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COVER THEME Social support and its effect on health

The connection between lack of social support and adverse health outcomes has been recognized for decades, yet many people remain disconnected from each other, their neighbors and their communities. In this issue of *WMJ*, researchers explore the effects of geographic isolation and the benefits of developing strong social support networks for better overall health.

Cover design by Mary Kay Adams-Edgette Volume 115, no. 2 • April 2016



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The WMJ (ISSN 1098-1861) is published by the Wisconsin Medical Society and is devoted to the interests of the medical profession and health care in the Midwest. The managing editor is responsible for overseeing the production, business operation and contents of the WMJ. The editorial board, chaired by the medical editor, solicits and peer reviews all scientific articles; it does not screen public health, socioeconomic, or organizational articles. All articles published herein, including commentaries, letters to the editor, and editorials represent the views of the authors, for which neither WMJ nor the Wisconsin Medical Society take responsibility, unless clearly stated. Advertising content is the responsibility of the advertiser and does not imply an endorsement or sponsorship by WMJ or the Wisconsin Medical Society and its affiliates unless specified. WMJ is indexed in Index Medicus, Hospital Literature Index, and Cambridge Scientific Abstracts.

Send manuscripts to *WMJ*, 330 E Lakeside St, Madison, WI 53715. Instructions to authors are available at www. wmjonline.org, call 866.442.3800, or e-mail wmj@wismed.org.

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Members: included in membership dues. Non-members: \$149. Current year single copies, \$25 each. Previous years' single copies, when available, \$12 each.

Periodical postage paid in Madison, Wis, and additional mailing offices.

Published every other month, beginning in February. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917. Authorized August 7, 1918.

Address all correspondence to *WMJ*, PO Box 1109, Madison, WI 53701. Street address: 330 E Lakeside St, Madison, WI 53715; e-mail: wmj@wismed.org

POSTMASTER

Send address changes to: *WMJ,* PO Box 1109, Madison, WI 53701

ISSN 1098-1861 Established 1903 © 2016 Wisconsin Medical Society

News Items and Personals

Editor's Note: The following is excerpted from the "News Items and Personals" pages of the June, 1916 issue of the Wisconsin Medical Journal. This was a regular feature in each issue of the Journal at that time.

Dr. Charles H. Vilas, Madison, has been appointed a regent of the University of Wisconsin to succeed Edward M. McMahon, resigned.

Dr Edward B. Brown, Beloit, was on May 3rd re-elected medical inspector of public school for that city.

Dr. John R. McDill, Milwaukee, has been selected surgeon-in-chief of two field hospitals to be established in Germany and Austria. Dr McDill sailed from New York on May 27, and will not return to Milwaukee until after next January, having agreed to take charge of the hospitals for six months.

Dr. E. H. Mensing, formerly assistant coroner at Milwaukee, and for the past two years a member of the staff at the Mayo Hospital, Rochester, sailed for Europe on May 27, to assist in the work in the field hospitals in Germany and Austria.

Dr. and Mrs. Harold C. Bradley, Madison, have offered to build and equip three rooms to be used as an infirmary in the Y.W.C.A. building, Madison.

A conference of the field men of the State Board of Health was held in Madison, May 5 and 6, presided over by Dr. G.W. Henika, deputy state health officer for the district, and Frank R. King, state plumbing inspector.

Dr. J. Donovan, Forrestville, had a narrow escape from death on May 19th,

when his automobile rammed into a bridge railing and dropped 25 feet into Green Bay. He suffered slight bruises as a result of his experience.

A motion to amend the complaint in the \$25,000 damage suit of Amelia Bear against Dr. Adam G. White, Milwaukee, was denied by Judge Fritz on May 11. Mrs. Bear sought to recover for injury alleged to have been suffered through an operation performed by Dr. White. The case was nonsuited May 4th.

John Schuette, who sued Dr. J. J. Nolan, Milwaukee, claiming that the physician left a splinter in his arm and damaged it, lost his case after a trial by jury in circuit court. A verdict was directed in favor of the defendant after the court was informed that the plaintiff had settled his injury case with the company that employed him.

The Misericordia Hospital, Milwaukee, observed its eighth anniversary on May 26th. Since its organization in 1908 by Archbishop Messmer, the institution has cared for 1,079 children. The institution is wholly dependent upon charity and private donations for its support. The annual expenses are approximately \$12,000.

The Milwaukee Health Department is planning to stop the indiscriminate use of cosmetics provided for the public in the ladies rooms of a number of hotels, according to the current monthly bulletin issued on May 27th.

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WMJ

Let us hear from you

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Water—Our Most Precious Resource

Joseph J. Mazza, MD

e live on one of the small inner planets 93 million miles from the sun and have been revolving around our star for more than 4.5 billion years, deriving virtually all of our energy from it.

Our planet has been blessed with the necessary ingredients so that organic matter has been able to evolve into multi-organ species with the ability to replicate. Our species happens to be an end result of the long and fascinating process called evolution, and one of the major ingredients that has sustained life through the eons of evolution is water.

In his 1943 paper "A Theory of Human Motivation," Abraham Maslow reported that the "hierarchy of needs" includes air, water, and food—the basic necessities of life on our planet. This essay focuses on water and food and reminds us of our obligatory, responsible stewardship to the environment. Life—plant and animal—cannot exist without fresh and potable water.

Approximately 70% of our planet is covered with water, but only 2.5% is fresh water—most of which is in the ice caps and glaciers—and only a small amount is drinkable. Thanks to the consistency of the planetary water cycle, the amount of water on the planet will not change. The water cycle has provided a unique and beneficial balance between clean salt water and ground water that has been purified by the land and the rain cycle. Much of this water has remained in the many huge caverns or aguifers

• • •

Doctor Mazza, a member of the *WMJ* Editorial Board, is Emeritus Senior Research Scientist, Marshfield Clinic Research Foundation, Marshfield, Wis. E-mail: mazza.joseph@mcrf.mfldclin.edu. for years and is our major source of potable water. These aquifers vary in size and geographical locations and can be easily tapped as a source of sustaining life.

However, the amount of fresh potable water that becomes contaminated can drastically change the amount available for use. The problem is compounded by the increasing global population—estimated to be greater than 8 billion by 2030. And with water being exploited by both agribusiness and industry, it elicits a compelling question: will there be enough food and water for the next 25 years?

In large agricultural areas where rainfall is meager yet huge amounts of water are needed for crops, crop yield becomes compromised and the aquifers become depleted before they can be replenished. A prime example is agribusiness in southern California's Central Valley—the major source of fruits and vegetables in the United States. Farmers in California use 80% of the state's available water and grow 230 varieties of crops. With lack of timely rain and snow from the mountains, crop variety will need to be selective and water conservation should be the No. 1 priority.

Industry, with its need for large amounts of water, also depletes the water supply by returning its water in an unpotable condition.

This problem becomes more important with respect to its impact on health and wellbeing, especially in developing and undeveloped countries. There, disease and ill health are major problems due to lack of clean water, which can lead to infectious disease of epidemic proportion, associated with significant mortality and morbidity.

However, the issues of health and wellness are not limited to under-developed countries. The situation in Flint, Michigan, serves as a timely example and reminder of how issues

Suggested Reading

1. Oxford Atlas of the World. 22nd ed. New York: Oxford University Press; November 1, 2015.

2. Pew Research Center. World Population 1950-2100 [chart]. June 8, 2015. http://www. pewresearch.org/fact-tank/2015/06/08/ scientists-more-worried-than-public-aboutworlds-growing-population/. Accessed March 3, 2016.

3. National Geographic. November 2015. [Cool it: The Climate Change Issue]

4. National Geographic. September, 2014.

with an entire community's potable water supply can go undetected until people become afflicted with maladies related to contaminated water.

Additionally, we are facing the broader issues of climate change, for which there appear to be no solutions or means of reversal. It is apparent that our species has contributed to these changes, but there are much larger factors—part of the planet's dynamics at work—affecting these global changes that are not clearly understood.

Some of the solutions to these problems are beyond our current technology, and "robbing Peter to pay Paul"—taking water from other areas—is unacceptable. But we must all face the global changes ahead.

As physicians and other health care providers, we have the responsibility to work with those in public health to assure that every community's drinking water is safe. And agribusiness and industry, because of their insatiable need for water, will need to devise stringent but necessary regulations and policies pertaining to water utilization in the future.



