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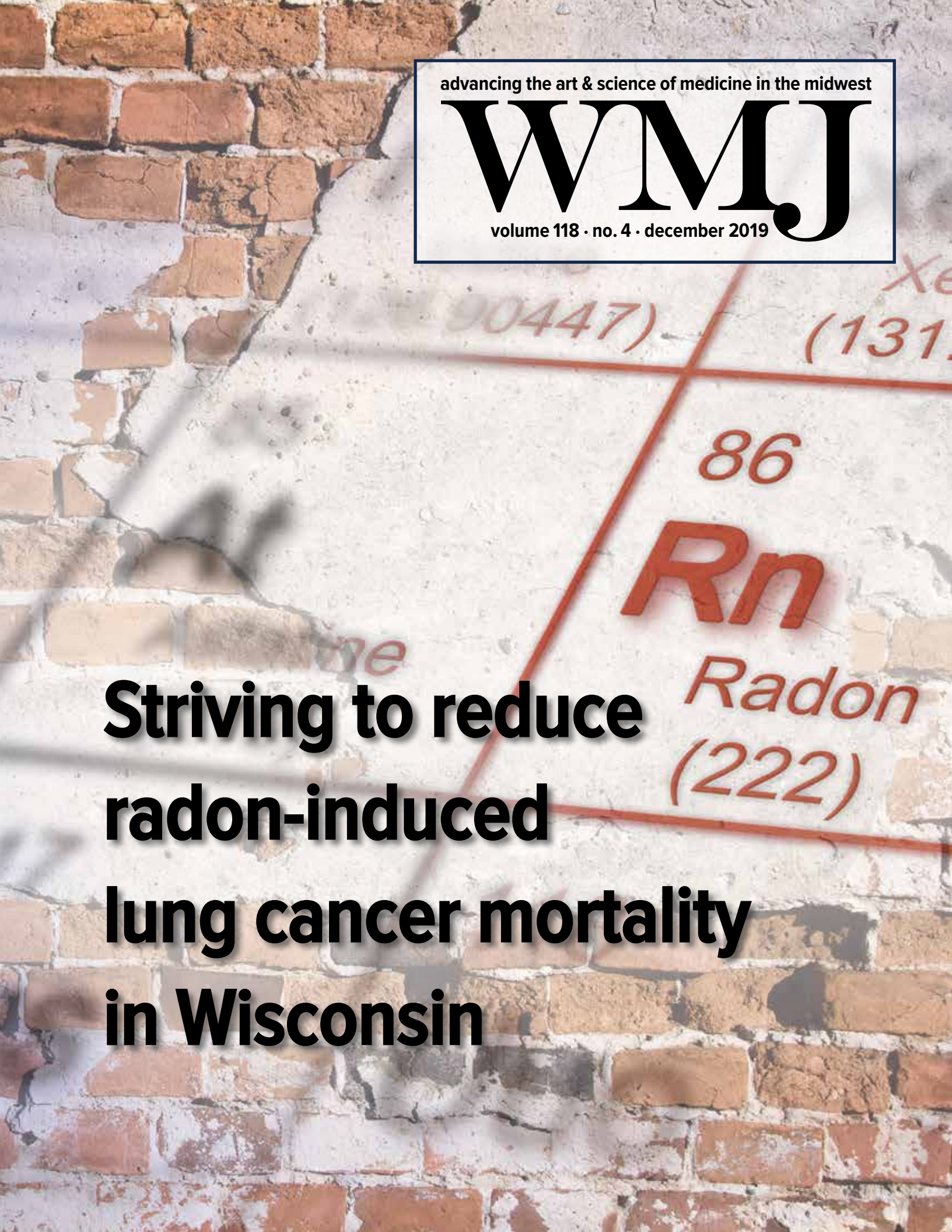

Striving to reduce radon-induced lung cancer mortality in Wisconsin

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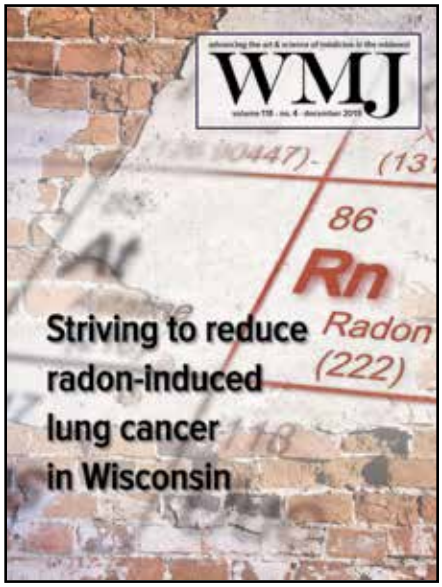

COVER THEME
Striving to Reduce Radon-Induced Lung Cancer in Wisconsin

After smoking, radon is the second-leading cause of lung cancer in the United States, the leading cause of lung cancer in nonsmokers, and is estimated to cause 21,000 deaths every year. In this issue of *WMJ*, researchers explore the prevalence of radon testing and mitigation in Wisconsin schools and homes and suggest that there is much room for improvement.

Cover design by Kendi Neff-Parvin

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WMJ

advancing the art & science of medicine in the midwest

EDITORIALS

In This Issue

Striving to Reduce Radon-Induced Lung Cancer in Wisconsin 155

Sarina Schrager, MD, MS, WMJ *Interim Editor-in-Chief*

REVIEW

'Medical Clearance' of Patients With Acute Mental Health Needs in the Emergency Department: A Literature Review and Practice Recommendations 156

Tony W. Thrasher, DO; Martha Rolli, MD; Robert S. Redwood, MD, MPH; Michael J. Peterson, MD, PhD; John Schneider, MD; Lisa Maurer, MD; Michael D. Repplinger, MD, PhD, for the Wisconsin Chapter of the American College of Emergency Physicians and the Wisconsin Psychiatric Association

ORIGINAL RESEARCH

Changes in Health Care Utilization for Pediatric Patients Treated at a Specialized Outpatient Pain Clinic 164

Antionette Spector, DPT, OCS; Ruta Brazauskas, PhD; Keri Hainsworth, PhD; George M. Hoffman, MD; Steven Weisman, MD; Laura D. Cassidy, MS, PhD

Survey of Radon Testing and Mitigation by Wisconsin Residents, Landlords, and School Districts 169

Ryan A. Denu, PhD; Jessica Maloney, BS; Carrie D. Tomasallo, PhD, MPH; Noah M. Jacobs; John K. Krebsbach; Amber L. Schmaling; Enio Perez, MPH; Andrew J. Bersch, MS; Tamara J. LeCaire, PhD; Jonathan G. Meiman, MD; Kristen M. Malecki, PhD, MPH; Noelle K. LoConte, MD

Evaluating the Effect of Reach Out and Read on Clinic Values, Attitudes, and Knowledge 177

Heather Burton, MD; Dipesh Navsaria, MPH, MSLIS, MD

The mission of *WMJ* is to provide an opportunity to publish original research, case reports, review articles, and essays about current medical and public health issues. *WMJ* is published through a partnership between the Medical College of Wisconsin and the University of Wisconsin School of Medicine and Public Health.

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Address all correspondence to: University of Wisconsin School of Medicine and Public Health, Attn: WMJ Editor, Health Sciences Learning Center, 750 Highland Ave, Madison, WI 537055; e-mail: wmj@med.wisc.edu

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BRIEF REPORTS

Beyond the Objective: Wisconsin Reaching Ischemic Heart Disease Mortality Objective Despite a Third of Counties Not Meeting the Goal 182
Samantha Aisen, MPH

Adult Asthma Control and Self-Management, Wisconsin 2012–2016 187
Grace M. Christensen, MPH; Carrie Tomasallo, PhD, MPH; Jon G. Meiman, MD

CASE REPORTS

Ocular Syphilis: Clinical Manifestations and Treatment Course 191
Tyler Etheridge, MD; Randy C. Bowen, MD, MS; Meisha Raven, DO; Karisa B. Snow, PharmD; Andrew W. Urban, MD; Jonathan S. Chang, MD

A Rare Cause of Prosthetic Valve Infective Endocarditis: *Francisella tularensis holarcticae* 196
Christian A. Olivo, MD; Claire Dysart, PharmD; Javeria Haque, MD; Cristina Olivo, MD; Sami El-Dalati, MD; Nathan Gundacker, MD

YOUR PROFESSION

A Farewell Tribute to a Retiring Editor 152
Kendi Neff-Parvin

Medical Schools Announce Collaboration to Publish *WMJ* 153

Dean's Corner
The Wisconsin Partnership Program: Balancing Our Goals and Responsibilities as a Funder 199
Amy J.H. Kind, MD, PhD; Robert N. Golden, MD

Important Topics in Medical Education 201
Joseph E. Kerschner, MD

2019 Index 203

A Farewell Tribute to a Retiring Editor

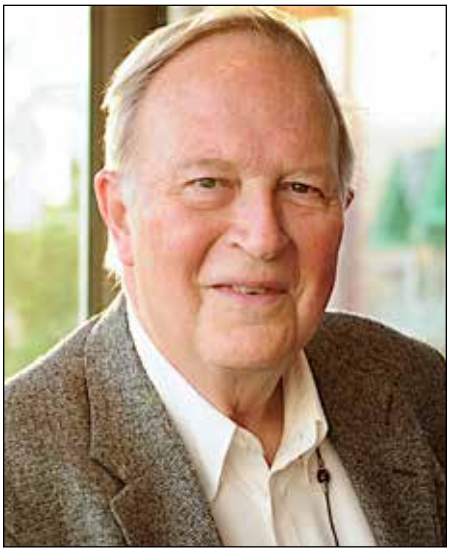
Kendi Neff-Parvin, *WMJ* Managing Editor

The end of 2019 signals not just the end of a decade, it's also the end of an era. After 13 years at the helm of *WMJ*, John J. Frey, III, MD, has retired as editor—leaving behind a remarkable legacy.

"I've enjoyed the privilege of knowing John for several decades, going back to the years when we were colleagues at the University of North Carolina-Chapel Hill, said Robert N. Golden, MD, dean of the University of Wisconsin School of Medicine and Public Health (SMPH) and vice chancellor for medical affairs, University of Wisconsin-Madison. "When I think of John, two phrases come to mind: 'Triple Threat' and 'Renaissance Man' (please pardon the gender specificity of the latter). It is rare to find an academic superstar who is truly committed to patient care, research, and education….and excels in each. When you add to that special mix literary brilliance, the cohort becomes VERY small."

A family medicine physician and emeritus professor at SMPH, Dr Frey also served as chair of the Department of Family Medicine from 1993 to 2006. Throughout his career, he has been a prolific writer, editor, educator, speaker and mentor—something that has not gone unnoticed, as evidenced by accolades that include the American Academy of Family Physicians' prestigious John G. Walsh Award for Lifetime Contributions to Family Medicine in 2017, the Folkert O. Belzer Award for lifetime contribution to the UW School of Medicine and Public Health in 2010, and the Wisconsin Medical Society's Directors Award—its highest honor—in 2015.

"John is about as supportive a teacher and mentor as you can find. His focus is on his colleagues getting better but also becoming fulfilled in their roles as educators, physicians, and scholars," said *WMJ* Editorial Board member William J. Hueston, MD, senior associate dean for Medical Education and associate provost of Education at the Medical College of Wisconsin. "I remember when he was my department chair and I served as residency director in Eau Claire and rather than focus on how productive I was, he told me, 'You really should take some time off each week to do something meaningful to you, like gardening.' I'd never had a boss tell me to work less and enjoy life more, but that is how John connects to people. It's not about what they are doing, it's all about them as a person."



John J. Frey, III, MD

"That is going to be part of his legacy—this idea that medicine is bigger than just what happens in the hospital or the doctor's office, that there's a whole world out there and it's full of interactions that people have with patients or other clinicians, support staff, and the rest of the team. It's just bigger," said *WMJ* Interim Editor Sarina Schrager, MD, MS, who first met Dr Frey when she joined the SMPH faculty in 1996. Eventually, he encouraged her to get involved with the *WMJ* Editorial Board and then invited her to serve as associate editor.

"John is the kind of mentor that you go into a meeting with and come out with lots of new ideas, excited about your plans, and you feel energized and enthusiastic. He is always able to see potential for new ideas, and instead of saying, 'that's impossible, we can't do that,' he'll say 'let's figure out how to make this happen'," she said.

Dr Frey's career in medicine began at Northwestern University Medical School. He interned at Cook County Hospital in Chicago and completed a residency in family medicine at the University of Miami. He went on to teach at the University of Massachusetts Medical School and was residency director at U Mass before serving as assistant in general practice to Julian Tudor Hart in the National Health Service in South Wales, United Kingdom. Before settling in Madison, he taught at the University of North Carolina (UNC) Department of Family Medicine and was director of the Faculty Development Program and acting chair for 18 months, and worked in student, resident and community-based health education center programs.

While at UNC, Dr Frey met Valerie Gilchrist, MD, a colleague who later became his successor as chair of the SMPH Department of Family Medicine.

"What I would want people to know about John is his dedication to patients and the underserved," said Dr Gilchrist. "Not only is he a passionate social advocate in caring for patients, but John's gift—more than any other I can think

of—is that he is the consummate storyteller. It influences how he teaches, and it certainly influences his editorial responsibilities."

Dr Frey has published numerous articles on a vast array of topics, including health care workforce issues and physician loneliness, graduate and undergraduate education, management of common clinical problems, and the social history of family medicine; and he is a frequent a speaker at medical conferences across the country and internationally. He was recruited to the *WMJ* Editorial Board by previous editor Thomas Meyer, MD, and in 2006 agreed to serve as editor when Dr Meyer retired. He was also editor of *Family Medicine,* the official journal of the Society of Teachers of Family Medicine, for nine years and is currently associate editor of the *Annals of Family Medicine*, a bimonthly, peer-reviewed research journal jointly sponsored by the American Academy of Family Physicians and six other major family medicine organizations.

"John knows how to write well but, more importantly, as an editor, he helps others write better," said Dr Hueston, who credits Dr Frey for positioning *WMJ* as "a healthy, thriving journal that serves the needs of practicing doctors across the state."

SMPH Professor Emeritus Patrick Remington, MD, MPH, agrees. "John is an exceptionally gifted writer, and as an editor, he views his role as an opportunity to teach and mentor. You don't get that often with editors," Dr Remington said. "What he has brought to the journal is an exceedingly professional perspective and high standard of editorial oversight. He focused very much on the quality of the publication and took his role very seriously, putting a tremendous amount of time and effort into it—and it's important to note that he did it as a volunteer. This was not a job for John, it was a passion."

> "When I think of John, two phrases come to mind: 'Triple Threat' and 'Renaissance Man'. It is rare to find an academic superstar who is truly committed to patient care, research, and education…and excels in each. When you add to that special mix literary brilliance, the cohort becomes VERY small."
>
> ***—Robert N. Golden, MD***

Dr Frey's commitment to *WMJ* likely stems, at least in part, from his interest in history.

"I have kind of a reputation in my field as being a student of history, and there are very few continuously published medical journals as long as the *WMJ* in the country," he said. "The journal creates a forum for the profession. It's is place to come together, where people can actually exchange ideas in ways that help understand each other better. I believe that the *WMJ* has a really important place in the history of the profession, not just in the state, but in the country, and to be a part of that really means a lot to me."

Dr Frey's successor will be named in early 2020; until then, Dr Schrager will continue to serve as interim editor. Meanwhile, Dr Golden summarized the sentiments of many involved with *WMJ* over the past 13 years: "Thank you, John, for sharing all of these gifts during your long and loving stewardship of the *WMJ*."

Medical Schools announce collaboration to publish *WMJ*

The Medical College of Wisconsin and the University of Wisconsin School of Medicine and Public Health (SMPH) are pleased to announce the acquisition of *WMJ*, the peer-reviewed, indexed scientific journal that has been published by the Wisconsin Medical Society (Society) since 1903. The Society transferred ownership of the journal to the schools in August.

"As the Society looked to focus our efforts while continuing to offer members tools and resources to improve their personal and professional lives, we felt the journal could have broader impact through the medical schools while continuing to be a resource for the physicians of Wisconsin," said Society CEO Bud Chumbley, MD, MBA.

WMJ operations will be overseen by a Publication Board comprised of representatives from each school, as well as an ex officio member from the Society. Publication Board members, the editor-in-chief, and the Editorial Board will be announced in early 2020.

"This collaboration offers an opportunity for each of our institutions to come together and advance some of our common scholarly goals: fostering professional communication, nurturing emerging research, broadening the dissemination of public health science, and encouraging continuing education for medical and public health professionals," said Joseph Kerschner, MD, dean of the School of Medicine and provost and executive vice president, Medical College of Wisconsin.

WMJ is available online at wmjonline.org and through the National Library of Medicine at PubMed.gov. In 2020, papers will be published online ahead of print each month, with quarterly print issues in March, June, September, and December.

"We are excited to bring *WMJ* forward into its second century of publication. In supporting this peer-reviewed journal, our aim is to provide a forum for thought leadership and an outlet for our faculty, residents, and students that showcases high quality 'home grown' research and discussion of the most pressing health issues in Wisconsin and beyond," said Robert N. Golden, MD, dean of the School of Medicine and Public Health and vice chancellor for medical affairs, University of Wisconsin-Madison.

For information about submitting a manuscript or serving as a reviewer, visit wmjonline.org or email wmj@med.wisc.edu.

Striving to Reduce Radon-Induced Lung Cancer in Wisconsin

Sarina Schrager, MD, MS, *WMJ* Interim Editor-in-Chief

January is National Radon Action Month. Radon is an odorless, tasteless, and colorless radioactive gas that is produced in soil and rocks from the degradation of radium, thorium, and uranium. It poses no threat outdoors because the air dilutes radon concentrations. However, in closed areas such as houses or schools, high levels of radon can lead to increased exposure. And while radon itself is not harmful, its degradation products—called "radon daughters"—are radioactive particles that can adhere to any surface, including dust and lung epithelium. Radon can seep into homes and other buildings through cracks in the foundation or drains in floors. It can also enter a house dissolved in well water and then be aerosolized into the air. After smoking, radon is identified as the second-leading cause of lung cancer. And, radon exposure in smokers potentiates the risk of lung cancer. It is estimated that in 2018, radon exposure caused over 21,000 deaths from lung cancer.[1]

There are kits available for $10 to $20 that individuals can use to test the radon levels in a house or building.[2] If radon levels are found to be high, specialized contractors are available to mitigate these levels. Mitigation usually involves increasing ventilation in basements and sealing floors and walls, and it can be expensive, costing over $1,000.[2] For this reason, many people who find high radon levels are not able to mitigate.

According to the Wisconsin Department of Health Services, up to 1 in 10 homes in Wisconsin have high radon levels. The upper Midwest is an area with higher radon levels. A paper in this issue of the *WMJ* by Thrasher et al looked at 2 large data sets and interviewed Wisconsin landlords and school administrators to evaluate how many homes and schools have been tested for elevated radon levels.[3] They found that about a third of homeowners, landlords, and school districts have tested for elevated radon levels. Of those that found elevated levels, however, only 60% were able to mitigate, citing cost as the biggest barrier.

As health professionals, we have the opportunity to educate patients about the risk of radon exposure, especially in smokers, and encourage people to test the radon levels in their homes.

As health professionals, we have the opportunity to educate patients about the risk of radon exposure, especially in smokers, and encourage people to test the radon levels in their homes. Clinicians also can advocate for all public buildings—especially schools—to be tested for radon and encourage government to pay for mitigation in order to protect against the development of lung cancer. For people who have been exposed, clinicians can discuss whether lung cancer screening is appropriate.[4]

Also in this issue is a paper detailing recommendations that resulted from a unique collaborative effort between the Wisconsin Chapter of the American College of Emergency Physicians and the Wisconsin Psychiatric Association.[5] With visits to the emergency department for mental health complaints on the rise, these two groups came together to develop a protocol to simplify and expedite the medical evaluation of patients requiring admission to inpatient psychiatric facilities in a way that is patient-centered, safe, and efficient. Endorsed by both organizations, the protocol emphasizes the importance of communication between the emergency physician and the admitting psychiatrist during the clinical encounter and beyond and recommends employing a uniform tool (the Wisconsin SMART Form) in all EDs to guide the medical evaluation of the patient.

REFERENCES

1. RadonLeaders.org. Reducing the Risk From Radon: A Guide for Health Care Providers. January 25, 2018. http://www.radonleaders.org/sites/default/files/HP_Radon_Guide_2018_FINAL_CRCPD%20E-18-2.pdf. Published January 25, 2018. Accessed December 2, 2019.

2. Wisconsin Department of Health Services. Radon information for Wisconsin. https://www.dhs.wisconsin.gov/radon/index.htm. Revised November 12, 2019. Accessed December 2, 2019.

3. Denu RA, Maloney J, Tomasallo CD, Jacobs NM, et al. Survey of Radon Testing and Mitigation by Wisconsin Residents, Landlords, and School Districts. *WMJ*. 2019;118(4):169-176.

4. Garcia-Rodriguez JA. Radon gas—the hidden killer: what is the role of family doctors. *Can Fam Physician*. 2018;64(7):496-501.

5. Thrasher TW, Rolli M, Redwood RS, et al. "Medical clearance" of patients with acute mental health needs in the emergency department: a literature review and practice recommendations. *WMJ*. 2019;118(4):156-163.

'Medical Clearance' of Patients With Acute Mental Health Needs in the Emergency Department: A Literature Review and Practice Recommendations

Tony W. Thrasher, DO; Martha Rolli, MD; Robert S. Redwood, MD, MPH; Michael J. Peterson, MD, PhD; John Schneider, MD; Lisa Maurer, MD; Michael D. Repplinger, MD, PhD, for the Wisconsin Chapter of the American College of Emergency Physicians and the Wisconsin Psychiatric Association

ABSTRACT

Introduction: Emergency departments have seen increasing numbers of patients presenting with acute mental illness. Currently, there is not a standard for assessing the medical stability of these patients prior to transfer to inpatient psychiatric services, which causes unnecessary delays in patient care.

Objective: Provide a literature review and multidisciplinary expert consensus recommendations to simplify and expedite the medical evaluation of patients requiring admission to inpatient psychiatric facilities.

Methods: A task force with representation from emergency physicians (Wisconsin Chapter of the American College of Emergency Physicians) and psychiatrists (Wisconsin Psychiatric Association) met to create this position statement. The members reviewed clinical practice guidelines and primary literature sources to develop evidence-based recommendations.

Results: Five categories of recommendations were developed: (1) A detailed history and physical exam should constitute the minimum necessary information required for most medical assessments. (2) Clinical information should guide further diagnostic testing; therefore, receiving facility blanket requirements for routine testing should be abandoned. (3) Emergency physicians should understand the limited medical capabilities of institutes of mental disease. Obtaining reasonable diagnostic testing that is not available at these facilities may be appropriate, though this should not delay patient transfer. (4) Structured medical evaluation algorithms should be used to enhance the uniformity of medical assessments for these patients. This task force recommends the Wisconsin SMART Form. (5) Emergency physicians and psychiatrists should communicate more regularly without intermediaries, both at the clinical encounter and beyond.

Conclusion: The recommendations in this paper are endorsed by the Wisconsin Chapter of the American College of Emergency Physicians and the Wisconsin Psychiatric Association, which strongly urge affected medical providers to adopt them into routine practice.

• • •

Author Affiliations: Milwaukee County Behavioral Health Division, Milwaukee, Wis (Thrasher, Schneider); Mendota Mental Health Institute, Madison, Wis (Rolli); Divine Savior Hospital, Portage, Wis (Redwood); University of Wisconsin – Madison Department of Psychiatry, Madison, Wis (Peterson); Emergency Medicine Specialists, Wauwatosa, Wis (Maurer); UW-Madison BerbeeWalsh Department of Emergency Medicine, Madison, Wis (Repplinger).

Corresponding Author: Michael D. Repplinger, MD, PhD, Suite 310, Mail Code 9123, 800 University Bay Dr, Madison, WI 53705; email mdrepplinger@wisc.edu; phone 608.890.5963.

INTRODUCTION

The purpose of this paper is to provide a literature review and practice recommendations regarding the care of emergency department (ED) patients with acute mental health needs. These recommendations carry the weight of a joint task force comprised of representatives from the Wisconsin Chapter of the American College of Emergency Physicians (WACEP) and the Wisconsin Psychiatric Association (WPA). The task force was convened to address multiple nonstandardized and suboptimal practices in the assessment of medical stability of these patients, a process previously termed "medical clearance." Discussed below is background of the problem, what constitutes medical stability, and the special issue of boarding patients in the ED who are awaiting transfer to a psychiatric facility. The task force's recommendations are aimed at streamlining the ED process in a way that is patient-centered, safe, and efficient. Though we refer to care provided by physicians, the task force believes that the recommendations apply to care rendered by other clinicians in the ED as well, particularly advanced practice providers.

BACKGROUND

Visits to the ED for mental health complaints are increasing; they account for 6% of all adult ED visits and 7% of pediatric ED visits.[1,2] When adult substance abuse-related visits are also included, this proportion increases to 12.5% of patients presenting to the ED for care annually.[3] In fact, the rate of ED vis-

its involving mental health or substance use disorders increased substantially from 2006 to 2014 (44.1%), outpacing the overall ED visit growth trend of 14.8%; suicidal ideation had the highest increase (414.6%) over the 9-year period.[4] While emergency physicians can be instrumental in facilitating the care of these patients, the increasing demand for mental health services has brought these resources to the brink of exhaustion, particularly inpatient psychiatric care. When not adequately operationalized, the health system becomes inefficient and patients' needs go unmet.

The incidence of mental illness nationally is rising while available services and funding are either decreasing or the rate of increase is not keeping pace with the demand.[5,6] This is even more daunting because it has been accompanied by deinstitutionalization, lack of meaningful parity for mental health care, funding shortages, and continued stigma surrounding mental health. Consequently, there are more patients with mental illness finding themselves in crisis or needing services further upstream to preempt such emergencies.[7]

The gravity of the situation is highlighted by the 2016-2017 National Survey on Drug Use and Health, which reported that 822,000 respondents (18.54% of the population) in Wisconsin suffered from mental illness during that year, with 217,000 (4.88% of the population) suffering from severe mental illness.[8] Despite this significant need, Wisconsin is noted to have a shortage of approximately 266 psychiatrists.[9] The future of the profession is additionally complicated by the fact that half of all psychiatrists in Wisconsin are over 55 years old [unpublished data, Wisconsin Medical Society briefing, 2018]. Perhaps unsurprisingly, Mental Health America ranks Wisconsin 34th out of all states in mental health workforce availability, while the Bureau of Labor Statistics places Wisconsin 30th with regard to psychiatrist employment rates.[10,11]

How Do We Assess Medical Stability?

Before transferring a patient to an inpatient psychiatric facility from an ED, the accepting inpatient team requires an assessment of medical stability. This is important because up to half of patients with mental health complaints have coexisting nonpsychiatric medical diseases that may cause or exacerbate their psychiatric condition.[12,13] Moreover, nonpsychiatric medical illness, even when not affecting psychiatric symptoms, is highly prevalent and often undertreated in patients with underlying psychiatric disorders like schizophrenia, bipolar disorder, and schizoaffective disorder.[14] Complicating this assessment is the fact that accepting psychiatric facilities are often freestanding, meaning they are not connected to a general hospital and, consequently, have limited ability to care for complex medical problems.

The goal of the ED-performed medical assessment is therefore twofold: (1) identify and stabilize any nonpsychiatric medical conditions that may be causing or contributing to the patient's current symptoms (eg, encephalopathy/delirium, substance intoxication/withdrawal, infections, etc); and (2) identify and stabilize any acute nonpsychiatric medical illness (including exacerbations of chronic conditions like chronic obstructive pulmonary disease or diabetes) such that the patient may be safely managed at an inpatient psychiatric setting.[15,16] This process is commonly referred to as "medical clearance," though we agree with the American Association of Emergency Psychiatry (AAEP) that this term is misleading. Instead, we will refer to this concept as "assessing medical stability" throughout the remainder of this manuscript. One key reason for this change in language is highlighted by Michael Weissberg in one of the first manuscripts discussing this issue: "The use of the term 'medically clear' in emergency room settings hinders patient care by impeding the flow of information between psychiatric and nonpsychiatric personnel."[17]

Key to the confusion in terminology and misunderstanding of its elements is the fact that it has no universally accepted definition. It may imply patient readiness for psychiatric evaluation, stability for transfer to inpatient psychiatry, or stability for discharge to outpatient care.[18] Confusion is exacerbated by the fact that this assessment cannot reliably be standardized in terms of requiring specific tests. Instead, it needs to be tailored to the individual patient, beginning with a detailed history and physical exam. In so doing, the ED clinician should be able to ascertain what additional information (eg, laboratory tests, imaging tests, specialist consultation, etc) is required to ensure that the patient is medically stable for transfer and admission to an inpatient psychiatric setting, where other medical specialists may not be available.

If an acute, nonpsychiatric medical finding requiring immediate intervention is uncovered during this assessment, the patient should have such interventions performed prior to transfer. This may be aimed at treating a nonpsychiatric cause for the patient's acute presentation, but could alternatively be aimed at stabilizing an acute decompensation of a chronic medical condition. Once identified and stabilized, the diagnosis and resulting treatment should be communicated to the receiving psychiatric center. Importantly, medical stability does not mean that the patient is free from all medical problems or comorbid conditions, nor does it negate the possibility of the patient developing new signs or symptoms of an illness at the receiving facility. However, it is imperative that emergency physicians perform an appropriately thorough evaluation and document their findings to assist in the patient's ongoing care at the receiving psychiatric center. Common errors in the process of assessing medical stability include failure to obtain collateral information, failure to complete a thorough physical exam, anchoring on a primary psychiatric diagnosis, and inappropriate use of diagnostic testing.[19] As a cautionary tale, 1 study found that 10 of 298 consecutive psychiatric admissions had a nonpsychiatric medical disease requiring treatment. Of those 10 patients, 8 were reported to

be "medically clear," even though their disease could have been identified during a standard history and physical exam.[20]

The Impact of ED Boarding

One of the key concerns with the current paradigm of assessing medical stability for patients with mental health crisis is its effect on ED boarding. Boarding is the time spent waiting in an ED for an inpatient hospital bed or transfer to another inpatient facility. It is an increasingly common phenomenon afflicting EDs nationwide,[21] and has been associated with increased hospital length of stay (LOS) and mortality.[22] The ED has a fixed capacity, and when the inflow (ie, patient arrivals) outpaces the outflow (ie, discharges and admissions), patients gather in the waiting area, delaying care for such individuals. Thus, for every mental health patient awaiting transfer to an inpatient facility, another patient's needs may go unnoticed, potentially causing morbidity and mortality.

It should also be noted that patients with mental health complaints have a significantly greater ED LOS than patients with nonpsychiatric complaints. One study reported mental health-related visits had a mean LOS of 446 minutes versus 128 minutes for patients with other complaints.[23] Another study reported that patients with Medicaid or who are uninsured—a frequent occurrence for patients with mental health needs—had significantly longer LOS and were twice as likely to be in the ED for over 24 hours than privately insured patients.[24]

METHODS

This task force was formed by WACEP and WPA in 2017. The mission at that time was broad: to combine complementary areas of expertise in order to synergistically solve mental health care concerns and advocate for positive health system changes as it relates to patients with acute mental illness. Initial meetings included a needs assessment, which yielded multiple inefficiencies in the mental health care continuum. One such area that received significant discussion was the process of assessing medical stability, so the task force focused its efforts on performing a literature review and developing recommendations—based on the available literature and expert consensus—to be used by both referring and receiving hospitals caring for patients with mental health emergencies.

Content experts from both emergency medicine and psychiatry (emergency psychiatry and inpatient psychiatry) were present during all discussions. Clinical practice guidelines from the American College of Emergency Physicians (ACEP) and the American Association of Emergency Psychiatry (AAEP) were reviewed.[16,18,25] Further, task force members with additional training in research methods conducted a systematic review to identify those relevant papers regarding the process of assessing medical stability. This involved key word and medical subject heading searches in PubMed, screening articles by review of their abstracts, and inclusion of articles deemed relevant to this topic, though it was limited to publications in English. Furthermore, the task force consulted key stakeholders involved in the process, including representatives of receiving psychiatric facilities, county mental health agencies, law enforcement professionals, and state and national psychiatric and emergency medicine organizations. The compilation of guidelines, references, and stakeholder discussions were then synthesized into a list of recommendations as described below in detail.

RECOMMENDATIONS

1. The emergency department evaluation of patients with acute mental health needs should include a detailed history and physical exam

While not all patients in acute mental health crisis require an assessment of medical stability in the ED, those who do present to the ED require a thorough history and physical exam, including a full set of vital signs.[18] Though classic medical teaching suggests that mental health patients have difficulty reporting medical symptoms or history accurately, Amin and Wang found this to be incorrect, concluding that history and physical exam is sufficient to guide further diagnostic testing in patients with mental health complaints.[26] Ascertaining both past general medical and psychiatric history yields guidance for further diagnostic evaluation and risk assessment. Further, the physical exam should include core organ systems with an eye to assessing for evidence of infection, trauma, or other pathologic conditions, including toxidromes.[19] It should, therefore, be done unclothed. If the patient refuses to disrobe for the exam, this limited physical exam must be communicated to the accepting physician in order to come to a consensus plan on what additional evaluation may be needed to ensure medical stability.

