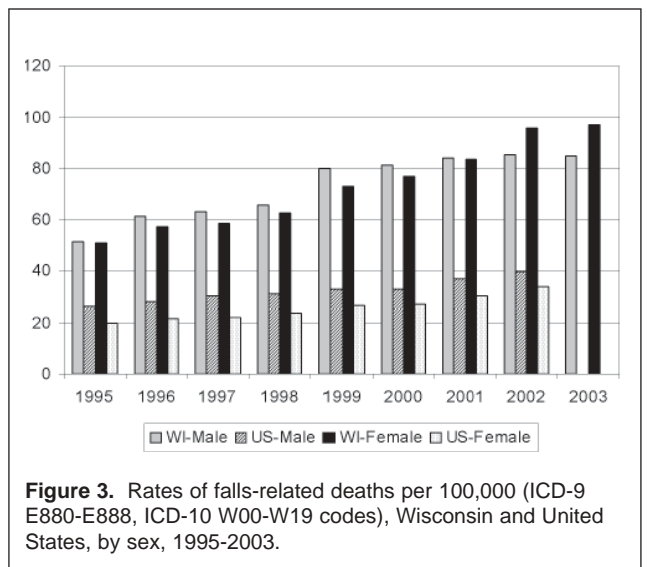


Figure 3. Rates of falls-related deaths per 100,000 (ICD-9 E880-E888, ICD-10 W00-W19 codes), Wisconsin and United States, by sex, 1995-2003.

patients were transferred to a general, intermediate, or a rehabilitation facility, 29.8% were discharged to home, and 3.8% died in the hospital. In 1995, however, 60.4% were transferred to a general, intermediate, or rehabilitation facility upon hospital discharge, 36.0% were discharged to home, while 3.4% died in the hospital (Figure 8).⁴

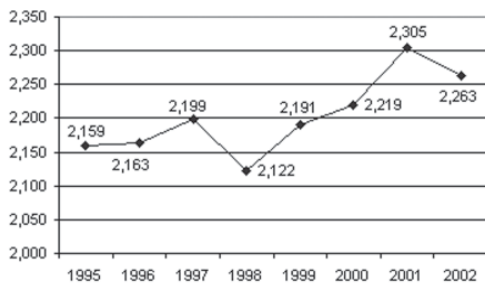


Figure 4. Rates of fall-related hospitalizations per 100,000 (ICD-9 codes E880-E886, E888), Wisconsin, 1995-2002.

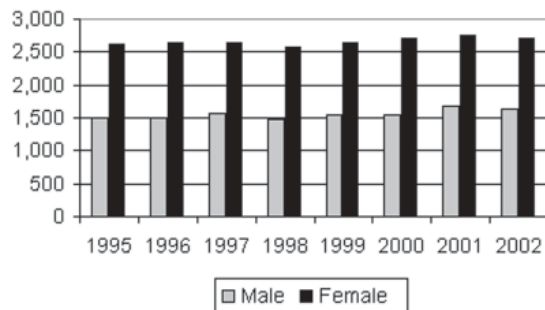


Figure 5. Rates of injury-related hospitalizations per 100,000 (ICD-9 codes E880-E886, E888), Wisconsin, by gender, 1995-2002.

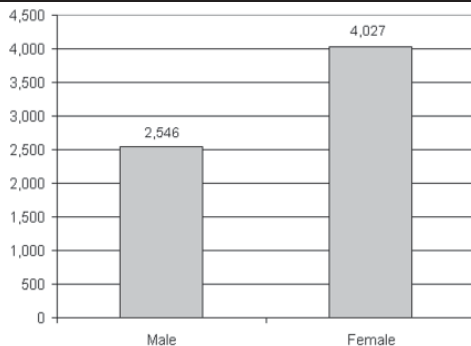


Figure 6. Rates of fall-related emergency department visits per 100,000, Wisconsin, by gender, 2002.



Figure 7. Annual fall-related in-patient and emergency department visit hospitalization costs in millions of dollars, Wisconsin, 1995-2002.