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Geographic Isolation and Social Support in Rural Wisconsin

John J. Frey III, MD, Medical Editor

the connection between lack of social support and adverse health outcomes has been a part of the literature for 40 years. Patients with poor social support from family, neighbors, and communities have higher levels of chronic illness, do less well managing those illnesses, and suffer from depression and other behavioral health problems that also increase their risk.1 Then why, after so much time and research into one of the most important determinants of health and illness, do so many people in society remain disconnected from each other, their neighbors, and their communities? Social isolation and lack of adequate social support is a problem particularly for older men and women.² Loneliness is one of the most powerful risk factors for all-cause mortality, and while guidelines about screening for depression are being widely adopted. I don't know any protocol that screens for loneliness.³ Also, screening should not be limited to older people, since the disconnection of patients from others begins early, and earlier interventions may have much more positive consequences.⁴

In this issue of *WMJ*, Tittman and colleagues⁵ focus on rural women and ask whether there is a relationship between geographic isolation and social support and, consequently, a higher risk for rural women to suffer the consequences of lack of social support. They found a direct relationship between the degree of rurality and the lack of social support and poor self-perceived health status. The challenge for our state and society is to find creative ways to nurture groups, connections, and collaboration among geographically isolated women so that support exists outside of families. Putnam has written eloquently about the erosion of social connections, social organizations, and simple "joining" that has eroded the social capital of America over the past 50 years.⁶

The rebuilding of communities decimated

The World of Medical Education

Two articles from the Medical College of Wisconsin address the needs of students on their way to finding satisfying and productive careers. Morzinski and colleagues present a program for students entering their senior year of medical school that helps them recog-

If we truly want to help our patients, we should use our influence in our communities and work with social services, faith-based groups, and neighbors to create networks and provide strategies to reach out to the isolated and bring them to supportive groups where they feel welcome.

by economic recession and creating a truly civil society is perhaps the greatest task facing our country in the next decades. Why this is important to physicians and medicine can be seen in the results from this small study and the large body of literature it joins. Isolated, disconnected people—rural women in this case—are those who are at greatest risk for health problems. If we truly want to help our patients, we should use our influence in our communities and work with social services, faith-based groups, and neighbors to create networks and provide strategies to reach out to the isolated and bring them to supportive groups where they feel welcome.

nize the importance of care transitions in the health of their patients and their own responsibility to address problems in those transitions.⁷ They discuss how critical incidents that were emotionally stressful for patients and clinicians provide opportunities for students to find ways to think about improving care. They present a structured educational program that takes students through a mnemonic (PRIMARY) that can be applied to future care transitions.

Many years ago, my son worked in an AmeriCorps program in California that was helping prepare unemployed homeless men to find jobs. Along with providing telephones and message service, haircuts and good clothes, and meals, the program drew on volunteers from the film industry. These volunteers would coach the clients on interviewing skills, then film test interviews and, afterward, critique them with the interviewees. This process was crucial to helping people who lacked interpersonal confidence feel that they could talk and respond to guestions in an intelligent way and improve their likelihood of gaining employment. I was reminded of that story in reading the article by Hueston and Holloway, who used a similar approach with medical students preparing to interview for residency positions.8 They provided an opportunity for senior medical students to engage in a mock interview in a specialty of their choice, fill out an evaluation of how the experience affected them, and receive direct feedback from their interviewers about how they might improve their interviewing skills. The success rate and overall positive review of the experience as helpful was similar for both the medical students and the homeless men: both groups had greater than expected success. Atul Gawande has written about how essential coaching is to improving performance in medicine.9 Coaching should be essential for improving interpersonal skills as well, and it doesn't just apply to medical students. In my career, some of the best coaching I have had to improve my relationship with patients has come from thoughtful, engaged students.

Original Research

Prostate cancer and the consequences of our treatment of it have resulted in large numbers of men who suffer from all the surgical and radiation side effects that we fear for our patients. In a very important article about patients who have had increasing side effects and unsuccessful attempts to correct them, Sack and colleagues spoke with 13 patients who had undergone a cystectomy and urinary diversion. The reaction from the large majority of them was that their quality of life would have been vastly improved if they had gone to the radical procedure much earlier.¹⁰ While the severity of the radiation effects is-fortunately-relatively rare, men should be advised earlier about their choices rather than be subjected to the long litany of what the authors call the consequences of a "devastated lower urinary tract."

Borchardt and colleagues¹¹ report on a statewide audit of hospitals to improve the prevention of maternal transfer of Hepatitis B infection in newborns. Even though Hep B surface antigen screening is supposed to be universal, we all know that "should" and "is" are often different. They found that all babies born to women who had been screened positive for Hep B received a birth dose of Hep B vaccine, but a large number of women were not screened at all and their babies lagged considerably in receiving a birth dose. The lesson? Make sure that babies with no maternal screening receive a birth dose before going home.

Case Reports

Joshi et al¹² warn us that treatment for severe inflammatory bowel disease, when using biologic agents, can have significant unanticipated complications and should be monitored carefully.

Haid and colleagues remind us¹³ that although rare diseases rarely occur, we need early tissue diagnosis, and careful and rigorous monitoring and treatment can have positive results. Cholecystectomies are one of the most common surgical procedures in medicine, while small cell carcinoma of the gall bladder is one of the rarest.

Kremens thoughtfully reviews what should and should not be the process of pulmonary stenting for patients in respiratory distress from obstructing masses. Technology is helpful in treatment and palliative care only if it is done according to evidence-based protocols.¹⁴

Finally, Joseph Mazza, MD, a longtime member of the *WMJ* Editorial Board, reflects on the effects of water shortages and contamination on the quality of life and the health in society—certainly an important issue that warrants our attention.

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The Effects of Geographic Isolation and Social Support on the Health of Wisconsin Women

Sarah M. Tittman, BS; Christy Harteau, Kirsten M. M. Beyer, MPH, PhD

ABSTRACT

Background: Rural residents are less likely to receive preventive health screening, more likely to be uninsured, and more likely to report fair to poor health than urban residents. Social disconnectedness and perceived isolation are known to be negative predictors of self-rated physical health; however, the direct effects of geographic isolation and social support on overall health have not been well elucidated.

Methods: A cross-sectional survey of women (n = 113) participating in Wisconsin Rural Women's Initiative programming was conducted, which included measures of geographic isolation, an assessment of overall health, and social support using the validated Interpersonal Support Evaluation List with 3 subscales, including belonging support, tangible support, and appraisal support.

Results: Geographic isolation was shown to be a negative predictor of belonging support (P=.0064) and tangible support (P=.0349); however, geographic isolation was not a statistically significant predictor of appraisal support. A strong and direct relationship was observed between social support and self-perceived health status among this population of Wisconsin women, and hospital access based on geographic proximity was positively correlated (P=.028) with overall health status.

Conclusions: The direct relationship between social support and overall health demonstrated here stresses the importance of developing and maintaining strong social support networks, which can be improved through rural support groups that have the unique ability to assist rural residents in fostering social support systems, advocating stress management techniques, and achieving a greater sense of well-being.

INTRODUCTION

It is recognized that health disparities exist between rural and urban populations. With over 20% of the population in the United States living in rural areas, we cannot afford to neglect their physical and mental health.¹ Rural residents are more likely

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to be uninsured, less likely to receive preventive screening, less likely to meet recommendations from the Centers for Disease Control and Prevention for physical activity, and are more likely to report fair to poor health status than their urban counterparts.² Rural counties have higher death rates from chronic obstructive pulmonary disease, suicide, and unintentional injury compared to highly urbanized counties.³ It is universally accepted that many factors affect overall health, including both interpersonal and community factors, yet these rural-urban discrepancies are not completely understood.

Recently, attention to the effects of social isolation on both physical health and mental health has increased. Social isolation poses a significant risk factor for mortality and morbidity,^{4,5} as socially isolated individuals have a relative risk of 2.43 for cardiac mortality from coronary artery disease compared to individuals with strong

social support networks.6 Cornwell et al demonstrated that social disconnectedness and perceived isolation are negative predictors of self-rated physical health among a population of older adults.7 However, social isolation not only contributes to the physical manifestations of disease, but also plays a role in mental health. A large-scale study recently showed that the absence of frequently contacted close friends was significantly associated with major depressive disorder, dysthymic disorder, social phobia, generalized anxiety disorder, alcohol use disorder, and alcohol abuse disorder.8 While we are starting to grasp an understanding of the consequences of social isolation on physical and mental health, the exact mechanism has not been clarified.9 Opposite of demonstrations of social isolation's detriment to the health of rural populations, we see beneficial health impacts where social support exists. Recently, it was shown that social support serves as a positive predictor of health status among older rural breast

cancer survivors,¹⁰ and social support also influences or facilitates physical activity among cancer survivors.¹¹

Geographic isolation poses challenges such as managing chronic illnesses and hindering access to mental health professionals and domestic violence shelters.^{12,13} With the percentage of family physicians attending to women's gender-specific health needs declining,¹⁴ rural women in particular find themselves facing significant challenges accessing necessary health services. These women are less likely to receive preventive screening tests, including fecal occult blood tests, dental exams, Pap smears, and mammograms.¹⁵ Also, limited access to specialized surgeons, including for cases of breast cancer, can lead to less favorable outcomes in terms of survival.¹⁶

This research was guided by 3 specific hypotheses: (1) there will be an inverse relationship between geographic isolation and social support; (2) geographic isolation will negatively affect self-perceived health status; and (3) social support will positively affect self-perceived health status. The interplay between geographic isolation and social support has not been unraveled in the exist-ing literature, and this information is necessary to understand the degree of social support that currently exists among rural Wisconsin women and to guide the development and testing of intervention programs designed to improve social support and overall health in rural populations.