Historically, documentation of physical exam findings for patients with psychiatric presentations to the ED has been poor. In 1 study, only 50% of patients with schizophrenia who were evaluated in the ED had a full set of vitals, defined as blood pressure, heart rate, respiratory rate, and temperature.[27] A separate evaluation of 137 patients with acute psychiatric symptoms demonstrated that none had a mental status exam documented and fewer than 20% had a neurologic exam.[28] When evaluating which parts of the exam were missing in documentation, cranial nerve exam was documented the least frequently (11.4%), while an assessment of behavior was included most frequently (75.7%).[27] Emergency physicians have been shown to be less likely to document a complete history and physical exam when compared with nurse practitioners and family medicine physicians, though there is wide variability in documentation among all clinician types.[29] This is an important area to highlight, because when attempting to detect a nonpsychiatric medical problem for patients presenting to the ED for a psychiatric chief complaint, history and physical exam alone detects 94% of abnormalities.[30]

As always, there are special patient populations for whom physicians should consider additional elements of the history and

physical exam. For example, among children, characteristics that should raise suspicion of nonpsychiatric medical disease include new-onset illness, onset before the age of 12 years, sudden onset of symptoms, visual or tactile hallucinations, seizures, and the absence of a family history of mental illness.[31] Similarly, pregnant patients should give clinicians pause, as it can be the first time during which patients exhibit psychiatric illness or their baseline illness may be exacerbated by their pregnancy. Finally, psychiatric symptoms in the elderly are frequently due to nonpsychiatric medical disease. Identification of delirium or encephalopathy, for instance, can potentially change management, and an assessment of mental status should be part of the medical evaluation of these patients.[13,32] In fact, frank disorientation among the elderly is more likely to be due to a medical cause than a primary psychiatric etiology. Previous reports suggest that emergency physicians miss the diagnosis of delirium in this cohort up to 76% of the time.[33,34] Ideally, mental status examination should include an assessment of attention, executive function, orientation, and recent memory.[16] Those who prefer a structured evaluation of mental status may refer to, among others, Kaufman and Zun, who found that a 6-item questionnaire worked well for identifying patients with severely impaired mental status.[35]

2. Diagnostic testing should be guided by an individual patient's history, review of systems, and physical examination and is not always required for assessing medical stability

Of all the elements of the medical assessment process for patients with mental health needs, none seems to be as controversial and subject to practice variation as the requirement for routine diagnostic testing.[36,37] On one side is the traditionally emergency medicine belief that testing should be geared toward findings that have a reasonable probability of existing for the patient and that would change management should an abnormality be identified. This conflicts with the concern of psychiatrists that all abnormalities should be identified in order to guide medical management at facilities that do not have comprehensive medical services. Requirements for routine testing are common, occurring for approximately 84% of psychiatric transfers,[36] and can be exhaustive, including sleep-deprived electroencephalogram (EEG).[38] In 1 report of patients admitted to a psychiatric facility in the United States during 2010 to 2014, 80% had at least 1 medical screening test performed.[39] The effects of having blanket requirements for diagnostic testing are significant: having any screening test performed increases ED LOS by 117 minutes (95% CI, 109.7-124.4).[40] Furthermore, overtesting corresponds directly with overtreatment, which can subject psychiatric patients to the side effects of a medical intervention without any of the benefits.[41]

A review of the literature, as referenced by policy statements from ACEP and AAEP,[16,18,25] would suggest that routine testing is unhelpful to the management of patients presenting to the ED with psychiatric complaints.[42] Though the point of this article is not to report an exhaustive search of the evidence, a few key studies of routine laboratory testing warrant discussion. For instance, when routine laboratory tests were checked for all patients admitted to an academic psychiatry ward, only 1 case of 519 would have changed management, while there were numerous cases of positive urine drug screens, hyperglycemia, and anemia—all of which were managed on the psychiatry ward.[43] Further, a prospective, multicenter study found that while psychiatrists requested testing in 44% of patients, only 1 patient (0.5%) had an abnormal result that led to a change in disposition.[44] Another prospective study of routine laboratory testing among a cohort of 375 patients with psychiatric presentations found that only 1.1% of patients had an abnormality (all were abnormal urinalyses, which did not affect final disposition).[26] Finally, in a 5-year retrospective, multicenter study evaluating the utility of head computed tomography in patients presenting to the ED with "bizarre behavior" but no focal neurological deficits on exam or preexisting central nervous system disease, none had an acute finding.[45]

Perhaps the most studied subset of routine laboratory testing for psychiatric patients is the urine drug screen. Opponents to the routine use of this test highlight that it is incorrect 24.8% of the time when compared with a gold standard of liquid chromatography/mass spectrometry testing.[46] This problem is exacerbated by the fact that its use in the ED is associated with increased ED LOS and charges, yet few have confirmatory testing done, suggesting that the results are used either erroneously or not at all.[47] One final note regarding urine testing is that urinalysis (to test for urinary infections) should not be performed in patients without urinary symptoms—even in the elderly—because asymptomatic pyuria and asymptomatic bacteriuria are common and are not indications for antibiotics.[48]

Obtaining laboratory testing in pediatric patients with mental health needs, in particular, is both challenging to do and of little benefit. Among pediatric patients brought to the ED for involuntary mental health holds who have a nonconcerning clinical exam, 94.3% have clinically nonsignificant laboratory results.[49]

Box. Recommendations

1. The emergency department evaluation of patients with acute mental health needs should include a detailed history and physical exam.
2. Diagnostic testing should be guided by an individual patient's history, review of systems, and physical examination and is not always required for assessing medical stability.
3. Emergency physicians should help facilitate the medical treatment of patients referred to freestanding psychiatric facilities, which have limited medical resources.
4. A uniform tool to guide the medical evaluation should be employed in all emergency departments in the state: The Wisconsin SMART Form.
5. Emergency physicians and psychiatrists should communicate directly about patient care.

Urine drug screens, in particular, have been shown to not affect management, even when positive.[50,51] Another study of 871 pediatric patients with laboratory tests performed found that abnormal testing was associated with only 7 (0.8%) disposition changes and only 50 (5.7%) management changes that were not associated with a disposition change.[40] Regarding costs related to testing, a significant range has been reported: 1 study found that the median cost of routine blood and urine tests was $1,235, while another found that the average charge for pediatric patients undergoing diagnostic testing was $17,240 when accounting for secondary ambulance transfers and wages for sitters.[49,52]

The purpose of discussing these largely negative studies is not to say that diagnostic testing of psychiatric patients has no role in their medical assessment. Rather, it highlights that adherence to a routine testing protocol may cause physicians to overlook instances when targeted testing is required. This is particularly true for higher risk populations, including the elderly, patients with no prior psychiatric history, and patients with preexisting medical disorders or current medical complaints.[53] Having no prior psychiatric history is especially concerning, with 1 study finding that 63% of patients with a new psychiatric complaint had a nonpsychiatric medical cause, most of which was toxicologic (cocaine and amphetamines).[54] Agitated patients requiring emergency intramuscular medications are another cohort that may require further investigation, since they are more likely to have abnormal laboratory findings than patients not requiring these medicines.[55] Korn et al suggested that routine comprehensive screening of all patients is prohibitive and unnecessary, instead recommending that routine laboratory evaluation be reserved for the elderly, homeless, and patients with new symptoms.[56] Diagnostic testing in these populations may include urinalysis, complete blood count, toxicology, basic metabolic profile, chest x-ray, electrocardiogram, and alcohol level.[15] When available, elevated alcohol levels may be appropriately reassessed by breathalyzer.

3. Emergency physicians should help facilitate the medical treatment of patients referred to freestanding psychiatric facilities, which have limited medical resources

Freestanding psychiatric facilities, which are labeled Institutes of Mental Disease (IMDs) by the Centers for Medicare and Medicaid Services (CMS), have limited medical resources. This type of receiving facility varies greatly in staffing and ability to manage complex medical issues and often has separate requirements outside of standard medical stability assessment, known as exclusionary criteria. These can be categorized as reflecting limitations due to: (1) pre-existing or current medical conditions (particularly infections or end-stage diseases); (2) administrative burdens affecting staffing or requiring advanced equipment/training; and (3) abnormal laboratory results that psychiatric clinicians are not comfortable managing.[57]

These variations in capacity to handle nonpsychiatric medical illnesses continue to be a rate-limiting factor for global acceptance criteria to an inpatient psychiatric unit. For instance, while most may assume that inpatient psychiatric care is typically provided in general hospitals on a specialized unit, the majority of capacity in Wisconsin's state system, including the largest county (Milwaukee), are that of freestanding psychiatric hospitals. Due to being dissociated from general medical services, a commonly overlooked challenge when admitting to these facilities is severe alcohol and drug intoxication or withdrawal.[32] Moreover, these facilities may have limited laboratory testing abilities, which may be the primary reason that such testing is requested prior to patient transfer. As such, requests for reasonable laboratory testing should be honored when possible, though this should not delay transfer of patients who are otherwise medically appropriate for transfer.[16] To assist in understanding this limitation, facility-specific exclusionary criteria should be clearly defined in regional protocols and should not discriminate based on race, religion, language spoken, legal status, insurance status, or payer type.

4. A uniform tool to guide the medical evaluation should be employed in all emergency departments in the state: The Wisconsin SMART Form

Algorithms or protocols to assess the medical stability of psychiatric patients have been studied extensively. One such study of a field screening protocol, which was dependent on clinical findings alone, successfully triaged patients to regional psychiatric facilities resulting in only 0.3% of patients being diverted for medical stability assessment at a nonpsychiatric facility.[58] A similar evaluation of clinical screening by paramedics in over 1000 patients resulted in 27.4% of patients being transferred directly to a psychiatric facility without further medical screening. Though 10 returned to an ED within 6 hours, none were admitted for previously unknown conditions.[59]

Based on these reports, it is logical that structured medical assessment of patients with primary psychiatric complaints in the ED is effective at identifying patients that do not need diagnostic testing. In 1 study of 500 consecutive patients for whom a structured assessment was employed, only 6 (1.2%) were sent back to the ED for reevaluation and none required more than an outpatient prescription.[60] The task force recommends the use of the Wisconsin SMART Form (see Figure), adapted from the SMART Form, which was created by the Sierra Sacramento Valley Medical Society.[61] This form, and its underlying principles of medical assessment, is the result of a collaboration between psychiatrists and emergency physicians who aimed to develop a process for evaluating patients in mental health crisis in a way that is safe and timely, facilitating transfer to appropriate treatment centers in a resource-conscious way. If all 5 categories of the form are checked "no," the patient is considered medically stable without further diagnostic testing. The categories include: (1) new onset psychiatric condition; (2) medical conditions

Figure. Wisconsin SMART Form

WACEP Wisconsin Chapter American College of Emergency Physicians

WISCONSIN PSYCHIATRIC ASSOCIATION

WISCONSIN "SMART" FORM

Criteria:	NO*	YES	RESOLVED (TIME)
SUSPECT **New Onset Psychiatric Condition?**	S		
Other MEDICAL Conditions that Require Screening?	M		
-Diabetes (FSBG <60 or >250)			
-Possibility of pregnancy (age 12-50)			
-Other non-psychiatric medical complaints that require screening			
ABNORMAL?	A		
-Vital Signs?			
-Temp: greater than 38°C (100.4°F)			
-HR: less than 50 or greater than 110 bpm.			
-BP: Systolic <100 or >180mm Hg. Diastolic >110mm Hg. (2 consecutive)			
-RR: less than 8 or greater than 22 rpm.			
-O_2 Sat: less than 95% on room air.			
-Mental Status?			
-Cannot answer name, month/year, and location (minimum of A/O X 3)			
-If clinically intoxicated, HII score of 4 or more (see next page)			
-Physical Exam (unclothed)?			
RISKY **Presentation?**	R		
-Age less than 12 or greater than 55			
-Possibility of ingestion (screen all suicidal patients)			
-Presence of Eating Disorders			
-Potential for alcohol withdrawal (daily use equal to or greater than 2 weeks; past complicated withdrawal)			
-Ill appearing, significant injury, prolonged struggle, or "found down"			
-Trauma involved in presentation (head injuries, assaultive behavior, cutting, ligature, s/p MVAs or hanging)			
THERAPEUTIC **Levels Needed?**	T		
-Phenytoin			
-Valproic Acid			
-Lithium			
-Digoxin			
-Warfarin (INR)			
-Other (Other anticonvulsants, Clozapine, TCAs, etc.)			

If all five SMART categories are checked "NO", then the patient is considered medically stabilized and no further testing is needed. If **ANY category is checked "YES", then appropriate testing and/or communication between physicians needs to occur with appropriate documentation and time that the issue was resolved.*

Date: _____ **Time:** _____ **Completed by:** _____ _____ **, MD/DO**

Signature *Printed*

NOTE: If there is any lack of agreement between the Emergency Medicine Physician and the Psychiatrist on the above results, then an immediate phone conversation (between the two providers) is expected to occur to resolve the situation and come to a consensus plan.

An answer of "no" to each of the elements indicates that no further diagnostic testing is needed for the medical assessment of a patient with mental health crisis. A "yes" answer to a category indicates that further testing may be warranted. Regardless of whether testing is performed, any "yes" answer should be communicated to the receiving facility's physician along with appropriate documentation of the time and manner in which the issue was resolved.

that require screening; (3) abnormal vital signs, mental status, or physical exam (which should be done unclothed); (4) risky presentation; and (5) therapeutic drug levels needed. If the referring clinician answers "yes" to any of the items on the list, then appropriate testing and/or communication between physicians needs to occur with appropriate documentation and time that the issue was resolved.

5. Emergency physicians and psychiatrists should communicate directly about patient care

Though there were no specific studies evaluating the benefit of this recommendation, it is the consensus of the task force that, in the state of Wisconsin, very little communication occurs between physicians at referring and receiving hospitals in the care of mental health patients. Efforts to improve this should occur both at the time of the ED visit, as well as outside of the patient encounter. While in the ED, emergency physicians should feel empowered and encouraged to contact the receiving psychiatric facility and speak directly with the accepting psychiatrist about the care of the patient. Not only does this eliminate speaking with multiple intermediaries and the subsequent confusion that tends to occur when nonphysicians enter this dialogue, it also facilitates a collegial conversation aimed at understanding and tending to the patient's needs.

Quality of care is improved when physicians communicate directly about assessment of medical stability, exclusionary criteria, and admission. As referenced above, communication also should take place outside of the clinical encounter. Ideally, this should occur at the department- or institution-level to develop sound clinical policies and protocols. However, individual multispecialty physician dialogues outside of clinical encounters also can be useful in terms of reestablishing trust between psychiatrists and emergency physicians. Suggested topics could include discussions of exclusionary criteria, capabilities regarding patients requiring seclusion, and what medical capabilities exist at accepting psychiatric facilities.

CONCLUSION

Caring for patients with mental health needs is a common occurrence in the ED. Though the health care system historically has suffered from a lack of uniformity as it pertains to the medical evaluation of these patients, this paper aims to correct that problem. The recommendations of this report seek to facilitate the safe and efficient care of patients requiring admission for psychiatric services.

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REFERENCES

1. Larkin GL, Claassen CA, Emond JA, Pelletier AJ, Camargo CA. Trends in U.S. emergency department visits for mental health conditions, 1992 to 2001. *Psychiatr Serv.* 2005;56(6):671-677. doi:10.1176/appi.ps.56.6.671

2. Simon AE, Schoendorf KC. Emergency department visits for mental health conditions among US children, 2001-2011. *Clin Pediatr.* 2014;53(14):1359-1366. doi:10.1177/0009922814541806

3. Owens PL, Mutter R, Stocks C. Mental health and substance abuse-related emergency department visits among adults, 2007: Statistical Brief 92. In: *Healthcare Cost and Utilization Project (HCUP) Statistical Briefs*. Rockville, MD: US Agency for Healthcare Research and Quality; 2006. http://www.ncbi.nlm.nih.gov/books/NBK52659/. Accessed October 25, 2018.

4. Trends in emergency department visits, 2006-2014. Healthcare Cost and Utilization Project (HCUP). https://www.hcup-us.ahrq.gov/reports/statbriefs/sb227-Emergency-Department-Visit-Trends.jsp. Statistical Brief 227. Published September 2017. Accessed October 26, 2018.

5. Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999-2014. *NCHS Data Brief*. 2016;(241):1-8.

6. McGinty E, Pescosolido B, Kennedy-Hendricks A, Barry CL. Communication strategies to counter stigma and improve mental illness and substance use disorder policy. *Psychiatr Serv*. 2018;69(2):136-146. doi:10.1176/appi.ps.201700076

7. Zeller SL. Treatment of psychiatric patients in emergency settings. *Prim Psychiatry*. June 1, 2010. http://primarypsychiatry.com/treatment-of-psychiatric-patients-in-emergency-settings/. Accessed August 21, 2019.

8. State data tables and reports from the 2016-2017 NSDUH. Substance Abuse and Mental Health Services Administration. https://www.samhsa.gov/data/nsduh/state-reports-NSDUH-2017. Accessed August 21, 2019.

9. Division of Care and Treatment Services, Wisconsin Department of Health Services. 2017 Wisconsin Mental Health and Substance Use Needs Assessment. https://www.dhs.wisconsin.gov/publications/p00613-17.pdf. Published July 2018. Accessed August 21, 2019.

10. Overal ranking. Mental Health America. https://www.mentalhealthamerica.net/issues/ranking-states. Published 2019. Accessed August 21, 2019.

11. Occupation employment and wages, May 2018. US Bureau of Labor Statistics. https://www.bls.gov/oes/current/oes291066.htm. Updated March 29, 2019. Accessed August 21, 2019.

12. Hall RC, Gardner ER, Stickney SK, LeCann AF, Popkin MK. Physical illness manifesting as psychiatric disease. II. Analysis of a state hospital inpatient population. *Arch Gen Psychiatry*. 1980;37(9):989-995. doi:10.1001/archpsyc.1980.01780220027002

13. Hoffman RS. Diagnostic errors in the evaluation of behavioral disorders. *JAMA*.1982;248(8):964-967. doi:10.1001/jama.1982.03330080046027

14. Jones DR, Macias C, Barreira PJ, Fisher WH, Hargreaves WA, Harding CM. Prevalence, severity, and co-occurrence of chronic physical health problems of persons with serious mental illness. *Psychiatr Serv*. 2004;55(11):1250-1257. doi:10.1176/appi.ps.55.11.1250

15. Alam A, Rachal J, Tucci VT, Moukaddam N. Emergency department medical clearance of patients with psychiatric or behavioral emergencies, part 2: special psychiatric populations and considerations. *Psychiatr Clin North Am.* 2017;40(3):425-433. doi:10.1016/j.psc.2017.05.001

16. Wilson MP, Nordstrom K, Anderson EL, et al. American Association for Emergency Psychiatry Task Force on Medical Clearance of Adult Psychiatric Patients. Part II: controversies over medical assessment, and consensus recommendations. *West J Emerg Med*. 2017;18(4):640-646. doi:10.5811/westjem.2017.3.32259

17. Weissberg MP. Emergency room medical clearance: an educational problem. *Am J Psychiatry*. 1979;136(6):787-790. doi:10.1176/ajp.136.6.787

18. Anderson EL, Nordstrom K, Wilson MP, et al. American Association for Emergency Psychiatry Task Force on Medical Clearance of Adults. Part I: introduction, review and evidence-based guidelines. *West J Emerg Me*d. 2017;18(2):235-242. doi:10.5811/westjem.2016.10.32258

19. Tucci VT, Moukaddam N, Alam A, Rachal J. Emergency department medical clearance of patients with psychiatric or behavioral emergencies, part 1. *Psychiatr Clin North Am*. 2017;40(3):411-423. doi:10.1016/j.psc.2017.04.001

20. Tintinalli JE, Peacock FW IV, Wright MA. Emergency medical evaluation of psychiatric patients. *Ann Emerg Med.* 1994;23(4):859-862. doi:10.1016/s0196-0644(94)70326-4

21. Schafermeyer RW, Asplin BR. Hospital and emergency department crowding

in the United States. *Emerg Med (Fremantle)*. 2003;15(1):22-27. doi:10.1046/j.1442-2026.2003.00403.x

22. Singer AJ, Thode HC Jr, Viccellio P, Pines JM. The association between length of emergency department boarding and mortality. *Acad Emerg Med*. 2011;18(12):1324-1329. doi:10.1111/j.1553-2712.2011.01236.x

23. Conrad HB, Hollenbach KA, Gehlbach DL, Ferran KL, Barham TA, Carstairs KL. The impact of behavioral health patients on a pediatric emergency department's length of stay and left without being seen. *Pediatr Emerg Care*. 2018;34(8):584-587. doi:10.1097/PEC.0000000000001565

24. Pearlmutter MD, Dwyer KH, Burke LG, Rathlev N, Maranda L, Volturo G. Analysis of emergency department length of stay for mental health patients at ten Massachusetts emergency departments. *Ann Emerg Me*d. 2017;70(2):193-202.e16. doi:10.1016/j.annemergmed.2016.10.005

25. Lukens TW, Wolf SJ, Edlow JA, et al; American College of Emergency Physicians Clinical Policies Subcommittee (Writing Committee) on Critical Issues in the Diagnosis and Management of the Adult Psychiatric Patient in the Emergency Department. Clinical policy: critical issues in the diagnosis and management of the adult psychiatric patient in the emergency department. *Ann Emerg Med*. 2006;47(1):79-99. doi:10.1016/j.annemergmed.2005.10.002

26. Amin M, Wang J. Routine laboratory testing to evaluate for medical illness in psychiatric patients in the emergency department is largely unrevealing. *West J Emerg Med*. 2009;10(2):97-100.

27. Szpakowicz M, Herd A. "Medically cleared": how well are patients with psychiatric presentations examined by emergency physicians? *J Emerg Me*d. 2008;35(4):369-372. doi:10.1016/j.jemermed.2007.11.082

28. Riba M, Hale M. Medical clearance: fact or fiction in the hospital emergency room. *Psychosomatics*. 1990;31(4):400-404. doi:10.1016/S0033-3182(90)72134-2

29. Pinto T, Poynter B, Durbin J. Medical clearance in the psychiatric emergency setting: a call for more standardization. *Healthc Q*. 2010;13(2):77-82. doi:10.12927/hcq.2013.21674

30. Olshaker JS, Browne B, Jerrard DA, Prendergast H, Stair TO. Medical clearance and screening of psychiatric patients in the emergency department. *Acad Emerg Med*. 1997;4(2):124-128. doi:10.1111/j.1553-2712.1997.tb03718.x

31. Baren JM, Mace SE, Hendry PL, Dietrich, AM, Golden RD, Warden CR. Children's mental health emergencies--part 2: emergency department evaluation and treatment of children with mental health disorders. *Pediatr Emerg Care*. 2008;24(7):485-498. doi:10.1097/PEC.0b13e31817de2bb

32. Reeves RR, Perry CL, Burke RS. What does "medical clearance" for psychiatry really mean? *J Psychosoc Nurs Ment Health Serv*. 2010;48(8):2-4. doi:10.3928/02793695-20100701-06

33. Han JH, Zimmerman EE, Cutler N, et al. Delirium in older emergency department patients: recognition, risk factors, and psychomotor subtypes. *Acad Emerg Med*. 2009;16(3):193-200. doi:10.1111/j.1553-2712.2008.00339.x

34. Hustey F, Meldon S, Palmer R. Prevalence and documentation of impaired mental status in elderly emergency department patients. *Acad Emerg Med*. 2000;7(10):1166.

35. Kaufman DM, Zun L. A quantifiable, Brief Mental Status Examination for emergency patients. *J Emerg Med*. 1995;13(4):449-456. doi:10.1016/0736-4679(95)80000-x

36. Broderick KB, Lerner EB, McCourt JD, Fraser E, Salerno K. Emergency physician practices and requirements regarding the medical screening examination of psychiatric patients. *Acad Emerg Med*. 2002;9(1):88-92. doi:10.1111/j.1553-2712.2002.tb01173.x

37. Zun LS, Hernandez R, Thompson R, Downey L. Comparison of EPs' and psychiatrists' laboratory assessment of psychiatric patients. *Am J Emerg Me*d. 2004;22(3):175-180. doi:10.1016/j.ajem.2004.02.008

38. Hall RC, Gardner ER, Popkin MK, Lecann AF, Stickney SK. Unrecognized physical illness prompting psychiatric admission: a prospective study. *Am J Psychiatry*. 1981;138(5):629-635. doi:10.1176/ajp.138.5.629

39. Yun BJ, Chou S-C, Nagurney JM, White BA, Wittmann CW, Raja AS. ED utilization of medical clearance testing for psychiatric admission: National Hospital Ambulatory Medical Care Survey analysis. *Am J Emerg Med*. 2018;36(5):745-748. doi:10.1016/j.ajem.2017.10.002

40. Donofrio JJ, Santillanes G, McCammack BD, et al. Clinical utility of screening laboratory tests in pediatric psychiatric patients presenting to the emergency department for medical clearance. *Ann Emerg Med*. 2014;63(6):666-675.e3. doi:10.1016/j.annemergmed.2013.10.011

41. Lyu H, Xu T, Brotman D, et al. Overtreatment in the United States. *PloS One*. 2017;12(9):e0181970. doi:10.1371/journal.pone.0181970

42. Conigliaro A, Benabbas R, Schnitzer E, Janairo MP, Sinert R. Protocolized laboratory screening for the medical clearance of psychiatric patients in the emergency department: a systematic review. *Acad Emerg Med*. 2018;25(5):566-576. doi:10.1111/acem.13368

43. Janiak BD, Atteberry S. Medical clearance of the psychiatric patient in the emergency department. *J Emerg Med*. 2012;43(5):866-870. doi:10.1016/j.jemermed.2009.10.026

44. Parmar P, Goolsby CA, Udompanyanan K, Matesick LD, Burgamy KP, Mower WR. Value of mandatory screening studies in emergency department patients cleared for psychiatric admission. *West J Emerg Me*d. 2012;13(5):388-393. doi:10.5811/westjem.2012.1.6754

45. Ng P, McGowan M, Goldstein M, Kassardjian CD, Steinhart BD. The impact of CT head scans on ED management and length of stay in bizarre behavior patients. *Am J Emerg Med*. 2018;36(2):213-217. doi:10.1016/j.ajem.2017.07.080

46. Bagøien G, Morken G, Zahlsen K, Aamo T, Spigset O. Evaluation of a urine on-site drugs of abuse screening test in patients admitted to a psychiatric emergency unit. *J Clin Psychopharmacol*. 2009;29(3):248-254. doi:10.1097/JCP.0b013e3181a45e78

47. Riccoboni ST, Darracq MA. Does the U stand for sseless? The urine drug screen and emergency department psychiatric patients. *J Emerg Med*. 2018;54(4):500-506. doi:10.1016/j.jemermed.2017.12.054

48. Schulz L, Hoffman RJ, Pothof J, Fox B. Top ten myths regarding the diagnosis and treatment of urinary tract infections. *J Emerg Med*. 2016;51(1):25-30. doi:10.1016/j.jemermed.2016.02.009

49. Donofrio JJ, Horeczko T, Kaji A, Santillanes G, Claudius I. Most routine laboratory testing of pediatric psychiatric patients in the emergency department is not medically necessary. *Health Aff*. 2015;34(5):812-818. doi:10.1377/hlthaff.2014.1309

50. Fortu JM, Kim IK, Cooper A, Condra C, Lorenz DJ, Pierce MC. Psychiatric patients in the pediatric emergency department undergoing routine urine toxicology screens for medical clearance: results and use. *Pediatr Emerg Care*. 2009;25(6):387-392. doi:10.1097/PEC.0b013e3181a79305

51. Shihabuddin BS, Hack CM, Sivitz AB. Role of urine drug screening in the medical clearance of pediatric psychiatric patients: is there one? *Pediatr Emerg Care*. 2013;29(8):903-906. doi:10.1097/PEC.0b013e31829e8050

52. Santillanes G, Donofrio JJ, Lam CN, Claudius I. Is medical clearance necessary for pediatric psychiatric patients? *J Emerg Med*. 2014;46(6):800-807. doi:10.1016/j.jemermed.2013.12.003

53. Gregory RJ, Nihalani ND, Rodriguez E. Medical screening in the emergency department for psychiatric admissions: a procedural analysis. *Gen Hosp Psychiatry*. 2004;26(5):405-410. doi:10.1016/j.genhosppsych.2004.04.006

54. Henneman PL, Mendoza R, Lewis RJ. Prospective evaluation of emergency department medical clearance. *Ann Emerg Med*. 1994;24(4):672-677. doi:10.1016/s0196-0644(94)70277-2

55. Schillerstrom TL, Schillerstrom JE, Taylor SE. Laboratory findings in emergently medicated psychiatry patients. *Gen Hosp Psychiatry*. 2004;26(5):411-414. doi:10.1016/j.genhosppsych.2004.06.004

56. Korn CS, Currier GW, Henderson SO. "Medical clearance" of psychiatric patients without medical complaints in the emergency department. *J Emerg Med*. 2000;18(2):173-176. doi:10.1016/s0736-4679(99)00191-2

57. Tucci V, Liu J, Matorin A, Shah A, Moukaddam N. Like the eye of the tiger: inpatient psychiatric facility exclusionary criteria and its "knockout" of the emergency psychiatric patient. *J Emerg Trauma Shock*. 2017;10(4):189-193. doi:10.4103/JETS.JETS_126_16

58. Trivedi TK, Glenn M, Hern G, Schriger DL, Sporer KA. Emergency medical services use among patients receiving involuntary psychiatric holds and the safety of an out-of-hospital screening protocol to "medically clear" psychiatric emergencies in the field, 2011 to 2016. *Ann Emerg Med*. 2019;73(1):42-51. doi:10.1016/j.annemergmed.2018.08.422

59. Mackey KE, Qiu C. Can mobile integrated health care paramedics safely conduct medical clearance of behavioral health patients in a pilot project? A report of the first 1000 consecutive encounters. *Prehospital Emerg Care*. 2018;1-10. doi:10.1080/10903127.2018.1482390

60. Shah SJ, Fiorito M, McNamara RM. A screening tool to medically clear psychiatric patients in the emergency department. *J Emerg Med*. 2012;43(5):871-875. doi:10.1016/j.jemermed.2010.02.017

61. SMART Medical Clearance: a project of the Sierra Sacramento Valley Medical Society. Sierra Sacramento Valley Medical Society. http://smartmedicalclearance.org/. Accessed October 29, 2018.

Changes in Health Care Utilization for Pediatric Patients Treated at a Specialized Outpatient Pain Clinic

Antionette Spector, DPT, OCS; Ruta Brazauskas, PhD; Keri Hainsworth, PhD; George M. Hoffman, MD; Steven Weisman, MD; Laura D. Cassidy, MS, PhD

ABSTRACT

Introduction: Pediatric pain clinics may be the most efficacious way to manage chronic and recurrent pain in children and adolescents, but families often rely heavily on nonspecialized care, such as the emergency department (ED). Health care utilization patterns for pediatric chronic pain have not been fully explored, particularly the patient-level factors that may contribute to underutilization or overutilization of certain services.

Objectives: To identify health care utilization patterns before and after treatment at a pediatric pain clinic and the associations by primary diagnosis and patient sociodemographics.

Methods: Data were obtained for all pediatric patients with an initial visit at an outpatient pediatric pain clinic between 2005 and 2009. Individual-level data included patient demographics, insurance type, and diagnosis at first pain clinic visit. Rate of health care system utilization 3 months before and after the initial pain clinic visit was quantified. Health care utilization rates before and after the initial visit to the pain clinic were compared using Wilcoxon signed-rank test.

Results: Eight hundred twenty-six pediatric pain clinic patients were included. Overall, there were significant decreases in ED utilization ($P < 0.001$) and increases in outpatient service utilization ($P < 0.001$) after the initial pain clinic visit. Similar patterns were noted for patients by diagnosis (headache, musculoskeletal, or abdominal pain diagnoses) and among those who were female, white, 15 to 18 years old, privately insured, middle- or high-income ($P < 0.05$).

Conclusions: Visits to an outpatient pediatric pain clinic were associated with shifts in health care utilization patterns. Important changes were an overall decrease in emergency visits and an increase in outpatient visits.

