

Obesity and Physical Inactivity Among Wisconsin Adults with Arthritis

Chetna Mehrotra, MPH, OTR; Nancy Chudy, MPH; Virginia Thomas, MS

ABSTRACT

Introduction: Arthritis is the leading cause of disability in Wisconsin, and affects approximately 34%¹ of Wisconsin adults. Obesity is an established risk factor for arthritis; however, the relationship between arthritis and obesity has not been well characterized at the population level in Wisconsin.

Objectives: Describe the relationship between arthritis, obesity, physical inactivity, and efforts to lose weight among Wisconsin adults.

Methods: Wisconsin Behavioral Risk Factor Surveillance System 2000-2001. Arthritis was defined by either doctor diagnosis or self-reported chronic joint symptoms.

Results: Overall, 36% of respondents had arthritis. Among adults with arthritis, 28% were obese (BMI>30) compared to 16% without arthritis. The prevalence of leisure time physical inactivity was substantially higher among those with arthritis compared to those without arthritis (27.8% vs. 19.2%). Although prevalence of obesity was higher among those with arthritis, only 46% of adults with arthritis made an effort to lose weight.

Conclusions: A high proportion of adults with arthritis are obese and are physically inactive, even though studies have shown that weight loss and regular physical activity relieve arthritis symptoms. Efforts should be made to promote weight loss and physical activities among adults with arthritis.

INTRODUCTION

Arthritis and other rheumatic conditions (e.g., osteoarthritis, rheumatoid arthritis, gout, fibromyalgia, other diseases of the joints) are the leading causes of

disability^{2,3} in the United States. An estimated 33% (approximately 69.9 million) of US adults have some form of arthritis.⁴ Overweight (including obesity) has emerged as a leading health problem both in Wisconsin and in the United States.⁵⁻⁸ The prevalence of obesity has dramatically increased in Wisconsin over the past decade (from 11% in 1990 to 22% in 2001), and about 58% of Wisconsin adults are overweight.⁶ Overweight is an established risk factor for arthritis of both weight and non-weight bearing joints.^{9,10} The public health burden of both obesity and arthritis is expected to increase as the population ages. The estimated annual cost attributable to obesity-related diseases in the US is approximately \$100 billion,¹¹ and is approximately \$60 billion for arthritis and related conditions.⁴

Physical activity has been shown to improve symptoms of arthritis, and is also critically important to maintaining an appropriate weight. Conversely, however, both arthritis and overweight are associated with lower levels of physical activity, including limited leisure-time physical activity (LTPA). Those with both arthritis and obesity are especially likely to be physically inactive.¹² This study used data from the Behavioral Risk Factor Surveillance System (BRFSS) to do a population-based assessment of the relationship between arthritis, obesity, and physical inactivity among Wisconsin adults.

METHODS

The Behavioral Risk Factor Surveillance System (BRFSS) is a series of state-based, cross-sectional, random digit telephone surveys of non-institutionalized US adults aged 18 years or older that are conducted by state health departments and coordinated by the Centers for Disease Control and Prevention (CDC). The Wisconsin BRFSS collects data about health behaviors and health-related conditions. A detailed description of survey methods is available elsewhere.^{13,14} For this analysis, data from the 2000 and 2001 Wisconsin BRFSS were aggregated to increase the precision of prevalence estimates. Data were collected on arthritis, body mass index (BMI), and weight loss efforts among Wisconsin adults. Since

Authors are from the Bureau of Chronic Disease Prevention and Health Promotion, Division of Public Health, Wisconsin Department of Health and Family Services. Ms Mehrotra is an epidemiologist; Ms Chudy is unit supervisor; Ms Thomas is the Arthritis Program coordinator. Please address correspondence to: Chetna Mehrotra, 1 W Wilson St, Room 218, Madison, WI 53703; phone 608.267.9007; fax 608.266.8925; e-mail mehroc@dhsf.state.wi.us.