METHODS

Participants

We used a cross-sectional survey of women participating in Wisconsin Rural Women's Initiative (WRWI) programming over a 2-year time period (January 28, 2011 to December 31, 2013). The WRWI is a nonprofit organization with over 15 years of experience hosting "gathering circles" for rural women throughout Wisconsin, focusing on generating social support and cultivating wellness. The survey collected demographic information, geographic and health information, and included several validated instruments to help us better understand the participant population. The demographic information we collected included age, race, and socioeconomic status. Here, socioeconomic status was measured simply by asking women whether their income was "sufficient to meet my needs," "more than enough to meet my needs," "less than enough to meet my needs," or "less than enough to meet my needs, but I have learned to live within my means." This classification was used rather than income data, because many farm women in our previous encounters had expressed challenges approximating income. Surveys were administered by WRWI staff, and all women participating in WRWI programming over this time period were asked to participate in the survey, with a 98% response rate. WRWI programming consisted of focused events for rural women, elderly women, and intimate partner violence (IPV) survivors. In total,

113 women took the survey and 12 of these women (10.62%) were IPV survivors. These data were included in all analyses, as this percentage is still below the reported prevalence (11%-44%) in community samples.¹⁷ While all surveys were taken anonymously, women's names were added to a list upon completion to ensure that no woman took the survey more than once. Oral consent was obtained from participants and all procedures were in accordance with a Medical College of Wisconsin Institutional Review Board (IRB) approved protocol.

Geographic Information

Geographic information was collected through several methods. Self-perceived rurality was assessed by asking women to describe their residence as urban, suburban, rural/farm, rural/nonfarm, or to specify if other. Women were asked to indicate the distance in miles between their homes and the following resources: neighbor, friend, courthouse, police station, hospital, and nearest village, town or city. Geographic isolation was assessed by calculating the mean distance to these resources. ZIP codes also were gathered to classify locations by Rural-Urban Commuting Area (RUCA) codes. We used the 2004 ZIP code data provided by the WWAMI Rural Health Research Center to classify residences by ZIP code as either urban, large rural, small rural, or isolated.18 Although there is no standardized definition of rural, ZIP codebased RUCA codes were used here given their frequent use in health research, since they can be used with ZIP code-related health data.1

Overall Health

Self-perceived health was assessed by asking women to rate their general health as excellent, very good, good, fair, or poor. The survey also included an item to assess for chronic conditions that had been diagnosed previously by a doctor, including heart disease, diabetes, depression, anxiety, hypertension, asthma, insomnia, eating disorders, or cancer. Women also were allowed to write in any additional conditions that had been diagnosed by a doctor.

Social Support

Social support was assessed using a 12-item version of the Interpersonal Support Evaluation List (ISEL) scale.¹⁹ Each item was scored on a 4-point scale (1=definitely false, 2=probably false, 3=probably true, 4=definitely true). This scale serves as a measurement of perceived availability of 3 discrete functions of social support: tangible, belonging, and appraisal. The tangible subscale is a measure of the perceived availability of material aid. The belonging subscale is a measure of the perceived availability of people with whom one can do things. The appraisal subscale is a measure of the perceived availability of someone to talk about one's problems. The total ISEL score was calculated simply by summing the responses to all 12 questions, with higher scores indicating more social support.

Data Analysis

All data was analyzed using Stata/IC 12.1 (StataCorp LP, College Station, Texas). P values <.05 were considered statistically significant. In calculations of rural-urban differences, we used RUCA codes to create a dichotomous variable where isolated, small rural, and large rural categories were classified as "rural" and compared to the "urban" classification. Individuals who did not fill out ZIP code information (2 women) were simply not included in these analyses under the assumption this data was missing completely at random. To examine the relationship between geographic isolation and social support, we performed a linear regression analysis, while controlling for age and socioeconomic status. Race was not controlled for in any of our models since 98.2% of the participant population was white. We used 1-way ANOVA analysis to examine the association between social support and health status since the means of 4 groups were compared, and Bonferroni corrections were used to correct for multiple comparisons. We used an ordered logistic regression to determine the effect of geographic isolation on overall health status.

RESULTS

Description of the Study Population

Although WRWI programming is aimed at meeting the needs of rural women, not all women attending the programs were from designated rural areas. The term "rural" in the context of health policy and research holds many definitions,1 so the research team used multiple tools to better characterize our participant population. We used both self-reported rurality and RUCA codes (Figure 1) to classify residence. Based on self-reported rurality, 61% of women lived in rural areas and 39% of women lived in urban areas. In order to look at rural-urban differences, we also used RUCA codes to create a dichotomous variable that classified women as either rural or urban. Based on RUCA code classifications, 58% of women lived in rural areas and 42% of women lived in urban areas. The average age of women in our study was 63 (range 25-93), and 98.2% of the participant population was white. The 3 most commonly reported health conditions among participants included hypertension (41.44%), depression (26.13%), and anxiety (20.72%).

Association Between Geographic Isolation and Social Support

Using a rural-urban dichotomy did not allow us to appreciate how social support is related to degree of geographic isolation, so we looked at this relationship using the mean value for geographic isolation. The correlation between geographic isolation and overall social support, when controlling for age and socioeconomic status, was not statistically significant (P=.0628, R²=.0907). However, when we assessed specific subscales of social support, we found that geographic isolation was a negative predictor of belonging support (P=.0349, R²=.1003) and tangible support (P=.0064, R²=.1372). Belonging support was assessed through



statements such as "If I wanted to have lunch with someone, I could easily find someone to join me" or "I don't often get invited to do things with others." Tangible support was assessed through statements such as "If I was stranded 10 miles from home, there is someone I could call who could come and get me" or "If I were sick, I could easily find someone to help me with my daily chores."

Association Between Geographic Isolation and Health Status

Geographic isolation was not a statistically significant predictor of overall health status among this population of women (P=.268). However, hospital access (P=.028) and courthouse access (P=.028) were positively correlated with overall health status by ordered logistic regression. Access to a police station, neighbor,



friend, or nearest city were not statistically significant predictors of overall health status. One advantage of using a cross-sectional survey design to study a community sample was that we were able to gather health information from a population of women that may not be regularly visiting a health care provider.

Association Between Social Support and Health Status

Since social isolation poses a significant risk factor for morbidity,^{4,5} a major goal of this work was to determine the relationship between social support and overall health among this population of Wisconsin women served by the WRWI. As shown in Figure 2, a direct association between social support and self-perceived health status was observed that follows an apparent gradient. Women in excellent health had an average total ISEL score of 44.2 (out of 48) compared to an average total ISEL score of 31.9 among women in fair health. Women in excellent health also had statistically significant higher social support scores in all three of the measured subscales compared to women in fair health. Overall, 14 women reported being in excellent health, 45 in very good health, 46 in good health, 18 in fair health, and 0 women in our study reported to be in poor health.

DISCUSSION

The term "rural" often conjures up visualizations of picturesque farm fields and pastoral scenery; however, it is oftentimes a landscape of geographic isolation, limited resources, and reduced access to health care. Our first hypothesis, that there will be an inverse relationship between geographic isolation and social support, did not yield a statistically significant overall result. Yet, 2 specific components of social support belonging support and tangible support were influenced by geographic isolation. Appraisal support, or the perceived availability of someone to talk about one's problems, did not show any association with geographic isolation in this study. This was likely secondary to improved technology today, where physical distance no longer raises significant barriers to communication.

Secondly, our hypothesis that geographic isolation will negatively affect self-perceived health status revealed that only hospital access and courthouse access were statistically significant predictors of overall health. The travel burden for rural residents to visit health care services based on a cross-sectional survey of the National Household Travel Survey was an average of 17.5 miles for rural residents compared

with an 8.3 mile trip for urban residents.²⁰ Studying the proximity to other health care entities in the future, including general practice and subspecialty clinics, may reveal additional important information. Surprisingly, close proximity to a courthouse was associated with improved overall health in our study. Whether the courthouse (a town-based entity) simply serves as a marker for proximity to a larger metropolitan area, or whether it represents a sense of security translating to well-being, is unknown at this time. We did not find a statistically significant correlation between participants' health and the distance from their homes to a police station, neighbor, friend, or nearest city.

Lastly, we initially hypothesized that social support will positively affect self-perceived health status. Here, we showed that WRWI participants from more geographically isolated areas in Wisconsin lack the perception of belonging support and tangible support compared to participants from less isolated areas. Although social support in the research context holds many definitions,²¹ one such definition states that "social support is defined as information leading the subject to believe that he is cared for and loved, esteemed, and a member of a network of mutual obligation."²² Social support previously has been implicated in many health-related processes. Individuals with higher levels of social support exhibit more rapid and extensive functional and cognitive recovery after stroke,²³ and social support also has been shown to be a positive predictor of physical and mental healthrelated quality of life among women diagnosed with breast cancer,²⁴ and is related to fewer depressive symptoms among heart failure patients.²⁵ We further highlighted the direct relationship between social support and overall health, and these observations stress the importance of developing and maintaining strong social support networks.