INTRODUCTION

Effective pain management is a national priority and an important benchmark for quality medical care.[1] Pain is the most commonly reported symptom leading to use of the health care system, and providing optimal care for pain is complex – particularly chronic pain.[2,3] Chronic pain is persistent or recurring pain that lasts longer than 3 months and has been estimated to account for 1 in 5 physician visits.[4] Moreover, chronic pain management has been cited as an area of frustration for many physicians and has become increasingly difficult amidst the opioid epidemic.[5-7]

The emergency department (ED) is a common setting to seek pain management for a growing number of people, including children.[2,8] Many ED visits are the result of patients seeking care for nonurgent conditions that could have been treated or prevented with a primary care visit and may be avoidable.[9] Furthermore, the overuse of EDs has been estimated to cost $38 billion annually and has been driven, in part, by an excess of diagnostic testing.[10,11] Additionally, ED overcrowding and long waiting times can create suboptimal experiences and poorer health outcomes for those seeking treatment for pain.[12]

In response, there has been an increased emphasis to improve the efficacy of pain management for adults, yet the burden of chronic pain in pediatric patients has received considerably less attention. In children and adolescents, some epidemiological research has estimated a chronic pain prevalence of 30% with associated societal costs of $19.5 billion annually.[8,13] Pediatric chronic pain is also associated with poorer quality of life, school absenteeism, increased health care utilization, and a greater risk for persistent pain into adulthood.[14] The most common pediat-

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Author Affiliations: Institute for Health and Equity, Medical College of Wisconsin, Milwaukee, Wis (Spector, Brazauskas, Cassidy); Children's Hospital of Wisconsin, Milwaukee, Wis (Hainsworth, Hoffmann, Weisman).

Corresponding Author: Antoinette Spector, DPT, OCS, Institute for Health and Equity, Medical College of Wisconsin, 8701 Watertown Plank Rd, Milwaukee WI, 53226; 414.955.7386; email alspector@mcw.edu.

ric chronic pain diagnoses include headache, abdominal pain, and musculoskeletal pain.[14] Sociodemographic characteristics also have been associated with differences in pediatric pain prevalence, with prevalence being higher among girls, older children, and children with lower socioeconomic status.[14]

To effectively manage pediatric chronic pain, some health care systems have established specialized pediatric pain clinics. These outpatient clinics emphasize an interdisciplinary approach to pain care and have demonstrated success in improving pain and functional outcomes, as well as decreasing ED and inpatient visits.[13,15] However, there is little understanding of how these health care utilization patterns may vary among different types of pediatric patients who have sought specialized pain treatment. Therefore, the purpose of this study was twofold: (1) to identify changes in the health care utilization patterns of pediatric patients with chronic pain after seeking treatment at a specialized pediatric pain clinic, and (2) to determine if there were differences in health care utilization patterns by the patient's primary pain diagnosis and sociodemographic characteristics.

METHODS

This retrospective study was conducted within a closed, nonprofit, pediatric health care system located in southeastern Wisconsin. All health care utilization for the study's patients was obtained from the system's billing records. Data were requested for the 3-month period before and after the start date at the system's outpatient pediatric pain clinic for a total study period of 6 months for each patient. A 6-month period was chosen to detect changes in health care utilization patterns. The multidisciplinary, pediatric pain clinic focused on in this study is located at a single site on the health care system's main campus. The clinic provides specialized, pediatric pain management services including both traditional management options like medication, physical and occupational therapy, and mental health counseling, as well as holistic treatments ranging from relaxation techniques to acupuncture. All initial appointments are 90 minutes in duration. Patients and families are all seen by specialists in the areas of pain medicine, nursing, and psychology. If warranted, patients also are seen by a physical therapist. The system's institutional review board approved all study procedures.

Participants

Data were obtained for all pediatric patients between the ages of 8 and 18 years who were seen for at least 1 visit at the outpatient pediatric pain clinic between 2005 and 2009 (n = 1,437). Patients with less than 3 months of medical records data either before or after the initial pain clinic visit (n = 611) were excluded from this study.

Measures

We obtained information on patient visits to the hospital or for any outpatient services within the health care system during the study period. We categorized visits as either ED, outpatient, or short stay. Outpatient visits were any visit that occurred in an outpatient setting (ie, visits to the pain clinic, the pediatrician's office, urgent care). Short stays included ED visits that resulted in an overnight stay.

We also obtained information on patient characteristics, including sex, race, age, socioeconomic status, insurance type, and diagnosis at first pain clinic visit. Sex was dichotomized as either male or female. Race was categorized as white, black, or other. Age was divided into 3 groups including 8 to 11 years, 12 to 14 years, and 15 to 18 years. The median household income for the ZIP code associated with the patient's home address was used as a proxy measure of the socioeconomic status. Patients income levels were categorized as low (≤ 200% federal poverty level), middle (201%-400% federal poverty level) and high (> 400% federal poverty level). Insurance status was categorized as either government, private, or self-pay. The primary pain diagnoses were divided into 6 groups: headache or orofacial, musculoskeletal, abdominal, neuropathic (also neuropathy or central), cardiovascular/chest, or other.

Table 1. Characteristics of the Cohort at Initial Pain Clinic Visit (n=826)

Variable	Count	(%)
Age, Years (range, 8-18)	Mean: 14.00	
Age category		
Elementary (age 8-11)	226	(27)
Middle School (age 12-14)	163	(20)
High School (age 15-18)	437	(53)
Sex		
Female	534	(65)
Male	292	(35)
Race		
White	616	(75)
Black	149	(18)
Other nonwhite	61	(7)
Income category		
Low (≤ 200% federal poverty level)	163	(20)
Middle (201%-400% federal poverty level)	453	(55)
High (> 400% federal poverty level)	209	(25)
Insurance status		
Government	141	(17)
Private	675	(82)
Self-pay	10	(1)
Diagnosis/pain location		
Headache or orofacial	262	(32)
Musculoskeletal	254	(31)
Abdominal	166	(20)
Other	64	(8)
Neuropathic, neuropathy, or central	42	(5)
Cardiovascular/chest	38	(4)

Statistical Analyses

Descriptive statistics were used to summarize characteristics of the pediatric patients seeking care at the pain clinic. The rate of health care system utilization before and after the initial pain clinic visit was quantified by determining the mean number of visits overall and by each category (ED, outpatient, short stay) per 3-month time interval. Next, the difference in mean health care utiliza-

Table 2. Demographic Characteristics by Pain Diagnosis

Category	Musculoskeletal n (%)	Headache n (%)	Abdominal n (%)	Other n (%)	Neuropathic n (%)	Cardiovascular n (%)	Total n
Age							
8-11	81 (36)	49 (22)	61 (27)	20 (9)	10 (4)	5 (2)	226
12-14	57 (35)	46 (28)	30 (18)	8 (5)	14 (9)	8 (5)	163
15-18	124 (28)	159 (36)	75 (17)	36 (8)	18 (4)	25 (6)	437
Sex							
Female	171 (32)	172 (32)	103 (19)	38 (7)	23 (4)	27 (5)	534
Male	91 (31)	82 (28)	63 (22)	26 (9)	19 (6)	11 (4)	292
Race							
White	201 (33)	185 (30)	145 (24)	45 (7)	31 (5)	9 (1)	616
Black	41 (28)	45 (30)	12 (8)	15 (10)	8 (5)	28 (19)	149
Other	20 (33)	24 (39)	9 (15)	4 (7)	3 (5)	1 (2)	61
Income							
Low	50 (31)	51 (31)	19 (12)	18 (11)	8 (5)	17 (10)	163
Middle	149 (33)	139 (31)	90 (20)	27 (6)	28 (6)	20 (4)	
High	62 (30)	64 (31)	57 (27)	19 (9)	6 (3)	1 (<1)	209
Insurance							
Government	32 (23)	43 (31)	25 (18)	14 (10)	15 (11)	12 (9)	141
Private	227 (34)	208 (31)	139 (21)	48 (7)	27 (4)	26 (4)	675
Self-Pay	3 (30)	3 (30)	2 (20)	2 (20)	0 (0)	0 (0)	10

Table 3. Health Care Utilization Rates (Mean Visits per 100 Patients) in the 3-Month Period Before and After Initial Pain Clinic Visit: Overall and by Diagnosis

Variable Type	Emergency		Short Stay		Outpatient	
	Before Mean (SD)	After Mean (SD)	Before Mean (SD)	After Mean (SD)	Before Mean (SD)	After Mean (SD)
Overall	23 (40)	17 (40)[a]	9 (20)	6 (16)[a]	218 (205)	268 (243)[a]
Diagnosis						
Headache	26 (45)	16 (34)[a]	6 (22)	4 (12)	197 (205)	246 (227)[b]
Musculoskeletal	19 (33)	16 (35)c	5 (14)	4 (14)	201 (177)	247 (220)[c]
Abdominal	21 (29)	13 (24)[a]	17 (22)	8 (15)[a]	237 (232)	297 (249)[b]
Neuropathic	20 (34)	20 (40)	11 (21)	7 (19)	234 (184)	283 (177)
Cardiovascular	30 (37)	50 (101)	6 (13)	6 (14)	239 (194)	314 (272)

[a]$P<0.001$
[b]$P<0.01$
[c]$P<0.05$

tion rates before and after the initial visit to the pain clinic was tested for the total sample, by diagnosis, and by sociodemographics using Wilcoxon signed-rank test. A statistical significance level of $P<0.05$ was used for all analyses and performed with SAS 9.3 software (SAS Institute, Cary, North Carolina).

RESULTS

Study Population Characteristics

The analysis included 826 pediatric patients aged 8 to 18 years old who received care at an outpatient pediatric pain clinic. Table 1 shows the demographic characteristics of the sample. Most patients were between 15 and 18 years old (53%), white (75%), and female (65%). The sample was also largely middle-income (55%), and the majority had private insurance (82%). The most common diagnoses were headache (or orofacial) pain (32%), musculoskeletal pain (31%), and abdominal pain (20%).

Table 2 shows the prevalence of each diagnosis within each sociodemographic category. Musculoskeletal pain was most common for several groups, including adolescents who were 8 to 11 years old (36%) and 12 to 14 years old (35%), males (31%), whites (33%), privately insured (34%), or middle-income (33%). The next most common diagnosis among the groups was headache pain, which was the most common diagnosis among blacks (30%) and other (39%), government insured (31%), and high-income (31%) groups. A few groups (female, self-pay, low-income) had an equal proportion of adolescents with either headache or musculoskeletal pain.

Health Care Utilization Patterns

Table 3 shows the health care utilization rates during the 3-month period before and after the initial pain clinic visit overall and by pain diagnosis. After the initial pain clinic visit, there was a significant overall decrease in ED visits (23 vs 17 visits per 100 patients; $P<0.001$) and short stays (9 vs 6 visits per 100 patients; $P<0.001$). There was also a significant overall increase in outpatient visits (218 vs 268 visits per 100 patients; $P<0.001$). Differences in health care utilization also were noted by diagnosis. ED visits decreased for patients with headache pain (26 vs 16 visits per 100 patients; $P<0.001$), musculoskeletal pain (19 vs 16 visits per 100 patients; $P<0.05$), and abdominal pain (21 vs 13 visits per 100 patients; $P<0.001$). Outpatient visits significantly increased for each of these same groups. Finally, patients with abdominal pain had a significant decrease in short stays (17 vs 8 visits per 100 patients; $P<0.001$).

Table 4 shows the health care utilization patterns in the 3-month period before and after an initial visit to the outpatient pediatric pain clinic by sociodemographic characteristics. The rate of ED visits significantly decreased within all age groups, both females and males, whites, those with private insurance or self-pay, as well as those in the middle-income and high-income categories. Outpatient visits significantly increased for many of the same groups, including patients 15 to 18 years old, females, whites, those with private insurance, and within the middle-income and high-income categories. There were also significant decreases in short stays among several sociodemographic groups. Patients from 8 to 11 and 12 to 14 years old had significantly fewer visits, as well as both females and males, whites and blacks, those with private

insurance, and patients in the low-income and middle-income categories.

Table 4. Health Care Utilization Rates (Mean Visits per 100 Patients) in the 3-Month Period Before and After Initial Pain Clinic Visit by Sociodemographic Characteristics

Variable Type	Emergency		Short Stay		Outpatient	
	Before Mean (SD)	After Mean (SD)	Before Mean (SD)	After Mean (SD)	Before Mean (SD)	After Mean (SD)
Age						
8-11	25 (45)	14 (27)a	12 (26)	6 (14)a	211 (189)	229 (198)
12-14	25 (38)	17 (52)a	8 (16)	4 (11)a	226 (217)	265 (244)
15-18	22 (39)	20 (40)b	7 (18)	7 (18)	218 (209)	290 (260)a
Sex						
Female	25 (42)	18 (37)a	8 (19)	6 (16)b	212 (209)	275 (258)a
Male	21 (37)	17 (44)c	10 (23)	6 (14)a	229 (199)	257 (212)
Race						
White	18 (33)	11 (25)a	9 (21)	6 (16)a	206 (187)	266 (233)a
Black	42 (59)	41 (70)	7 (18)	5 (14)b	267 (243)	285 (289)
Other	29 (44)	23 (35)	8 (19)	4 (13)	216 (259)	255 (215)
Insurance						
Government	35 (54)	33 (69)	10 (19)	8 (17)	279 (243)	310 (306)
Private	21 (37)	14 (29)a	9 (21)	5 (16)a	206 (195)	260 (226)a
Self-pay	21 (30)	4 (11)b	1 (3)	2 (5)	154 (143)	269 (267)
Income						
Low	44 (57)	42 (70)	6 (16)	4 (14)b	246 (229)	282 (285)
Middle	20 (36)	12 (25)a	10 (20)	5 (14)a	220 (209)	262 (226)c
High	15 (24)	11 (22)b	9 (24)	8 (20)	191 (174)	274 (240)a

[a]$P<0.001$
[b]$P<0.01$
[c]$P<0.05$

DISCUSSION

The purpose of this study was to identify if there were changes in health care utilization patterns after an initial visit at an outpatient pediatric pain clinic, and if those patterns differed by pain diagnosis and sociodemographic characteristics. We found that patients seeking treatment at the pediatric pain clinic were most likely to be female, 15 to 18 years old, have private insurance, and self-identify as white; common reasons for the initial visit were headaches, musculoskeletal pain, and abdominal pain. We identified statistically significant changes in utilization rates from 3 months before to 3 months after the initial pain clinic visit with a reduction in ED visits and short stays, and an increase in outpatient visits, overall. These findings are consistent with previous research and lend support to specialized outpatient pain clinics being an effective way to reduce the higher costs associated with emergency and inpatient services.[15] Increases in outpatient visits also aligned with prior research in that ongoing outpatient service utilization is likely once patients initiate specialized pain care.[15] While we did not account for the types of visits that occurred after the initial pain clinic visit, previous authors have asserted that an increase in outpatient care is suggestive of patients being engaged in more regularly scheduled, routine appointments to manage their pain symptoms.[15]

While there were significant changes in utilization rates overall, these patterns were not consistent within all groups. Nonwhite, low-income, and those with government insurance did not have a significant change in their overall health care utilization or their ED visits. While the specific factors that contributed to these findings are unclear, disparities in the management of pain in minority patients, who are also more likely to be low-income and on government insurance, are well-documented and multifactorial in nature.[16,17] These patients may have experienced barriers to engaging with the pain management program due to issues related to clinic accessibility (ie, difficulties with transportation or attending appointments during clinic hours of operation), cost of recommended treatments, and differences in patient-provider relationships that can affect communication and building of trust. Alternatively, their clinical presentation may have been more complex, and a 3-month period may have been inadequate in capturing any changes in utilization patterns if they did exist. Future studies should consider a longer timeframe—before and after the initial pain clinic visit—and account for the other factors, such as condition severity, when examining sociodemographic differences.

The study also identified differences in health care utilization patterns by sex. While male participants had a significant change in rates of ED visits and short stays following their initial visit to the pain clinic, there was not a significant change in their outpatient visits or overall rates of health care utilization. This may be related to differences in the types of conditions that boys seek care for compared to girls. Alternatively, there may be variations in how boys and girls cope with chronic pain. Girls may be more responsive to a collaborative approach, which offers more opportunities to interact with multiple providers and to access social support.[18]

While this study advances the knowledge of factors associated with health care utilization patterns in children and adolescents with chronic pain, there are several limitations. First, this was a cross-sectional study and data were analyzed retrospectively from a clinical database within a single hospital system. Therefore, we cannot say that the pain clinic visit caused any changes in health care utilization patterns. Additionally, patients seeking care at this pain clinic may not reflect the general population of children and adolescents with chronic pain and limits the generalizability of our findings. Our study also had a couple of groups with very small sample sizes (eg, self-pay). While our analyses were unadjusted and only focused on differences within groups, it is possible that there were not enough observations to detect statistically significant changes in groups with relatively smaller samples. We also did not account for the type or intensity of treatments that patients

received at the pain clinic, so there is no way to determine if these factors may have differed between groups and the degree to which that influenced our findings. Lastly, we did not distinguish the type of outpatient visits that occurred during the study period, nor did we conduct a cost-analysis. Therefore, we are unable to confirm that the increase in outpatient utilization was related to pain-related care or establish if changing health care utilization patterns translated into direct or indirect cost savings to the health care system.

Notwithstanding these limitations, the results of this study take an important step in identifying specific factors that are associated with changes in health care patterns before and after a visit to an outpatient pediatric pain clinic. These results can inform future studies that aim to improve care and reduce the overall burden of pediatric chronic pain among children and adolescents, as well as those around them. Future research should adjust for confounding factors and examine potential interactions among the demographic and diagnostic variables. Multivariate analyses would allow for a clearer understanding of factors that drive utilization patterns, in general, and the specific factors that may foster or hinder engagement in a pediatric chronic pain management program. Mixed-methods designs, incorporating qualitative data, would be useful in interpreting findings, particularly those related to health disparities. Cost-analyses also would prove valuable in determining how changes in utilization patterns may translate into cost savings.

CONCLUSION

An initial visit to an outpatient, pediatric pain clinic was associated with shifts in health care utilization patterns. The most notable finding was an overall decrease in emergency visits and an increase in outpatient visits. Although the majority of groups followed the same pattern, the magnitude of change varied by diagnosis and sociodemographic characteristics.

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REFERENCES

1. Institute of Medicine. *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*. Washington, DC: National Academies Press; 2011. doi:10.17226/13172

2. Motov SM, Khan AN. Problems and barriers of pain management in the emergency department: are we ever going to get better? *J Pain Res.* 2008;2:5-11. doi:10.2147/JPR.S4324

3. Glajchen M. Chronic pain: treatment barriers and strategies for clinical practice. *J Am Board Fam Pract.* 2001;14(3):211-218.

4. Treede R-D, Rief W, Barke A, et al. A classification of chronic pain for ICD-11. Pain. 2015;156(6):1003-1007. doi:10.1097/j.pain.0000000000000160

5. Upshur CC, Luckmann RS, Savageau JA. Primary care provider concerns about management of chronic pain in community clinic populations. *J Gen Intern Med.* 2006;21(6):652-655. doi:10.1111/j.1525-1497.2006.00412.x

6. O'Rorke JE, Chen I, Genao I, Panda M, Cykert S. Physicians' comfort in caring for Patients with chronic nonmalignant pain. *Am J Med Sci.* 2007;333(2):93-100. doi:10.1097/00000441-200702000-00005

7. Jamison RN, Sheehan KA, Scanlan E, Matthews M, Ross EL. Beliefs and attitudes about opioid prescribing and chronic pain management: survey of primary care providers. *J Opioid Manag*. 2014;10(6):375-382. doi:10.5055/jom.2014.0234

8. Groenewald CB, Essner BS, Wright D, Fesinmeyer MD, Palermo TM. The economic costs of chronic pain among a cohort of treatment-seeking adolescents in the United States. *J Pain*. 2014;15(9):925-933. doi:10.1016/j.jpain.2014.06.002

9. Gindi RM, Jones LI. Reasons for emergency room use among U.S. children: National Health Interview Survey, 2012. *NCHS Data Brief.* 2014;Jul(160):1-8.

10. Adams JG. Emergency department overuse: perceptions and solutions. *JAMA*. 2013;309(11):1173-1174. doi:10.1001/jama.2013.2476

11. Korley FK, Pham JC, Kirsch TD. Use of advanced radiology during visits to US emergency departments for injury-related conditions, 1998-2007. *JAMA*. 2010;304(13):1465-1471. doi:10.1001/jama.2010.1408

12. Pines JM, Hollander JE. Emergency department crowding is associated with poor care for patients with severe pain. *Ann Emerg Med.* 2008;51(1):1-5. doi:10.1016/j.annemergmed.2007.07.008

13. Odell S, Logan D. Pediatric pain management: the multidisciplinary approach. *J Pain Res.* 2013;6:785-790. doi:10.2147/JPR.S37434

14. King S, Chambers CT, Huguet A, et al. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. *Pain*. 2011;152(12):2729-2738. doi:10.1016/j.pain.2011.07.016

15. Mahrer NE, Gold JI, Luu M, Herman PM. A cost-analysis of an interdisciplinary pediatric chronic pain clinic. *J Pain*. 2018;19(2):158-165. doi:10.1016/j.jpain.2017.09.008

16. Anderson KO, Green CR, Payne R. Racial and ethnic disparities in pain: causes and consequences of unequal care. *J Pain*. 2009;10(12):1187-1204. doi:10.1016/j.jpain.2009.10.002

17. Green CR, Anderson KO, Baker TA, et al. The unequal burden of pain: confronting racial and ethnic disparities in pain. *Pain Med*. 2003;4(3):277-294. doi:10.1046/j.1526-4637.2003.03034.x

18. Lynch AM, Kashikar-Zuck S, Goldschneider KR, Jones BA. Sex and age differences in coping styles among children with chronic pain. *J Pain Symptom Manage.* 2007;33(2):208-216. doi:10.1016/j.jpainsymman.2006.07.014

Survey of Radon Testing and Mitigation by Wisconsin Residents, Landlords, and School Districts

Ryan A. Denu, PhD; Jessica Maloney; Carrie D. Tomasallo, PhD, MPH; Noah M. Jacobs; John K. Krebsbach; Amber L. Schmaling; Enio Perez, MPH; Andrew J. Bersch, MS; Tamara J. LeCaire, PhD; Jonathan G. Meiman, MD; Kristen M. Malecki, PhD, MPH; Noelle K. LoConte, MD

ABSTRACT

Introduction: Radon is the second-leading cause of lung cancer in the United States, the leading cause of lung cancer in nonsmokers, and is estimated to cause 21,000 deaths every year. Radon is especially prevalent in the upper Midwest. This study aimed to assess radon testing and mitigation practices among residential homeowners, landlords, and school districts in Wisconsin.

Methods: Two survey sample datasets were used to assess radon testing and mitigation in residential homes: the Survey of the Health of Wisconsin (SHOW) and Wisconsin Behavioral Risk Factor Surveillance System (BRFSS) survey. Wisconsin landlords and school administrators were surveyed to assess radon testing and mitigation in rental properties and schools, respectively.

Results: Approximately 30% of Wisconsin homeowners (22.1% from SHOW and 39.9% from BRFSS) have tested their properties for radon. Similarly, 31.0% of Wisconsin landlords (40/129) and 35.1% of Wisconsin school districts (78/222) have tested their schools for radon. Of homeowners with elevated radon, about 60% mitigated. School districts whose radon levels tested high most commonly did not mitigate, with costs and/or lack of funding cited as the most common barrier.

Discussion/Conclusion: Radon testing and mitigation practices are inadequate in Wisconsin, and future work will seek to determine the best methods to increase testing and mitigation and reduce radon-induced lung cancer deaths in Wisconsin.

INTRODUCTION

Radon is a naturally occurring, colorless, odorless, radioactive, carcinogenic gas that comes from the soil. It is the largest source of background radiation, making up 37% of Americans' total annual radiation exposure.[1] Radon exposure is the second-leading cause of lung cancer nationwide, causing about 21,000 deaths per year in the United States and about 500 deaths per year in Wisconsin.[2] The initial evidence for radon causing lung cancer comes from studies of thousands of uranium miners carried out over 50 years worldwide,[3,4] and further evidence has been provided from residential studies.[5-7] Radon also poses a risk to smokers and may actually synergize with smoking to cause lung cancer;[8,9] indeed, some estimates suggest that a majority of radon-induced lung cancers occur in smokers.[7]

Radon in the home is often assessed at the point of real estate transactions by a certified professional. Alternatively, radon can be assessed using self-test kits, which can be purchased for about $10 from a local health department or hardware store. In Wisconsin, there are 17 local health departments that serve as radon information centers for the general public and test kits are made available at reduced rates. Results from test kits are used to populate an online interactive map that illustrates radon risk potential in the state (https://www.dhs.wisconsin.gov/radon/index.htm). Although high levels of radon have been detected in every state, the upper Midwest has some of the highest levels in the country.[10] The Environmental Protection Agency (EPA) recommends taking action to mitigate radon levels once indoor concentrations meet or exceed 4 pCi/L. However, there is no "safe" level of radon exposure. In Wisconsin, 29 out of 72 (40.3%) counties have a predicted average indoor radon screening level greater than 4 pCi/L, and the remaining 43 (59.7%) counties have a predicted average indoor radon screening level between 2 and

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Author Affiliations: Department of Medicine, University of Wisconsin School of Medicine and Public Health (UW SMPH), Madison, Wis (Denu, Jacobs, Krebsbach, Schmaling, LoConte); Carbone Cancer Center, UW, Madison, Wis (Denu, Jacobs, Kresbach, Schmaling, LoConte); Wisconsin Department of Health Services, Madison, Wis (Maloney, Tomasallo, Meiman); Medical College of Wisconsin, Milwaukee, Wis (Perez); Department of Population Health Sciences, UW SMPH, Madison, Wis (Bersch, LeCaire, Malecki).

Corresponding Authors: Ryan A. Denu, PhD, 6068 WIMR, 1111 Highland Ave, Madison, WI 53705, email rdenu@wisc.edu; Noelle K. LoConte, MD, 600 Highland Ave, Madison, WI 53792, email ns3@medicine.wisc.edu.

4 pCi/L.[11] However, these data do not necessarily indicate geographic areas of highest risk, and it is recommended that all homes be tested for radon.

Fortunately, elevated indoor radon levels can be prevented or mitigated with a variety of strategies. Radon-resistant construction techniques can be implemented at the time of building construction, and the cost to the builder of including radon-resistant features in a new home during construction is typically less than the cost to mitigate the home after construction. After construction, elevated radon levels can be easily reduced with an active mitigation system, which usually is installed by a professional and costs about $1000.

Herein, we sought to assess awareness and knowledge of radon in Wisconsin and to determine what percentage of residents, landlords, and school districts in the state have ever tested for radon and mitigated their building(s) if radon levels were high.

METHODS

Survey of the Health of Wisconsin (SHOW)

The Survey of the Health of Wisconsin (SHOW), collected from 2008 to 2013, has been previously detailed.[12] The question "Have you tested for radon in this home? (yes, no, refused, don't know)" was used to assess prevalence of radon testing. If respondents indicated "yes," they were subsequently asked, "What was the result of this test?" Response options included "positive but below recommended action level," "positive but above recommended action level," positive but don't remember action level," or "negative." Data were analyzed using SAS (version 9.4). Rao-Scott Pearson chi-square tests were used to test for significant differences. Multiple logistic regression modeling was performed to assess the relative importance of select demographic factors. Analyses accounted for the clustering and stratification in the sampling design and were weighted to the adult population of Wisconsin age 21 to 74.

Wisconsin Behavioral Risk Factor Surveillance System

The Wisconsin Behavioral Risk Factor Surveillance System (BRFSS) is part of the national surveillance system coordinated by the Centers for Disease Control and Prevention (CDC) to measure adult health risk behaviors and health outcomes by a random-digit-dialed landline and cellular telephone survey of residents aged 18 and older. Prevalence estimates from the core survey questions and a state-added optional radon module were analyzed. Respondents were asked: "Are you aware of the health risks associated with exposure to radon?"; "Has your household air been tested for the presence of radon gas?"; and "Were the radon levels in your household above the Environmental Protection Agency's recommendation action level of 4 picocuries per liter?" If respondents reported a value greater than the EPA's action level (4 pCi/L), they then were asked: "In response to a high radon test, did you take any of the following actions? and were allowed to choose as many of the following choices that applied: retest, have a mitigation system installed, no longer go in basement, do nothing, or do something else. BRFSS core survey demographics were analyzed with the radon module, including age (categorized as 18-34 years, 35-64 years, or 65 years and over), homeowner status (categorized as homeowners, renters, or other), and geographic location in Wisconsin (northern, northeastern, western, southern, or southeastern). Annual Wisconsin BRFSS data from 2014 to 2016 were combined to increase precision of estimates. Data were analyzed using SAS (version 9.4). Rao-Scott Pearson chi-square tests were used to test for significant differences.

Survey of Landlords

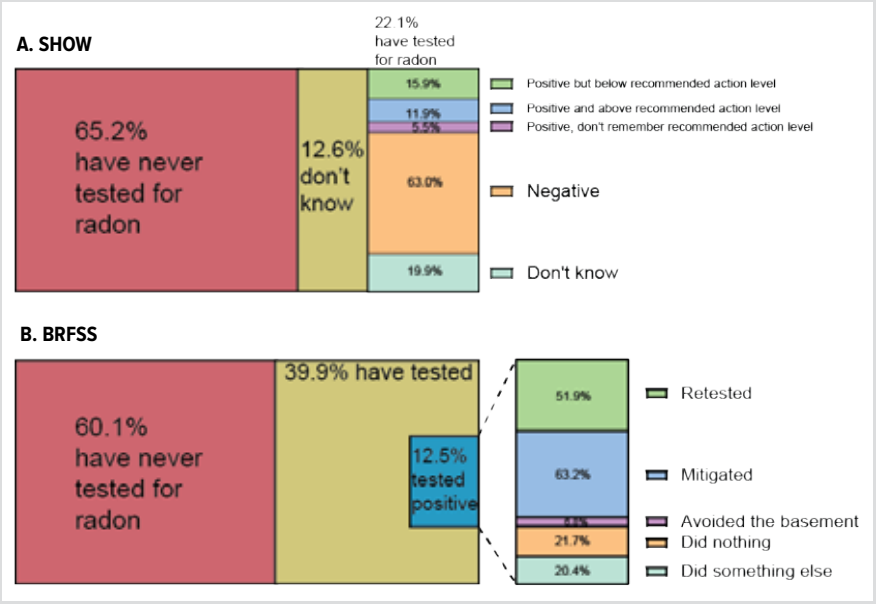
A list of Wisconsin landlords was obtained using the Wisconsin Housing Search (WIHousingSearch.org) database, which compiles a listing of rental housing throughout the state. Lists of landlords were collected from the following metropolitan areas: Milwaukee, Madison, Green Bay, Kenosha, Racine, Appleton, Oshkosh, Eau Claire, Janesville, La Crosse, and Fond du Lac. These areas were chosen because they represent the largest population centers in Wisconsin (combine for approximately 25% of Wisconsin's total population) and are geographically dispersed throughout the state. The Dane County Tenant Resource Center (www.tenantresourcecenter.org) provides a list of Madison's management and rental companies, and this resource was used to supplement the list of landlords contacted in Madison. We randomly selected a subset of landlords within each metropolitan area and called the following number of landlords from each area: 30 from Milwaukee (12 completed responses, 40.0% response rate), 89 from Madison (26 completed responses, 29.2% response rate), 13 from Green Bay (11 completed responses, 84.6% response rate), 17 from Kenosha (13 completed responses, 76.5% response rate), 8 from Racine (7 completed responses, 87.5% response rate), 9 from Appleton (1 completed responses, 11.1% response rate), 11 from Oshkosh (10 completed responses, 90.9% response rate), 63 from Eau Claire (19 completed responses, 30.2% response rate), 14 from Janesville (9 completed responses, 64.3% response rate), 14 from La Crosse (11 completed responses, 78.6% response rate), and 14 from Fond du Lac (12 completed responses, 85.7% response rate). This yielded a total of 282 landlords that were contacted. One hundred fifty-one (53.5%) refused to participate, did not answer the phone after 3 attempts, did not respond to voice mails, or did not respond to an email if an email address was given during the initial phone call. This yielded a total of 131 completed responses. *(See Appendix 1 for survey questions.)*

Survey of School Districts

Public schools were surveyed to assess potential risks of exposure to radon among school children. A publicly available list of school administrators was obtained from the Wisconsin

Department of Public Instruction (DPI). A survey was emailed 3 times to these public school administrators for all districts in Wisconsin (n = 443 administrators). This yielded 174 responses (39.1% response rate). Subsequently, administrators who did not respond were called. This survey yielded a total of 231 completed responses (final response rate of 52.1% of school districts in Wisconsin). A response was considered completed if all survey questions except for the free response questions were completed. Fifty-three responses (22.9%) were obtained from superintendents, 81 (35.1%) from directors/managers of buildings and grounds or facilities, 52 (22.5%) from other district administrators, and 45 (19.5%) from other staff. *See Appendix 2 for survey questions.*

Figure 1. Survey of the Health of Wisconsin (SHOW) assessment of Radon Testing by Wisconsin Residents



1A. Treemap demonstrating the percentage of Wisconsin residents in the Survey of the Health of Wisconsin (SHOW) who have tested for radon and whether their tests were positive or negative.
1B. Treemap demonstrating the percentage of Wisconsin residents in the Wisconsin Behavioral Risk Factor Surveillance System (BRFSS) survey who tested for radon, and mitigated if radon levels were high based on whether they are homeowners or renters.