Table 1. Prevalence of Arthritis, Obesity and Physical Inactivity among Wisconsin Adults, by Selected Characteristics, Wisconsin 2000-2001

Characteristics n=6326	Arthritis (% <i>, 95% CI*</i>)	Obesity (% <i>, 95% CI</i>)	Physical Inactivity (% <i>, 95% CI</i>)
Total	36.1 (34.6-37.4)	21.2 (20.1-22.4)	37.9 (36.9-35.3)
Age			
18-34	16.7 (14.5-18.8)	16.8 (14.5-18.9)	33.3 (30.5-35.9)
35-54	33.7 (31.7-35.7)	22.6 (20.6-24.3)	36.8 (34.5-38.6)
55+	58.8 (56.3-51.3)	24.3 (22.0-26.5)	44.5 (41.9-47.0)
Sex			
Male	32.9 (30.9-34.9)	22.4 (20.6-24.2)	34.8 (32.8-36.8)
Female	38.9 (37.1-40.9)	20.1 (18.5-21.6)	40.9 (38.9-42.8)
Race			
White, Non-Hispanic	36.1 (34.7-37.6)	20.4 (19.2-21.7)	36.8 (35.4-38.3)
Black, Non-Hispanic	35.7 (29.8-41.5)	37.1 (30.9-43.2)	52.1 (45.9-58.4)
Hispanic	28.9 (21.1-36.8)	24.3 (16.9-31.9)	51.9 (43.5-60.3)
Other	37.5 (30.2-44.7)	25.0 (18.2-3.9)	35.9 (28.9-43.1)
Education			
High School/Less than HS	43.1 (40.9-45.2)	24.5 (22.7-26.4)	44.7 (42.6-46.8)
College Graduate or more	30.4 (28.6-32.1)	18.6 (17.1-20.2)	32.5 (30.7-34.3)
Income			
<\$25,000	45.9 (42.8-48.9)	22.7 (20.2-25.2)	47.5 (44.4-50.7)
\$25,000-\$49,999	35.6 (33.4-37.8)	22.5 (20.6-24.5)	36.6 (34.5-38.8)
>=\$50,000	26.6 (24.3-28.9)	19.5 (17.4-21.7)	30.9 (28.4-33.2)
Employment Status			
Employed	28.9 (27.3-30.5)	21.1 (19.6-22.5)	35.7 (34.0-37.4)
Out of Work	48.8 (40.4-57.3)	30.5 (22.8-38.2)	54.9 (46.4-63.2)
Homemaker/Student	29.1 (25.0-33.1)	14.2 (11.2-17.1)	33.1 (28.7-37.4)
Retired	61.4 (58.0-64.7)	23.1 (20.1-26.1)	43.4 (39.9-46.8)
Unable to Work	74.5 (66.8-82.1)	32.6 (24.4-40.8)	64.3 (55.8-72.8)
Health Insurance			
Yes	36.4 (34.9-37.8)	21.1 (19.8-22.3)	37.3 (35.8-38.7)
No	33.7 (29.2-38.0)	23.3 (19.5-27.2)	45.5 (40.7-50.3)

*Total may not add due to rounding

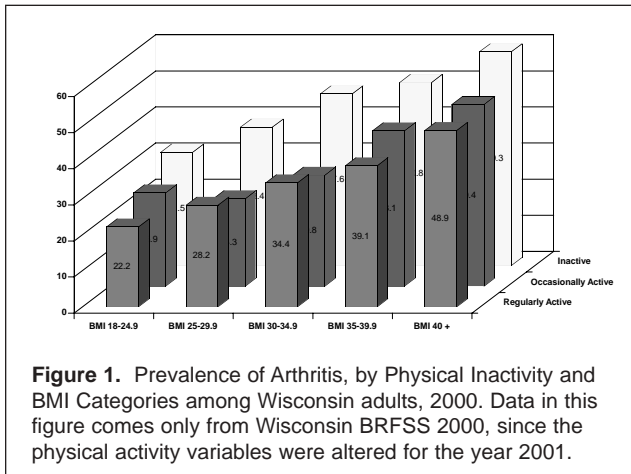
Source: 2000 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Wisconsin Department of Health and Family Services.

studies have shown a positive association between arthritis and both obesity and physical inactivity, we assessed the distribution of obesity and no LTPA among those with and without arthritis.