Limitations

The recognized limitations of our study include the relatively small sample size (n=113), self-perceived measures of health, and the weaknesses inherent to cross-sectional surveys. Due to the cross-sectional survey design of this study, we are unable to determine causality between social support and overall health outcomes. Another challenge that persists in the study of rural health and the establishment of rural-urban disparities is determining the classification of rural versus urban. In the context of health care policy and research, this classification system is vital, yet there is considerable incertitude as to how to apply rural taxonomies, since many classification systems exist. In an effort to minimize this limitation, we used RUCA-ZIP code approximations to draw the distinction between rural and urban populations, as RUCA-ZIP code approximations are very sensitive to demographic change and can differentiate rural areas according to their economic integration with urban areas and other rural areas.1

Rural populations still fare worse among many dimensions of health compared to more urban populations,³ but rural support groups have the ability to assist residents in fostering social support systems, coping with and managing stress, and ultimately achieving a greater sense of well-being and health. Moving forward, it would be beneficial to compare measures of social support and overall health among participants in social networks like the WRWI to a control population, in order to determine the effects social support groups have on different measures of emotional well-being and perceptions of support. It is our hope that others will utilize existing support groups or create new ones to reach geographically isolated and inaccessible rural people in order to diminish the disadvantages they face.

Funding/Support: This project was supported by the Medical College of Wisconsin and by the Healthier Wisconsin Partnership Program, through grant number 2012D-02.

Financial Disclosures: None declared.

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Cystectomy and Urinary Diversion for the Management of a Devastated Lower Urinary Tract Following Prostatic Cryotherapy and/or Radiotherapy

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ABSTRACT

Introduction: We investigated the outcomes and quality of life measures in men who underwent cystectomy and urinary diversion for devastating lower urinary tract toxicity after prostatic radio-therapy and/or cryotherapy for the treatment of prostate cancer.

Methods: Records of patients who underwent cystectomy and urinary diversion for the management of a devastated lower urinary tract following prostatic radiotherapy or cryotherapy were reviewed retrospectively. A postoperative, retrospective quality of life (QOL) survey was designed specific to this patient subset and obtained by telephone interview.

Results: Extirpative surgery with urinary diversion for management of a devastated lower urinary tract was performed on 15 patients with a mean age of 72 years (range 63-82). Toxicities leading to bladder removal included bladder neck contractures, prostatic necrosis, incontinence, osteo-myelitis, bladder calculi, fistulae, urethral strictures, abscesses, necrotizing fasciitis, and radiation/ hemorrhagic cystitis. The mean number of failed conservative, minimally invasive interventions per patients prior to cystectomy was 3.7 (range 1-12). The average time period from major complication following radiotherapy/cryotherapy to cystectomy was 29.1 months (range 5-65). The QOL survey showed all of the patients who completed the survey (n=13) would undergo the procedure again and 11 (85%) would have undergone the procedure an average of 13.2 months sooner (range 5-36).

Conclusion: Toxicities secondary to prostatic radiotherapy or cryotherapy may be debilitating. Our results demonstrate that cystectomy with urinary diversion can improve QOL in patients with a devastated lower urinary tract.

INTRODUCTION

Cryotherapy and radiotherapy are common primary, salvage, and/ or adjuvant treatment options offered for the management of localized prostate cancer. While these interventions have documented

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evidence demonstrating biochemical diseasefree survival benefit,1-4 they carry the risk of toxicities to the local and surrounding tissue. Prostatic external beam radiotherapy has been reported to produce moderate to severe genitourinary complications in 3% to 23% of patients.5-10 Severe and debilitating late complications may occur in approximately 3% of this population.11 Late grade 2 or greater genitourinary toxicity has been seen in 14% of patients undergoing low-dose brachytherapy as a primary treatment modality.12 Bladder outlet obstruction and tissue sloughing after cryotherapy has been documented in 3% to 21% and 4% to 15% of patients, respectively.13-15 Reported complications after salvage cryotherapy include bladder outlet obstruction (12%), tissue sloughing (8.2%), and rectourethral fistula (RUF) in 1.6% of patients.16

Moderate and severe toxicities from radiotherapy and/or cryotherapy often are managed with multiple interventions of increas-

ing invasiveness. The purpose of this study is to review the treatment outcomes of men with devastated bladder outlets following radiotherapy or cryotherapy for the management of prostate cancer ultimately treated with cystectomy and urinary diversion.

METHODS

Following institutional review board approval, we retrospectively examined the medical records of all patients that underwent cystectomy with urinary diversion for toxicities related to prostatic radiotherapy and/or cryotherapy from January 2004 to September 2014.

Recorded preoperative characteristics included patient age, prostate cancer treatment modalities, number/type/grade of toxicities related to therapy, and the number/type of interventions used to manage these complications. Cryotherapy and other surgical intervention related toxicities were graded based on the Clavien-Dindo Classification of Surgical Complications.17 Radiotherapy-related toxicities were graded based on the Radiation Therapy Oncology Group (RTOG)/ European Organization for Research and Treatment of Cancer (EORTC) late radiation morbidity scoring schema (Table 1).18 Postoperative characteristics including duration of hospital stay, early (≤ 30 days) and late (>30 days) complications and patient quality of life (QOL) scores were recorded. A postoperative QOL survey (Box) was designed by the authors since no specific survey for this patient population exists. Results were obtained via telephone interview by an independent third party.

Table 1. Radiation Toxicity and Surgical Complication Classification Systems Clavien-Dindo Classification of Surgical Complications ¹⁷ Any deviation from the normal postoperative course without need for any type of treatment except Grade 1 pharmacological treatments of antiemetics, antipyretics, analgesics, diuretics, and electrolytes Grade 2 Requiring pharmacological treatment with drugs other than allowed for Grade I complications Requiring surgical, endoscopic, or radiological intervention Grade 3 Grade 4 Life-threatening complication requiring intensive care unit management Grade 5 Death of patient RTOG/EORTC Radiation Toxicity Grading System – Genitourinary/Bladder 18 Grade 0 None Grade 1 Mild urinary frequency and dysuria not requiring pharmacological treatment Microhematuria Moderate urinary frequency, dysuria, bladder spasms Grade 2 Intermittent gross hematuria Grade 3 Severe urinary frequency, dysuria, pelvic pain, or bladder spasms Reduction in bladder capacity Frequent gross hematuria without clot passage Grade 4 Severe urinary frequency, dysuria, pelvic pain, or bladder spasms Necrosis/contracted bladder (capacity < 100 cc) Severe gross hematuria/hemorrhagic cystitis necessitating blood transfusion Acute bladder obstruction not secondary to clot passage, ulceration, or necrosis Grade 5 Death

RESULTS

Fifteen men with a mean age of 72 years (range 63-82) underwent extirpation for a devastated bladder outlet secondary to prostatic radiotherapy and/or cryotherapy. Prostate cancer treatment modalities leading to extirpation are listed in Table 2. Clavien Grade 2-3, RTOG/EORTC Late Radiation Morbidity grade 2-4 toxicities and failed conservative therapies following complications after prostate cancer treatment are shown in Table 3. The mean number of failed interventions per patient prior to urinary diversion was 3.7 (range 1-12). The average time from significant prostate cancer treatment toxicity to urinary diversion was 29.1 (range 5-65) months. Incontinence was present in all but 1 patient and required a mean of 7.3 pads/day (range 1-20). Three of 4 patients (75%) with rectourethral fistulae (RUF) reported florid fecal incontinence and were omitted from the calculation of daily pad usage. One patient (25%) experienced a Clavien Grade 4 (life threatening complications requiring intensive care unit [ICU] admission) secondary to urosepsis and necrotizing fasciitis of his perineum and right lower extremity.

Ten men underwent cystectomy (66%) and 5 underwent cystoprostatectomy (33%). Thirteen patients received ileal conduit urinary diversions (87%), 1 patient chose a continent catheterizable pouch, and 1 patient with RUF underwent a colon conduit urinary diversion. Two of 4 men (50%) with RUF had fecal diversion with colostomy prior to urinary diversion. At the time of urinary diversion, they underwent completion of the pelvic exenteration. The 2 other RUF patients had a partial proctectomy and end colostomy at the time of urinary diversion. Mean hospital stay following cystectomy and diversion was 12.2 days (range 3-43). Early and late postoperative complications are included in Table 4. Two of four early complications (50%) were Clavien Grade 3 and required immediate operative intervention. The other 2 early complications were Clavien Grade 2 and managed conservatively. Of 7 late com-

Box. Quality-of-Life Survey

1. How would you categorize your overall satisfaction with the procedure?

- 1. Completely unsatisfied
- 2. Mostly unsatisfied
- 3. Halfway satisfied
- 4. Mostly satisfied
- 5. Completely/considerably satisfied

2. Did the treatment meet your expectations?

- 1. Did not meet expectations at all
- 2. Did not meet expectations moderately
- 3. Met expectations halfway
- 4. Met expectations moderately
- 5. Completely/considerably met expectations
- 3. Overall how big a problem has urinary function been during the last 4 weeks?
 - 1. No problem
 - 2. Very small problem
 - 3. Small problem
 - 4. Moderate problem
 - 5. Big problem
- 4. Would you elect to have a cystectomy again if you were given the choice?