Statistics

Prior to the study, R (V 3.3.1) was used to calculate expected half-widths of Wald 95% confidence intervals based on various combinations of possible sample sizes and response proportions for both school districts and landlords. Expecting that the response proportion of respondents (for both landlords and school districts) that tested for radon would be 0.25, it was found that a survey sample of at least 73 schools and 73 landlords would result in confidence interval half-widths of approximately 0.1 (Appendix 3A-B).

RESULTS

Radon Awareness, Testing, and Mitigation Practices Among Wisconsin Residents

The SHOW study surveyed 3381 participants from 2008 to 2013, of whom 2753 reported having a basement in their home. Of those with basements, 22.1% (95% CI, 20.0-24.3) reported that they tested their home for radon, 65.2% (95% CI, 62.3-68.1) reported that they had not tested their home for radon and 12.6% (95% CI, 10.6-14.6) responded that they did not know if they had tested their home for radon (Figure 1, Table 1). This percentage did not differ significantly based on sex or urbanicity (Table 1). There was a trend toward greater testing rates for older respondents (Table 1). Also, respondents with higher educational attainment and higher per capita household income were significantly more likely to test for radon (Table 1). Multivariate analysis revealed higher education and home built before 1900 to be associated with testing for radon.

Based on estimates from the 2014-2016 BRFSS sample, 73.4% of Wisconsin residents report being aware of the health risks associated with exposure to radon (Figure 1B). Just over 80% (80.4%) of Wisconsin residents who own their home are aware of radon risks, compared to 54.7% of renters and 47.5% of those who reported living in other arrangements (Table 2). Nearly 40% (39.9%) of Wisconsin residents have tested their households for the presence of radon, which translates to approximately 1.34 million residents. Again, the testing rate was higher for homeowners (41.9%) compared to renters (33.9%) and residents who reported other living arrangements (28.7%) (Table 2). Of the Wisconsin residents who tested for radon, 12.5% found elevated levels of radon (above 4 pCi/L). Of those residents who reported elevated radon levels, 51.9% retested, 63.2% mitigated, 6.8% avoided the basement, 21.7% did nothing, and 20.4% did something else (respondents could select more than 1 choice). Twice as many homeowners as renters mitigated if they found an elevated test result (67.7% of homeowners vs 30.2% of renters and 51.7% of those in other living arrangements) (Table 2).

This study next assessed if there were differences in radon awareness based on age and geographic location. Adults 65 years and older reported the greatest radon awareness (81.8%) compared to younger age groups, but there were no significant differences in testing and mitigation practices based on age (Table 2). When assessing potential differences based on geographic area, radon awareness was greatest in northern Wisconsin (81.1%) and lowest in southeastern Wisconsin (68.9%) (Table 2). Additionally, those from northeast Wisconsin were the most likely to report testing for radon (Table 2). Interestingly, those

Table 1. Survey of the Health of Wisconsin (SHOW) Assessment of Radon Testing

	Tested		Not tested		Don't know				
	N	Percentage[a]	N	Percentage[aa]	N	Percentage[a a]	Chi-Square *P*-value	OR[b]	Regression *P*-value
All participants with basements[c]	637	22.1 (20.0-24.3)	1770	65.2 (6.23-68.1)	346	12.6 (10.6-14.6)			
Age									
21 - 39	166	18.6 (15.5-21.8)	507	61.9 (57.2-66.5)	178	19.5 (15.7-23.3)	<0.001	1.03 (0.67-1.56)	0.91
40 - 54	241	25.2 (21.6-28.8)	625	65.6 (61.1-70.1)	82	9.2 (6.3-12.1)		1.22 (0.92-1.64)	0.17
55 - 74	230	22.6 (19.3-25.9)	638	69.0 (64.9-73.0)	86	8.4 (6.4-10.3)		Ref	
Sex									
Male	273	22.3 (19.4-25.2)	802	66.6 (62.7-70.5)	131	11.1 (8.3-13.8)	0.11	0.95 (0.76-1.19)	0.63
Female	364	21.9 (19.3-24.6)	968	63.9 (60.6-67.2)	215	14.2 (11.9-16.5)		Ref	
Race/ethnicity									
Non-Hispanic white	532	22.6 (20.2-25.0)	1537	66.2 (63.4-68.9)	277	11.2 (9.4-13.1)	0.04	Ref	
Non-Hispanic black	56	19.5 (12.7-26.4)	120	57.7 (47.1-68.3)	36	22.7 (12.0-33.5)		1.60 (0.83-3.07)	0.16
Hispanic	17	20.5 (11.4-29.6)	47	57.7 (37.1-78.3)	13	21.8 (3.3-40.3)		1.40 (0.68-2.92)	0.36
Other	32	18.7 (9.2-28.2)	62	63.7 (53.4-74.0)	20	17.6 (8.0-27.2)		1.38 (0.65-2.94)	0.40
Education									
High school degree or less	148	17.0 (13.4-20.5)	524	66.0 (60.7-71.4)	116	17.0 (12.4-21.6)	<0.001	0.45 (0.32-0.64)	<0.01
Some college or associate's degree	217	20.3 (17.2-23.4)	680	66.8 (62.7-70.9)	132	12.9 (10.0-15.9)		0.67 (0.51-0.89)	0.01
Bachelor's degree or higher	272	28.2 (24.2-32.2)	565	62.9 (58.8-67.1)	97	8.9 (6.7-11.1)		Ref	
Poverty									
< 200% FPL	125	15.2 (11.8-18.6)	456	61.9 (57.3-66.5)	159	22.9 (18.0-27.8)	<0.001	0.87 (0.56-1.36)	0.54
≥ 200% FPL	487	24.6 (21.8-27.5)	1248	67.1 (63.7-70.5)	159	8.3 (6.6-9.9)		Ref	
Urbanicity (2010 Census)[d]									
Urban	407	22.0 (19.5-24.6)	1107	63.9 (60.4-67.4)	241	14.1 (11.4-16.8)	0.05	1.00 (0.72-1.38)	0.99
Rural	230	22.4 (18.2-26.6)	663	68.1 (63.3-72.8)	105	9.5 (7.3-11.7)		Ref	
Wisconsin health region									
Southeastern	230	23.9 (20.0-27.8)	538	62.5 (56.7-68.2)	117	13.6 (9.4-17.8)	0.56	1.10 (0.72-1.67)	0.66
Southern	124	21.2 (17.6-24.7)	352	64.4 (59.7-69.1)	75	14.4 (10.9-18.0)		0.91 (0.60-1.36)	0.64
Western	63	19.5 (13.3-25.8)	240	67.3 (59.6-75.0)	54	13.1 (6.3-19.9)		0.86 (0.51-1.46)	0.57
Northern	86	21.8 (15.8-27.8	250	69.9 (64.2-75.6)	34	8.3 (5.6-11.0)		0.92 (0.56-1.53	0.75
Northeastern	134	22.0 (16.5-27.4)	390	67.6 (61.2-74.0)	66	10.4 (7.4-13.5)		Ref	
Year of home construction									
Before 1900	51	15.8 (11.4-20.1)	197	67.3 (60.8-73.7)	41	17.0 (11.5-22.5)	0.0003	0.61 90.39-0.94)	0.03
1900 - 1950	133	20.5 (16.6-24.4)	406	69.1 (64.7-73.5)	67	10.4 (7.4-13.3)		0.70 (0.47-1.05)	0.09
1951 - 1978	186	26.8 (22.2-31.5)	416	62.5 (56.6-68.3)	65	10.7 (7.0-14.4)		1.08 (0.75-1.56)	0.68
1979 - 1990	82	28.8 (21.5-36.0)	177	63.5 (56.1-71.0)	28	7.7 (4.4-11.0)		1.13 (0.69-1.85)	0.62
1991 - present	138	26.6 (21.7-31.5)	355	65.6 (60.4-70.9)	49	7.8 (5.1-10.5)		Ref	
Duration at current residence (years)									
< 1	38	13.7 (8.5-19.0)	159	66.1 (58.8-73.4)	56	20.2 (14.2-26.2)	<0.001	0.78 (0.42-1.47)	0.44
1 - 4	132	21.3 (16.7-25.9)	365	60.6 (54.8-66.4)	105	18.1 (13.8-22.4)		1.06 (0.68-1.67)	0.79
5 - 9	133	23.3 (18.3-28.2)	377	67.5 (62.5-72.6)	58	9.2 (6.7-11.7)		0.84 (0.56-1.26)	0.40
≥ 10	332	24.3 (21.3-27.3)	856	66.5 (62.4-70.6)	121	9.2 (6.8-11.6)		Ref	

[a]Row percentages weighted to represent the civilian, noninstitutionalized population of Wisconsin age 21 to 74. The estimates also account for the stratification and clustering in the complex survey design.

[b]Multiple logistic regression model of the response "Tested for radon," adjusted for all of the variables in the table, as well as stratification and clustering in the complex survey design.

Abbreviation: FPL, federal poverty level.

from southeast Wisconsin were most likely to report elevated radon levels, yet they were not the most likely to report mitigation if radon levels were high (Table 2). Those from south and northeast Wisconsin were the most likely to mitigate if radon levels were elevated (Table 2).

Radon Testing and Mitigation Practices Among Wisconsin Landlords

This study also assessed radon testing and mitigation practices by lessors/landlords/management companies in Wisconsin (Figure 2A). We found that 31.0% of surveyed landlords reported that they had ever tested at least one of their buildings, while 49.6% reported that they had never tested, and 19.4% were unsure (Figure 2B). There is no significant trend in likelihood to test for radon based on the size of the landlord or management com-

Table 2. Wisconsin Behavioral Risk Factor Surveillance System (BRFSS) Survey of Radon Awareness, Testing, and Mitigation

	Radon Awareness			Radon Testing			Tested and Radon Was Elevated			Elevated Radon and Mitigated		
	N (weighted)	Percentage	*P*-value	N (weighted)	Percentage	*P*-value	N (weighted)	Percentage	*P*-value	N (weighted)	Percentage	*P*-value
Age (years)												
18-34	526,950	55.3 (52.6 - 58.0)	< 0.001	344,326	39.8 (37.1 - 42.5)	0.102	34,379	11.10 (8.4 - 13.9)	0.347	19,241	60.2 (47.4 - 73.0)	0.118
35-64	1,438,601	79.2 (77.9 - 80.5)		719,213	40.8 (39.3 - 42.3)		89,963	13.20 (11.7 - 14.8)		60,520	67.2 (61.4 - 73.1)	
65+	616,136	81.8 (80.3 - 83.3)		273,668	37.6 (35.7 - 39.5)		29,883	12.20 (10.1 - 14.3)		15,683	54.6 (45.7 - 63.5)	
Region												
South	686,735	72.7 (70.3 - 75.0)	< 0.001	342,006	37.9 (35.5 - 40.4)	0.001	31,982	10.10 (7.8 - 12.3)	0.001	22,043	69.5 (59.2 - 79.9)	0.047
North	254,969	81.1 (79.0 - 83.2)		121,914	40.4 (37.9 - 43.0)		12,236	10.80 (8.0 - 13.6)		6,585	53.9 (39.2 - 68.5)	
West	373,408	74.2 (71.7 - 76.7)		175,830	36.5 (33.9 - 39.1)		17,599	10.80 (7.9 - 13.7)		8,624	48.4 (34.4 - 62.4)	
Northeast	595,243	76.3 (74.2 - 78.3)		321,721	43.3 (40.9 - 45.6)		35,381	11.70 (9.6 - 13.9)		23,673	70.4 (61.6 - 79.1)	
Southeast	689,163	68.9 (66.6 - 71.1)		382,789	40.5 (38.3 - 42.8)		57,406	16.70 (14.0 - 19.4)		34,519	62.0 (53.4 - 70.5)	
Living Situation												
Own	2,094,690	80.4 (79.3 - 81.5)	<0.0001	1,069,648	42.0 (40.7 - 43.3)	<0.0001	131,405	12.9 (11.6 - 14.2)	0.1908	88,531	67.7 (62.7 - 72.8)	<0.0001
Rent	444,974	54.7 (52.1 - 57.2)		243,233	33.9 (31.4 - 36.5)		19,693	10.0 (7.1 - 12.9)		5099	30.2 (16.1 - 44.2)	
Other	59,854	47.5 (40.8 - 54.2)		31,380	28.8 (22.9 - 34.7)		3507	12.7 (5.5 - 19.8)		1814	51.7 (22.0 - 81.5)	

P-values are from Rao-Scott chi-square tests.

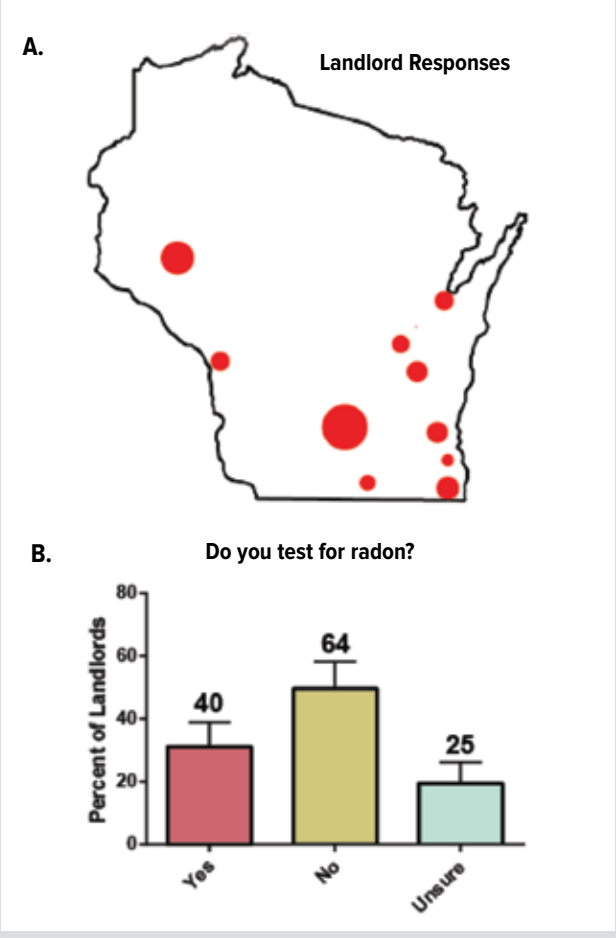
pany (Appendix 4A). A majority of tests were performed using self-test kits (53.2% self-test kits vs 31.9% professional testing and 14.9% unsure; Appendix 4B). Just over 12% of landlords (12.4%) reported that their buildings have mitigation systems, while 43.8% reported that their buildings do not have mitigation systems (Appendix 4C). Additionally, 6.7% of landlords reported that their properties were built with radon-resistant construction compared to 36.5% who reported they did not use radon-resistant construction and 56.7% who were unsure (Appendix 4D).

Radon Testing and Mitigation Practices in Wisconsin Schools

In addition to landlords and residents, our study also assessed radon testing and mitigation practices by public school districts (Figure 3A). Of 231 completed responses, 35.1% of districts reported that all of their schools had been tested previously for radon, 8.1% of school districts reported that a subset of their schools had been tested previously for radon, 19.8% of school districts had not tested for radon, and 36.9% of school districts were unsure (Figure 3B). By examining school district size based on number of buildings and by enrollment, there is no significant difference in propensity to test for radon based on district size. Of 32 districts that reported elevated radon tests, 25.0% took some sort of action (eg, mitigation, fresh air ventilation, or retesting), while 46.9% of schools did nothing in response to a high radon test (Figure 3C). We also asked whether or not school districts installed radon mitigation systems in their schools, either during building construction or ex post facto. Only 2.1% reported having a mitigation system in place, while 79.2% reported no mitigation system.

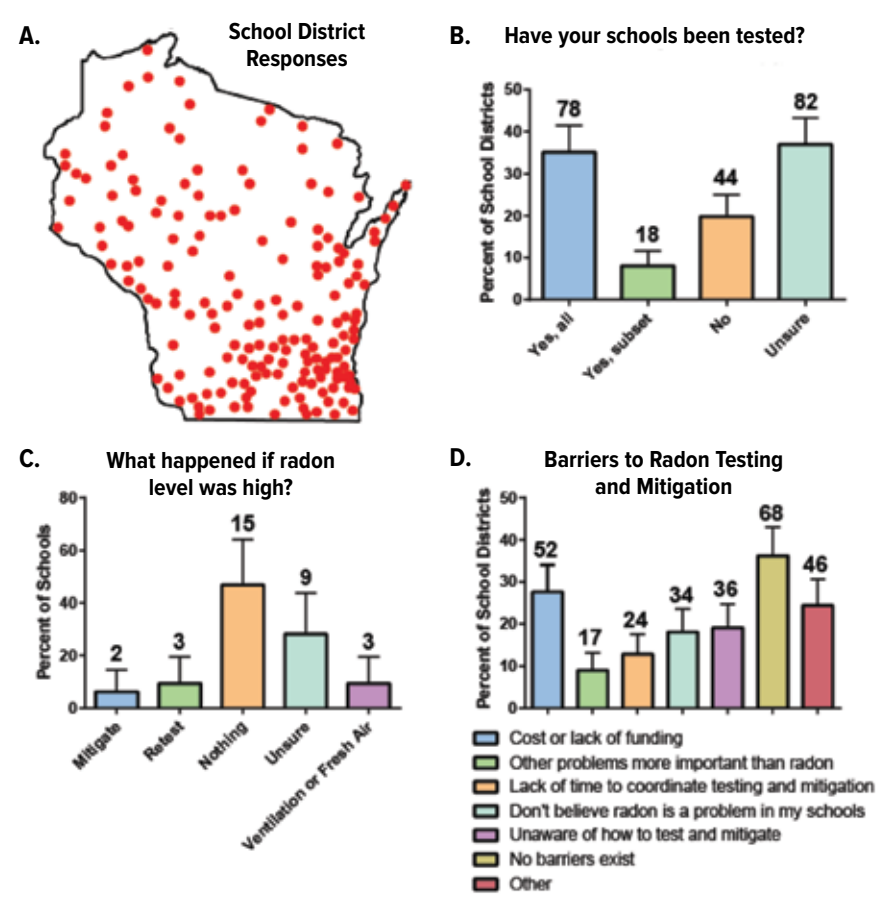
Finally, potential barriers to radon testing and mitigation in schools were assessed (Figure 3D). The most common response was that no barriers exist (36.2% of respondents). The next most common reported barrier was cost or lack of funding (27.7% of respondents).

Figure 2. Survey of Radon Testing and Mitigation by Landlords in Wisconsin



2A. A map of Wisconsin demonstrating the distribution of landlords from which responses were obtained. The sizes of the red circles correlate with the number of completed responses that were obtained from each of the indicated metropolitan areas.
2B. Percentage of landlords that have tested at least 1 of their buildings for radon. The number above each bar is the absolute number of responses in each category.

Figure 3. Survey of Radon Testing and Mitigation in Schools in Wisconsin



3A. A map of Wisconsin demonstrating the distribution of schools from which responses were obtained. Each red circle represents 1 district.
3B. Percentage of school districts that have tested their building(s) for radon.
3C. Actions that were taken by school districts who reported an elevated radon test.
3D. Percent of school districts that reported the following barriers to radon testing and mitigation. Respondents were allowed to choose multiple barriers, if applicable. N=188. Throughout the figure, bars represent percentages ±95% CIs, and the absolute number of response is shown above each bar.

DISCUSSION

The results of this study demonstrate that approximately 30% of residential homeowners (22.1% from SHOW and 39.9% from BRFSS), 31.0% of landlords, and 35.1% of public school districts have tested for radon. Furthermore, of the buildings that have been tested, our data demonstrate that approximately 12.5% of buildings have elevated radon. Lastly, of those that reported elevated radon, 63% of residential home owners and 25% of public school districts took actions to mitigate. (We were unable to draw a conclusion from landlords based on the low number of tests with known results.) As 73.4% of residents reported being aware of radon in the BRFSS data, it appears that awareness may not be the biggest barrier to testing in the residential setting. Previous studies have cited lack of perceived threat and cost as the biggest barriers to testing and mitigation.[13] With regard to landlords, the biggest barrier to radon testing and mitigation appears to be awareness, as many landlords surveyed were not aware of radon or were unsure of whether their buildings had ever been tested and/or mitigated. Additionally, some landlords reported that radon testing and mitigation was not their responsibility and thought the state or local government was responsible. Interestingly, of school districts that reported elevated radon levels, only about 25% took some sort of action. The most commonly cited barrier to testing and mitigation was lack of funding, suggesting that providing funding to public schools could improve radon testing and mitigation rates. It may be particularly effective to intervene in schools and protect children, as longer, less-intense exposures to radon are generally more carcinogenic than shorter, more-intense exposures.[14] These results are similar to a recent study of radon testing practices in Minnesota schools, which found that 53 of 331 (16%) school districts report having tested classrooms for radon since 2012.[15] Furthermore, the aforementioned EPA study of 927 schools nationwide estimated that over 70,000 US classrooms were likely to have radon concentrations above the EPA's action level of 4 pCi/L.[16] These results add to existing literature by providing a relatively comprehensive assessment of radon testing and mitigation practices in residential dwellings and schools in an upper Midwest state with high radon levels and demonstrate potential areas of intervention to increase radon testing and mitigation.

A major barrier to radon testing and mitigation is a general lack of awareness and concern surrounding radon, and research and remediation programs have stalled.[17] In fact, a recent review of CDC-funded National Comprehensive Cancer Control Programs found that approximately one-third of these grantees still do not include radon in their cancer control plans.[18] In addition, survey data suggest that even among people who are aware of radon as a health hazard, only a small fraction live in a home that has been tested.[19] A major challenge to communicating radon risk and promoting radon remediation is that the radon threat is inherently perceived as either being low or simply nonexistent. Furthermore, the lack of sensory cues to alert people that radon is an immediate threat prevents people from taking action.[13] Several studies around

the United States have demonstrated a lack of radon awareness and action. Data from New York state suggest that about 1 out of 5 New York residents are aware of radon, and of those, only 15% had their homes tested.[20] Similarly, a survey of Madison County, Alabama, demonstrated that 70.2% of households had heard of radon, but only 7.3% of houses had been tested for radon.[21] Lastly, a study of Vermont residents who tested for radon and had elevated radon levels demonstrated that 43% mitigated.[19] It is unclear how well these survey data can be extrapolated to the upper Midwest where radon levels are highest, and such a survey in Wisconsin has never been reported.

Current radon testing practices and cost of mitigation may increase health disparities. The risks of radon traditionally have been mentioned only with home sale or transfer, making renters less likely to be aware of such risks.[22] Nearly twice as many renter-occupied households are below the poverty line (eg, minorities, low-income individuals) compared to owner-occupied households. The homeownership rate among white Americans is about 71% compared to about 41% for black Americans and about 47% for Hispanic Americans.[23] Furthermore, those who rent may not have the financial resources to install a mitigation system and also do not own the property and may not have the authority to install a mitigation system. This radon disparity may also be true among homeowners, as a study in Illinois found that lower income and more rural households were less likely to have tested their homes for radon.[24] One potential strategy to reduce disparities is to require landlords to test their properties for radon and mitigate if levels are elevated.

Wisconsin law currently requires disclosure of known prior radon testing during real estate transactions but does not require testing and/or mitigation at real estate transactions, by landlords, or by schools. Given the magnitude of the problem, current testing and mitigation policies and efforts are insufficient, but there are several solutions for this problem. First, communities could implement a multipronged, collaborative approach to increase radon testing, similar to an approach employed by Iowa.[25] This approach involved establishing a coalition of stakeholders including the University of Iowa, the American Lung Association, local public health, lung cancer survivors, radon testers, and mitigation specialists, among others. As a result, from 2009 to 2014, the number of radon tests completed in Iowa increased by 20%, and the number of mitigations completed by certified mitigators increased by 108%.

Policy changes also could help address the radon problem. Fourteen states have no laws regarding radon, radon testing, and disclosure to and from homeowners. Twenty-three states (including Wisconsin) require disclosure of previous radon testing during real estate transaction, 4 states require radon testing in schools, and 2 states require radon mitigation in schools if radon is elevated.[26] However, no states require homes to be tested for radon during a real estate transaction. Furthermore, there is a dearth of policies protecting renters from radon. Two states have laws that address the subject of radon in rental housing directly. Maine requires landlords to test for and disclose radon levels in their properties when requested by the tenant, and Illinois requires landlords to disclose known elevated radon levels.[26] Given that one-third of the nation's housing units are occupied by renters and that the risks of radon traditionally have been disclosed only with home sale or transfer, renters are less likely to be aware of the risks of radon. Wisconsin could make significant progress in increasing the prevalence of testing for and mitigation of radon gas through a combination of the policy changes implemented in other states and community-based initiatives to raise awareness of the health risks and the effectiveness of mitigation.

Lastly, physicians could address this problem by asking their patients about radon, ensuring that radon is emphasized in undergraduate and graduate medical education, and by distributing radon test kits in primary care clinics, which represents an intriguing area of future research.

This study has several limitations. The data are based on survey responses, which are subject to multiple biases. The wording of the radon question in SHOW (ie, have you tested for radon in this home?) may pose limitations in estimating the prevalence of radon testing in all residential dwellings. For example, if the respondent focuses on the "you" in the question, they may have reported "no" if someone else did or coordinated the testing. This may explain why this SHOW estimate is lower than the BRFSS estimate. Also, only SHOW participants who reported having a basement in their home were asked about radon testing, which may affect the prevalence estimate. Response bias may have influenced the results of the school district and landlord surveys, as those school districts and landlords that have tested for and/or mitigated radon are more likely to respond and complete the survey. This would artificially increase our measured percentage. While we can speculate that many of the "unsure" responses about testing and mitigation probably indicate a lack of awareness of radon and therefore a lack of testing and/or mitigation, we could not categorize these as such.

CONCLUSION

These results demonstrate that current levels of radon testing and mitigation in residential homes, landlords, and school districts in the state of Wisconsin are inadequate. Implementation of innovative strategies will be required to improve awareness, mitigation, and testing of radon, which could help prevent about 500 unnecessary Wisconsin deaths every year.

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REFERENCES

1. Radon toxicity case study:what are the routes of exposure to radon? Centers for Disease Control. https://www.atsdr.cdc.gov/csem/csem.asp?csem=8&po=6. Updated May 24, 2010. Accessed Apr 18, 2017.

2. Samet JM, Avila-Tang E, Boffetta P, et al. Lung cancer in never smokers: clinical epidemiology and environmental risk factors. *Clin Cancer Res*. 2009;15(18):5626-5645. doi:10.1158/1078-0432.CCR-09-0376

3. Radford EP, Renard KG. Lung cancer in Swedish iron miners exposed to low doses of radon daughters. *N Engl J Me*d. 1984;310(23):1485-1494. doi:10.1056/NEJM198406073102302

4. Thomas DC, McNeill KG, Dougherty C. Estimates of lifetime lung cancer risks resulting from Rn progeny exposure. *Health Phys*. 1985;49(5):825-846. doi:10.1097/00004032-198511000-00014

5. Krewski D, Lubin JH, Zielinski JM, et al. Residential radon and risk of lung cancer: a combined analysis of 7 North American case-control studies. *Epidemiology.* 2005;16(2):137-145. doi:10.1097/01.ede.0000152522.80261.e3

6. Field RW, Krewski D, Lubin JH, et al. An overview of the North American residential radon and lung cancer case-control studies. *J Toxicol Environ Health A*. 2006;69(7):599-631. doi:10.1080/15287390500260960

7. Lubin JH, Boice JD. Lung cancer risk from residential radon: meta-analysis of eight epidemiologic studies. *J Natl Cancer Inst*. 1997;89(1):49-57. doi:10.1093/jnci/89.1.49

8. Darby S, Hill D, Auvinen A, et al. Radon in homes and risk of lung cancer: collaborative analysis of individual data from 13 European case-control studies. *BMJ*. 2005;330(7485):223. doi:10.1136/bmj.38308.477650.63

9. Lubin JH, Alavanja MC, Caporaso N, et al. Cigarette smoking and cancer risk: modeling total exposure and intensity. *Am J Epidemiol.* 2007;166(4):479-489. doi:10.1093/aje/kwm089

10. Levy BT, Wolff CK, Niles P, Morehead H, Xu Y, Daly JM. Radon testing: community engagement by a rural family medicine office. *J Am Board Fam Med*. 2015;28(5):617-623. doi:10.3122/jabfm.2015.05.140346

11. Radon information for Wisconsin. Wisconsin Department of Health Services. https://www.dhs.wisconsin.gov/radon/index.htm. Updated November 12, 2019. Accessed November 6, 2017.

12. Nieto FJ, Peppard PE, Engelman CD, et al. The Survey of the Health of Wisconsin (SHOW), a novel infrastructure for population health research: rationale and methods. *BMC Public Health*. 2010;10:785. doi:10.1186/1471-2458-10-785

13. Hevey D. Radon risk and remediation: a psychological perspective. *Front Public Health*. 2017;5:63. doi:10.3389/fpubh.2017.00063

14. Kreuzer M, Fenske N, Schnelzer M, Walsh L. Lung cancer risk at low radon exposure rates in German uranium miners. *Br J Cancer*. 2015;113(9):1367-1369. doi:10.1038/bjc.2015.324

15. Lagoe AJ, Kummer JC, Eckert S. KARE 11 investigates: Minnesota schools fail to test for cancer-causing radon [transcript]. *Kare 11.* November 12, 2018.

16. Radon in schools. United States Environmental Protection Agency. https://www.epa.gov/radon/radon-schools. Updated October 23, 2019. Accessed November 6, 2017.

17. Angell WJ. The US radon problem, policy, program and industry: achievements, challenges and strategies. *Radiat Prot Dosimetry*. 2008;130(1):8-13. doi:10.1093/rpd/ncn105

18. Acree P, Puckett M, Neri A. Evaluating progress in radon control activities for lung cancer prevention in National Comprehensive Cancer Control Program plans, 2011-2015. *J Community Health.* 2017;42(5):962-967. doi:10.1007/s10900-017-0342-7

19. Riesenfeld EP, Marcy TW, Reinier K, et al. Radon awareness and mitigation in Vermont: a public health survey. *Health Phys.* 2007;92(5):425-431. doi:10.1097/01.HP.0000254862.50407.4a

20. Wang Y, Ju C, Stark AD, Teresi N. Radon awareness, testing, and remediation survey among New York State residents. *Health Phy*s. 2000;78(6):641-647. doi:10.1097/00004032-200006000-00006

21. Siza C, Morrison M, Harris S, Hatch T, Tyler M. Assessment of community awareness and practices concerning indoor air pollutants - Madison County, Alabama, June 2017. *MMWR Morb Mortal Wkly Rep*. 2018;67(15):447-450. doi:10.15585/mmwr.mm6715a3

22. Darby S, Hill D, Doll R. Radon: a likely carcinogen at all exposures. *Ann Oncol.* 2001;12(10):1341-1351. doi:10.1023/a:1012518223463

23. Goodman L, Pendall R, Zhu J. *Headship and Homeownership: What Does the Future Hold?* Washington, DC: The Urban Institute; 2015.

24. Zahnd WE, Mueller-Luckey GS, Ratnapradipa K, Smith T. Predictors and spatial variation of radon testing in Illinois, 2005-2012. *J Public Health Manag Pract.* 2018;24(2):e1-e9. doi:10.1097/PHH.0000000000000534

25. Bain AA, Abbott AL, Miller LL. Successes and challenges in implementation of radon control activities in Iowa, 2010-2015. *Prev Chronic Dis*. 2016;13:E50. doi:10.5888/pcd13.150596

26. Radon overview. National Conference of State Legislatures. http://www.ncsl.org/research/environment-and-natural-resources/radon.aspx. Published September 14,2015. Accessed April 11, 2017.

Evaluating the Effect of Reach Out and Read on Clinic Values, Attitudes, and Knowledge

Heather Burton, MD; Dipesh Navsaria, MPH, MSLIS, MD

ABSTRACT

Objective: Reach Out and Read is a primary care clinic-based early childhood literacy promotion program that facilitates discussion around literacy and encourages shared reading at home. No prior studies have examined the effect of program implementation on clinic staff and clinic values, attitudes, and knowledge related to early literacy. The hypothesis of this study was that Reach Out and Read implementation not only improves early childhood literacy promotion, but also improves aspects of the clinician's work environment. Understanding the potential effects of this program on clinic staff is important, since many clinics will implement this program in the near future.

Methods: Semistructured key informant interviews were performed with 10 study clinics with Reach Out and Read and 7 control clinics. Interviews were transcribed, coded, and analyzed according to standard qualitative research protocol. Comparisons were made for differences in clinic morale and attitudes towards early childhood literacy. A secondary analysis examined practice and workplace changes in study clinics.

Results: The coded transcripts showed that clinicians at the majority of the study clinics believed that the program boosted clinic morale, increased provider satisfaction, improved patient-clinician relationships, and promoted a literacy-rich environment. Compared to clinicians in control clinics, clinicians in study clinics were more likely to report that they played a large role in promoting literacy and reported having more consistent literacy discussion in visits. Funding was the only concern mentioned consistently by clinics with Reach Out and Read.