DISCUSSION

Risk Assessment

Multiple risk factors exist for falls among older adults. The Centers for Disease Control and Prevention (CDC) has compiled some of the most frequently reported risk factors for falls and the evidence supporting each of them (Table 1).⁷ One of the best predictors for a fall in an older adult is a previous fall. If they have had a previous fall, an older adult is 2-3 times more likely to fall within the next year.⁸ The US Preventive Services Task Force has recommended that adults age 70-74 years who have 1 or more risk factors for falls, and all adults 75 years and older be counseled about falls prevention.⁹ The American Geriatrics Society, British Geriatric Society, and American Academy of Orthopedic Surgeons Panel on Falls Prevention has recommended in a 2001 consensus statement that older patients should be asked about falls at least once a year during a health care visit with their primary provider.¹⁰ Those with 2 or more falls in the past year, or 1 fall with injury, should receive a multifactorial falls evaluation and appropriate interventions, based on the underlying abnormalities detected on evaluation.

Those with 1 fall in the past year are in an intermediate category of risk. For these patients, the need for further risk assessment should be based on a simple evaluation of balance and gait. The panel recommends that the provider have the individual perform the "Get Up and Go Test."¹¹ In this test, the person is observed as he or she rises from a chair without using the arms, walks 10 feet, turns around, walks back, and sits down. Difficulty or unsteadiness indicates the need for future evaluation for falls risk factors. The recommended algorithm summarizing the assessment and management of falls is represented in the 2001 consensus statement.¹⁰

The falls evaluation should include history of falls, evaluation for underlying medical diseases contributing to falls risk, evaluation of psychotropic and other medications, evaluation of vision, and examination of gait and balance, lower limb joints, and neurological and cardiovascular systems.

Prevention and Intervention

Falls among older adults are preventable. The Panel on Falls Prevention has recommended that the evaluation for underlying risk factors should be followed by a multifactorial intervention to reverse or treat remediable causes.¹⁰ The multifactorial intervention should be based on findings from the evaluation, and should include, as appropriate: provision of gait, balance, and exercise programs; medication modification; treatment of postural hypotension; environmental hazard modification; and treatment of cardiovascular or other remediable conditions that may be contributing to falls risk.

Environmental factors, such as loose carpets, poor lighting, lack of handrails near bathtubs and toilets, clutter on stairways, low tables, footrests in pathways, and electrical or telephone cords in pathways, can contribute to falls in this population. Although home safety checks and remediation of identified problems can help to make the homes of older adults safer, it is important to note that there is not sufficient evidence that environmental modification alone reduces the risk of a fall.¹⁰

Nationally, more than half (53.7%) of all unintentional fatal falls occur in the home.¹² Falls are the leading cause of unintentional home injury death and account for almost 6000 deaths annually. Nationally, falls account for greater than one third of unintentional home injury deaths, more than 40% of nonfatal home injuries, and more than one third of injuries resulting in an ED visit. In Wisconsin, the main causes of falls-related hospitalizations among adults 65 years and older include slipping, tripping, or stumbling (4665 hospitalizations and 8389 ED visits); falling from one level to another (1475 hospitalizations and 2964 ED visits); stairs and steps (937 hospitalizations and 1721 ED visits); and ladders (194 hospitalizations and 340 ED visits).

Evidence for the benefit of a multifactorial intervention comes from several randomized, controlled trials.¹³⁻¹⁷ In these trials, the intervention has typically included counseling for behavioral change, detection and treatment for vision problems, and exercise that includes a strong component of balance exercises. One study compared a combination of vision improvement, exercise, and home safety modification to each intervention alone. The combination of all three interventions was most beneficial, while neither vision improvement nor home safety modification alone were of benefit. Exercise alone was beneficial, but only half as effective as the combination of all 3 interventions.¹⁷

With regard to exercise for prevention of falls, the strongest data on benefits have been with exercises that focus on balance. In general, exercises should be individualized, progressive, and of long duration (at least 3 months). Physical therapy may provide the optimal approach for very frail older adults. This approach is supported by 2 randomized trials for high-risk older adults, both of which showed a reduction in falls with individualized, progressive home exercise programs delivered by a physical therapist or a trained nurse.^{18,19} For less frail older adults, recent studies suggest that group classes that include standing balance exercises may also be efficacious, with up to 40% reduction in the rate of falls.^{17,20,21}

Although a multifactorial intervention approach has been well studied, data exist to support a number of treatments as single interventions to prevent falls. One of