YES / NO

If you answered NO: Please explain why

5. Would you have chosen to have the cystectomy earlier? YES / NO

If you answered YES: How soon after your complications began would you have agreed to have the procedure? _____months

plications, 4 (57%) were Clavien Grade 3 and also required operative intervention. The other late complications were Clavien Grade 2 and managed conservatively. Average length of follow-up was 28.3 (5-88) months.

Treatment Modalities (n = 15)	Number
RP with adjuvant XRT	6
XRT with salvage cryotherapy	5
Brachytherapy	1
(RT	1
(RT and brachytherapy	1
FURP followed by XRT	1

Abbreviations: RP, radical prostatectomy (robotic or retropubic); XRT, external beam radiotherapy; TURP, transurethral resection of prostate.

 Table 3. Treatment Toxicities and Failed Conservative Therapies

Toxicities	Number
Bladder neck contracture	17
Incontinence	13
Prostate tissue necrosis/sloughing	12
Pubic osteomyelitis	7
Pelvic abscess	6
Recurrent bladder calculi	4
Recto-urethral fistula	4
Radiation/hemorrhagic cystitis	3
Prostatic stricture/stone	3
Necrotizing fasciitis	2
Urethral stricture	1
Radiation induced osteonecrosis	1
Failed Conservative Interventions	Number
Failed Conservative Interventions Transurethral bladder neck incision	Number 20
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement	20 9
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess	20
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy	<u>Number</u> 20 9 5 4
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations	Number 20 9 5 4 3
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations Nephrostomy tube insertion	Number 20 9 5 4 3 3
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations Nephrostomy tube insertion Urethral dilation	Number 20 9 5 4 3 3 2
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations Nephrostomy tube insertion Urethral dilation Fecal diversion with colostomy	Number 20 9 5 4 3 2 2 2
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations Nephrostomy tube insertion Urethral dilation Fecal diversion with colostomy Artificial urinary sphincter insertion	Number 20 9 5 4 3 2 2 2 2 2 2 2 2 2 2 2
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations Nephrostomy tube insertion Urethral dilation Fecal diversion with colostomy Artificial urinary sphincter insertion Clean intermittent catheterization	Number 20 9 5 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations Nephrostomy tube insertion Urethral dilation Fecal diversion with colostomy Artificial urinary sphincter insertion Clean intermittent catheterization Transobturator sling implantation	Number 20 9 5 4 3 2 2 2 2 2 2 2 2 2 2 1
Failed Conservative Interventions Transurethral bladder neck incision Suprapubic tube placement Drainage of pelvic abscess Hyperbaric oxygen therapy Intravesical instillations Nephrostomy tube insertion Urethral dilation Fecal diversion with colostomy Artificial urinary sphincter insertion Clean intermittent catheterization Transobturator sling implantation Urethral stenting	Number 20 9 5 4 3 2 2 2 2 2 2 1

At the time of extirpation, residual prostate cancer was found in 4 patients (27%). Three of the patients had primary radiotherapy followed by salvage cryotherapy and one had primary brachytherapy followed by salvage cryotherapy.

The postoperative QOL telephone survey was completed by 13 of 15 patients (87%). One patient refused to complete the questionnaire, and 1 was unreachable. The survey results showed that patients were satisfied with the surgical outcome and would undergo the extirpative surgery an average of 13.2 months (range 5-36) sooner (Table 5).

DISCUSSION

Most toxicity related to prostatic radiotherapy and/or cryotherapy is successfully managed conservatively. Unfortunately, some patients experience debilitating Clavien Grade 2-3 and RTOG/EORTC Grade 3-4 complications that are refractory to medical management or minimally invasive interventions. This patient subset often undergoes futile procedures over a protracted time period before the patient and urologist decide to pursue cystectomy with urinary diversion. This study retrospectively investigates our experience with such a patient population and assesses postoperative QOL.

Our retrospective analysis demonstrates that men may present with a myriad of toxicities after radiotherapy and/or cryotherapy. Depending on the degree of bother, the toxicities can be managed with a wide range of interventions. While these treatment modalities are successful for many, others require more invasive therapies. Unfortunately, the method of determining which patient is a candidate for conservative interventions versus cystectomy with urinary diversion is not algorithmic. We discuss extirpation early in the treatment course, so patients are aware that if conservative interventions fail, a more radical approach is available. Recommendations for urinary diversion are often made because of the near impossibility of successful conservative management of toxicities resulting from pelvic radiotherapy and/or cryotherapy. It is difficult to assess the number of patients who needed or were given the recommendation for cystectomy with urinary diversion because of the referral nature of our institution. Additionally, patient medical comorbidity was rarely a surgical contraindication; it was the patient who would choose to avoid or defer surgery.

While no metric exists to predict which patient will benefit from urinary diversion, findings from the postoperative QOL survey provide qualitative evidence that men with significant pelvic comorbidities from radio/cryotherapy are satisfied with the outcome and would undergo the procedure again. In addition, patients reported that, if possible, they would have undergone surgical extirpation with diversion an average of 13.2 months sooner.

The majority of publications describing cystectomy and diversion after prostate irradiation are for concomitant urothelial carcinoma of the bladder¹⁹⁻²² or for bladder invasion by prostate cancer.²³ The authors subjectively note that extirpation is an effective and durable treatment, despite increased perioperative morbidity compared to patients who underwent cystectomy without prior prostate irradiation. The findings in our patient population mirror these results.

The largest previous series describing radical extirpation for prostate cancer treatment toxicity focused on 11 patients with RUF secondary to brachytherapy. The authors also concluded that anterior pelvic exenteration with urinary diversion for RUF can be associated with good results.²⁴ In another study, Izawa et al focused on toxicities related to salvage prostatic cryotherapy in 6 patients. Similarly, they reported that radical intervention with extirpation and urinary diversion is justifiable and safe.²⁵

In our cohort, 10 (66%) men underwent cystectomy and 5 (33%) cystoprostatectomy. The decision to remove the prostate was made at the time of surgery and was determined by perceived ease

of prostatectomy and overall health of the surrounding pelvic tissue. No postoperative complications could be attributed directly to either prostatectomy or the retained prostate.

The weaknesses of this study include the variation in treatment methods leading to cystectomy with urinary diversion. Although this is true, all patients in this cohort began their course with prostate cancer, ultimately requiring cystectomy with urinary diversion. In addition, the sample size is small and limits interpretation. Also, the survey specifically designed for this study has not been validated for effectiveness, but does provide a qualitative understanding of the patient's postoperative quality of life. Last, each patient completed the survey at different post-operative time periods, which may lead to recall bias.

The severity of toxicities secondary to prostatic cryotherapy and/or radiotherapy can be debilitating. Our series, the largest to date, demonstrates that cystectomy with urinary diversion is safe and improves the quality of life in patients with a devastated lower urinary tract following prostatic radiotherapy and/or cryotherapy.

Funding/Support: None declared.

Financial Disclosures: None declared.

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Complications	Туре	Number
Early (<30 days)	Abdominal dehiscence	2
	Bowel leak	1
	Clostridium difficile colitis	1
Late (>30 days)	Incisional hernia	2
	Pelvic abscess	2
	Enterocutaneous fistula	1
	Parastomal hernia	1
	Ureteroenteric stricture	1

Quality of Life Survey Results (n=13)				
Question	Average score	Range		
Satisfaction	4.3	3-5		
Expectation	4.2	3-5		
Problematic urinary function	2.5	1-5		
Question	Yes	No		
Undergo again	13	0		
Sooner	11	2		
How much sooner	Mean 13.2 months			

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Prevention of Perinatal Transmission of Hepatitis B Virus: Assessment Among Wisconsin Maternity Hospitals

Stephanie M. Borchardt, PhD, MPH; Anna Kocharian, MS; Daniel Hopfensperger, BS; Jeffrey P. Davis, MD

ABSTRACT

Purpose: To evaluate the completeness of identification of pregnant women testing positive for hepatitis B surface antigen (HBsAg) and birth dose hepatitis B vaccine administration, and the extent of appropriate prophylaxis of infants born to women with and without maternal HBsAg status documented in the infant medical record.