The sample size for this analysis was 6326. Our case definition of arthritis corresponded to that of the BRFSS. A respondent was classified as having arthritis if he or she reported chronic joint symptoms or doctor-diagnosed arthritis. Chronic joint symptoms were defined by a positive response to both questions: "In the past 12 months, have you had pain, aching, stiffness, or swelling in or around a joint?" and "Were these symptoms present on most days for at least a month?" Respondents were considered to have doctor-diagnosed arthritis if they answered "yes" to the question, "Have you ever been told by a doctor that you have arthritis?"

BRFSS also collects information about height and weight. BMI was calculated by dividing a respondent's reported weight in kilograms by the square of their height in meters. Overweight was defined as a BMI >25 and <30. Obesity was defined as a BMI >30. No LTPA was defined when an adult reported no participation in any kind of leisure time activity other than their regular job. Efforts to lose weight were defined as an individual answering yes to the question "Are you trying to lose weight?" Sample weights were applied to produce state representative estimates.

SAS version 8.2 was used to calculate point estimates and 95% confidence intervals (CI). Confidence intervals or *P*-values can be used whenever there is a need to describe uncertainty in a point estimate. Both *P*-value and confidence intervals may provide a measure of sta-



tistical significance, however use of confidence intervals is recommended because they provide a better description of possible values and are less subject to misinterpretation. It is a “richer” inference than a *P*-value, because it focuses on how large an effect may be, rather than just whether it is different from 0, and it points out the precision of our knowledge and the likely values for the parameter we’re estimating.¹⁵

RESULTS

Based on the BRFSS data for Wisconsin in the year 2000-2001, the prevalence of arthritis was 36.1%; the prevalence of obesity was 21.2% (Table 1). About 38% of Wisconsin adults do not take part in any LTPA on a regular basis. The prevalence of all 3 conditions increased with age (Figure 1). The prevalence of arthritis was highest among adults 55 years and older (58%), those who had not completed high school (43.1%), those who were out of work (49%), and those who were unable to work (74.5%)

The prevalence of obesity was similar across all demographic characteristics: sex, age, race, education, and work status. However, adults above 55 years of age had a higher prevalence (24.3%) than adults aged 18-34 years (16.8%). The prevalence of no LTPA increased with age and was highest among those above 55 years (44.5%) and blacks and Hispanic adults. Prevalence of no LTPA was higher among those with less than high school education and with an annual income less than \$50,000 (Table 1).

Obesity was disproportionately distributed among those with arthritis. Overall, persons with arthritis had a higher prevalence of obesity (28.1%) compared with those without arthritis (15.7%) (Table 2). Men with arthritis were more likely to be obese than those without arthritis (29.3 vs.11.8%); there was a similar relationship for women (28.4% vs.19.3%).

Obesity was more common among those with arthritis than those without arthritis for all age groups; however, the differences were greatest for those aged 55 years and older and statistically significant for all age groups except those between 18-34 years (Table 2). In this age group, 30.3% of persons with arthritis reported obesity, compared with 17.7% of persons without arthritis. A significantly larger percentage of blacks with arthritis reported obesity than whites with arthritis. Among whites, 27% of those with arthritis were obese, compared with 45.4% among blacks and 25.3% among Hispanics. A strong relationship was found between increase in small units of BMI and prevalence of arthritis (Figure 1). Prevalence of arthritis was 59% among those with BMI >40 and who reported being physically inactive.

The estimated prevalence of obesity among persons reporting arthritis varied by their work status (Table 2). Overall, rates ranged from 20.9% among those out of work to 39.7% among those unable to work. The prevalence of obesity differed significantly among those with and without arthritis for those with incomes less than \$50,000 and for education levels, with 26.3% among those with high school or less than high school vs. 14.2% among those with college education. A significant difference was found in obesity prevalence among those adults with health insurance: 28.1% among those with arthritis vs. 14.7% among those without arthritis. However, among adults who reported no health insurance coverage, prevalence of obesity did not differ much between those with and without arthritis.

DISCUSSION

The results of this study show that in Wisconsin, obesity, arthritis, and lack of LTPA affects more than one third of its adults. Furthermore, this study demonstrates that there is a strong relationship between arthritis, obesity, and physical inactivity.^{1,16-21} Specifically, the prevalence of obesity is considerably higher among adults with arthritis regardless of sex, race/ethnicity, age, income, or educational level (Table 2).