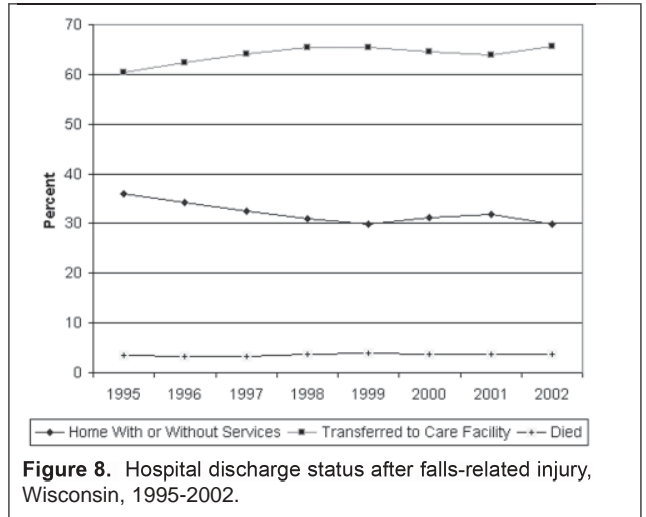


Figure 8. Hospital discharge status after falls-related injury, Wisconsin, 1995-2002.

Table 1. Frequently Reported Risk Factors for Falls⁷

Gender
Race
History of previous fall
Lower body weakness, or gait or balance problems (e.g., vertigo)
Physical limitations
Wearing corrective lens or having other visual problems
Osteoporosis
One or more chronic diseases
History of stroke
Parkinson's disease
Neuromuscular disease (e.g., diabetic neuropathy, stroke)
Urinary incontinence
Postural hypotension
Cognitive impairment (e.g., dementia, delerium, depression)
Taking more than 4 medications
Using psychoactive medications
Wearing shoes with thick, soft soles (e.g., jogging shoes)

the most important interventions is reduction in psychotropic medications. A recent randomized, controlled trial showed a 66% reduction in falls risk associated with withdrawal or reduction of psychotropic medications.²² New evidence also suggests that Vitamin D may be important in reducing falls. Vitamin D is a potent steroid in terms of effects on muscle, and Vitamin D deficiency is associated with myopathy and impaired physical function. In a recent meta-analysis of 5 randomized trials looking at the effect of Vitamin D on falls, Vitamin D therapy was associated with a corrected odds ratio of falling of 0.78 (95% CI 0.64-0.92).²³ The benefit of vision improvement in reducing falls has not been examined in a randomized,

Table 2. Assessment and Interventions to Prevent Falls

History: Consider acute medical contributors (metabolic, dehydration, infectious). Consider syncope if fall is without clear precipitant. Evaluate circumstances of falls.

- Medications: Evaluate psychotropic medications (long- and short-acting benzodiazepines, sedative hypnotics, antidepressants, antipsychotics). Use lowest dose possible.

Physical examination

- Distance vision and visual fields: Refer to ophthalmologist to maximize vision each eye.
- Neurological and cardiovascular exams, including orthostatic blood pressure and pulse: Detect and treat abnormalities as appropriate. Consider reversible central and peripheral nervous system deficits. Consider orthostatic hypotension as potentially contributing to fall if previous fall was associated with lightheadedness and occurred after arising from seated or supine position.
- Balance and gait abnormalities: Refer to physical therapy for evaluation for assistive device and prescription of balance and strengthening exercises as appropriate. Follow physical therapy with sustained exercise program (individual or group) that includes standing balance exercises.

Laboratory assessments

- Consider TSH, Free T4, B12, and Hct; consider 25-OH Vitamin D.
- Radiographic: Bone mineral density; others as indicated by exam.

Interventions: As dictated by history and physical examination, but should also include

- Footwear: firm, thin-soled shoes.
- Calcium (1200-1500 mg/day) and Vitamin D (800 IU per day).
- Home safety interventions: Good lighting, decrease clutter, secure or remove all throw rugs, remove loose cords, secure railings on stairs, minimize tripping hazards, mark step edges with bright-colored tape, bathroom equipment (raised toilet seat, shower or tub rail, shower or tub bench) as necessary.
- Behavioral interventions: Increase attention to movements, use assistive device at all times, slow down movements, maximize lighting, widen base of support with turns, hold on to assistive device or furniture with complex movements.

controlled trial; however, a prospective study of rate of falls before and after cataract surgery found a significant reduction in falls after the surgery.²⁴

In select patients, pacemaker placement may help decrease falls. A recent randomized trial evaluated the use of a pacemaker in older adults with recurrent unexplained falls who had cardio-inhibitory carotid sinus hypersensitivity on examination. The odds ratio for falling was 0.42 in the group receiving pacemakers, as compared with the

usual care group.²⁵ Thus, a cardiovascular etiology may need to be considered when there are reports of multiple unexplained falls, even when syncope is not reported.