Methods: We conducted medical record reviews of 3058 maternal and infant pairs at 58 Wisconsin maternity hospitals that cumulatively delivered 90% of Wisconsin's 2010 birth cohort.

Results: A documented HBsAg test result for the current pregnancy was included in 2928 (95.7%) of maternal records, and in 2676 (87.5%) infant records. Four infants (15%) were born to HBsAg-positive women; all 4 infants received appropriate prophylaxis: hepatitis B immunoglobulin (HBIG) and a dose of hepatitis B vaccine within 12 hours of birth. However, among 382 infants without a documented maternal HBsAg test result in the infant medical record, only 135 (35%) received appropriate prophylaxis: a dose of hepatitis B vaccine within 12 hours of birth or a dose of hepatitis B vaccine and HBIG within 12 hours of birth for infants weighing < 2000 g. Among all infants, 81.6% received hepatitis B vaccine prior to hospital discharge.

Conclusions: Hospitals must ensure that infants without a documented maternal HBsAg test result receive appropriate prophylaxis to prevent hepatitis B vaccine infection. All infants, regardless of maternal HBsAg test result, should receive a dose of hepatitis B vaccine before hospital discharge to serve as a "safety net" to prevent infection among infants born to HBsAg-positive women who are not identified prenatally. A written hospital policy for universal hepatitis B vaccine birth dose administration should be developed to reinforce admission orders.

INTRODUCTION

Hepatitis B virus (HBV) is a major cause of acute and chronic hepatitis, cirrhosis, and primary hepatocellular carcinoma. In the United States, an estimated 1.4 million people have chronic HBV

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CME available. See page 80 for more information.

infection, which is the underlying cause of 2000 to 4000 deaths annually.¹ Prevalence of HBV infection varies among subpopulations in Wisconsin, and is high among immigrants and refugees from highly endemic regions. In 2013, 46% (162/354) of Wisconsin residents with newly reported HBV infection were Asian or Pacific Islander. This subpopulation represents 5% of the US population and 2.3% of the Wisconsin population,² but more than 50% of US residents living with chronic HBV infections.¹

One common mode of HBV transmission is from mother to infant during birth or infancy; 70% to 90% of infants born to women who test positive for hepatitis B surface antigen (HBsAg) will become infected with HBV if they do not receive timely prophylaxis with hepatitis B immunoglobulin (HBIG) and hepatitis B vaccine.³ Among HBV-infected infants, approximately 90% will become chronically infected; about

25% of those chronically infected will die prematurely from cirrhosis or hepatocellular carcinoma.³ Because perinatal infection and potential sequelae can be prevented through screening and identification of HBV-infected pregnant women and by provision of prophylaxis to infants born to these women, the Advisory Committee on Immunization Practices (ACIP) recommends universal screening of pregnant women for HBV infection and administration of a dose of hepatitis B vaccine to all newborns before hospital discharge (birth dose).^{4,5}

Nationally, about 95% of pregnant women are tested for HBsAg. A positive result indicates HBV infection, and a high percentage of infants born to HBsAg-positive women complete postexposure prophylaxis. In 2013, local health departments in Wisconsin reported 161 births to HBsAg-positive women. Nearly all of these infants (99%; 160/161) received appropriate prophylaxis at birth. However, gaps remain in the identifi-

cation and subsequent case management of HBsAg-positive pregnant women and their infants.⁶ One important gap involves errors in documenting maternal HBsAg test results. Compared to infants born to women with appropriately documented HBsAg test results, infants born to women with unknown or discrepant HBsAg test results are less likely to receive HBIG or a birth dose of hepatitis B vaccine.⁶

To address this gap, a comprehensive medical record review was conducted among Wisconsin hospitals to evaluate completeness of the following: identification of HBsAg-positive pregnant women before delivery, hepatitis B vaccine birth dose administration, use of admission orders for birth dose administration and appropriate prophylaxis of infants born to HBsAg-positive women or infants born to women without maternal HBsAg status documented in the infant medical record.

METHODS

Medical record reviews were conducted at hospitals that cumulatively delivered 90% of the Wisconsin birth cohort dur-

ing the year 2010. Maternal and infant hospital medical records were reviewed for the presence of any maternal HBsAg test result (including the test date), administration of hepatitis B vaccine and HBIG within 12 hours of birth to infants born to HBsAg-positive women, administration of hepatitis B vaccine within 12 hours of birth to infants born to women without maternal HBsAg status documented in the infant medical record, administration of a dose of hepatitis B vaccine to all infants prior to hospital discharge, birth weight, insurance status, type of attending provider, and patient demographic data.

This study was a required cooperative agreement objective for all funded state Perinatal Hepatitis B Prevention Programs administered by the Centers for Disease Control and Prevention (CDC). This public health study was exempt from institutional review board review.

Sampling Methods

We used the number of births in 2010 (by hospital) obtained from the Wisconsin Department of Public Health (DPH) office of health informatics⁷ to select the Wisconsin hospitals that accounted for 90% (59,770/66,411) of births in 2010. The 101 Wisconsin hospitals were sorted by the number of live births in 2010, and those with the highest volume were selected in order from greatest to least until the selection cumulatively represented



Figure 2. Geographic Distribution of Hospitals Visited and Mean Annual Incidence of HBV Infection per 100,000 Women Aged 15-44 During 2001-2010, by County



90% of the 2010 birth cohort. The number of paired (maternal and infant) medical records to review at each hospital was generated using the number of live births in 2010 at each hospital,



the number of infants who received a dose of hepatitis B vaccine before hospital discharge (by hospital) from a 2010 survey of Wisconsin maternity hospitals (unpublished), and a table of sample sizes (provided by the CDC) for hospital medical record reviews to assess maternal HBsAg screening or hepatitis B vaccine birth dose.⁸ The number of records selected for review at each hospital was more heavily weighted on the hospital birth dose coverage rather than the number of live births at each hospital. For a given birth cohort size, the greater the expected birth dose coverage the smaller the number of records needed.

Site Visits and Data Abstraction

A letter was sent to each of the selected hospitals to arrange for the site visit. Each hospital was provided with instructions regarding proper selection of the paired (maternal and infant) medical records. This included listing all 2010 births in alphabetical order according to birth mother's last name, pulling every fifth record until the requested number of records was reached, and then pulling the corresponding infant medical records. If a selected woman gave birth to multiple infants (ie, twins), we reviewed the medical record for each infant born to her. Site visits were conducted during 2011-2013. Medical record abstraction forms were either completed while on site (41 hospitals) or through review of hospital-specific data that was sent electronically (17 hospitals). Site visits were conducted at hospitals that sent data electronically after analyzing and summarizing their hospital specific data.

Analysis

Descriptive analyses and pair-wise comparisons using the chi-square test for significance were conducted using SAS 9.2 (SAS Institute, Inc, Cary, North Carolina).

RESULTS

Initially, 56 hospitals were selected. After 1 hospital declined to participate, 3 additional hospitals were selected for a total of 58 hospitals (Figure 1). Among these, the total number of live births during 2010 was 59,957 and the range in number of births per participating hospital was 291 to 3702 (median 725) births. The number of paired records reviewed ranged from 26 to 129 per hospital (Figure 1). Among the 43 nonselected hospitals (including the one not participating), the total number of live births during 2010 was 6454 births, and the range in number of births per hospital was 8 to 885 (median 136) births. Hospitals selected were largely representative of Wisconsin counties known to have

a significant HBV-infected population (Figure 2).

Site visits were conducted at 58 of the 101 Wisconsin hospitals and medical records for 4.6% (3058/66,411) of the 2010 Wisconsin birth cohort were reviewed (Figure 1). Among the 3058 maternal and infant pairs, 3024 (98.9%) represented singleton births and 34 (1.1%) represented 17 twin births. Among 3058 maternal and infant pair records reviewed, 2928 (95.7%) had a documented HBsAg test result in the maternal record for the current pregnancy and 2676 (87.5%) had a documented maternal HBsAg test result in the infant record (Figure 3).

Among 2676 infants born to women with a documented HBsAg test result in the infant record, 4 (0.15%) were born to an HBsAg-positive woman, each at a different hospital. All 4 of these infants received prophylaxis that was appropriate for this situation: HBIG and a dose of hepatitis B vaccine within 12 hours of birth. There were 382 infants with absence of a maternal HBsAg test result in the infant medical record, although 339 (89%) of the corresponding 382 maternal records included documentation of the maternal HBsAg test result. Among these 382 infants, only 135 (35.3%) received prophylaxis that was appropriate for this situation: a dose of hepatitis B vaccine within 12 hours of birth or a dose of hepatitis B vaccine and HBIG within 12 hours of birth for infants weighing <2000 g. Four hospitals accounted for 295 (77.2%) of 382 infants with the absence of a maternal HBsAg test result in the infant medical record.

Extrapolation of these data to the population from which our

sample was derived (90% of the 2010 birth cohort) results in estimates of 78 infants born to HBsAg-positive women, and 7466 infants born to women whose HBsAg test results or test status were not included in the infant medical records. Among the latter group, an estimated 4853 infants would not have received appropriate prophylaxis.