Conclusion: Understanding potential changes that can occur in clinics because of the Reach Out and Read program is crucial to help clinics adequately prepare for the implementation process. Knowing that this program has many advantages and few disadvantages in clinics may encourage more participation. Further studies should compare clinics with Reach Out and Read to those with no interest in the program to determine if results from this study can be more broadly generalized.

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Author Affiliations: University of Wisconsin School of Medicine and Public Health, Madison, Wis (Burton, Navsaria); University of Wisconsin Hospital and Clinics (Navsaria).

Corresponding Author: Heather Burton, MD, 3925 NE 45th St, Apt 111, Seattle, WA 98105; phone 920.573.2119; email hsmaby@wisc.edu.

INTRODUCTION

Reach Out and Read is a primary care clinic-based program that promotes early childhood literacy through providing books and advice within pediatric well-child visits. Prior studies show that parents who participate in the program read aloud to their children more often, own more children's books, and enjoy reading together as a family more than families who do not participate.[1-3] In addition, children participating in Reach Out and Read were found to have higher vocabulary scores and higher expressive and receptive language scores than their peers.[4,5] These skills are crucial for children's social, cognitive, and emotional development.[6] Despite evidence supporting Reach Out and Read, remarkably little research has been performed regarding the effect of the program on the clinic itself and staff. In 2009, King et al examined how clinic culture influenced successful program implementation, but no published research has examined the opposite: how Reach Out and Read affects clinic environment and employees.[8]

In August 2014, the American Academy of Pediatrics (AAP) released a policy statement recommending that early childhood literacy promotion be incorporated into pediatric practices and referenced Reach Out and Read as a successful evidence-based model.[7] UW Health has funded Reach Out and Read in all of its primary care clinics that see children, although at the time of this study, not all UW Health clinics had yet implemented the program. With the

Table 1. Comparison of Study and Control Group Demographics

	Study Group	Control Group
Number of clinics participating	10	7
Clinic response rate	38%	28%
Participants	5 family medicine physicians 4 pediatricians 3 clinic coordinators	5 family medicine physicians 2 pediatricians 1 clinic coordinator
Geographic location	6 in Madison/ Milwaukee 4 in other areas of Wisconsin	2 in Madison/ Milwaukee 5 in other areas of Wisconsin
Clinic type	3 community health centers 2 resident clinics 5 academic or private clinics	1 community health center 1 resident clinic 5 academic or private clinics
Participant average age	44 years	43 years
Participant sex	11 females, 1 male	7 females, 1 male
Participant average length of time working at that clinic	8 years	10 years

Table 2: Unique Responses to Interview Questions Among Study and Control Groups

Interview Question	Study Group	Control Group
What is something about your clinic that makes you proud?	• High quality patient care • Being proactive for community health needs	• Strong staff commitment
What is a clinician's role in promoting childhood literacy?	• Getting books into the home • Promote family reading • Encourage bedtime reading routines • Connecting families to community literary resources • Helping parents who struggle with literacy themselves	• Stress the importance early of reading to families
What is your current literacy promotion?	• Consistent literacy promotion in every visit with free book	• Some inconsistent literacy discussion during visits
What do you think are the advantages of the Reach Out and Read program?	• Promoting family bonding • Using the book as an icebreaker • Increasing provider knowledge of literacy • Helps parents remember the conversation about literacy when they get home • Large impact on families but requires little time or effort	• Stress the importance of literacy • Helps connect families to community resources
What do you think are the disadvantages of the Reach Out and Read program?	• Inadequate funding • Extra work • Implementation • Inadequate program staff	• Time commitment for providers

AAP recommendation, clinics considering implementing Reach Out and Read may find further insight helpful.

This study sought to answer the following questions: (1) How are clinic values, attitudes, and knowledge relating to early childhood literacy affected by Reach Out and Read implementation? (2) How do providers and clinic staff feel that the program has changed their clinic environment? (3) What are the barriers to implementation in clinics? We hypothesized that Reach Out and Read not only improves early childhood literacy promotion, but also improves aspects of clinicians' job satisfaction, patient-clinician relationships, and clinic culture.

METHODS

This study involved a qualitative descriptive evaluation of the effects of Reach Out and Read on clinic attitudes, values, and knowledge relating to early childhood literacy. Key informant semistructured interviews were the primary research methodology. The Institutional Review Board of the University of Wisconsin classified this study as exempt.

Study Population

Two different clinic groups were used in this study: (1) a study group consisting of Wisconsin clinics that have had Reach Out and Read in effect for at least 1 year (those with fewer than 1 year of operation were excluded as changes may not yet be evident); (2) a control group consisting of Wisconsin clinics that had applied for Reach Out and Read but were preimplementation.

The clinics in both groups were distributed geographically throughout rural, urban, and suburban Wisconsin and included a mix of independent, academic, community, and federally qualified health centers, as well as clinics that are a part of larger health care systems.

Recruitment and Data Collection

A purposive sample of clinics from both groups was selected, and medical consultants and clinic coordinators responsible for the daily management of Reach Out and Read at each clinic were contacted via email requesting an interview. Twenty-six out of 145 Wisconsin clinics with Reach Out and Read and 25 out of 66 clinics in application were contacted about participating in the study. A follow-up email was sent to all clinics that did not respond. Phone interviews were scheduled at the convenience of the interviewee. No incentives were offered for participation.

Standardized interview scripts were prepared to learn about the overall clinic environment and attitudes toward early childhood literacy promotion. All participants were asked a series of questions regarding work environment, clinic morale, patient-clinician relationships, interactions among coworkers, and early childhood literacy promotion. In addition, the study group participants were asked directly about changes they had seen in their clinic or in their well-child care as a result of Reach Out and Read. The interviews lasted between 15 and 45 minutes and all were performed

by the same interviewer. *See Appendices A and B at www.wmjonline.org for interview questions.*

Data Analysis

With appropriate permissions and informed consent, phone interviews were recorded and transcribed, then analyzed according to qualitative methods following the protocol of Taylor-Powell and Renner.[9] Transcripts were openly coded by 1 coder, and core themes were developed based on the interview questions and emergent patterns from the transcript codes. Major codes were developed based on content repetition and word frequency. Further analysis looked specifically at how employees at the study clinics perceived the program affects their clinic.

RESULTS

Of the 26 clinics with Reach Out and Read that were contacted initially, 10 participated in phone interviews. Of the 25 clinics contacted in the control group, 7 participated in interviews: 5 via phone and 2 via email (per physician request based on scheduling constraints). Table 1 shows a comparison of the study and control group demographics.

Clinics involved in Reach Out and Read that were not studied are a mix of long-engaged programs (>10 years) and recently engaged programs (2-10 years), in a variety of settings and practice populations. Less is known about the clinics that do not have pending program applications, although they are also heterogenous, representing a mix of settings and practice populations.

Comparison Between Study and Control Groups

A comparison of coded interview transcripts from clinics in both groups showed many similarities in overall clinic work environment. In both groups, the majority of individuals indicated that their clinic was a good place to work with a positive environment and dedicated staff, although 2 participants in each group said there were some recent challenges related to staff turnover or clinic administration changes. No notable differences in clinic morale, interactions among coworkers, or patient-clinician relationships were found between the 2 groups.

When asked how about the importance of early childhood literacy on a child's growth, development, and overall health, every participant stated that early childhood literacy is very important. When asked what a clinician's role is in promoting early childhood literacy, respondents in both groups had similar responses, but the study group identified additional responsibilities compared to the control group. In both groups, interviewees mentioned giving anticipatory guidance for parents about literacy; stressing the importance of reading for parents; helping get books into the home; and giving parents expectations, tips, and age-appropriate suggestions for their child's reading. Study group participants offered additional responses, including encouraging bedtime reading routines, promoting family bonding through reading, helping parents who struggle with literacy themselves, connecting parents to community resources such as libraries, encouraging families to use reading as a healthy alternative to TV, and using motivational interviewing to educate and guide families about literacy.

Box 1. Changes Reported by Study Clinics Since Implementation of Reach Out and Read

- Clinics are taking a larger approach to literacy overall (literacy rich waiting rooms, lending libraries, etc.)
- Increased time spent on literacy in visits
- More free books given out
- Books are now developmentally- and culturally- appropriate
- Boosted clinic morale
- Exciting for providers and clinic staff
- Improved provider satisfaction
- Increased literacy discussion among employees
- Helps providers uncover extra information about patients during visits
- Improved patient-clinician relationships
- Families and kids enjoy receiving the books

Box 2. Summary of Notable Comments From Physicians and Staff Working at Clinics With Reach Out and Read

- "[The clinician's role is] providing books and just really talking about how important it is to start reading with your child as early as possible, even to a newborn... And helping them find other sources if the parents are illiterate, encouraging them to go to the library or finding those other resources in the community even though parents might be at a bit of a disadvantage."
- "I think it's more than just talking about it, I think it's actually showing them and having them see a book... that really fields it, really makes it much more meaningful to families."
- "We have multiple languages which is wonderful, but trying to keep them stocked adequately for both English and Spanish...I guess that's maybe the one disadvantage, and I don't really know that that's really a disadvantage, it's just more or less an added responsibility that goes along with it. But I think we're all happy to do it with the many, many benefits that it provides our patients."
- "It [Reach Out and Read] is high yield and relatively low input of time and effort."
- "I'm probably happier with my job and my work [since implementation of the Reach Out and Read program at the clinic]."
- "[Reach Out and Read] has given some people an opportunity to showcase some additional skills, giving them more responsibility to do some things, and giving them some ownership."

Although all participants from both groups said that clinicians have a responsibility in promoting early childhood literacy, none of the control clinic interviewees identified current formal literacy promotion programs. Most control clinic participants said that the only current literacy promotion in the clinic was some verbal discussion during well-child visits, but it was not consistent and varied based on provider (5 out of 7 clinics).

When asked about the main advantages of implementing Reach Out and Read, participants from study clinics recognized many more benefits. Control clinic respondents gave a variety of responses, including giving out free books, stressing the importance of literacy to parents, helping kids get ready for school, connecting the family to libraries and community resources, and introducing literacy in a positive way. Study clinic respondents cited promoting family bonding; providing free books, especially for low-income or high-risk patients; and using the book as a good

ice breaker/ conversation starter about literacy. Other common responses from the study clinics were that Reach Out and Read increases provider knowledge of literacy, prepares kids for school and gets them interested in reading, helps parents remember the conversation about literacy when they get home, and helps less-experienced providers develop additional skills.

Regarding disadvantages of Reach Out and Read, control clinic respondents identified time commitments for providers, funding, extra work, and remembering to give the family the book. Some control clinics were also worried about the implementation process and having adequate staff or resources. When study clinics were asked about program disadvantages, the majority (6/10) of respondents cited funding as the primary issue. The second most-common response was that there were no disadvantages (4/10 clinics). Most concerns identifed by the control clinics were not mentioned by study clinics. However, 3 respondents from the study clinics mentioned logistics, such as stocking books in multiple languages, as a challenge. One study clinic identified fitting in resident training a challenge, but no other clinics with Reach Out and Read mentioned the time commitment or training as a disadvantage. When asked specifically about the implementation process, the majority of study clinics (8/10) said it went smoothly and easily. Table 2 summarizes the major differences in responses to interview questions between the 2 groups.

Analysis of Clinics in the Study Group

Additional analysis revealed that employees of study clinics believe that Reach Out and Read has had a positive impact on many clinic aspects. In general, most said that since implementation, their clinic has started taking a broader approach to literacy promotion (9/10). Many also indicated that not only have they given out more developmentally and culturally appropriate books and increased the amount of time spent promoting early childhood literacy in pediatric visits, but they also have increased literacy promotion and awareness for all patients by creating literacy-rich waiting rooms and exam rooms, opening lending libraries, and holding other literacy events such as book drives.

When we analyzed the 2 groups, no differences were noted in clinic morale, interactions among coworkers, or patient-clinic relationships. However, when the study group was asked directly about what changes they perceived had occurred as a result of the program, they specifically stated that Reach Out and Read had positively affected clinic morale, coworker interactions, and the overall work environment. Most of the study clinics (7/10) said that Reach Out and Read boosted morale to varying degrees, because the program is very exciting for staff and it is fun for the provider to give books to families. Importantly, many study clinics mentioned the positive impact on satisfaction for all clinic employees, including clinical staff, providers, front desk staff, and residents. One provider said, "Everyone's having a ton of fun with this, [the providers] are loving it, the patients are loving it, the staff is loving it."

In addition to boosting clinic morale, most clinics (9/10) indicated that Reach Out and Read has had a positive effect on well-child care and patient-clinician relationships. Nearly all study clinic respondents said that since implementation, they have more consistent literacy discussion and spend more time on anticipatory guidance for literacy during well-child visits (9/10). Many clinicians also said that they use Reach Out and Read as a tool for developmental surveillance and to assess parent-child interactions; family dynamics; the home reading environment; and developmental, motor, and speech delays (5/10). One clinician said, "There's a lot of information verbally and nonverbally that you can get from just putting a book in front of a child."

Overall, Reach Out and Read resulted in only positive changes at the clinics where it was implemented. One physician who participated in the study said, "It's kind of a win-win. I mean, they (the parents and kids) are happy, we're happy. And we're talking about how important (literacy) is for kids." Every individual in the study group said Reach Out and Read is a valuable program at their clinic and many said they would like to see it continue to grow. No clinics reported any negative changes associated with the program. Positive changes seen in clinics since Reach Out and Read implementation are summarized in Box 1; Box 2 summarizes some other notable comments by participants.

DISCUSSION

Qualitative analysis of coded interviews revealed that clinic employees believe that Reach Out and Read has had many positive effects at clinics where it has been implemented, including boosting clinic morale, improving employee satisfaction, and positively affecting patient-clinician relationships.

Limitations

This is a small qualitative study. Clinics in application for the program were chosen for the control group because there may be some fundamental differences between clinics interested in applying for a program like Reach Out and Read and those that are not interested. Clinics that were already motivated to implement the program were utilized in order to more directly examine the changes that occurred in clinics as a result of Reach Out and Read implementation. This does lead to the possibility that the control group may not be representative of all clinics, and the same results may not be seen among a group of clinics with no previous knowledge or interest in the program. In the future, it would be useful to perform a similar study comparing clinics with Reach Out and Read and clinics that have not expressed any interest in the program to see if the results are consistent with the findings of this study. In addition, these were individuals' opinions and may not represent the opinions of all individuals working at a particular clinic, especially since the interviewees were likely to be program advocates.

Another limitation of this study is potential social desirabil-

ity bias. Although the clinics were explicitly informed that everything stated in the interview would remain confidential, there may have been reluctance to give negative feedback, especially given the involvement of the medical director of Reach Out and Read Wisconsin, although he only saw anonymized transcripts. In addition, as many of the clinics interviewed are affiliated with UW Health, results may be biased towards a more positive experience as this organization provides full funding for Reach Out and Read.

Since this was a self-report study, it is possible the key informants did not provide entirely accurate descriptions of their program use. Selection bias was introduced by the research team in the creation of strict exclusion/inclusion requirements for this study. In addition, due to study limitations, only 1 coder analyzed the interview transcripts.

CONCLUSION

Despite the small sample size and limitations, there are many implications for clinics and systems considering Reach Out and Read. First and foremost, these data provide support for current Reach Out and Read programs and can help sustain funding for this valuable community program. In addition, based on this study, clinics considering implementing Reach Out and Read can understand some of the positive changes seen in other clinics after program implementation. This research also may encourage more clinics to apply for Reach Out and Read because it showcases the program's many advantages and very few disadvantages. Finally, large clinic systems that support early childhood literacy promotion may consider offering full-system financial support for Reach Out and Read, knowing that funding is the main barrier to execution in many clinics. They also may consider investing in the program, knowing the benefits of improving employee morale and engaging around the mission to improve child health.

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REFERENCES

1. About Reach Out and Read. Reach Out and Read National Center. http://www.reachoutandread.org/about-us/. Accessed June 10, 2015.

2. High PC, LaGasse L, Becker S, Ahlgren I, Gardner A. Literacy promotion in primary care pediatrics: can we make a difference? *Pediatrics*. 2000;105(4 Pt 2):927–934.

3. Needlman R, Toker KH, Dreyer BP, Klass P, Mendelsohn AL. Effectiveness of a primary care intervention to support reading aloud: a multicenter evaluation. *Ambul Pediatr.* 2005;5(4):209-215. doi:10.1367/A04-110R.1

4. Weitzman CC, Roy L, Walls T, Tomlin R. More evidence for Reach Out and Read: a home-based study. *Pediatrics*. 2004;113(5):1248–1253. doi:10.1542/peds.113.5.1248

5. Mendelsohn AL, Mogilner LN, Dreyer BP, et al. The impact of a clinic-based literacy intervention on language development in inner-city preschool children. *Pediatrics*. 2001;107(1):130–134. doi:10.1542/peds.107.1.130

6. Navsaria D, Shriver AE. *The Elephant in the Clinic: Early Literacy and Family Well-Being*. Washington, DC: The Aspen Institute; 2015. http://ascend.aspeninstitute.org/pages/the-elephant-in-the-clinic-early-literacy-and-family-well-being. Accessed June 10, 2015.

7. Council on Early Childhood, High PC, Klass P. Literacy promotion: An essential component of primary care pediatric practice. *Pediatrics*. 2014;134(2):1-6. doi:10.1542/peds.2014-1384

8. King TM, Muzaffar S, George M. The role of clinic culture in implementation of primary care interventions: the case of Reach Out and Read. Academic Pediatrics 2009; 9(1):40-46. doi:10.1016/j.acap.2008.10.004

9. Taylor-Powell E, Renner M. *Analyzing Qualitative Data.* Madison, WI: University of Wisconsin-Extension; 2003. https://cdn.shopify.com/s/files/1/0145/8808/4272/files/G3658-12.pdf. Accessed June 10, 2015.

10. UW Health expands literacy program. UW Health. https://www.uwhealth.org/news/uw-health-expands-literacy-program/45940. Published June 16, 2015. Accessed June 10, 2015.

Beyond the Objective: Wisconsin Reaching Ischemic Heart Disease Mortality Objective Despite a Third of Counties Not Meeting the Goal

Samantha Aisen, MPH

ABSTRACT

Introduction: Ischemic heart disease is one of the leading causes of death in the United States, with some geographic groups being more affected than others. A Healthy People 2020 objective exists to reduce ischemic heart disease mortality.

Methods: This study examined ischemic heart disease mortality in Wisconsin by county and 4 county categories, based on an urban to rural spectrum, and observed progress towards the Healthy People 2020 objective.

Results: Ischemic heart disease mortality rates have been decreasing. Currently, 67% of Wisconsin counties meet the objective; however, 71% of counties not meeting the objective are more rural.

Discussion: Although further investigation is needed to better understand the factors that cause disparities, more resources should be directed towards communities at highest risk.

INTRODUCTION

Ischemic heart disease is the cause of 1 out of every 4 deaths in the United States and is the leading cause of death for African Americans, Hispanics, and whites.[1] Although research shows that heart disease mortality has been decreasing since the mid-1960s—likely due to a reduction in the occurrence of heart disease as well as a decrease in the case-fatality rate—ischemic heart disease mortality remains a problem for the United States as a whole and for some groups more than others.[2] Recent studies show that health disparities related to ischemic heart disease mortality exist and are indicated by slower decreases in ischemic heart disease mortality among rural communities and African American or black populations.[3] Because of the impact ischemic heart disease has on the US population, reducing ischemic heart disease deaths from 129.2 as of 2007 (age-adjusted to the year 2000 standard population, per 100,000 people) to 103.4 is a Healthy People 2020 objective.[4] The purpose of this paper is to expand on existing literature regarding ischemic heart disease mortality by describing the epidemiology of ischemic heart disease mortality in Wisconsin by county and county categories, based on an urban to rural spectrum, and observe progress towards the Healthy People 2020 objective.

METHODS

Data on ischemic heart disease mortality (ICD-10 I20-I25, the same codes used by Healthy People 2020) were collected for all people in Wisconsin (ages, races, and sex) by county for all counties from the CDC WONDER Underlying Cause of Death database for 3 equal time periods: 1999-2004, 2005-2010, and 2011-2016.[5] Ischemic heart disease death rates were age-adjusted to the 2000 US standard population. Counties were then categorized into frontier (most rural), rural (rural, but not as remote as frontier), micropolitan (counties containing or near small urban centers), and metropolitan (counties containing or near large urban centers) based on classifications made by the University of Wisconsin Applied Population Laboratory, the Wisconsin Office of Rural Health, and the US Office of Management and Budget.[6,7]

The US Office of Management and Budget defines a Core Based Statistical Area (CBSA) as a geographic area consisting of a core population of 10,000 or more people. The area surrounding the core is included in the CBSA if commuting patterns

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Author Affiliation: University of Wisconsin School of Medicine and Public Health, Madison, Wis (Aisen).

Corresponding Author: Samantha Aisen, MPH; email saisen@wisc.edu.

indicate high economic and social integration.[8] CBSAs are then categorized as metropolitan statistical areas if they contain urban areas with more than 50,000 people, or micropolitan statistical areas if they contain urban areas with a population above 10,000 and below 50,000 people. Metropolitan and micropolitan statistical areas can be comprised of single or multiple counties.

For this paper, counties that are part of metropolitan or micropolitan CBSAs were classified as metropolitan and micropolitan, respectively. Counties that were not classified as part of metropolitan or micropolitan statistical areas were categorized as rural. Frontier counties were identified based on designations made by the Wisconsin Office of Rural Health and the National Center for Frontier Communities. Counties categorized as frontier had residents that lived an hour or more from a major city and at least a 15-minute drive from an area with a population of more than 2,500.[7] For the purposes of this paper, if there was disagreement between the classifications of a county between the Office of Management and Budget and the Wisconsin Office of Rural Health, the more rural classification was used.

To compare counties and observe progress towards the Healthy People 2020 objective, age-adjusted ischemic heart disease mortality rate histograms were created for each of the 3 time periods. From these histograms, percentages of counties meeting or not meeting the Healthy People 2020 objective were calculated for each time period. For the most recent time period (2011-2016), percentages of frontier, rural, micropolitan, and metropolitan counties reaching and not reaching the Healthy People 2020 objective also were calculated. Additionally, the percent change between each time period for all counties was calculated, and then the median percent change was identified for each county category.

Table 1A. Ischemic Heart Disease Mortality By County, Frontier and Rural Counties, 1999-2016 (Frontier and Rural)

	1999-2004		2005-2010		2011-2016	
	Age Adjusted Rate Per 100,000	95% CI	Age Adjusted Rate Per 100,000	95% CI	Age Adjusted Rate Per 100,000	95% CI
Frontier Counties (n=11)						
Bayfield	138.4	116.8 - 159.9	129.1	109.6 - 148.7	95.5	79.1 - 111.8
Iron	169.9	139.6 - 200.3	169.0	139.0 - 199.1	94.9	74.1 - 119.7
Ashland	209.9	184.8 - 235.0	139.2	118.9 - 159.5	92.5	75.9 - 109.0
Sawyer	188.2	164.3 - 212.1	141.6	121.4 - 161.7	121.9	104.0 - 139.8
Washburn	174.2	152.1 - 196.2	129.4	111.1 - 147.7	138.7	119.8 - 157.6
Burnett	104.5	87.2 - 121.7	85.3	69.7 - 100.8	63.8	50.4 - 77.3
Rusk	147.6	126.7 - 168.5	103.1	85.6 - 120.6	120.5	102.2 - 138.8
Price	163.7	142.8 - 184.7	113.5	95.7 - 131.2	111.7	94.0 - 129.5
Florence	141.5	108.7 - 181.0	132.0	99.5 - 171.9	134.4	103.5 - 171.6
Forest	177.9	149.2 - 206.7	125.0	100.8 - 149.2	125.2	101.2 - 149.2
Menominee	161.9	102.6 - 242.9	134.1	86.8 - 198.0	94.5	57.8 - 146.0
Median	**163.7**		**129.4**		**111.7**	
Rural Counties (n=28)						
Barron	153.1	140.4 - 165.8	123.1	112.2 - 134.0	94.9	85.5 - 104.3
Polk	142.5	129.3 - 155.7	104.0	93.2 - 114.8	85.0	75.6 - 94.3
Vilas	159.8	142.5 - 177.1	116.4	102.4 - 130.4	110.7	96.9 - 124.5
Oneida	154.2	140.4 - 168.1	118.9	107.3 - 130.5	100.2	89.7 - 110.7
Langlade	185.2	165.7 - 204.8	142.1	125.2 - 159.1	104.1	89.8 - 118.5
Oconto	122.9	109.3 - 136.5	132.2	118.5 - 145.9	122.4	109.8 - 135.0
Shawano	219.1	203.3 - 235.0	115.1	103.9 - 126.3	88.9	79.2 - 98.5
Waupaca	189.1	176.2 - 202.0	148.3	137.2 - 159.3	120.6	110.9 - 130.4
Taylor	134.8	116.3 - 153.3	109.7	93.8 - 125.7	77.4	64.7 - 90.2
Clark	152.6	137.5 - 167.6	113.7	100.9 - 126.5	105.4	93.3 - 117.5
Jackson	187.0	164.3 - 209.7	116.2	98.7 - 133.6	122.2	105.2 - 139.3
Trempealeau	167.3	150.4 - 184.2	108.1	94.5 - 121.7	95.2	82.7 - 107.6
Buffalo	126.8	105.5 - 148.0	90.6	73.2 - 107.9	86.8	70.2 - 103.3
Pepin	160.4	129.1 - 191.7	107.8	84.5 - 135.5	84.1	64.1 - 108.2
Kewaunee	109.6	93.1 - 126.1	87.3	73.2 - 101.5	76.2	63.3 - 89.1
Door	135.6	121.3 - 150.0	105.8	93.9 - 117.7	102.9	91.3 - 114.5
Monroe	187.0	171.0 - 203.0	138.6	125.4 - 151.9	104.5	93.4 - 115.6
Juneau	182.3	163.1 - 201.5	101.4	88.0 - 114.8	107.1	93.3 - 120.9
Adams	154.3	135.1 - 173.5	128.7	112.2 - 145.2	121.2	106.0 - 136.5
Waushara	205.7	186.0 - 225.3	151.1	134.6 - 167.7	153.7	137.6 - 169.8
Marquette	123.7	104.0 - 143.5	94.2	77.9 - 110.5	66.5	53.5 - 79.6
Green Lake	158.3	139.6 - 177.1	110.8	95.3 - 126.3	83.2	70.1 - 96.3
Columbia	141.7	129.7 - 153.6	97.8	88.1 - 107.5	90.7	81.6 - 99.7
Vernon	161.3	144.9 - 177.7	95.8	83.5 - 108.2	86.3	75.1 - 97.4
Richland	136.9	118.0 - 155.9	105.7	89.8 - 121.7	75.6	62.6 - 88.6
Crawford	158.5	137.3 - 179.8	110	92.7 - 127.4	89.3	73.8 - 104.8
Iowa	191.4	169.0 - 213.7	147.2	128.4 - 166.1	114.9	99.4 - 130.4
Lafayette	171.2	147.9 - 194.5	117.6	98.7 - 136.6	90.3	74.3 - 106.3
Median	**158.4**		**112.2**		**95**	

RESULTS

Age-adjusted mortality rates due to ischemic heart disease for all 72 Wisconsin counties (grouped by county category) for the 3 different time periods are listed in Table 1. From 1999 to 2004, age-adjusted mortality rates due to ischemic heart disease ranged from 104.5 to 219.1 per 100,000 people. During 2005 to 2010, rates ranged from 78.9 to 169 per 100,000 people. And, during 2011 to 2016, rates ranged from 63.8 to 153.7 per 100,000 people. With few exceptions, mortality rates consistently decreased for all counties over time and, on average, rates were lower in metropolitan counties and higher in frontier counties for all 3 time periods.

Histograms created to see trends in the number of counties meeting and not meeting the Healthy People 2020 objective revealed a steady increase in the number of counties meeting the objective as well as a potential urban-rural disparity (Figure 1). For

Table 1B. Ischemic Heart Disease Mortality By County, Frontier and Rural Counties, 1999-2016 (Micropolitan and Metropolitan)

	1999-2004		2005-2010		2011-2016	
	Age Adjusted Rate Per 100,000	95% CI	Age Adjusted Rate Per 100,000	95% CI	Age Adjusted Rate Per 100,000	95% CI
Micropolitan Counties (n = 11)						
Marinette	199.3	184.9 - 213.8	158.3	145.6 - 171.0	129.9	118.7 - 141.1
Lincoln	158.7	142.7 - 174.7	101.2	88.8 - 113.6	113.8	101.0 - 126.6
Dunn	130.9	116.0 - 145.8	82.5	71.5 - 93.4	78.7	68.7 - 88.7
Wood	120.3	111.3 - 129.2	100.9	93.0 - 108.7	86.4	79.3 - 93.5
Portage	135.9	124.2 - 147.6	96.5	87.2 - 105.8	86.0	77.7 - 94.2
Manitowoc	140.2	131.0 - 149.5	111.8	103.9 - 119.7	86.6	79.7 - 93.4
Dodge	192.6	181.6 - 203.6	137.1	128.2 - 146.0	97.0	89.7 - 104.2
Jefferson	163.3	151.7 - 174.8	128.3	118.5 - 138.0	92.8	85.0 - 100.7
Walworth	162.2	152.0 - 172.4	107.8	99.9 - 115.7	95.3	88.2 - 102.4
Grant	172.9	159.5 - 186.3	130.8	119.4 - 142.3	94.8	85.3 - 104.3
Sauk	160.7	148.3 - 173.2	112.1	102.3 - 121.8	110.1	100.8 - 119.3
Median	**160.7**		**111.8**		**94.8**	
Metropolitan Counties (n = 22)						
Douglas	154.6	140.7 - 168.5	110	98.3 - 121.8	85.1	75.1 - 95.1
Chippewa	160.7	148.2 - 173.2	98.7	89.5 - 108.0	106.5	97.3 - 115.8
Eau Claire	118	109.1 - 126.9	91.2	83.6 - 98.7	73.3	66.8 - 79.8
St. Croix	144.4	131.5 - 157.3	94.3	84.8 - 103.8	71.5	64.0 - 79.1
Pierce	151.3	133.4 - 169.1	87.9	75.1 - 100.7	79.9	68.6 - 91.2
Marathon	107.3	100.3 - 114.4	86.6	80.7 - 92.6	73	67.8 - 78.2
Outagamie	137.2	129.5 - 144.8	95.7	89.7 - 101.7	83.3	78.0 - 88.5
Brown	160.1	153.0 - 167.2	111.9	106.4 - 117.4	110.2	105.0 - 115.3
Winnebago	117	110.3 - 123.7	84.8	79.4 - 90.2	69.6	64.9 - 74.2
Calumet	112.3	98.2 - 126.3	95.3	83.5 - 107.0	93.4	82.7 - 104.1
Fond Du Lac	148.5	139.5 - 157.5	109.3	101.9 - 116.8	92.1	85.5 - 98.6
Sheboygan	141.2	132.9 - 149.5	106.7	99.7 - 113.7	93	86.7 - 99.3
Washington	135.1	126.4 - 143.9	93	86.5 - 99.6	80.3	74.7 - 85.9
Ozaukee	132.2	122.3 - 142.1	99.1	91.4 - 106.9	79.3	72.8 - 85.8
Milwaukee	170.8	167.4 - 174.2	129.9	127.0 - 132.9	110.3	107.6 - 113.0
Waukesha	143.2	138.2 - 148.2	95	91.3 - 98.7	73.4	70.4 - 76.4
Racine	140.9	134.0 - 147.9	110.2	104.4 - 116.0	88.6	83.6 - 93.6
Kenosha	170.1	161.3 - 178.9	142.6	135.0 - 150.3	120.5	113.8 - 127.3
Rock	146.8	139.1 - 154.5	104	98.1 - 110.6	95	89.1 - 100.4
Green	117.4	103.9 - 131.0	80.1	69.4 - 90.9	71.8	62.1 - 81.5
Dane	115.1	110.5 - 119.7	78.9	75.4 - 82.4	70.6	67.5 - 73.6
La Crosse	126	117.5 - 134.6	87.6	80.9 - 94.3	77.5	71.5 - 83.4
Median	**141**		**95.5**		**81.8**	

the first time period (1999-2004), no counties had age-adjusted ischemic heart disease mortality rates lower than 103.4; thus, no Wisconsin counties met the Healthy People 2020 objective. For the 2005-2010 period, 36% (26) of counties had age-adjusted ischemic heart disease mortality rates lower than 103.4, and 64% (46) had rates that were higher. And from 2011 to 2016, 67% (48) of counties met the Healthy People 2020 goal of rates lower than 103.4, while 33% (24) had higher rates. More specifically, 45% (5 of 11) of frontier counties, 60% (17 of 28) of rural counties, 73% (8 of 11) of micropolitan counties, and 82% (18 of 22) of metropolitan counties met the goal during this time period (Figure 2). Of the 33% of counties that did not meet the Healthy People 2020 objective, 71% were either rural or frontier. Additionally, the statewide age-adjusted rate for this time period was 92.4 (95% CI, 91.5-93.4).