This is the first population-based study to estimate the rates of obesity among persons with arthritis. Although the cross-sectional study design of BRFSS does not support a temporal association between obesity and arthritis (i.e., among obese adults excess body weight leads to degenerative joint disease and arthritis), a number of analytic studies have demonstrated that obesity can lead to degenerative joint conditions, that weight loss can prevent subsequent arthritis, and that weight loss can improve existing arthritis symptoms.^{9,10,22}

The study highlights a strong relationship between

Table 2. Prevalence of Obesity and Physical Inactivity among Wisconsin Adults, by Arthritis Status, 2000-2001

Characteristics n=6326	Arthritis (%, 95%CI*) n=2339	No Arthritis (%, 95%CI) n=3987	Arthritis (%, 95%CI) n=2339	No Arthritis (%, 95%CI) n=3987
	Percent Obese		Percent Physically Inactive	
Total	28.1 (24.9-31.4)	15.7 (13.8-17.7)	27.8 (24.6-30.9)	19.2 (17.2-21.3)
	Age			
18-34	18.3 (10.1-26.3)	16.0 (11.9-18.4)	19.2 (10.6-27.7)	17.8 (14.3-21.2)
35-54	28.8 (23.8-33.7)	17.6 (12.6-18.3)	22.4 (17.9-26.9)	19.3 (16.3-22.3)
55+	30.3 (25.6-35.1)	17.7 (13.8-22.0)	33.5 (28.7-38.2)	22.1 (17.4-26.9)
	Sex			
Male	28.4 (23.2-32.9)	19.3 (16.3-22.4)	25.6 (20.8-30.4)	16.4 (13.8-19.1)
Female	29.3 (23.9-32.5)	11.8 (9.5-13.9)	29.2 (25.1-33.5)	22.2 (19.1-25.4)
	Race			
White, Non-Hispanic	27.0 (23.6-30.4)	14.9 (13.0-17.1)	26.4 (23.1-29.7)	17.8 (15.6-19.9)
Black, Non-Hispanic	45.4 (31.3-59.4)	34.4 (22.7-46.1)	41.7 (28.3-55.2)	37.9 (27.3-48.4)
Hispanic	25.3 (34.7-47.0)	12.5 (5.8-36.0)	46.9 (18.5-72.9)	41.6 (23.9-59.2)
Other	40.9 (24.7-57.1)	12.5 (4.9-20.3)	35.6 (20.1-50.9)	55.2 (11.9-33.6)
	Education			
High School/Less than HS	29.9 (25.6-34.3)	18.3 (15.1-21.4)	34.1 (29.5-38.7)	26.7 (22.9-30.4)
College Graduate/ more	26.3 (21.6-31.1)	14.2 (11.8-16.6)	21.1 (16.7-25.4)	14.4 (12.0-16.7)
	Income\$			
<\$25,000	29.6 (23.4-35.8)	15.4 (11.3-19.5)	40.8 (34.2-47.4)	28.2 (22.7-33.8)
\$25,000-\$49,999	30.1 (24.8-35.2)	17.1 (13.9-20.2)	22.8 (18.1-27.5)	19.7 (16.4-23.1)
>=\$50,000	25.4 (18.6-32.1)	16.3 (12.7-19.8)	14.7 (9.9-19.9)	11.8 (8.9-14.6)
	Employment Status			
Employed	28.6 (24.2-32.9)	15.9 (13.7-18.3)	22.6 (18.6-26.7)	18.5 (16.1-20.8)
Out of Work	20.9 (17.7-35.7)	29.2 (14.1-44.3)	28.9 (10.5-47.3)	33.9 (16.9-51.0)
Homemaker/Student	22.9 (13.9-31.9)	8.3 (4.4-12.2)	25.4 (16.2-34.4)	16.9 (10.6-23.2)
Retired	27.9 (21.6-34.3)	17.3 (11.3-23.3)	33.6 (27.2-40.1)	17.7 (11.6-23.7)
Unable to Work	39.7 (25.8-34.3)	18.1 (11.9-34.9)	43.5 (29.7-57.3)	68.1 (46.6-89.7)
	Health Insurance			
Yes	28.1 (24.8-31.5)	14.7 (12.8-16.7)	27.9 (24.6-31.3)	18.4 (16.3-20.5)
No	27.2 (16.2-38.3)	28.1 (20.2-35.9)	26.2 (24.7-31.3)	28.6 (20.3-37.0)