Among 3046 infants with birth dose information available (not available in 12 infant records), 2486 (81.6%) received a birth dose of hepatitis B vaccine prior to hospital discharge. Among 560 infants who did not receive a birth dose, 276 (49.3%) had a documented guardian refusal in the medical record and 284 did not have a documented guardian refusal. Thus, among 2770 infants without documented guardian refusals, 2486 (89.7%) received a birth dose. Infants born to mothers with private health insurance were significantly less likely to receive a birth dose compared to infants born to mothers with Medicaid coverage (P<.0001) (Table). There were no significant differences in birth dose receipt rate by maternal race or type of attending provider (obstetrician or family physician) (Table).

Based on data from the 58 site visits involving 2414 infants who received a birth dose and had information regarding whether it was administered following an admission order in the medical record, 2239 infants (92.8%) received the birth dose following an admission order in the medical record.

During medical record abstraction, 5 maternal and infant pairs were detected with discordant HBsAg test results wherein the maternal record included a positive HBsAg test result and the infant record included a negative test result or the result was missing. Each of these HBsAg test results was abstracted from a clinician-transcribed result rather than the original laboratory report, which is the current recommendation. Further investigation revealed that laboratory reports for each of these women included a negative HBsAg test result.

DISCUSSION

This evaluation of practices to prevent perinatal HBV transmission was conducted among Wisconsin maternity hospitals representing 90% of the 2010 Wisconsin birth cohort. While these hospitals provided appropriate prophylaxis to all infants born to known HBsAg-positive women, our evaluation detected issues of concern with opportunities for substantial improvement, particularly regarding the provision of prophylaxis to infants born to women without maternal HBsAg status documented in the infant medical record.

We found that documentation of prenatal HBsAg test results was more complete among maternal records than infant records. Providers should routinely test each pregnant woman for HBsAg early during each pregnancy and document the result by placing a copy of the original laboratory report in the woman's medical record and her infant's medical record, upon birth. It is impor-

P ^b
.145
<.0001
.126

a The total number varies, by characteristic, as a result of missing information. b Value does not include other/unknown category.

c Includes African American, Asian, American Indian or Alaska Native, and Native Hawaiian or other Pacific Islander race categories.

tant to document the maternal HBsAg test result in the infant medical record to alert the child's pediatrician or family physician of the need for timely prophylaxis against HBV infection when it is indicated.

Our results demonstrated that all 4 infants born to HBsAgpositive women received timely and appropriate prophylaxis, but this success is difficult to extrapolate broadly because the sample of HBsAg-positive women was small. Notably, among the nearly 13% of infants who were born to women whose maternal HBsAg status was not documented in the infant medical record, only 35% received appropriate prophylaxis, which has been reported previously.^{6,9} Because the likelihood of developing a chronic HBV infection is inversely related to age at the time of infection, HBV infected infants are at particularly high risk of chronic HBV infection. Hospitals must ensure that appropriate prophylaxis is received by infants who are born to HBsAgpositive women or to women whose maternal HBsAg status is not documented in the infant medical record.

During our medical record abstraction, we detected 5 maternal and infant pairs with discordant HBsAg test results. These test results were abstracted from a clinician-transcribed result rather than the original laboratory report. Although investigation revealed that laboratory reports for each of these women contained a negative HBsAg test result, this highlights the need to verify the maternal HBsAg test result with the original laboratory report because transcription error does occur and has been well documented.^{6,10}

The percentage of infants who received a dose of hepatitis B vaccine before hospital discharge was relatively high and is on track to meet or exceed the Healthy People 2020 target of 85%.¹¹ Administering a birth dose to all infants before hospital discharge serves as a "safety net" to prevent perinatal infection among infants born to HBsAg-positive women who were not identi-

fied as a result of errors in maternal HBsAg testing or failures in reporting of test results.¹² In our study, 49% of the infants who did not receive a dose of hepatitis B vaccine before hospital discharge did not receive a dose because of a guardian refusal. Luthy et al found that parents who exempted their children from 1 vaccine most commonly exempted the hepatitis series (hepatitis A and B), and that parents associated HBV infection with sexual transmission and therefore did not perceive the need for their child to be vaccinated.13 Parents who are hesitant about or who refuse the birth dose of hepatitis B vaccine for their infant should be asked additional questions to elicit their specific vaccination concern so it may be addressed by hospital labor and delivery staff. Hospitals should ensure that each infant receives a dose of hepatitis B vaccine prior to hospital discharge and educate parents regarding the importance of on-schedule immunization. In addition, it is important that infants born to HBsAg-positive women obtain postvaccination serologic testing after completing the vaccine series to confirm vaccine-induced immunity to HBV.

We noted that among the birth doses administered to infants in our study, the vast majority were administered as a result of hospital admission orders. Although the number of hospitals with written policy to routinely administer a dose of hepatitis B vaccine to all infants before hospital discharge was not assessed during this study, results of a separate survey of Wisconsin maternity hospitals during 2011 demonstrated that 60% (56/94) had a written policy and 89% (87/98) used admission orders to routinely administer hepatitis B vaccine to all infants before hospital discharge. Madlon-Kay noted the strongest predictor of vaccine administration was having a written hospital policy for universal hepatitis B vaccine administration to newborns before hospital discharge.14 Our data, and data from other studies, strongly support the use of a written hospital policy that includes obtaining consent on admission for the hepatitis B vaccine birth dose.6 Therefore, we recommend a written hospital policy for universal hepatitis B vaccine birth dose administration to reinforce admission orders.

Our study has some limitations. First, although the majority of data abstractions were conducted by DPH staff, the remainder were abstracted by trained hospital personnel. This may have resulted in some inconsistencies in abstraction. Second, medical records reviewed within each hospital were not selected randomly. While we believe this was unlikely to have generated selection bias, it is feasible. Third, our study included hospitals which collectively accounted for 90% of the 2010 birth cohort; however, 43 hospitals were not included. Hospitals in each of the Wisconsin counties known to have a sizeable HBV-infected population were included in our study; most of the 43 hospitals not included are located in rural areas and had smaller numbers of births.

In Wisconsin, recommendations for testing pregnant women during each pregnancy are generally being followed, and results are being documented in the maternal medical record (and to a lesser extent in the infant medical record). Additionally, infants born to HBsAg-positive women received appropriate prophylaxis. However, among infants without a maternal HBsAg result included in their infant medical record, an alarmingly low percentage received appropriate prophylaxis. Hospitals should not underestimate the importance of documenting the maternal HBsAg result in the infant record. The percentage of infants who received a birth dose of hepatitis B vaccine was relatively high; however, there is an opportunity for improvement. In February 2013, the National Quality Forum endorsed a measure specific to the vaccination of newborn infants with hepatitis B vaccine before hospital discharge.¹⁵ The use of a National Quality Forum measure marks progress toward improving the hepatitis B birth dose vaccination rate, although other aspects of perinatal hepatitis B prevention will need considerable attention before elimination of perinatal HBV transmission will be a reasonable prospect.

Acknowledgments: The authors thank Jacqueline Kowalski, Susan Nelson, Dr Stephanie Schauer, Dr Wilmot Valhmu, Cathy Edwards, Carey Cullen and Joanie Kuennen for their assistance with medical record abstraction, and Ashley Petit, Ruth Koepke and Roman Ayele for their assistance with data entry.

Funding/Support: This investigation was funded by a grant from the Centers for Disease Control and Prevention, CDC-RFA-IP13-1301. The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

Financial Disclosures: None declared.

Planners/Reviewers: The planners and reviewers for this journal CME activity have no relevant financial relationships to disclose.

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Quiz: Prevention of Perinatal Transmission of Hepatitis B Virus: Assessment Among Wisconsin Maternity Hospitals

EDUCATIONAL OBJECTIVES

Upon completion of this activity, participants will be able to:

- 1. Describe the appropriate prophylaxis for infants born to hepatitis B-infected women, women with unknown hepatitis B status at delivery, and to woman not infected with hepatitis B.
- 2. Describe the best practice for hepatitis B screening during pregnancy and documentation of the laboratory result.
- 3. Outline the reason that the initial dose of hepatitis B vaccine, commonly referred to as the "birth dose," is important.

PUBLICATION DATE: April 2, 2016

EXPIRATION DATE: April 2, 2017

QUESTIONS

- 1. An infant born to a hepatitis B-infected mother should receive the following prophylaxis:
- □ A. Hepatitis B immunoglobulin and hepatitis B vaccine before hospital discharge.
- B. Hepatitis B immunoglobulin before hospital discharge and hepatitis B vaccine at the first well-child visit.
- □ C. Hepatitis B immunoglobulin and hepatitis B vaccine within 12 hours of birth.
- D. Hepatitis B immunoglobulin and hepatitis B vaccine within 24 hours of birth.