In terms of trends over time, percent change between each time period and overall illustrates that ischemic heart disease mortality is decreasing and that the decrease has been slowing over time. Between 1999 to 2004 and 2005 to 2010, age-adjusted mortality rates decreased between 25% and 29% for all county categories—or about 4% to 5% per year. Between 2005 to 2010 and 2011 to 2016, rates decreased between 14% and 17% for all county categories—or about 2% to 3% per year. And between 1999 to 2004 and 2011 to 2016, rates decreased around 40% across all county categories.

DISCUSSION

This study finds that the state of Wisconsin is currently meeting the Healthy People 2020 objective of an age-adjusted ischemic heart disease mortality rate of less than 103.4 per 100,000 people, despite 33% of counties not meeting this goal. The majority of counties not meeting the objective (71%) were categorized as either rural or frontier. Ischemic heart disease mortality decreased for each county category, on average, over the time period studied. Furthermore, percent change in ischemic heart disease mortality was larger from the first time period (1999-2004) to the second time period (2005-2010) than it was from the second time period to the third time period (2011-2016), indicating that the rate of decrease is slowing.

The findings of this study in terms of an urban-rural health disparity and a consistent, yet slowing decrease in ischemic heart disease mortality, echo what existing literature reports.[2,3,9,10] Like other studies have shown, location matters for health. Rural communities tend to be worse off than more urban settings in terms of ischemic heart disease mortality and some other health indicators. However, urban communities do not always fair better than rural communities, especially on measures of water and air quality, mental health issues due to limited green space, and higher rates of poverty, among other issues.[10-13]

Likewise, existing literature supports this study's findings that ischemic heart disease mortality rates are consistently decreasing and that the rate of decrease is slowing for some groups. In the mid-1960s, death due to ischemic heart disease peaked and has been declining since. The increase in ischemic heart disease mortality from the early 20th century into the mid-20th century is thought to be related to increases in negative health behaviors,

such as poor diet and smoking, and the decrease in mortality since the mid-20th century is thought to be attributed to improvements in primary, secondary, and tertiary prevention.[2,3] This investigation did not explore why rates of ischemic heart disease mortality are decreasing more slowly now than in previous years, but further study into how increasing obesity rates relate to ischemic heart disease mortality may be an appropriate next step.

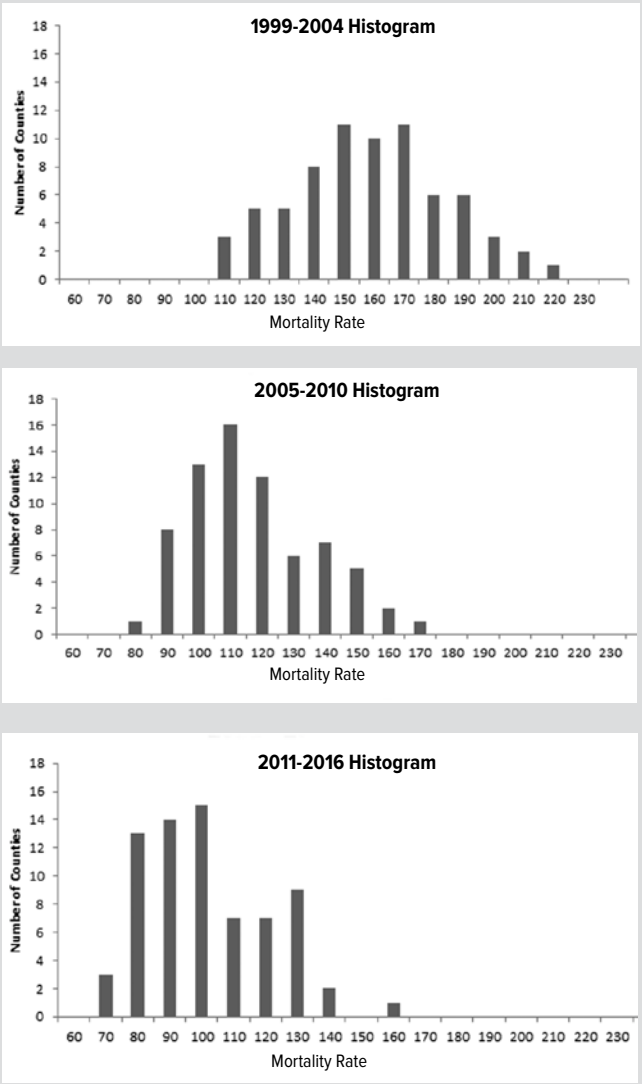
Similarly, while this paper does not examine the underlying causes for ischemic heart disease mortality disparities, existing literature creates a solid foundation for further study. Rural communities may experience higher ischemic heart disease mortality than urban and suburban communities due to issues in access to care as well as health behaviors. Access to care may be limited for rural residents due to higher uninsured rates and longer travel times to health care providers, which can make health care unreachable.[14,15] Lifestyle also may play a role as leisure time spent physically active is lower; the prevalence of obesity is higher—even after adjusting for age, sex, race/ethnicity, and education level; and smoking rates tend to be higher in rural adults as compared to urban and suburban populations.[16-18] Understanding the unique barriers faced by rural communities and adapting a systems-thinking approach to addressing those barriers will be invaluable when trying to reduce ischemic heart disease mortality.

This study has some notable limitations. First, the data used for this study are based on death records. Death record documentation and underlying cause of death determinations may vary based on who is collecting and recording the data. Second, although this study examined data from 1999 to 2016, the data was summarized in 3 data points each representing 6 years; thus, some variability within the 6-year periods was lost. Third, some of the county categories were small and consequently made it difficult to meaningfully compare between county categories. Fourth, classifying counties into frontier, rural, micropolitan, and metropolitan may hide variability that exists within a geographic region by factors such as race or ethnicity.[19] Finally, this is a single study in 1 state. Although results are echoed in similar studies from other regions, further research into ischemic heart disease mortality in other frontier, rural, micropolitan, and metropolitan counties is needed to generalize the results.[3]

CONCLUSION

This study's findings make it clear that ischemic heart disease mortality is decreasing and that recognizable progress is being made. However, this study also reveals that more rural communities are not reaching ischemic heart disease mortality goals at the same rates as more urban counties. As time to evaluate the Healthy People 2020 objectives approaches and passes, it will be important that policies and programs acknowledge progress, but that equal acknowledgment is given to the existence of health disparities in a state that will likely meet the Healthy People 2020 objective.

Figure 1. Ischemic Heart Disease Mortality Histograms 1999-2004, 2005-2010, and 2011-2016



Like other current public health problems, the underlying cause of disparities in ischemic heart disease mortality between urban and rural geographic areas are likely the result of differences in primary, secondary, and tertiary prevention. Effective and equitable policy is needed to dedicate resources to investigate underlying causes of mortality rate differences across geographic locations and to subsequently distribute available resources so that rural communities struggling to meet Healthy People 2020 objectives are supported with public health programs.

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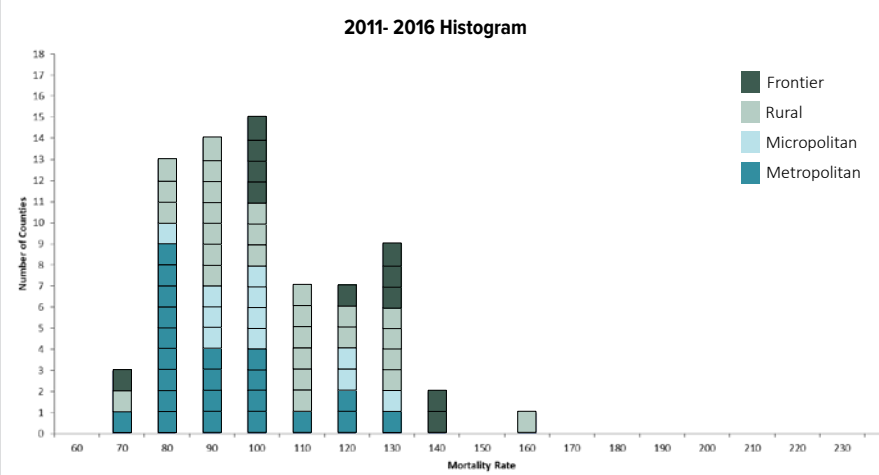
Figure 2. Histogram with County Categories 2011-2016



REFERENCES

1. Heart disease facts. Centers for Disease Control and Prevention. https://www.cdc.gov/heartdisease/facts.htm. Updated November 28, 2017. Accessed December 15, 2018.

2. Dalen JE, Alpert JS, Goldberg RJ, Weinstein RS. The epidemic of the 20th century: coronary heart disease. *Am J Med*. 2014;127(9):807-812. doi:10.1016/j.amjmed.2014.04.015

3. Kulshreshtha A, Goyal A, Dabhadkar K, Veledar E, Vaccarino V. Urban-rural differences in coronary heart disease mortality in the United States: 1999-2009. *Public Health Rep*. 2014;129(1):19-29. doi:10.1177/003335491412900105

4. Heart disease and stroke. Healthy People 2020. https://www.healthypeople.gov/2020/topics-objectives/topic/heart-disease-and-stroke/objectives. Accessed December 15, 2018.

5. Underlying cause of death, 1999-2017 request. Centers for Disease Control and Prevention. https://wonder.cdc.gov/ucd-icd10.html. Accessed December 15, 2018.

6. Urban, rural & frontier counties in WI. Wisconsin Office of Rural Health. http://worh.org/library/urban-rural-frontier-counties-wi. Accessed December 15, 2018.

7. Jones M, Ewald M. Putting rural Wisconsin on the map. WisContext. https://www.wiscontext.org/putting-rural-wisconsin-map. Published May 17, 2017. Accessed December 15, 2018.

8. 2010 standards for delineating metropolitan and micropolitan statistical areas. Federal Register. https://www.federalregister.gov/documents/2010/06/28/2010-15605/2010-standards-for-delineating-metropolitan-and-micropolitan-statistical-areas. Published June 28, 2010. Accessed August 15, 2019.

9. Sidney S, Quesenberry CP Jr, Jaffe MG, et al. Recent trends in cardiovascular mortality in the United States and public health goals. *JAMA Cardiol*. 2016;1(5):594-599. doi:10.1001/jamacardio.2016.1326

10. Eberhardt MS, Pamuk ER. The importance of place of residence: examining health in rural and nonrural areas. *Am J Public Health.* 2004;94(10):1682-1686. doi:10.2105/ajph.94.10.1682

11. Strosnider H, Kennedy C, Monti M, Yip F. Rural and urban differences in air quality, 2008-2012, and community drinking water quality, 2010-2015 – United States. *MMWR Surveill Summ*. 2017;66(13):1-10. doi:10.15585/mmwr.ss6613a1

12. South EC, Hohl BC, Kondo MC, MacDonald JM, Branas CC. Effect of greening vacant land on mental health of community-dwelling adults: a cluster randomized trial. *JAMA Netw Open*. 2018;1(3):e180298. doi:10.1001/jamanetworkopen.2018.0298

13.A comparison of rural and urban America: household income and poverty. US Census Bureau. https://www.census.gov/newsroom/blogs/random-samplings/2016/12/a_comparison_of_rura.html. Published December 22, 2016. Accessed August 18, 2019.

14. Hoadley J, Alker J, Holmes M. Health insurance coverage in small towns and rural America: the role of Medicaid expansion. Georgetown University Center for Children and Families and the University of North Carolina NC Rural Health Research Program. https://ccf.georgetown.edu/wp-content/uploads/2018/09/FINALHealthInsuranceCoverage_Rural_2018.pdf. Published September 25, 2018. Accessed August 18, 2019.

15. Douthit N, Kiv S, Dwolatzky T, Biswas S. Exposing some important barriers to health care access in the rural USA. *Public Health.* 2015;129(6):611-620. doi:10.1016/j.puhe.2015.04.001

16. Doogan N, Roberts M, Wewers M, et al. A growing geographic disparity: rural and urban cigarette smoking trends in the United States. *Prev Me*d. 2017;104:79-85. doi:10.1016/j.ypmed.2017.03.011

17. Lundeen EA, Park S, Pan L, O'Toole T, Matthews K, Blanck HM. Obesity prevalence among adults living in metropolitan and nonmetropolitan counties - United States, 2016. *MMWR Morb Mortal Wkly Rep.* 2018;67(23):653-658. doi:10.15585/mmwr.mm6723a1

18. Patterson PD, Moore CG, Probst JC, Shinogle JA. Obesity and physical inactivity in rural America. *J Rural Heal*th. 2004;20(2):151-159. doi:10.1111/j.1748-0361.2004.tb00022.x

19. James CV, Moonesinghe R, Wilson-Frederick SM, Hall JE, Penman-Aguilar A, Bouye K. Racial/ethnic health disparities among rural adults - United States, 2012-2015. *MMWR Surveill Summ*. 2017;66(23):1-9. doi:10.15585/mmwr.ss6623a1

Adult Asthma Control and Self-Management, Wisconsin 2012–2016

Grace M. Christensen, MPH; Carrie Tomasallo, PhD, MPH; Jon G. Meiman, MD

ABSTRACT

Introduction: This report describes the current state of asthma control and management among adults in Wisconsin.

Methods: Data from the 2012-2016 Wisconsin Behavioral Risk Factor Surveillance System Asthma Call-back Survey were analyzed. Asthma control, self-management, and work-related asthma were described using prevalence estimates.

Results: Among adults with asthma, 40.1% (95% CI, 35.7-44.5) were well-controlled, 36.7% (95% CI, 32.5-40.9) were not well-controlled, and 23.2% (95% CI, 19.5-26.9) were very poorly controlled. One third (35.1%, 95% CI, 30.8-39.4) of adults were given a written asthma action plan by their health care providers.

Discussion/Conclusion: Many adults did not have well-controlled asthma during the study period. Health care providers should consider providing additional self-management education to help patients manage their asthma symptoms.

INTRODUCTION

Asthma is a chronic disease affecting the lung characterized by airflow obstruction, bronchial hyperresponsiveness, and underlying inflammation.[1] Nationally, asthma affects over 22 million Americans, with 8.3% of adults in the United States reporting a current diagnosis of asthma in 2016. In Wisconsin, 8.5% of adults 18 years and older report currently having asthma.[2] Poorly controlled asthma can result in significant morbidity and high health care utilization. In 2016 alone, there were 12,751 asthma-related emergency department (ED) visits and 1,514 hospitalizations among Wisconsin adults.[3] These ED and hospital visits are costly; Wisconsin ED visit charges for asthma exceeded $24.5 million in 2011.[4]

Health care providers play a central role in helping their patients achieve asthma control. Self-management techniques, identification of environmental and work-related triggers, and regular checkups are necessary to properly manage symptoms.[1] However, a recent review of asthma care interventions suggests that health care providers do not consistently adhere to asthma care guidelines.[5]

This report aims to estimate asthma control among adults with asthma in Wisconsin and to assess the prevalence of routine checkups and asthma self-management knowledge by asthma control categories. Additionally, this report provides estimates of work-related asthma among adults.

METHODS

Data were obtained from the Wisconsin Behavioral Risk Factor Surveillance System (BRFSS) Asthma Call-back Survey (ACBS) during 2012 to 2016. The BRFSS is a cross-sectional telephone survey conducted by state health departments with assistance from the Centers for Disease Control and Prevention (CDC). Random digit dialing techniques are used on both landlines and cell phones to recruit participants. In Wisconsin, the response rate was 49.8% for 2016.[6] Survey weights were developed to make the data generalizable to Wisconsin's population demographics. More details on the BRFSS sampling methodology can be found in the CDC ACBS guidance.[7] All BRFSS participants who reported ever having been diagnosed with asthma were invited to participate in the

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Author Affiliations: Wisconsin Department of Health Services, Bureau of Environmental and Occupational Health, Madison, Wis (Christensen, Tomasalla, Meiman); Centers for Disease Control and Prevention, CSTE Applied Epidemiology Fellowship (Christensen).

Corresponding Author: Jonathan Meiman, MD, 1 W Wilson St, Room 150, Madison, WI 53703; phone 608.266.1253; email jonathan.meiman@wi.gov.

Table 1. Behavioral Risk Factor Surveillance System Asthma Call-Back Survey Asthma Control Categories

Element	Well-Controlled	Not Well-Controlled	Very Poorly Controlled
Symptoms[a]	≤8 days in past 30 days	>8 days in past 30 days but not throughout the day	Every day in the past 30 days and throughout the day
Nighttime Awakenings[a]	≤2 times in past 30 days	≥3 and ≤12 times in the past 30 days	≥13 times in the past 30 days
Rescue Medication Use[b]	≤0.29 uses per day	>0.29 and <2.00 uses per day	≥2.00 uses per day
Limited Activity[a]	No limitations in past 30 days	Some limitation past 30 days	Extremely limited past 30 days
Overall	All elements well-controlled	At least 1 element not well-controlled; no elements very poorly controlled	At least 1 element very poorly controlled

[a]Asked frequency over last 30 days.
[b]Frequency of inhaler rescue medication uses per day or week for all medications taken in last 3 months was converted to the number of uses per day and summed. Rescue medications used only for treatment before exercise were excluded.

Table 2. Prevalence Estimates With 95% CI for Individual Elements of Asthma Control Classification Among Adults With Current Asthma, Wisconsin Behavioral Risk Factor Surveillance System, 2012-2016

Asthma Control Element	Prevalence	(95% CI)
Symptoms[a]		
≤8 days in past 30 days	62.3	(58.2 - 66.4)
>8 days in past 30 days but not throughout the day	25.8	(22.1 - 29.4)
Every day in the past 30 days and throughout the day	11.9	(9.1 - 14.7)
Nighttime Awakenings[a]		
≤2 times in past 30 days	76.5	(72.9 - 80.2)
≥3 and ≤12 times in the past 30 days	12.6	(9.9 - 15.4)
≥13 times in the past 30 days	10.8	(8.2 - 13.5)
Rescue Medication Use[b]		
≤0.29 uses per day	93.1	(91.4 - 94.9)
>0.29 and <2.00 uses per day	2.2	(1.2 - 3.3)
≥2.00 uses per day	4.6	(3.2 - 6.0)
Limited Activity[a]		
No limitations in past 30 days	54.2	(49.9 - 58.5)
Some limitation past 30 days	39.9	(35.7 - 44.1)
Extremely limited past 30 days	5.9	(3.9 - 7.8)

[a]Asked frequency over last 30 days.
[b]Frequency of inhaler rescue medication uses per day or week for all medications taken in last 3 months was converted to the number of uses per day and summed. Rescue medications used only for treatment before exercise were excluded.

ACBS, which defines adults with current asthma as those who state that they currently have asthma.

Asthma control was assessed by examining 4 measures of impairment: symptoms, nighttime awakenings, rescue medication use, and activity limitations. To assess each measure, survey respondents were asked about frequency of symptoms and nighttime awakenings in the past 30 days, if activity was limited because of asthma symptoms in the past 30 days, and how often rescue medication was used in the past 3 months. Answers to these questions were ranked and put into categories of "well-controlled" to "very poorly controlled," as shown in Table 1. The overall level of asthma control was based on the most severe measure of impairment (eg, a respondent's asthma was classified as "very poorly controlled" if any individual measure was "very poorly controlled"). All measures must have been "well-controlled" for asthma to be classified as "well-controlled." This classification method is recommended by CDC's ACBS guidance and is consistent with the National Heart, Lung, and Blood Institute (NHLBI) Expert Panel Report-3 (EPR-3) asthma guidelines.[1,8]

Self-management was assessed using dichotomous yes/no questions regarding respondent experiences with health care providers when discussing their asthma. Work-related asthma estimates were based on: (1) respondents who reported that workplace exposures either caused or aggravated their asthma; and (2) respondents who reported doctor-diagnosed or self-diagnosed work-related asthma.

Measures of asthma control, the overall asthma control category, self-management knowledge, and work-related asthma were described using prevalence estimates and 95% confidence intervals (CI). Chi-square analysis was used to test for differences in categorical variables, such as income, routine checkups, and self-management knowledge between asthma control categories. Frequencies, prevalence estimates, 95% CIs, and chi-square statistics were obtained using weighted survey procedures to address the complex sampling design. All analyses were conducted using SAS software version 9.4 (SAS Institute, Cary, North Carolina).

RESULTS

Asthma Control

Among adults who currently had asthma, 40.1% (95% CI, 35.7 - 44.5) had well-controlled asthma, 36.7% (95% CI, 32.5 - 40.9) had asthma that was not well-controlled, and 23.2% (95% CI, 19.5 - 26.9) had very poorly controlled asthma. Prevalence estimates and 95% CIs for individual measures of asthma control are detailed in Table 2.

Among individuals with very poorly controlled asthma, 51.3% (95% CI, 42.4 - 60.2) reported symptoms every day and throughout the day in the past 30 days. Among this same group, 46.8% (95% CI, 37.7 - 55.8) had nighttime awakenings ≥ 13 times in the past 30 days, and 26.2% (95% CI, 18.5 - 33.8) were extremely limited in the past 30 days. Lastly, 19.9% (95% CI, 14.0 - 25.9) of those with very poorly controlled asthma reported ≥2 rescue medication usages per day. Symptoms and nighttime awakenings were the main drivers for being categorized as very poorly controlled.

There were significant differences between asthma control groups in the proportion of those who had routine checkups for their asthma. Those with well-controlled asthma (39.4%, 95% CI, 31.8 - 47.0) were less likely to report a routine doctor's visit for their asthma compared to their counterparts in the not well-

controlled (62.3%; 95% CI, 55.6-69.0) or very poorly controlled (71.9%; 95% CI, 63.3-80.5) categories (χ^2, $P<0.0001$).

There was also a significant difference in the proportions of asthma control by income. Among adults with asthma who reported an annual household income <$15,000, 40% (95% CI, 27.4-52.6) had very poorly controlled asthma, compared to 9.3% (95% CI, 5.6-12.9) of those with a household income >$50,000 ($\chi^2$, $P<0.001$). Conversely, asthma was well-controlled in 52.9% (95% CI, 45.6-60.3) of adults with asthma who reported a household income >$50,000, compared to 25.5% (95% CI, 11.9-39.2) of those with a household income <$15,000 ($\chi^2$, $P<0.001$).

Self-Management

Almost all adults with current asthma (97.7%; 95% CI, 96.8-99.0) reported having been taught how to use their inhaler by their health care provider, but only 78.9% (95% CI, 75.5-82.3) reported that their provider had observed them using it. Furthermore, only 49.9% (95% CI, 45.5-54.4) reported having been taught how to use a peak flow meter to monitor their asthma symptoms.

Approximately one-third of adults with current asthma (35.1%; 95% CI, 30.8-39.4) were given a written asthma action plan with instructions detailing when to use medication, when to call the doctor for advice, and when to go to the ED; however, 64.6% (95% CI, 60.4-68.9) were taught to recognize asthma symptoms, and 77.7% (95% CI, 74.1-81.3) were taught what to do during an attack. There were no significant differences in self-management knowledge by asthma control category (χ^2, $P>0.05$).

Work-Related Asthma

Among ever-employed adults with current asthma, 54.8% (95% CI, 50.3-59.2) reported that their asthma was caused or aggravated by their current or previous job, and 21.8% (95% CI, 18.5-25.1) reported that they had either self-identified or doctor-diagnosed work-related asthma.

DISCUSSION

This analysis indicates that many adults in Wisconsin do not have well-controlled asthma, which is a likely contributor to the thousands of ED visits and hospitalizations every year for exacerbations. Further, in this group of respondents, asthma symptoms and nighttime awakenings were the most common drivers of having very poorly controlled asthma.

Self-management education is an effective strategy for achieving asthma control. A meta-analysis of self-management education on chronic disease outcomes found that there was a 41% reduction in asthma attacks (log rate ratio, 0.59; 95% CI, 0.35-0.83) among individuals receiving self-management education. This analysis also suggested that using a peak flow meter to monitor disease activity is beneficial.[9] A systematic review of the asthma literature found that self-management education involving self-monitoring with a peak flow meter and regular doctor visits significantly reduced hospitalizations, ED visits, unscheduled visits to the doctor, days off work or school, and nocturnal asthma. The authors concluded that self-management education that includes a written action plan and allows patients to adjust their medication use is most effective.[10] Despite the benefits of self-management education, an analysis using the 2012 National Asthma Survey of Physicians found low adherence to asthma guidelines. Only 16.4% of primary care physicians provided patients written asthma action plans, and only 11.2% recommended at-home peak flow monitoring to their patients.[5] While our analysis found higher estimates of asthma patients being taught to use a peak flow meter (49.9%) and receiving an asthma action plan (35.1%), there is still substantial room for improvement.

Work-related asthma is a common but underdiagnosed issue in adults with asthma. This underdiagnosis is attributed to low awareness by physicians and a lack of knowledge and time.[11] In Wisconsin, over half of adults with asthma reported that their work either caused or aggravated their asthma. Physicians should ask patients about occupational exposures and timing of asthma symptoms to improve diagnosis and management of work-related asthma.

Given the need for improved self-management education by providers, the CDC-funded Wisconsin Asthma Program, housed within the Wisconsin Division of Public Health, funds a variety of projects to help improve asthma control in high-burden communities. The Wisconsin Asthma Program partners with the American Lung Association of the Upper Midwest to implement comprehensive asthma quality improvement projects within clinics in high-burden areas of the state. These projects ensure that clinic staff consistently provide asthma diagnosis, treatment, and patient education for children and adults that meet the NHLBI EPR-3 asthma guidelines. The Asthma Care program is another initiative available in southeastern Wisconsin to children and adults with poorly controlled asthma. The program offers targeted services, including intensive asthma self-management education and environmental home assessments, in an effort to improve asthma control. In addition, referrals are provided to clients who do not have a primary care provider and/or health insurance.[12]

CONCLUSION

State survey data indicate that the majority of Wisconsin adults do not have well-controlled asthma. Increased provider adherence to consensus guidelines for self-management education can improve control and reduce asthma-related morbidity.

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REFERENCES

1. National Heart Lung and Blood Institute, National Asthma Education and Prevention Program. *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma - Full Report 2007.* Washington, DC: U.S Department of Health and Human Services, National Institutes of Health; 2007. https://www.nhlbi.nih.gov/files/docs/guidelines/asthgdln.pdf. Accessed December 3, 2018.

2. 2016 adult asthma data: prevalence tables and maps. Centers for Disease Control and Prevention. https://www.cdc.gov/asthma/brfss/2016/tableC1.htm. Updated October 3, 2018. Accessed October 15, 2018.

3. 2016 Hospital Discharge and Emergency Department Visit Data Files. Madison, WI: Wisconsin Hospital Association Information Center; 2018.

4. Burden of asthma in Wisconsin 2013. Wisconsin Department of Health Services. https://www.dhs.wisconsin.gov/publications/p4/p45055-2013.pdf. Updated May, 2013. Accessed November 30, 2018.

5. Cloutier MM, Salo PM, Akinbami LJ, et al. Clinician agreement, self-efficacy, and adherence with the guidelines for the diagnosis and management of asthma. *J Allergy Clin Immunol Pract.* 2018;6(3):886-894.e4. doi:10.1016/j.jaip.2018.01.018

6. National Center for Chronic disease Prevention and Health Promotion, Division of Public Health. Behavioral Risk Factor Surveillance System: 2016 Summary Data Quality Report. Atlanta, GA: Centers for Disease Control and Prevention; 2017. https://www.cdc.gov/brfss/annual_data/2016/pdf/2016-sdqr.pdf. Published June 29, 2017. Accessed December 3, 2018.

7. National Asthma Control Program. *Behavioral Risk Factor Surveillance System: Asthma Call-Back Survey History and Analysis Guidance.* Atlanta, GA: Centers for Disease Control and Prevention; 2017. https://www.cdc.gov/brfss/acbs/2014/pdf/ACBS_HistoryDoc_2014Release_Ap112017CLEARED.pdf. Published February 2, 2017. Accessed November 30, 2018.

8. Measures to identify and track racial disparities in childhood asthma: asthma control. Centers for Disease Control and Prevention. https://www.cdc.gov/asthma/asthma_disparities/asthma_control.htm. Updated July 14, 2016. Accessed December 3, 2018.

9. Warsi A, Wang PS, LaValley MP, Avorn J, Solomon DH. Self-management education programs in chronic disease: a systematic review and methodological critique of the literature. *Arch Intern Med.* 2004;164(15):1641-1649. doi:10.1001/archinte.164.15.1641

10. Gibson PG, Powell H, Wilson A, et al. Self-management education and regular practitioner review for adults with asthma. *Cochrane Database of Syst Rev.* 2003(1):CD001117. doi:10.1002/14651858.CD001117

11. Parhar A, Lemiere C, Beach JR. Barriers to the recognition and reporting of occupational asthma by Canadian pulmonologists. *Can Respir J.* 2011;18(2):90-96. doi:10.1155/2011/754726

12. Asthma care program. Wisconsin Department of Health Services website. https://www.dhs.wisconsin.gov/asthma/control.htm. Updated May 2, 2019. Accessed December 3, 2018.

Ocular Syphilis: Clinical Manifestations and Treatment Course

Tyler Etheridge, MD; Randy C. Bowen, MD, MS; Meisha Raven, DO; Karisa B. Snow, PharmD; Andrew W. Urban, MD; Jonathan S. Chang, MD

ABSTRACT

Introduction: We report 3 ocular syphilis cases that highlight the increasing incidence, variable presentation, diagnostic challenges, and treatment considerations of this potentially vision-threatening disease.

Case Series: A 39-year-old woman with diabetes and intravenous (IV) drug use presented with 3 weeks of decreased vision, left-eye photopsia, and rash. A 52-year-old man who has sex with men (MSM), presented with a 1-month history of upper respiratory infection-like symptoms, right-eye scotoma, redness, headache, and muffled hearing. A 24-year-old man with a history of MSM presented with right-eye scotoma and a history of transaminitis, rash, and systemic symptoms months prior.

Discussion: Syphilis rates are increasing. Each patient presented with nonspecific symptoms that, in retrospect, were early signs of infection. Vision recovery depends on the extent of ocular involvement, early recognition, and prompt initiation of appropriate therapy.

Conclusion: Ocular syphilis must be considered in at-risk groups, but systemic signs may precede vision changes. Diagnosis requires a high index of suspicion and treatment with IV penicillin is effective.

INTRODUCTION

Since 2013, syphilis rates have increased two-fold in Wisconsin[1] and nationwide.[2] Syphilis is a sexually transmitted infection (STI) caused by the spirochete Treponema pallidum, and can affect multiple organ systems, becoming a sexually transmitted disease (STD). Ocular syphilis can present at any stage of syphilis with various vision-threatening conditions, most commonly, uveitis.[3] We report 3 cases of ocular syphilis managed at the University of Wisconsin Hospital and Clinics between January 2018 and April 2019 (Table 1).

CASE PRESENTATIONS

Case 1

A 39-year-old woman with a history of poorly controlled type-1 diabetes mellitus and intravenous (IV) drug use presented to the emergency department with gradual, painless vision loss, floaters, and photopsia in the right eye for 3 to 4 weeks followed by vision loss in the left eye for 1 week. She had been seen by 2 optometrists and a primary care provider, who prescribed clindamycin for a painless ulcerative lesion on her upper lip. She reported a full-body rash 1 month prior to her presentation, which resolved without treatment. She had no prior ophthalmic history and denied other recent illnesses, trauma, or travel outside the United States. She is married with no new sexual partners, and her last use of IV drugs was 9 months prior.

The right and left eye visual acuity (VA) was 20/400 and 20/300, respectively. Her pupils were poorly reactive to light with a right afferent pupillary defect. Intraocular pressure (IOP) and ocular motility were normal. Inferior visual field defects were pronounced with mild superior peripheral deficits. Examination showed keratic precipitates with anterior chamber cell and flare in both eyes. In the right eye, a 2+ vitritis with superotemporal white placoid chorioretinal lesions and optic nerve edema was present

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Author Affiliations: Department of Ophthalmology and Visual Sciences, University of Wisconsin School of Medicine and Public Health (UW SMPH), Madison, Wis (Etheridge, Bowen, Raven, Chang); Department of Medicine, UW SMPH, Madison, Wis (Urban); Department of Pharmacy, William S. Middleton Memorial Veterans Hospital, Madison, Wis (Snow).

Corresponding Author: Jonathan S. Chang, MD, Department of Ophthalmology and Visual Sciences, 2870 University Ave, Suite 206, Madison, WI 53705; email jschang4@wisc.edu; phone 608.263.6646.