*Total may not add due to rounding

Source: 2000 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Wisconsin Department of Health and Family Services

increase in small units of BMI levels, no LTPA, and prevalence of arthritis among Wisconsin adults. The findings in this report also indicate that persons with arthritis had substantially higher rates of no reported LTPA compared with those without arthritis. Rates of LTPA among persons with arthritis may be low because of arthritis-related disability or because of a perceived risk of exacerbating arthritis symptoms. However, previous studies indicate that persons with arthritis can adapt to increased levels of physical activity without adverse effects,²³ and that physical activity produces improvements in muscle function, cardiorespiratory capacity, and physical performance;²⁴⁻²⁶ and that older

adults with arthritis have had subjective and objective improvement in their condition as a result of physical activity.²⁷ Several recent randomized controlled trials^{22,28-30} have shown the benefits of weight loss with regular exercise on reduction of pain and disability among adults with knee osteoarthritis.

The findings in this report are subject to at least 2 limitations. First, because BRFSS does not sample persons aged <18 years, persons who are in institutions, or those who are in households without a telephone, findings in this report cannot be generalized to all Wisconsin adults. Second, the survey data are self-reported; such indicators of activity limitations and definitions used to identify per-

sons with arthritis have not been validated as measures of arthritis, and persons might not report height and weight accurately, thus affecting the calculation of BMI.

CONCLUSIONS

Weight loss and physical activity are some of the very few modifiable risk factors for arthritis. Given the strong association among the 3 conditions documented in this study, and given the proven utility of weight loss and enhanced physical activity for arthritis treatment that has been documented in other studies, we recommend that clinicians and public health agencies incorporate weight control and increased physical activity as cornerstones of their efforts to prevent and treat arthritis. Health care providers and organizations should encourage persons with arthritis to increase their activity level and to achieve and maintain an ideal body weight. Persons with arthritis should be a priority for public health programs aimed at improving overall levels of physical activity among adults. Furthermore, accessible information about land- and water-based exercise programs and individualized and group approaches to increasing physical activity should be made available. However, adults with arthritis should consult health care professionals before increasing LTPA to determine appropriate levels of physical activity. Clinicians should also work with their arthritis patients to promote the attainment and maintenance of an appropriate body weight.

ACKNOWLEDGEMENTS

We thank Timothy S. Naimi, MD, William Washington, MD, Margaret Taylor, Peter Rumm, MD, Wendy Schell, and Karl Pearson.