Recent data have shown that a focus on falls prevention after hospitalization may be very effective. Older adults are at high risk for falls after any hospitalization for acute medical illness.^{26,27} Two randomized, controlled trials have shown that home visits by an occupational therapist or other members of an interdisciplinary team (such as a registered nurse or physical therapist) after hospitalization are effective in decreasing falls during the following year. In both studies, the home visits focused on practical safety issues, including teaching safe behaviors and maneuvers, assessing and providing mobility aids, modifying home hazards, and recommending safe footwear.^{28,29}

Other interventions that may help decrease falls include switching from bifocal, trifocal, or progressive lenses to single-vision, distance lenses; use of firm, thin-soled shoes; and use of an assistive device for ambulation. Although these strategies have not been evaluated in randomized, controlled trials, epidemiologic data suggest their potential utility, and they have been included as components of interventions in multifactorial falls prevention trials. Table 2 summarizes key components of a falls assessment and intervention strategy for older adults.

CONCLUSION

Falls result in substantial morbidity and mortality in Wisconsin. Wisconsin's death rate from falls is high, and rises with age. Although the US death rate due to falls also increases with age, Wisconsin's rate is substantially above the national average for all older age groups. Reasons for the high death rate in Wisconsin are unclear. State death rates are derived from death certificates. One possible explanation is that, compared with other states, Wisconsin's death certificate reporting may more completely report falls as the cause of death.

Nevertheless, falls-related injuries remain a substantial cause of hospitalization and ED utilization for older adults in Wisconsin, and hospitalization costs associated with falls have approximately doubled over the past 10 years. Also of note is that the falls-related injury hospitalization rate is substantially higher in women than men. This highlights the importance of including osteoporosis prevention and treatment as part of any injury prevention strategy.

All primary physicians should ask their older adult patients about falls at least once a year. Using a comprehensive individualized approach, Wisconsin health care professionals may potentially reduce morbidity and mortality from falls in older adults. However, although studies have

shown that multifactorial interventions by primary care providers may help decrease falls, few studies demonstrate successful application of these models in a community setting. Studies are ongoing now in Wisconsin to determine the efficacy of implementing a multifactorial approach to falls prevention in the community setting.

Currently in Wisconsin, in order to assist health care professionals in addressing the environmental and psychosocial support issues related to falls and falls prevention, each county or tribe has an aging office that can provide a wide range of services, information, and referrals in the community or region. Contact information is noted in the list of resources of this article (Table 3).

Some aging offices in Wisconsin are developing falls-prevention activities that may include links to referrals for exercise, education programs, or home safety evaluations. Even with this assistance, the primary care provider will continue to play a key role in evaluating and intervening for medical conditions or medications that may be contributing to falls in older adults.

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Table 3. Falls-Prevention Resources

The American Geriatrics Society

The Empire State Building
350 Fifth Ave, Suite 801
New York, NY 10118
www.americangeriatrics.org/news/pdf/consumer_pamphlet.pdf

Wisconsin County and Tribal Aging Offices

Information about county and tribal aging offices that provide services to older adults in all counties and tribes. Aging offices can provide a wide range of services, information, and referrals in their community or region.

Brochure: *A Patient's Guide to Prevention Falls*
<http://dhfs.wisconsin.gov/aging/contacts/COAGOF.HTM>

American Academy of Orthopedic Surgeons

6300 N River Rd
Rosemont, IL 60018
Patient Education Brochure: *Don't Let A Fall Be Your Last Trip* (available by mail)

Home Safety Council

Web link to Home Safety Council Safe Steps Fall Prevention Campaign
www.homesafetycouncil.org/programs/pr_safesteps_w001.aspx

Centers for Disease Control and Prevention

National Center for Injury Prevention and Control
Web link to CDC fall prevention information including: *A Tool Kit to Prevent Senior Falls*
www.cdc.gov/ncipc/factsheets/falls.htm

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Wisconsin Medical Journal

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The *Wisconsin Medical Journal* (ISSN 1098-1861) is the official publication of the Wisconsin Medical Society and is devoted to the interests of the medical profession and health care in Wisconsin. The managing editor is responsible for overseeing the production, business operation and contents of *Wisconsin Medical Journal*. The editorial board, chaired by the medical editor, solicits and peer reviews all scientific articles; it does not screen public health, socioeconomic or organizational articles. Although letters to the editor are reviewed by the medical editor, all signed expressions of opinion belong to the author(s) for which neither the *Wisconsin Medical Journal* nor the Society take responsibility. The *Wisconsin Medical Journal* is indexed in Index Medicus, Hospital Literature Index and Cambridge Scientific Abstracts.

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