Table 1. Comparison of Clinical Characteristics, Laboratory Results, and Ophthalmological Findings of 3 Cases

	Patient 1	Patient 2	Patient 3
Age of onset	39	52	24
Sex	Female	Male	Male
Presenting symptoms	Photopsia, reduced vision	Scotoma	Scotoma
Presenting visual acuity, right eye and left eye	20/400 and 20/300	20/30 and 20/20	20/20 both eyes
Timing of secondary temic syphilis symptoms	Body rash 1 month prior	URI-like symptoms, headache, muffled hearing 1 month prior	Body rash and sys-symptoms[a] 9 months prior
Serum RPR titer	1:128	1:64	1:64
CSF VDRL	Reactive	Reactive	Non-reactive
CSF WBC (0-5 per µL)	426 (89% lymphocytes)	14 (96% lymphocytes)	4 (no differential)
CSF protein (15 - 40 mg/dL)	1,145	73	25
CSF glucose (40 - 80 mg/dL)	125	63	67
Laterality	Bilateral	Right	Right
Anterior uveitis	Yes	Yes	Yes
Vitritis	Yes	No	No
Chorioretinitis	Yes	Yes	Yes
Subretinal fluid	No	No	Yes
Optic neuritis	Yes	No	No

[a]Systemic symptoms: sore throat, nonproductive cough, nausea, muscle cramps, lymphadenopathy, arthralgia, and strawberry tongue in setting of transaminitis.
Abbreviations: URI, upper respiratory infection; RPR, rapid plasma reagin; CSF, cerebrospinal fluid; VDRL, Venereal Disease Research Laboratory; WBC, white blood cell.

(Figure 1A). In the left eye, there was a 1+ vitritis with optic nerve edema and adjacent macular edema (Figure 1B).

Findings were concerning for syphilis or an endogenous endopthalmitis. A comprehensive laboratory and serology workup revealed negative blood cultures, reactive rapid plasma reagin (RPR) titer of 1:128, reactive serum fluorescent treponemal antibody absorption (FTA-ABS), and nonreactive HIV antigen-antibody testing. A lumbar puncture revealed a cerebrospinal fluid (CSF) white blood cell (WBC) count of 426 cells/mm^3 with 89% lymphocytes, glucose 125 mg/dL, protein 1,145 mg/dL, and a reactive CSF Venereal Disease Research Laboratory (VDRL) test. Due to her childhood-reported penicillin allergy, without features of an IgE-mediated or type-4 delayed-type hypersensitivity, she did not undergo skin testing but started a supervised penicillin graded challenge, which was well tolerated. After 2 weeks of IV aqueous crystalline penicillin G 24 million units per day, the patient's right and left eye vision improved to 20/60 and 20/200, respectively. At last follow-up, 2.5-months after presentation, chorioretinal lesions and optic nerve edema improved, but some vitritis remained without further improvement of VA (Figure 1C-D).

Case 2

A 52-year-old man with a history of multiple male sexual partners presented with a 3-day history of a "black spot" in his superonasal right visual field. He also noted a red-eye, 1-month history of upper respiratory tract symptoms, and headache with muffled hearing that developed prior to the new scotoma. The patient denied history of genital ulcers. He was seen initially by his primary care provider, who referred him to ophthalmology.

The right and left eye VA at presentation was 20/30 and 20/20, respectively. Intraocular pressure was normal. A superonasal visual field defect was noted by confrontation in the right eye. Slit lamp examination showed trace anterior chamber cell in the right eye, but was otherwise unremarkable. Retinal exam demonstrated a placoid chorioretinal lesion in the inferotemporal macula (Figure 1E and Figure 2A-D,F-G). The left eye had a normal examination.

A uveitis workup revealed a reactive RPR titer of 1:64, reactive serum FTA-ABS, and nonreactive HIV antigen-antibody testing. Lumbar puncture revealed a CSF WBC of 14 cells/mm^3 with 96% lymphocytes, glucose 63 mg/dL, protein 73 mg/dL, and a reactive CSF VDRL. Following treatment with 2 weeks of IV aqueous crystalline penicillin G 24 million units per day, VA improved to 20/25 at the 6-month follow-up and the chorioretinal lesion resolved (Figure 1F and Figure 2E).

Case 3

A 24-year-old man with an ocular history of a right eye retinal hole, treated with cryopexy 3 months prior, was referred to the uveitis service for evaluation of a new right retinal lesion and posterior uveitis. The patient presented with a sudden "black spot" in the periphery of his right visual field 1 week prior. He was seen 9 months prior by his primary care provider with sore throat, nonproductive cough, muscle cramps, cervical lymphadenopathy, arthralgia, strawberry tongue, and transaminitis. He followed up 1 month later with a diffuse maculopapular rash of his trunk, penis, palms, and soles, which was subsequently evaluated by dermatology but had resolved on its own, so no biopsy or additional labs were performed. He denied any genital ulcerations.

At presentation, VA was 20/20 in both eyes. He had a normal pupillary response and intraocular pressure. Despite the black spot, visual fields by confrontation were full in both eyes. Slit lamp examination demonstrated 1-2+ anterior chamber cell and minimal vitreous cell in the right eye. The right temporal retina contained 2 chorioretinal lesions with surrounding subretinal fluid and overlying vitreous clumping (Figure 1G). The left eye was normal.

Laboratory workup for his uveitis revealed a reactive RPR titer of 1:64, reactive serum FTA-ABS, and nonreactive HIV antigen-antibody testing. Lumbar puncture revealed a CSF WBC count

of 4 cells/mm^3 without differential due to low cell count, glucose 67 mg/dL, protein 25 mg/dL, and a nonreactive CSF VDRL. The patient was treated with IV aqueous crystalline penicillin G 24 million units per day for 2 weeks and azithromycin for Chlamydia trachomatis urogenital co-infection. At time of admission, he described having multiple male sexual partners. One month after treatment, the patient's VA remained 20/20 in both eyes and the chorioretinal lesion resolved (Figure 1 H).

DISCUSSION

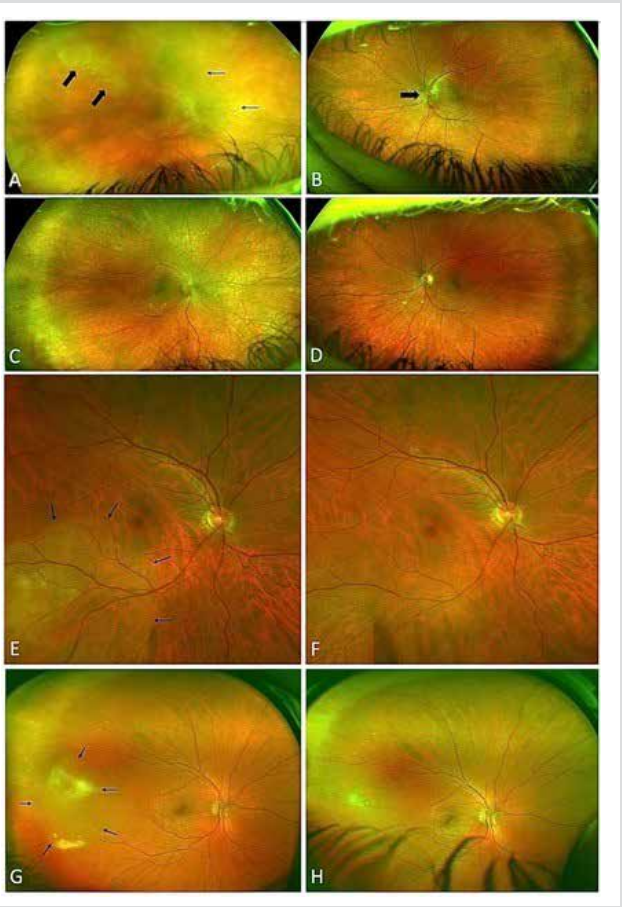
According to the Centers for Disease Control and Prevention (CDC), the number of newly diagnosed syphilis cases in the United States increased 79.9% from 2013 to 2017.[2] Primary and secondary syphilis increased 76.4%. In Wisconsin, a total of 510 syphilis cases were reported in 2018, a 100% increase from 2013.[1] The largest percentage of cases were from Southeastern Wisconsin (53% in 2018).[1]

A review of newly diagnosed syphilis cases from 8 other states in 2014 and 2015 revealed that 0.17% to 3.9% were ocular syphilis.[4] In the largest prospective series to date, the British Ocular Syphilis Study (BOSS) described that ocular syphilis was most common among men, with a mean age at presentation of 48.7 years.[5] Approximately 51% were MSM, and 31% were HIV positive. Our cases fit the profile of the BOSS patients as well, suggesting that younger patients should have a detailed history taken when presenting with vision changes.

Syphilis is divided into multiple stages according to clinical manifestations.[6] Primary syphilis presents approximately 3 weeks (range 10 to 90 days) after exposure with 1 or more cutaneous chancres that resolve spontaneously within days to weeks. Secondary syphilis usually presents from 3 weeks to 3 months after infection with a nonspecific constitutional syndrome of fever, chills, and malaise. It is often mistaken for a "viral" syndrome. Rash is usually macular, nonpruritic, and often covers the entire body, including palms and soles. Other manifestations can include lymphadenopathy, mucosal lesions, patchy alopecia, hepatitis, and bone and renal involvement. Latent syphilis is categorized by positive serology in the absence of clinical manifestations. In some, tertiary syphilis may occur years later with gummas involving multiple organ systems, cardiovascular syphilis, or neurologic manifestations such as tabes dorsalis and general paresis. This is now a very uncommon presentation in the United States. Neurosyphilis and ocular syphilis can present at any stage of syphilis, with early clinical manifestations occurring within months or years after infection. In each of our cases, the patients presented with initial findings of secondary syphilis and had been seen by other care providers. These cases highlight the importance of obtaining a thorough history and having a high index of suspicion for syphilis in patients with risk factors for infection.

Ocular manifestations of syphilis are highly variable and can present at any stage of syphilis.[3] In the BOSS series, mean duration of symptoms prior to presentation was 1 month, and mean VA at presentation was 20/63.[5] The series reported that most patients had bilateral involvement and posterior segment uveitis. Two of our cases had good acuity and all patients had varying presentations of posterior uveitis (Table 1). Case 2 was a typical presentation of acute syphilitic posterior placoid chorioretinitis, which often has mild symptoms and can have full recovery with early treatment. In addition, anterior segment involvement also varies, with some patients demonstrating nonspecific granulomatous anterior uveitis or iris nodules. Often presenting symptoms can be vague, such as reduced vision, eye pain, redness, floaters, photophobia, photopsia, or scotoma.[7] Patients are often diagnosed

Figure 1. Fundus Photos for Each of 3 Cases

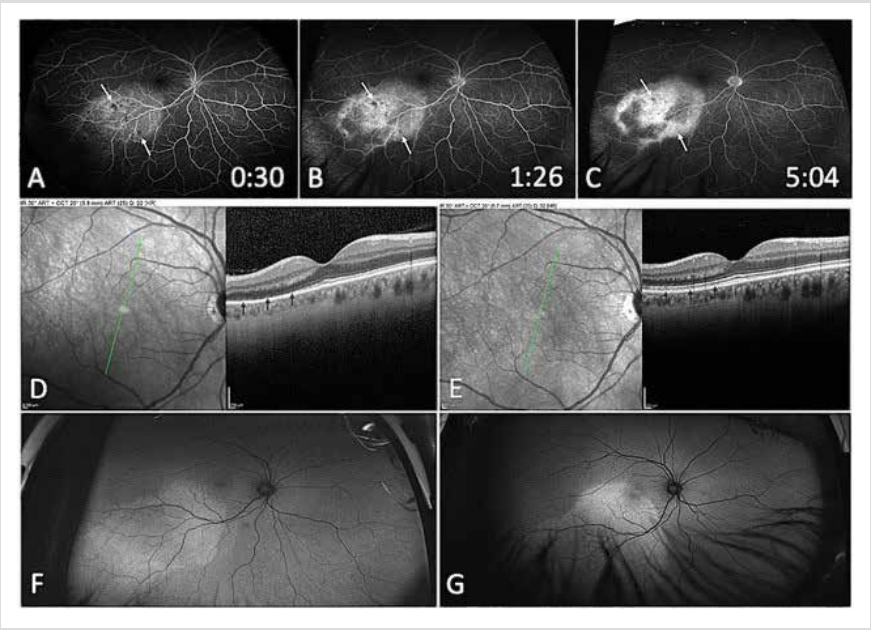


Case 1, A-D: A. Right eye at initial presentation showed multiple yellow-white fluffy vitreous floaters superotemporally (thick arrows), several yellow placoid retinal lesions with overlying vitritis (thin arrows), and mild papillitis. B. Left eye at presentation with severe optic nerve edema with flame hemorrhages (thick arrow), and macular edema. Eight weeks post IV penicillin shows some resolution of vitritis and chorioretinal lesions in right eye (C), as well as resolved optic nerve edema and mild nasal radiating macular exudates in left eye (D).

Case 2, E-F: E. Wedge of retinal whitening around the narrowed inferotemporal arteriole in the right eye at the time of presentation (thin arrows). F**.** Resolution of retinal lesion 4 weeks post treatment.

Case 3, G-H: G. Right temporal retina with raised whitened chorioretinal lesions with overlying vitreous clumping with subretinal fluid (thin arrows). H. The subretinal fluid resolved and there was improvement of the chorioretinal lesions and vitritis after 2 weeks of treatment.

Figure 2. Case 2 Syphilitic Retinal Placoid in the Right Eye



A-C. Fluorescein angiography showed progressive hyperfluorescence of placoid lesion with scattered hypofluorescent spots (white arrows) in the area corresponding to the yellow opacifications seen in Figure 1E.
D. Retinal OCT at day 5 showed outer retinal thinning inferotemporal to the macula (black arrows).
E. OCT at 6 months post treatment with improved inferotemporal outer retina (black arrows).
F. Fundus autofluorescence showed inferotemporal hyperautofluorescence corresponding to the area of the placoid lesion at time of presentation.
G. Progression of lesion toward fovea was seen on fundus autofluorescence at day 5.
Abbreviations: OCT, optical coherence tomography.

because of inflammatory changes on exam and a uveitis workup with laboratory evaluation.

Serology remains the cornerstone of syphilis diagnosis, utilizing a combination of nontreponemal (eg, RPR or VDRL) and treponemal (eg, FTA-ABS, TP-PA, enzyme immunoassay) tests. Two different laboratory approaches can be used, known as the traditional and reverse screening algorithms.[3] The traditional algorithm starts with a screening nontreponemal test followed by a confirmatory treponemal test for reactive samples. The reverse algorithm starts with screening treponemal test followed by a nontreponemal test for reactive tests, and is being utilized by an increasing number of clinical laboratories.[8] A lumbar puncture should be performed in all cases of ocular syphilis, regardless of the severity of ocular disease or stage of presentation.[9] If baseline CSF abnormalities are present, this provides another means of posttreatment follow-up. However, CSF testing can be normal in ocular syphilis and does not rule out ocular disease.[3] All patients diagnosed with ocular syphilis should undergo testing for HIV and other STIs due to high risk of co-infection.

Penicillin G is the gold standard treatment for syphilis, and IV aqueous crystalline penicillin G 18 million to 24 million units per day administered as 3 million to 4 million units every 4 hours or as a continuous infusion for 10 to 14 days is the recommended regimen for ocular syphilis and neurosyphilis.[3] All 3 cases were treated with IV penicillin G. Penicillin allergy warrants evaluation, including potential skin testing and desensitization if there is a history of immediate-type or delayed-type hypersensitivity reaction. In Case 1, the patient was able to be treated with close monitoring and no formal testing. In the BOSS, mean VA improved from 20/63 to 20/40 following antibiotic treatment in over 90% of patients.[5] The addition of corticosteroids may have a role, especially in reducing vitritis; however, steroids should not be started until adequate antibiotic therapy has been initiated.[10] The most common complications of ocular syphilis include cataract, glaucoma, epiretinal membrane, optic nerve atrophy, and retinal detachment. Early identification and treatment are imperative to prevent permanent vision loss.[11] In addition, timely diagnosis significantly lessens the financial burden placed on patients and the health care system as a whole (ie, outpatient clinic visit vs 10- to 14-day hospital admission).

Our cases highlight the importance and difficulties in diagnosing syphilis. The diagnosis requires high suspicion, a careful history, and close follow-up, often with multispecialty care. Follow-up includes ophthalmologic exams, evaluation of systemic syphilis features, posttreatment serology, and reassessment of CSF abnormalities. Nontreponemal antibody titers are used to follow treatment response, with a four-fold change demonstrating significance. The treponemal tests generally remain reactive for life. Syphilis is a reportable communicable disease and all cases should be reported to the local public health department within 72 hours upon recognition of a case.[12] Mandatory reporting is imperative for partner notification as well as disease prevention and control programs.

CONCLUSION

Syphilis rates are on the rise pointing to the need for increased awareness in outpatient clinics, urgent care, and emergency departments. All 3 of our cases presented with vision changes, but in retrospect had other classic syphilis manifestations that predated the ocular complaints and were diagnostically challenging due to the mild symptoms. Ocular syphilis must be considered with groups at risk for syphilis with reduced vision. Diagnosis requires a low threshold for serologic testing. Early recognition and IV penicillin treatment can prevent permanent vision loss.

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REFERENCES

1. Sexually transmitted diseases (STDs): Wisconsin statistics. Wisconsin Department of Health Services. https://www.dhs.wisconsin.gov/std/data.htm. Updated November 14, 2019. Accessed April 25, 2019.

2. Sexually transmitted disease surveillance report 2017. Centers for Disease Control and Prevention. https://www.cdc.gov/std/stats17/toc.htm. Updated July 24, 2018. Accessed April 24, 2019.

3. Workowski KA, Bolan GA. Sexually transmitted diseases treatment guidelines, 2015. *MMWR Recomm Rep.* 2015;64(RR-03):1-137.

4. Oliver SE, Aubin M, Atwell L, et al. Ocular syphilis - eight jurisdictions, United States, 2014-2015. *MMWR Morb Mortal Wkly Rep*. 2016;65(43):1185-1188. doi:10.15585/mmwr.mm6543a2

5. Mathew RG, Goh BT, Westcott MC. British Ocular Syphilis Study (BOSS): 2-year national surveillance study of intraocular inflammation secondary to ocular syphilis. I*nvest Ophthalmol Vis Sci.* 2014;55(8):5394-5400. doi:10.1167/iovs.14-14559

6. Centers for Disease Control and Prevention. S*yphilis Pocket Guide for Providers.* Atlanta, GA: U.S. Department of Health and Human Services; 2017. https://www.cdc.gov/std/syphilis/Syphilis-Pocket-Guide-FINAL-508.pdf. Accessed April 24, 2019.

7. Lobo AM, Gao Y, Rusie L, Houlberg M, Mehta SD. Association between eye diagnosis and positive syphilis test results in a large, urban sexually transmitted infection/primary care clinic population. *Int J STD AIDS.* 2018;29(4):357-361. doi:10.1177/0956462417726700

8. Rhoads DD, Genzen JR, Bashleben CP, Faix JD, Ansari MQ. Prevalence of traditional and reverse-algorithm syphilis screening in laboratory practice: a survey of participants in the College of American Pathologists Syphilis Serology Proficiency Testing Program. *Arch Pathol Lab Med.* 2017;141(1):93-97. doi:10.5858/2016-0110-CP

9. Ormerod LD, Puklin JE, Sobel JD. Syphilitic posterior uveitis: correlative findings and significance. *Clin Infect Dis.* 2001;32(12):1661-1673. doi:10.1086/320766

10. Orsoni JG, Zavota L, Manzotti F, Gonzales S. Syphilitic interstitial keratitis: treatment with immunosuppressive drug combination therapy. *Cornea*. 2004;23(5):530-532. doi:10.1097/01.ico.0000114122.05360.c2

11. Moradi A, Salek S, Daniel E, et al. Clinical features and incidence rates of ocular complications in patients with ocular syphilis. *Am J Ophthalmol*. 2015;159(2):334-343.e1. doi:10.1016/j.ajo.2014.10.030

12. Sexually transmitted diseases (STDs). Wisconsin Department of Health Services. https://www.dhs.wisconsin.gov/std/index.htm. Updated October 11, 2019. Accessed August 25, 2019.

A Rare Cause of Prosthetic Valve Infective Endocarditis: *Francisella tularensis holarctica*

Christian A. Olivo, MD; Claire Dysart, PharmD; Javeria Haque, MD; Cristina Olivo, MD; Sami El-Dalati, MD; Nathan Gundacker, MD

ABSTRACT

Introduction: *Francisella tularensis* subspecies *holarctica* is the most common cause of tularemia in Europe and Japan. Tularemia presents in clinical syndromes, usually as ulceroglandular and glandular syndrome. This entity rarely causes endocarditis. In the United States, only 1 case of a native valve infectious endocarditis has been described to date.

Case Presentation: In this article, we report a case of a patient with several weeks of fevers, night sweats, and myalgias who was diagnosed with prosthetic valve infectious endocarditis secondary to *F tularensis* subspecies *holarctica*.

Discussion: Four previous case reports of *F tularensis* endocarditis have been reported worldwide, with this being the first case of prosthetic valve endocarditis. Antibiotic therapy alone has provided effective treatment in all reported cases of endocarditis.

Conclusion: Infective endocarditis caused by *F tularensis* is an important entity for physicians to understand in areas of endemicity, especially in cases of culture-negative endocarditis.

INTRODUCTION

Francisella tularensis is the etiologic agent of tularemia, a rare zoonotic infection that affects mostly the Northern Hemisphere.[1,2] This highly infectious gram-negative coccobaccillus can be transmitted to humans through multiple mechanisms that include arthropod bite (ticks, flies), animal bite, inhalation, and consumption of contaminated food or water.[1] The natural reservoir is small mammals, including rabbits, squirrels, and muskrats. Currently there are 4 recognized species of *F tularensis*. The two more commonly associated with disease are *F tularensis tularensis* (type A) found in North America and *F tularensis holarctica* (type B), mainly seen in Europe and Japan.[1] Approximately 125 cases have been reported annually in the United States during the past 2 decades.[3] In 2016, the US states with highest incidence were South Dakota, Wyoming, and Arkansas. It is more common during the summer months between May and September.[4] It can be divided into 6 distinct syndromes, including ulceroglandular, glandular oculoglandular, oropharyngeal, pneumonic, and typhoidal. Rarely, tularemia can cause meningitis, pericarditis, and endocarditis.[5]

Endocarditis due to *F tularensis* has been reported 4 times in English literature. Of those, just 1 case has been reported in the United States.[6] Previously, a Canadian patient presented with infection of a pacemaker lead with *F tularensis*.[7] We present the second case of tularemia endocarditis in the United States and the first associated with a prosthetic valve.

CASE PRESENTATION

A 58-year-old man from the Upper Peninsula of Michigan sought medical care in Milwaukee, Wisconsin in the fall due to nighttime fevers for 1 month. He also noticed a right flank skin lesion that appeared 2 days after fever onset. The lesion was pustular in

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Author Affiliations: Department of Medicine, Mount Sinai St. Luke's - West Hospital, New York City, NY (Olivo CA); Zablocki VA Medical Center, Milwaukee, Wis (Dysart); Department of Medicine, Division of Infectious Diseases, Medical College of Wisconsin, Zablocki VA Medical Center, Milwaukee, Wis (Haque, Gundacker); Gorgas Memorial Institute for Health Studies, Panama City, Panama (Olivo C); Department of Medicine, Division of Infectious Diseases, University of Michigan (El-Dalati).

Corresponding Author: Nathan D. Gundacker, MD, Department of Medicine, Division of Infectious Diseases, Medical College of Wisconsin, Zablocki VA Medical Center, 8701 Watertown Plank Rd, Milwaukee, WI 53226; email ngundacker@mcw.edu.

Table 1. Summary of Previous Cases With *F tularensis* Endocarditis Reported in the Literature and the Current Case Report

Characteristic	Case 1[6]	Case 2[7]	Case 3[5]	Case 4[5]	Current Case
Age	42	63	75	66	58
Sex	Male	Female	Male	Male	Male
Cardiovascular history	Hypertension	None	None	MVR, AVR, PPM	MVR, CAD
Exposure	Unknown	Domestic pet	No	No	Tick
Geography	United States (Arkansas)	Canada (Ontario)	France	France	United States (Michigan)
Initial presentation	Febrile, cough	Febrile, cough, fatigue, new valvular murmur	Febrile, cough, new valvular murmur	Febrile, fatigue	Febrile, ecchymotic skin lesion
Temperature	39.8°C	Febrile	40°C	39°C	37.1°C
Adenopathy	None	None	None	None	None
Cardiac localization	Mitral	Posterior aortic cusp	Posterior aortic cusp and tricuspid valve	Pacemaker lead	Mitral prosthesis
Secondary localization	None	Pulmonary	Pulmonary	None	None
Serology (IU/mL, titer)	1:80 on day 7 1:800 on day 14	1:400	IgM 1:50 andIgG negative on day 2; IgM 1:100, IgG 400 on day 19	1:2560 on day 14 1:14,640 on day 60	1:10,240 on day 11
Culture	BC positive day 9	BC positive	Negative	BC positive day 8 negative on PPM	BC positive day 5
PCR	Not performed	Not performed	16s DNA PCR positive on blood	16s DNA PCR positive on blood	DNA detected in blood
Subspecies treatment	Unspecified	Holarctica	Unspecified	Holarctica	Holarctica
Treatment	IV gentamicin	Moxifloxacin (28 days) + IV gentamicin (14 days)	IV amoxicillin/clavulanate + gentamicin (19 days), then levofloxacin (23 days)	Ciprofloxacin (42 days) + IV gentamicin (14 days)	IV gentamicin + ciprofloxacin (14 days) + PO ciprofloxacin (28 days)
Treatment duration	28 days	28 days	42 days	42 days	42 days
Outcome	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory, Repeat MVR

Abbreviations: MVR, mitral valve replacement; AVR, aortic valve replacement; CAD, coronary artery disease; PPM, pacemaker; BC, blood culture; PCR, polymerase chain reaction; PO, oral.

appearance with a central bite mark that he attributed to a recent tick bite.

One week prior to presentation, the patient also developed diffuse myalgias and generalized weakness. His medical history was significant for being a former smoker, coronary artery disease status post multiple coronary stents, coronary artery bypass and bioprosthetic mitral valve replacement 2 years prior to presentation, as well as hypertension and ulcerative colitis (on mesalamine). He owned a pet dog and had a remote history of hunting and skinning both deer and bear. On exam, his vital signs were normal; he was edentulous and had a small right subconjunctival hemorrhage. On his right flank, he had a small eschar surrounded by an ecchymosis 3 inches in diameter. Initial laboratory workup demonstrated hemoglobin of 12.2 g/dL and leukocytosis of 13,000 cells/µl. Three initial blood cultures were all positive for growth on day 5, revealing gram-negative coccobacillus on gram stain. The organisms were found to be oxidase negative, urease negative, and weakly catalase positive, raising concerns for *F tularensis.* The specimen then was sent to the Wisconsin state lab, which confirmed *F tularensis* subspecies *holarctica* by polymerase chain reaction (PCR). Repeat blood cultures on day 5 were negative. Francisella antibody titer returned positive on day 11 with a titer of 1:10,240. Serological tests results for babesiosis, Lyme, erlichosis, and anaplasmosis were negative. A transesophageal echocardiogram showed 2 mobile echodensities measuring approximately 1.4 x 0.6 cm and 0.9x0.3 cm attached to the mitral prosthesis consistent with a vegetation, which were new compared to 2 years prior

The patient was initiated on dual therapy, with ciprofloxacin 400 mg intravenously every 12 hours and gentamicin 5mg/kg/day intravenously (using ideal body weight and Hartford nomogram for dosing), planned for 14 days, followed by ciprofloxacin 750 mg orally every 12 hours for another 14 days (total of 28 days duration). Unfortunately, he left the hospital against medical advice and missed 3 doses of intravenous (IV) gentamicin; however, he was able to resume daily IV gentamicin (dosed every 24 hours) at a facility near his home approximately 48 hours after discharge. He subsequently required readmission due to a pulmonary embolism, and his antibiotics were continued. Ultimately, he received approximately 2 weeks of IV gentamicin and 6 weeks of ciprofloxacin. The ciprofloxacin course was extended to 6 weeks given his potential medication nonadherence and missed doses early in therapy. His serum *F tularensis* titer continued to decrease to 1:1280; however, about 1 year later, his titer rose to 1:5120 and repeat transesophageal echocardiogram showed a 1.7 x 0.78 cm vegetation on the mitral valve with some inflow restriction but no mitral valve regurgitation. He was placed back on ciprofloxacin perioperatively and taken for repeat mitral valve replacement. The explanted valve was

found to have dense pannus formation surrounding the entire sewing cuff as well as vegetations on the atrial side of the leaflets. Valve culture and 16 S rRNA bacterial sequencing were negative. The specimen was sent to the Centers for Disease Control and Prevention for microscopic pathologic review, which demonstrated significant lymphohistiocytic inflammation, collagen fiber alteration, and adherence of fibrin to the endocardial surface. *F tularensis* immunohistochemistry assay, Warthin-Starry, and Grocott's methenamine silver stains were negative. He did well and was given 2 weeks of gentamicin and another 6 weeks of oral ciprofloxacin 750 mg by mouth twice daily.

DISCUSSION

Our patient had the classic risk factors for tularemia (animal exposure, tick bite, and involvement in hunting and skinning animals). Michigan is not a high-incidence area of tularemia,[4] making an epidemiological diagnosis difficult. The presence of an ulcerative lesion in the skin suggested ulceroglandular tularemia; however, he lacked lymphadenopathy. His clinical course did not fit cleanly into any of the 6 typical manifestations of tularemia; however, he did not seek medical attention upon onset of symptoms, and it is possible he failed to notice lymphadenopathy or other symptoms.

Of the 4 endocarditis cases reported in the literature, 2 reported the subspecies as *F tularensis* subspecies *holarctica*: 1 in Canada[7] and 1 in France.[5] Our patient is subspecies *holarctica*, an uncommon species in North America. Although there has been a reported case of cardiac device infection with tularemia before, this is the first report of prosthetic valve infectious endocarditis.

F tularensis is a fastidious bacteria that grows poorly on standard culture media; usually resulting in a diagnostic delay. Risk factors for tularemia should be taken in account when evaluating a patient with fever of unknown origin in endemic areas. If risk factors are present, the lab should be notified that *F tularensis* is suspected so appropriate biosafety precautions are implemented. Patient blood should be inoculated on chocolate agar with cysteine/cystine that facilitates bacteria growth.[6] Definitive diagnosis is made by culture or serology; either a single titer >1:160 by standard tube agglutination or a fourfold or greater increase in titer.[7] The patient was treated initially with ciprofloxacin and gentamicin intravenously for 14 days with a subsequent course of oral (PO) ciprofloxacin for 28 days. In the previously published reports, patients have been treated with various combinations of antibiotics, including 28 days of IV gentamicin, moxifloxacin for 28 days plus IV gentamicin for 14 days, amoxicillin-clavulanate plus IV gentamicin for 19 days and subsequent levofloxacin for 23 days, and ciprofloxacin for 42 days plus 14 days of IV gentamicin.[5-7] Although optimal antimicrobial therapy for *F tularensis* infective endocarditis remains unknown, antimicrobial treatment is largely successful with no previous cases reporting the need for valvular surgical intervention with the exception of pacemaker extraction.[5]

CONCLUSION

This case demonstrates the challenge of making the diagnosis of prosthetic valve infectious endocarditis due to *F tularensis* and clinicians should be aware of tularemia as a cause of endocarditis in regions where this pathogen is present in conjunction with the risk factors involved in this zoonotic disease.

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REFERENCES

1. World Health Organization. *WHO Guidelines on Tularaemia.* Geneva, Switzerland: World Health Organization; 2007. https://www.who.int/csr/resources/publications/WHO_CDS_EPR_2007_7.pdf?ua=1. Accessed April 13, 2019

2. Nigrovic LE, Wingerter SL. Tularemia. *Infect Dis Clin North Am*. 2008;22(3):489-504, ix. doi: 10.1016/j.idc.2008.03.004

3. Centers for Disease Control and Prevention (CDC). Tularemia - United States, 2001–2010. *MMWR Morb Mortal Wkly Rep.* 2013;62(47):963-966.

4. Tularemia: table of reported cases - U.S. 2006-2016. Centers for Disease Control and Prevention. https://www.cdc.gov/tularemia/statistics/index.html. Updated May 13, 2019. Accessed April 13, 2019.

5. Gaci R, Alauzet C, Selton-Suty C, et al. Francisella tularensis endocarditis: two case reports and a literature review. *Infect Dis (Lond).* 2017; 49:128-131. doi:10.1080/2374423 5.2016.1222546

6. Tancik CA, Dillaha JA. Francisella tularensis endocarditis. *Clin Infect Dis*. 2000; 30(2):399-400. doi:10.1086/313678

7. Salit IE, Liles WC, Smith C. Tularemia endocarditis from domestic pet exposure. *Am J Med*. 2013;126(10):e1. doi:10.1016/j.amjmed.2013.04.011

Amy J.H. Kind, MD, PhD

Robert N. Golden, MD

The Wisconsin Partnership Program: Balancing Our Goals and Responsibilities as a Funder

Amy J.H. Kind, MD, PhD; Robert N. Golden, MD

The clinicians, researchers, and educators at the University of Wisconsin School of Medicine and Public Health (SMPH) have the opportunity to witness and contribute to the translation of new ideas into clinical care innovations, which ultimately advance the health of people and populations. Our academic community holds a deep appreciation for the rigorous processes of inquiry, program development, and research. We also strongly value our partnerships with diverse stakeholders to ensure that innovations and discoveries lead to meaningful health improvements. Through the Wisconsin Partnership Program (WPP), we have the privilege of seeing how these concepts unite to benefit people and communities across our state.[1]

The Wisconsin Partnership Program was established as a permanent endowment within the SMPH in 2004. It resulted from the conversion of Blue Cross/Blue Shield United of Wisconsin to a stock insurance corporation and was established with the sole purpose of improving health in Wisconsin. In accordance with the Order of the Commissioner of Insurance, the proceeds from the sale of the company were distributed between the SMPH and the Medical College of Wisconsin, which established a "sister" program.