REFERENCES

- Marks R, Allegrante JP. Body mass indices in patients with disabling hip osteoarthritis. *Arthritis Res.* 2002;4:112-116.
- CDC. Arthritis prevalence and activity limitations-United States 1990. *MMWR.* 1994;43:433-438.
- CDC. Prevalence of disabilities and associated health conditions among adults-United States, 1999. *MMWR.* 2001;50:120-125.
- CDC. Prevalence of self-reported arthritis or chronic joint symptoms among adults- United States, 2001. *Morbidity and Mortality Weekly Report.* 2001;51(42):948-950.
- Arthritis in Wisconsin. Madison, WI: Division of Public Health, Wisconsin Department of Health and Family Services; 2002.
- Mokdad A, Ford ES, Bowman B, et al. The continued spread of the obesity epidemic. *JAMA.* 2003;289(1):76-79.
- Mokdad AH, Serdula MK, Dietz WH, Bowman BA, Marks JS, Koplan JP. The continuing epidemic of obesity in the United States. *JAMA.* Oct 4 2000;284(13):1650-1651.
- Mokdad AH, Serdula MK, Dietz WH, Bowman BA, Marks JS, Koplan JP. The spread of the obesity epidemic in the United States, 1991-1998. *JAMA.* Oct 27 1999;282(16):1519-1522.
- Felson DT, Lawrence RC, Hochberg MC, et al. Osteoarthritis: new insights. Part 2: treatment approaches. *Ann Intern Med.* Nov 7 2000;133(9):726-737.
- Felson DT, Anderson JJ, Naimark A, Walker AM, Meenan RF. Obesity and knee osteoarthritis. *Ann Intern Med.* 1988;109:18-24.
- US Department of Health and Human Services. The Surgeon General's call to action to prevent and decrease obesity. Rockville, MD: Department of Health and Human Services, Public Health Service, Office of the Surgeon General; 2001.
- CDC. Prevalence of leisure-time physical activity among persons with arthritis and other rheumatic conditions-United States, 1990-1991. *MMWR.* May 9 1997;46(18):389-393.
- Gentry E, Kalsbeek W, Hogelin G. The Behavioral Risk Factor Surveys, II. *Am J Prev Med.* 1985;1:9-14.
- Wakesberg J. Methods for random digit dialing. *J Am Stat Assoc.* 1978;73:40-46.
- International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *JAMA.* Mar 19 1997;277(11):927-934.
- Davis MA, Ettinger WH, Neuhaus JM. Obesity and osteoarthritis of the knee: evidence from the National Health and Nutrition Examination Survey (NHANES I). *Semin Arthritis Rheum.* 1990;20(3 suppl 1):34-41.
- Hartz AJ, Fischer ME, Brill G, et al. The association of obesity with joint pain and osteoarthritis in the HANES data. *J Chron Dis.* 1986;39:311-319.
- Leach RE, Baumgard S, Broom J. Obesity: its relationship to osteoarthritis of the knee. *Clin Orthop Related Res.* 1973;93:271-273.
- Coggon D, Reading I, Croft P, McLaren M, Barrett D, Cooper C. Knee osteoarthritis and obesity. *Int J Obes.* 2001;25:622-627.
- Cicuttin FM, Baker JR, Spector TD. The association of obesity with osteoarthritis of the hand and knee in women: a twin study. *J Rheumatol.* 1996;23:1221-1226.
- Sturmer T, Gunther K, Brenner H. Obesity, overweight and patterns of osteoarthritis: the Ulm osteoarthritis study. *J Clin Epidemiol.* 2000;53:307-313.
- Felson DT, Zhang Y, Anthony JM, Naimark A, Anderson JJ. Weight loss reduces the risk for symptomatic knee osteoarthritis in women. *Ann Intern Med.* 1992;116:535-539.
- Minor MA. Exercise in the management of osteoarthritis of the knee and hip. *Arthritis Care Res.* Dec 1994;7(4):198-204.
- Minor MA, Hewett JE. Physical fitness and work capacity in women with rheumatoid arthritis. *Arthritis Care Res. Sep* 1995;8(3):146-154.
- Minor MA, Lane NE. Recreational exercise in arthritis. *Rheum Dis Clin North Am.* Aug 1996;22(3):563-577.
- Minor MA. Arthritis and exercise: the times they are a-changin'. *Arthritis Care Res.* Apr 1996;9(2):79-81.
- Panush RS, Holtz HA. Is exercise good or bad for arthritis in the elderly? *South Med J.* May 1994;87(5):S74-78.
- Miller GD, Rejeski WJ, Williamson, JD, et al. The arthritis, diet and activity promotion trial: design, rationale, and baseline results. *Controlled Clin Trials.* 2003;24:462-480.
- Ettinger WH, Jr., Burns R, Messier SP, et al. A randomized trial comparing aerobic exercise and resistance exercise with a health education program in older adults with knee osteoarthritis. The Fitness Arthritis and Seniors Trial (FAST). *JAMA.* Jan 1 1997;277(1):25-31.
- Penninx BW, Messier SP, Rejeski WJ, et al. Physical exercise and the prevention of disability in activities of daily living in older persons with osteoarthritis. *Arch Intern Med.* Oct 22 2001;161(19):2309-2316.



The mission of the *Wisconsin Medical Journal* is to provide a vehicle for professional communication and continuing education of Wisconsin physicians.

The *WMJ* (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 *WMJ*. 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 *WMJ* nor the Society take responsibility. The *WMJ* is indexed in Index Medicus, Hospital Literature Index and Cambridge Scientific Abstracts.

For reprints of this article contact the *WMJ* Managing Editor at 866.442.3800 or e-mail wmj@wismed.org.

© 2003 Wisconsin Medical Society