The Wisconsin Partnership Program has two governing committees: the Oversight and Advisory Committee and the Partnership Education and Research Committee. They are comprised of public members and faculty who are responsible for directing and approving the funds for public health, research, and education initiatives aimed at improving population health. Since its launch in 2004, the WPP has awarded more than $244 million to support research, education, and public health initiatives, including more than $90 million to support over 300 community partnerships. Grantees have leveraged WPP dollars to successfully compete for more than $600 million in additional funding from organizations such as the National Institutes of Health. These innovations have reached into every corner of Wisconsin to advance the WPP's vision of everyone in Wisconsin living healthy and full lives.

The Wisconsin Partnership Program's approach to grantmaking utilizes "gold-standard" processes of science, as well as community knowledge and input to provide the best possible investments for improving health in Wisconsin. The success of the WPP's awards is based in large part on its commitment to a robust review process that balances the confidentiality needs of scientists and community partners, with the public's right to information. Since its inception, the Wisconsin Partnership Program has adhered to a review process that is tightly aligned with that used by the National Institutes of Health, as well as other public funders and academic institutions. This includes a confidential, rigorous, multistep review process conducted by content experts, and further review, discussion, and decision-making by the governing committees. In addition to peer reviews and rankings, final committee decisions also are based on how each proposal aligns with the WPP's strategic priorities and fits within the context of its total port-

> The Wisconsin Partnership Program is committed to its vision of advancing health throughout our state... Ultimately, our goal is to ensure that opportunities for optimal health and well-being extend to all corners of our state.

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Dr Kind is chair, Oversight and Advisory Committee, Wisconsin Partnership Program, University of Wisconsin School of Medicine and Public Health (SMPH); director, Health Services and Care Research Program, Department of Medicine, SMPH; and associate professor, Division of Geriatrics and Gerontology, Department of Medicine, SMPH. Dr Golden is dean of SMPH and vice chancellor for medical affairs, University of Wisconsin-Madison.

folio, taking into consideration factors such as geographic reach and potential impact.

Recently, the WPP faced a court challenge that received attention in our local media related to the application of the requirements of the open meetings and public records laws to community grant applicants. Despite numerous affidavits from scientific experts across the country supporting the critical importance of maintaining the confidentiality of reviewer comments as part of a gold-standard grant-review process, the Dane County court disagreed. The court declared that reviewer comments for community applications are public records and must be released to the public upon request. The Wisconsin Partnership Program will, of course, follow the court's ruling.

The WPP's goal always has been, and continues to be, to honor the nature of the competitive review process while balancing the public's need for information and recognizing that the honest feedback of reviewers is vital to the grant process and ultimately to the success of the work. It is clear that the WPP's approach to grantmaking holds great promise for improving health and health equity. For example, a research project recently identified a genetic link that makes Wisconsin Hmong residents more susceptible to the deadly fungal infection blastomycosis, which could lead to new therapies; another research initiative resulted in an innovative tele-ophthalmology program that has increased diabetic eye screenings in rural Wisconsin; and a community initiative is piloting a recovery house model of opioid treatment and recovery in Richland and Iowa counties. In addition, WPP grants to education initiatives within the SMPH ensure that Wisconsin has a sufficient and highly skilled health care workforce that is trained in the best approaches for preventing and treating illness, dedicated to serving urban and rural areas, and capable of addressing public health challenges at the population level. Going forward, our objective is for the WPP grant processes to continue to both attract and allow for the rigorous sifting and winnowing necessary to move the very best proposals forward.

The Wisconsin Partnership Program is committed to its vision of advancing health throughout our state. Our research grant programs will continue to advance scientific discovery, while our education initiatives will ensure our physicians and public health leaders are among the most well-prepared in the nation. Our community partnerships will continue to address health challenges at the population level, with the goal of reducing health disparities and improving health across Wisconsin. We will continue to meet our responsibility as a funder by respecting both the integrity of our grantmaking process while fully complying with all state and federal regulations. Ultimately, our goal is to ensure that opportunities for optimal health and well-being extend to all corners of our state.

REFERENCES

1. Golden RN, Smith EM. The Wisconsin Partnership Program: Investing in a healthier state. *WMJ*. 2012;11(4):189-190.

Joseph E. Kerschner, MD

Important Topics in Medical Education

Joseph E. Kerschner, MD

Medical education is intrinsically connected to our state and nation's health. Currently, as we consider the education of our nation's physicians, we must include a discussion on student well-being, transition from medical school to residency, and the number of residency positions available to train the next generation of physicians – which are important areas and in need of improvement.

Here in Wisconsin, we are privileged to have two outstanding schools of medicine: the Medical College of Wisconsin (MCW) and the University of Wisconsin School of Medicine and Public Health (UWSMPH). These two institutions train the vast majority of physicians who practice in hospitals, clinics, health systems, medical groups, and private practice throughout the state. The fact that Wisconsin is consistently ranked at or near the top among the national leaders in overall quality of health care is a testament to the excellence of medical education in our state.[1]

However, we know that we have a crisis in health care – both within Wisconsin and elsewhere – as it relates to the well-being of our students, residents, and ultimately the physician workforce. More than 50% of US physicians report significant symptoms of burnout, which can have serious, wide-ranging consequences, from reduced job performance and high turnover rates to medical error and clinician suicide. Recent reports note that the prevalence of physician burnout has reached critical levels.[2]

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Dr Kerschner is dean, School of Medicine, and provost and executive vice president, Medical College of Wisconsin, Milwaukee, Wis.

> Fundamentally, the "cap" on GME positions supported through CMS … needs to be revised so that institutions such as MCW and UWSMPH have access to additional federal dollars to expand their GME programs.

Clinician well-being is essential for safe, high-quality patient care. Supporting clinician well-being requires sustained attention and action at organizational, state, and national levels. The Association of American Medical Colleges (AAMC) supports a culture in academic medicine that values the well-being of learners, faculty, and staff, including a robust well-being website for medical students.[3] In my national role as the recently elected chair of the board of the AAMC, among other endeavors, I am helping to facilitate ongoing discussions related to how medical students can best transition to the role of resident physician.

We know that one of the most important items impacting student well-being is the pressure that exists in single "high-stakes" examinations such as the US Medical Licensure Examination (USMLE) process (especially Step 1), which is governed through the Federation of State Medical Boards and the National Board of Medical Examiners. The AAMC is helping to convene conversations related to the Step examination processes. I have participated in numerous national conversations on this topic looking to develop possible solutions regarding how the Step 1 exam is currently utilized as a tool to evaluate medical student performance and as part of the residency Matching process. These conversations are particularly important given that this examination has demonstrated limited ability in meaningfully correlating with a physician's level of quality in future clinical practice. I remain optimistic that solutions to consider in this area will be forthcoming in the near future.[4]

At MCW, although we have distance to travel to enhance our overall well-being for faculty, staff, and students, we continue to prioritize initiatives to enhance wellness. The mission of our Wellness Program is to create and maintain a workplace environment that encourages a healthy lifestyle and individual wellness for all members of the MCW family. We offer a Well-Being Index designed to evaluate fatigue, depression, burnout, anxiety/stress, and men-

tal/physical quality of life, as well as resources to address each of these areas. We offer an Employee Assistance Program that provides free, immediate, and confidential support with work, health, and life challenges. We offer classes, tools, and resources to help individuals create and maintain a healthy lifestyle and have incorporated the topic of wellness into our routine communications. We also provide a wellness champion for each department in the institution.

Additionally, specifically for students and residents, we offer behavioral health services and provide a single-source, all-inclusive website that contains information on services provided, common concerns, hours for appointments, general and emergency contacts, behavioral health clinic providers, information on mental health resources in the Milwaukee metro area, a Stress and Depression Questionnaire, FAQs, and more.

Speaking of the Residency Match, there is also substantive work being done nationally to examine the possibility of moving toward a system in which the Match would occur more than once a year. This would enable more flexible academic programs at medical schools to accommodate specific student needs – both educationally or personally. A more flexible Match system would allow more individualized academic progression; this has been identified as another potential enhancement in medical education to support student well-being.

In addition to the above, enhancing opportunities in the Match for those students completing their degrees would alleviate some concerns related to the recent expansion of medical students being trained in the United States. During this period of growth, comparatively fewer new residency positions were created.[5] Equally important to providing more opportunities to US-trained medical students is the fact that the country and Wisconsin are facing a very large physician shortage and expansion of Graduate Medical Education (GME) positions is necessary to alleviate this difficulty for the future. (In my Dean's Corner, which was published in Volume 118, No. 2 of the *WMJ*, I discussed important work being done to help alleviate the projected physician shortage.) Although there have been some federal initiatives to grow GME positions nationally, most notably through the Department of Veterans Affairs, these initiatives will fall far short of what is needed nationally to prevent the physician shortage – which has been well-documented for well over a decade. Fundamentally, the "cap" on GME positions supported through the Centers for Medicare & Medicaid Services (CMS) – which has been held in place since 1997 – needs to be revised so that institutions such as MCW and UWSMPH have access to additional federal dollars to expand their GME programs.

There are additional solutions to federal sponsorship of GME programs, and at MCW, we have made progress in adding new residency positions, including two new four-year psychiatry residency programs attached to our regional medical school campuses (seven residents in total per year), 18 FTE GME positions through our partners at the Clement J. Zablocki VA Medical Center, a new three-year family medicine residency program that is training six residents per year at Froedtert Community Memorial Hospital in Menomonee Falls, and a planned new three-year family medicine residency in Green Bay in conjunction with Prevea Health and Hospital Sisters Health System to train four residents per year.[6]

By 2020, Wisconsin will have 133 more Wisconsin physician residents in the pipeline to practice in Wisconsin thanks to the GME matching grant legislation that was passed with the help of the Wisconsin Hospital Association (WHA) and bipartisan support in the Wisconsin legislature in 2013. Initial results are encouraging, and the state has improved its state rank from 25th to 18th for the number of GME residency spots compared to medical school enrollments, according to the WHA's Wisconsin 2018 Health Care Workforce Report.[7]

We are grateful to the elected officials in Wisconsin who have supported state funds for these programs. We will look to this support in the future as we work with UWSMPH to develop additional GME programs in underserved areas for the future.

REFERENCES

1. Wahlberg D. Wisconsin has best health care quality in the nation, federal agency says. *Wisconsin State Journal*. August 23, 2017. https://madison.com/wsj/news/local/health-med-fit/wisconsin-has-best-health-care-quality-in-the-nation-federal/article_d194bcd9-5c4b-5b74-a42e-000a2d20ce5b.html. Accessed December 1, 2019.

2. Jha A, Iliff A, Chaoui A, Defosez S, Bombaugh M, Miller Y, for the Massachusetts Medical Society, Massachusetts, Health and Hospital Association, Harvard T.H. Chan School of Public Health, and Harvard Global Health Institute. *A crisis in health care: A call to action on physician burnout*. Waltham, MA: Massachusetts Medical Society. https://cdn1.sph.harvard.edu/wp-content/uploads/sites/21/2019/01/PhysicianBurnoutReport2018FINAL.pdf. Published January 30, 2019. Accessed December 2, 2019.

3. Medical Student Well-Being. Association of American Medical Colleges website. https://students-residents.aamc.org/attending-medical-school/medical-school-survival-tips/medical-student-well-being/. Accessed December 1, 2019.

4. Cooper K, Brownell S. Who perceives they are smarter? Exploring the influence of student characteristics on student academic self-concept in physiology. *Adv Physiol Educ*. 2018;42(2):200-208. doi:10.1152/advan.00085.2017

5. Averting physician shortage now depends on more slots for residency training [press release]. Washington, DC: Association of American Medical Colleges; July 25, 2019. https://www.aamc.org/news-insights/press-releases/us-medical-school-enrollment-surpasses-expansion-goal. Accessed December 2, 2019.

6. Kerschner J. Helping to alleviate the projected physician shortage. *WMJ*. 2019;118(20):103-104.

7. *Wisconsin 2018 Health Care Workforce Report.* Madison, WI: Wisconsin Hospital Association. https://www.wha.org/WisconsinHospitalAssociation/media/WHA-Reports/2018_Workforce_Report.pdf. Published December 13, 2018. Accessed December 2, 2019.

Index to Articles: Vol. 118 (2019)

Authors

Aeschbach, MPH, Chelsea: 3-126
Ahlawat, MD, Rajni: 3-140
Aisen, MPH, Samantha: 4-182
Alaniz, MPH, Kristine: 3-120
Antony, MD, MSCI, Kathleen M.: 3-114
Arain, MD, MPH, Abeer: 1-49
Azene, MD, Ezana: 1-30
Baltes, BS, Amelia: 2-84
Bersch, MS, Andrew J.: 4-169
Bhatt, BS, Drumil: 1-44
Birstler, MS, Jen: 2-84
Boateng, BS, Samuel: 2-75
Borgert, PhD, Andrew J.: 1-30, 2-65
Bowen, MD, MS, Randy C.: 4-191
Brazauskas, PhD, Ruta, PhD: 4-164
Brown, MD, PhD, Randall T.: 2-84
Brozak, PA-C, Shannon: 1-30
Budzak-Garza, MD, Ann E.: 3-109
Burton, MD, Heather: 4-177
Campbell, MD, Sarah: 1-42
Cassidy, MS, PhD, Laura D.: 4-156
Chandratre, MD, Sonal: 2-88
Chang, MD, Jonathan S.: 4-191
Chou, MD, Erica: 1-4
Christensen, MPH, Grace M.: 1-21, 4-187
Christensen, PhD, MPH, Krista: 1-16
Christiansen, PhD, Bruce: 3-120
Co, MD, Dominic: 3-135
Cohen, MD, MS, Gary A.: 1-35
Coons, RN, MS, Marjorie J.: 1-16
Creswell, PhD, Paul D.: 1-9, 1-21
Denu, PhD, Ryan A.: 4-169
Devo, MPH, Brienna: 2-84
Dexter, MD, Donn D.: 1-27
Dodson, MD, Lisa: 2-88
Dosch, BS, Natalie: 2-60
Dysart, PharmD, Claire: 4-196
Ebert, PsyD, Amber G.: 1-27
Edgoose, MD, MPH, Jennifer Y.C.: 2-60
Ehrenthal, MD, MPH, Deborah B.: 3-126
El-Dalati, MD, Sami: 4-196x
Escher, BA, Paul J.: 1-30
Etheridge, MD, Tyler: 4-191
Evans, BS, Elizabeth: 3-114
Fiore, MD, MPH, MBA, Michael C.: 3-120
Fischer, MD, MHA, Matt: 2-91
Fisher, MD, Mason: 1-30
Fletcher, MD, Kathlyn: 1-4
Furstenberg-Knauff, APNP, Meghan: 3-135
Garg, MD, MS, Shivani: 3-132
Gibson, MPH, Crystal: 1-9
Gilligan, MD, MaryAnn: 1-4
Golden, MD, Robert N.: 2-101, 3-146, 4-199
Graff, MD, Arne H.: 3-109
Guinn, MD, Judy: 3-109
Gundacker, MD, Nathan: 4-196
Ha, MPH, Barbara: 3-126
Hainsworth, PhD, Keri: 4-164
Hampton, MD, Adrienne: 2-60
Haney, MD, Suzanne: 1-47
Haque, MD, Javeria: 4-196
Harper, MD, James: 1-47
Hartwig, MD, Danielle: 1-5
Heimen, BBA, Zachary M.: 1-39
Hematti, MD, Peiman: 3-146
Hoffman, MD, George M.: 4-164
Holzhauer, MD, John R.: 2-71
Hoppe, DO, MS, Kara: 3-126
Horstman, PA-C, Andrew: 1-30
Hsu, MD, PhD, David: 3-135
Hueston, MD, William H.: 1-39
Idso, BS, John M.: 1-39
Iniguez, DO, Kristin C.: 3-109
Jacobs, Noah M.: 4-169
Jha, MD, Pinky: 2-98
Jhaveri, MBBS, DNB, Ajay: 3-140
Kaiser, BS, Margaret: 2-84
Kaufman, MD, PhD, Dixon B.: 3-146
Kerschner, MD, Joseph E.: 2-103, 3-145, 4-201
Khalil, MS, JD, Lisette: 3-120
Kim, MD, MS, MBA, Peggy Y.: 2-91
Kind, MD, PhD, Amy J.H.: 4-199
Knox, MD, Barbara L.: 3-109
Kramer, MPH, Renee D.: 3-126
Krebsbach, John K.: 4-169
Kremens, MD, Karol: 2-95
Kugler, MD, Nathan W.: 2-75
Kumar, MD, MS, James: 1-49
Kushner, PhD, Kenneth P.: 2-71
LeCaire, PhD, Tamara J.: 4-169
LoConte, MD, Noelle K.: 4-169
Mack, BS, Lianna: 2-65
Malecki, PhD, MPH, Kristen M.: 4-169
Maloney, BS, Jessica: 4-169
Mathur, MD, MPH, Mala: 1-42
Maurer, MD, Lisa,: 4-156
Meiman, MD, Jon G.: 1-9, 1-16, 1-21, 4-169, 4-187
Melidosian, BS, Lauren: 3-114
Meurer, MD, MBA, John R.: 1-39
Mowry, PhD, Donald: 2-80
Muntz, MD, Martin: 1-4
Nash, MD, Carolyn R.: 3-109
Navsaria, MPH, MSLIS, MD, Dipesh: 4-177
Neary, MD, MS, Elizabeth: 1-16
Neff-Parvin, Kendi: 4-152
Nocton, MD, James J.: 1-35
Olivo, MD, Christian A.: 4-196
Olivo, MD, Cristina: 4-196
Parikh, MD, Nirzar S.: 3-140
Parsons, DO, Benjamin: 1-30
Patel, MD, Jayshil J.: 1-4
Payne, MD, Eric: 3-135
Perez, MPH, Enio: 4-169
Peterson, MD, PhD, Michael J.: 4-156
Petska, MD, MPH, Hillary W.: 3-109
Pfeifer, MD, Kurt: 1-4
Pinzon, MD, MS, Maria Mora: 3-132
Polewski, MD, Peter J.: 1-30
Prunuske, MD, Jacob: 2-88
Quinn-Lee, PhD, Lisa: 2-80
Ranheim, MD, PhD, Erik: 2-56
Rasmussen, MS, Cary: 2-65
Raven, DO, Meisha: 4-191
Redwood, MD, MPH, Robert S.: 4-156
Repplinger, MD, PhD, Michael D.: 4-156
Rohan, PhD, Angela: 3-126
Rolli, MD, Martha: 4-156
Schellhase, MD, MPH, Ken: 1-44
Schmaling, Amber L.: 4-169
Schneider, MD, John: 4-156
Schrager, MD, MS, Sarina: 1-7, 2-59, 3-113, 4-155
Seagren, PharmD, Ryan M.: 3-135
Shahlapour, Minaliza: 2-101
Sheets, MD, Lynn K.: 3-109
Smith, MA, Angela L.: 1-30
Snow, PharmD, Karisa B.: 4-191
Spector, DPT, OCS, Antionette: 4-164
Steinkamp, PT, PhD, MBA, Lisa: 2-60
Stewart, MD, Katharina: 3-114
Subramaniam, MD, Thanujaa: 3-135
Sullivan, BS, Emily Tingting: 3-120
Swaminathan, MD, Mahesh: 1-49
Tamm, MSN, AG-ACNP, Allison M.: 2-95
Tarula, MD, Erick: 3-135
Temte, MD, PhD, Jonathan L.: 2-71
Theobald, MD, PhD, Jillian: 1-9
Thrasher, DO, Tony W.: 4-156
Tomasallo, PhD, MPH, Carrie D.: 4-164, 4-187
Treat, PhD, Robert: 1-35
Trevino, PhD, Colleen M.: 2-75
Truemper, MD, Edward: 1-47
Urban, MD, Andrew W.: 4-191
Vang, MPH, Kong: 2-60
Vannatta, PT, DPT, C. Nathan: 2-65
Ventura, DNP, Rita: 3-109
Wallace, MD, Adam: 3-135
Walsh, BS, Reghan O.: 1-16
Wang, MD, Benjamin: 2-98
Webb, MD, Travis P.: 2-75
Weisman, MD, Steven: 4-164
Westbrook, MD, PhD, Cecilia: 3-135
Ziegelbein, MD, Kurt: 1-30
Zukin, Helen: 2-101

Articles

Adult Asthma Control and Self-Management, Wisconsin 2012–2016 (Christensen, Meiman, Tomasallo): 4-187
Barriers to Enrollment for the Uninsured: A Single-Site Survey at an Urban Free Clinic in Milwaukee (Bhatt, Schellhase): 1-44
Beyond the Objective: Wisconsin Reaching Ischemic Heart Disease Mortality Objective Despite a Third of Counties Not Meeting the Goal (Aisen): 4-182
Carbon Monoxide Exposure and Poisoning Cases in Wisconsin, 2006-1016 (Christensen, Creswell, Meiman): 1-21
A Case of Atypical Adult Presentation of Urea Cycle Disorder (Jha, Wang): 2-88
Changes in Health Care Utilization for Pediatric Patients Treated at a Specialized Outpatient Pain Clinic (Brazauskas, Cassidy, Hainsworth, Hoffman, Spector, Weisman): 4-164
Childhood Lead Poisoning in Wisconsin (Christensen, Coons, Meiman, Neary, Walsh): 1-16
Comparing Board Examination Scores Between Pediatric Residents in Continuity Clinics at Different Sites (Cohen, Nocton, Treat): 1-35
Correlation Between Climate Change and Dysphoria in Primary Care (Holzhauer, Kushner, Temte): 2-71
Corticosteroid-Induced Psychosis After a Single Tranforaminal Epidural (Fischer, Kim): 2-91
Does Timing of Inferior Vena Cava Filter Retrieval Planning Impact Retrieval Rates? A Comparison of Planning Before or After Hospital Discharge (Azene, Borgert, Brozak, Escher, Fisher, Horstman, Parsons, Polewski, Smith, Ziegelbein): 1-30
Effects of Personalized Music on Caregivers of Older Adults With Dementia in the Community (Mowry, Quinn-Lee): 2-80

Enteric Fistula Treatment and Management: Results of an Institutional Inpatient Treatment Protocol (Boateng, Kugler, Trevino, Webb): 2-75
Evaluating the Effect of Reach Out and Read on Clinic Values, Attitudes, and Knowledge (Burton, Navsaria): 4-177
Exposures to Opioids Among Wisconsin Children and Adolescents, 2002-2016 (Creswell, Gibson, Meiman, Theobald): 1-9
Febrile Infection-Related Epilepsy Syndrome Treated Successfully With Anakinra in a 21-Year-Old Woman (Co, Furstenberg-Knauff, Hsu, Payne, Seagren, Subramaniam, Tarula, Wallace, Westbrook): 3-135
Helping Low Income Pregnant Women Quit Smoking: Improving the First Breath Program (Alaniz, Christiansen, Fiore, Khalil, Sullivan): 3-120
'Medical Clearance' of Patients With Acute Mental Health Needs in the Emergency Department: A Literature Review and Practice (Maurer, Peterson, Redwood, Repplinger, Rolli, Schneider, Thrasher): 4-156
A Novel Curriculum to Faciliate Career Choice in an Accelerated Medical Education Program (Chandratre, Dodson, Prunuske): 2-88
Ocular Syphilis: Clinical Manifestations and Treatment Course (Bowen, Chang, Etheridge, Raven, Snow, Urban): 4-181
Prevalence and Course of Treatment of Common Hip Diagnosis Presenting to a Sports Medicine Clinic (Borgert, Mack, Rasmussen, Vannatta): 2-65
Progesterone Supplementation for the Prevention of Preterm Birth: Provider Practice in Wisconsin (Aeschbach, Ehrenthal, Ha, Hoppe, Kramer, Rohan): 3-126
Progressive Familial Intrahepatic Cholestasis Presenting With an Intracranial Bleed Mimicking Abusive Head Trauma (Haney, Harper, Truemper): 1-47
A Qualitative Study of Undergraduate Racial and Ethnic Minority Experiences and Perspectives on Striving to Enter Careers in the Health Profession (Dosch, Edgoose, Hampton, Steinkamp, Vang): 2-60
A Rare Cause of Prosthetic Valve Infective Endocarditis: *Francisella tularensis holarctica* (Dysart, El-Dalati, Gundacker, Haque, Olivo CA, Olivo C): 4-196
Renal Cell Carcinoma Presenting as Pleural Effusion (Arain, Kumar, Swaminathan): 1-49
Rituximab for Salvage Therapy of Refractory Hypersensitivity Pneumonitis (Kremens, Tamm): 2-95
Statewide Pediatric Quality Improvement Collaborative for HPV Vaccine Initiation (Campbell, Mathur): 1-42
Student Leadership Development Initiative: A Pilot for Sustainable, Replicable Model for Incorporating Leadership Into Medical Education (Heimen, Hueston, Idso, Meurer): 1-42
Survey of Radon Testing and Mitigation by Wisconsin Residents, Landlords, and School Districts (Bersch, Denu, Jacobs, Krebsbach, LeCaire, LoConte, Malecki, Maloney, Meiman, Perez, Schmaling, Tomasallo): 4-169
Survey of Southern Wisconsin Needle Exchange Clients Regarding Opioid Overdose and Nalaxone Use (Baltes, Birstler, Brown, Devo, Kaiser): 2-84
Travel During Pregnancy: A Study of Postpartum Women in Madison, Wisconsin (Antony, Evans, Melidosian, Stewart): 3-114
Trends and Risk Factors of Secondhand Smoke Exposure in Nonsmoker Pregnant Women in Wisconsin, 2011-2016 (Garg, Pinzon): 3-114
Triple Diagnosis of Crohn's Disease, Celiac Disease, and Eosinophilic Esophagitis (Ahlawat, Jhaveri, Parikh): 3-140
A Unique Pattern on Memory Testing in Dementia Screening Predicts Obstructive Sleep Apnea (Dexter, Ebert): 1-27

Editorial/Commentary

Advocating for Our Youngest Victims: Wisconsin's Approach to Testing Drug-Endangered Children (Budzak-Garza, Graff, Guinn, Iniguez, Knox, Nash, Petska, Sheets, Ventura): 3-109
A Starfish Approach to a Crisis in Dignity (Ranheim): 2-56
Talking to African-American Teens About Sex (Hartwig): 1-5

In This Issue

Children and Risk (Schrager): 1-7
Health and the Environment (Schrager): 2-59
Smoking in Pregnancy (Schrager): 3-113
Striving to Reduce Radon-Induced Lung Cancer in Wisconsin (Schrager): 4-155

Your Profession/Dean's Corner

A Farewell Tribute to a Retiring Editor (Neff-Parvin): 4-152
Healthy Classrooms Foundation: An Effective Model for Medical Student Public Health Engagement (Golden, Shahlapour, Zukin):2-101
Helping to Alleviate the Projected Physician Shortage (Kerschner): 2-103
Immunosuppression-Free Kidney Transplantation: Advancing New Treatments by Building on Our Past Foundation (Golden, Hematti, Kaufman): 3-146
Important Topics in Medical Education (Kerschner): 4-201
Medical Schools Announce Collaboration to Publish *WMJ* (Neff-Parvin): 4-13
The Value to Academic Medicine of the Association of American Medical Colleges (Kerschner): 3-145
The Wisconsin Partnership Program: Balancing Our Goals and Responsibilities as a Funder (Golden, Kind): 4-199

Letter to the Editor

The Illusion of Selection Bias in Matters of Students' Mental Health (Chou, Fletcher, Gilligan, Muntz, Patel, Pfeifer): 1-4

DEATHS FROM PRESCRIPTION PAINKILLERS HAVE INCREASED BY 38% IN WISCONSIN.

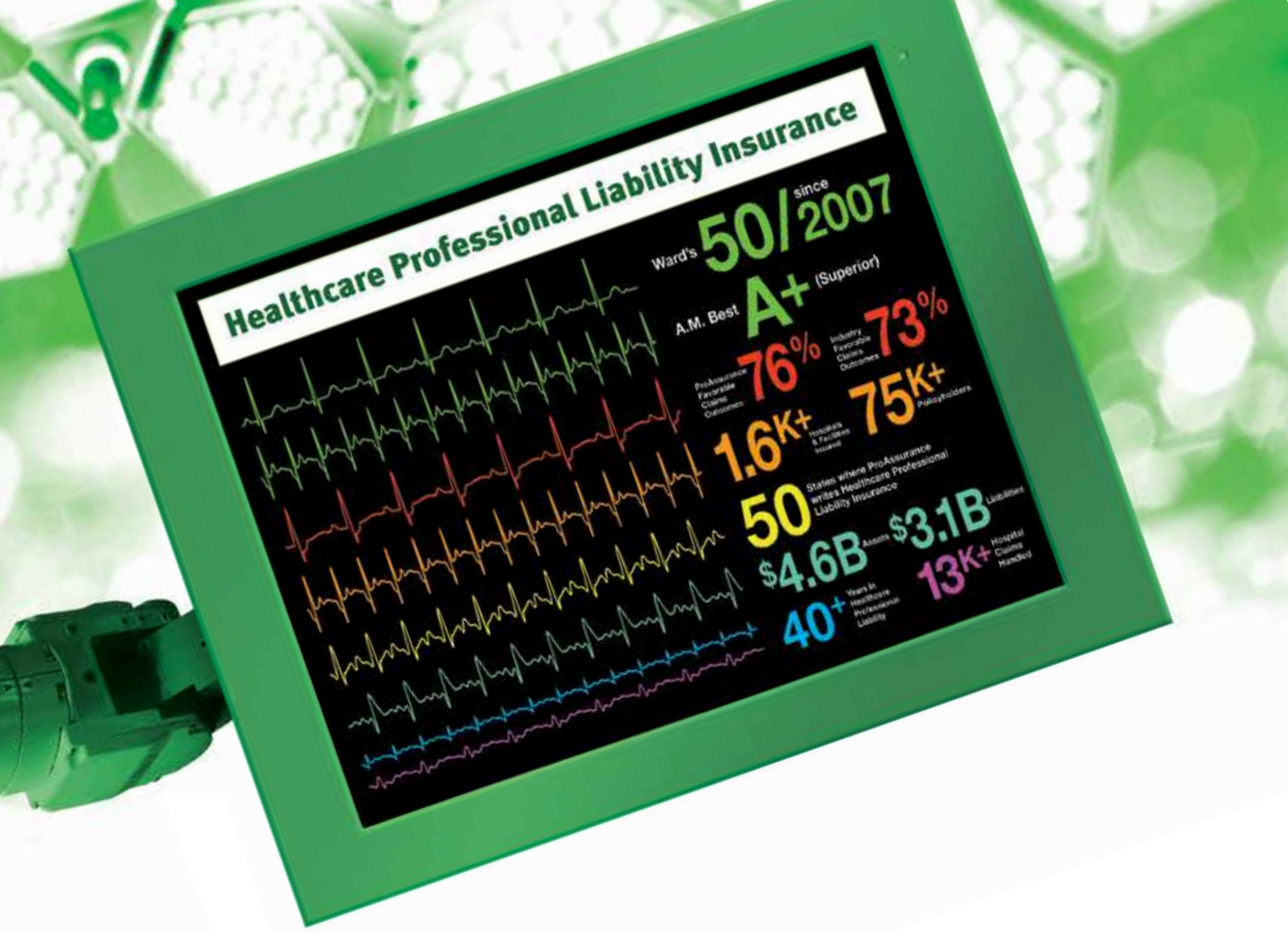
It's a myth that prescription painkillers are completely safe because a doctor prescribes them. The Dose of Reality is that in Wisconsin, prescription painkillers are involved in more overdose deaths than heroin and cocaine combined. And everyone is at risk of addiction, especially young people ages 12 – 25.

Working together, we can prevent prescription painkiller abuse in Wisconsin. Since 4 out of 5 heroin addicts start with prescription painkillers, we can also help to curb the statewide heroin epidemic. Go to DoseOfRealityWI.gov to learn what you can do to help.

DOSE OF REALITY
PREVENT PRESCRIPTION PAINKILLER ABUSE IN WISCONSIN.

Learn more at:
DoseOfRealityWI.gov
A message from Wisconsin Department of Justice, Brad Schimel, Attorney General, and the Wisconsin Department of Health Services

Wisconsin Department of Health Services



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