You may earn CME credit by reading the designated article in this issue and successfully completing the quiz (>75% correct). Return completed quiz to *WMJ* CME, 330 E. Lakeside St, Madison, WI 53715 or fax to 608.442.3802. You must include your name, address, telephone number and e-mail address. You will receive an e-mail from wmj@wismed.org with instructions to complete an online evaluation. Your certificate will be delivered electronically.

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- 2. Best practice for hepatitis B surface antigen (HBsAg) testing during pregnancy and documentation is:
- A. To test only for HBsAg if it has been more than 1 year since a prior pregnancy, otherwise the laboratory result from her previous pregnancy may be recorded for the current pregnancy and documented in the infant's medical record, upon birth.
- B. To test for HBsAg early during each pregnancy and document the laboratory result in the infant's medical record, upon birth.
- C. To test for HBsAg during the third trimester and document the laboratory result in the woman's medical record and in the infant's medical record, upon birth.
- D. To test for HBsAg early during each pregnancy and document the laboratory result in the woman's medical record and in the infant's medical record, upon birth.
- 3. The initial dose of hepatitis B vaccine or the "birth dose" is important because:
- A. It serves as a "safety net" to prevent perinatal infection among infants born to HBsAg-positive women who were not identified as a result of errors in maternal HBsAg testing.
- B. It serves as a "safety net" to prevent perinatal infection among infants born to women with unknown hepatitis B status at delivery.
- C. The child can complete the hepatitis B vaccine series more quickly if the first dose is received before hospital discharge rather than at the first well-child visit.
- $\Box \quad D. \quad A \text{ and } B.$
- $\square \quad E. \quad A \text{ and } C.$
- 4. Infants born to HBsAg-positive women should obtain postvaccination serologic testing after completing the vaccine series to confirm vaccine-induced immunity to hepatitis B.
- True.
- □ False.
- 5. Infants weighing less than 2000 g, born to a woman with unknown hepatitis B status, should receive a dose of hepatitis B vaccine and HBIG within 12 hours of birth.
- True.
- □ False.

Students' Critical Incidents Point the Way to Safer Patient Care Transitions

Jeffrey A. Morzinski, PhD; Heather Toth, MD; Deborah Simpson, PhD; Staci Young, PhD; Karen Marcdante, MD

ABSTRACT

Introduction: Patient care transitions are prevalent in health care, and faulty transition-related communications are associated with 80% of serious medical errors. While medical student curricula on care transitions are increasing, there are limited evaluation reports and little guidance on primary care transition training.

Methods: The Medical College of Wisconsin initiated an annual 2-hour patient care transition intersession for third-year medical students. The intersession used a critical incident report, where students wrote about a recent, de-identified patient transition they witnessed that evoked in them "a strong emotional reaction." Next, intersession training included a novel, structured communication handoff mnemonic. At the intersession conclusion, students wrote what they would do differently if their critical incident transition occured in the future. Evaluations (2010-2014) consisted of students' post-session reactions and learning. Authors completed a detailed, qualitative analysis of students' critical incident reports from the 2010 intersession.

Results: Students reacted positively to all intersession elements, especially clinician-led, smallgroup discussions. Student reports revealed that over 90% of their critical incident evoked negative emotional reactions (eg, frustrated, disappointed, helpless). Post-intersession, 86% of students reported intentions to adopt new strategies to improve future care transitions, and 38% referenced components of the learned mnemonic.

Conclusion: Medical students reacted positively to this intersession, especially small-group discussions. Students revealed mostly negative emotions from their critical incident on patient handoffs, but they gained effective strategies for future handoff communications. Authors recommend continued use of the handoff mnemonic, with greater attention to training environments that emphasize patient and learner safety.

INTRODUCTION

Care transitions refer to the movement of patients from one health care provider or setting to another. The patient handoff

Author Affiliations: Department of Family and Community Medicine, Medical College Wisconsin, Milwaukee (Morzinski, Young); Department of Internal Medicine, Medical College of Wisconsin, Milwaukee (Toth); Aurora Health Care, Milwaukee, Wis (Simpson); Department of Pediatrics, Medical College of Wisconsin, Milwaukee (Toth, Marcdante).

Corresponding Author: Jeffrey A. Morzinski, PhD, Department of Family and Community Medicine, Medical College of Wisconsin, 8701 Watertown Plank Rd, Milwaukee, WI 53226; Phone 414.955.4985; fax 414.955.6523; e-mail jmorzins@mcw.edu. is a related term, which refers to clinicianto-clinician communication that transfers accountability for a patient's care, and sometimes involves a change in patient location. Care transitions are crucial times in patient care when errors may ensue and be propagated in patient outcomes. Failed caregiver communications during patient care transitions are estimated to contribute to 80% of serious medical errors.¹

The high error rates associated with care transitions make them an area of major interest for health care systems, clinicians, health profession schools, and clinicians-in-training as patient safety comes to the forefront. Highlighting the importance of safety and care transitions, the Accreditation Council on Graduate Medical Education (ACGME), through its Clinical Learning Environment Review, identified transitions in care as one of its 6 learning environment review priorities.² The Association of American Medical Colleges' (AAMC) core professional activities for new residents highlight that gradu-

ating medical students must be taught and entrusted to identify system failures and contribute to a culture of safety and improvement.³

As members of health care teams, medical students participate in and observe patient care transitions. Students may help to ascertain medical and social histories, gain insights into chief and secondary complaints, and contribute to care planning around the times of patient entry and departure from hospital units, rehabilitation facilities, and outpatient clinics. They often witness transitions conducted by their supervising resident or attending physician.

As part of patient safety training, curricula focused on care transitions existed prior to 2009.⁴⁻⁶ A majority of these interventions were aimed at third- or fourth-year medical students or

residents, were brief (1 hour), and addressed objectives related to communication, inpatient, or discharge care. More recently, a 2014 review of medical student handoff curricula within internal medicine showed that 15% of required clerkships provided a structured handoff curriculum, and over a third (37%) reported handoff curricula during medical students' subinternship rotations.⁷ While medical students may see growing opportunities for care-transition training, there are few reports of their effectiveness or impact.

METHODS

The medical student curriculum presented here focused explicitly on care transitions. In this paper, we present our care transitions curriculum, including the use of student-generated critical incidents and methods for analysis of these incidents. We highlight our curriculum and expand on our prior publication that analyzed student-generated critical incidents.^{8,9} We analyze student reports on what they would do differently in future, similar care transition incidents. Finally, we discuss implications of what we learned as well as study limitations. Our project was granted exempt status by the Medical College of Wisconsin institutional review board.

Teaching Care Transitions: The STEP Team and PRIMARY Mnemonic

Two years prior to the first student intersession, a group of 12 Medical College of Wisconsin primary care faculty memberspediatricians, general internists, and family medicine educatorstook part in a faculty development project titled Safe Transitions for Every Patient (STEP), with the goal of developing medical education curricula on safe handoffs. We began with a comprehensive needs assessment that included a literature review, written surveys, and in-person discussions with medical residents, internists, pediatricians, and family physicians at conferences, including continuing education venues in south central and southeastern Wisconsin.¹⁰ Three main findings from the needs assessment were: (1) primary care clinicians view patient care transitions as challenging and complex, often evoking their strong emotional responses, such as irritation and frustration; (2) formal preclinical training for conducting successful handoffs is missing or inadequate; and (3) emerging care transition models such as SBAR (Situation, Background, Assessment, Recommendation) were designed mainly for in-hospital use, and there has been less attention to the interests and perspectives of primary care clinicians serving outpatients.11

Furthermore, our needs assessment sources confirmed the overall usefulness of written and retrievable electronic formats for handoff communication, although they expressed being hampered by nonstandardization across various health care systems. They indicated that the pace and demands of primary care often required in-person care transition communications that consider the people involved in the transition (including the patient, family members, community providers, and subspecialists), their assessed capacity to assist the transition, opportunities for input and interaction between the sender and receiver, and clarifying who was accountable for carrying out the agreed-upon recommendations. These emphases are consistent with recent communication solutions advanced by the Joint Commission.¹²

The instructional format selected for teaching our medical students was a mandatory care transition intersession. The intersession format had been used previously for improving patient-centered care and teaching professionalism.^{13,14} Our STEP project team developed and presented the curriculum for the first time in April 2010, and early in each calendar year since then. We delivered our required curriculum during the middle of the third year. By then students have had exposure to care transitions and would still have opportunities to implement what they learned during medical school, residency, and beyond. Intersession goals were to raise awareness of care transition risks, ascertain student experiences and reactions to handoffs, and teach the STEP model for effective handoffs. The full intersession curriculum and worksheets are available online.⁸ Intersession elements are summarized in Table 1.

Critical incident worksheets were particularly important to the intersession. After the introduction, but prior to the didactic presentation, students completed the first part of the worksheet, identifying a care transition they witnessed or experienced that evoked a strong emotional reaction, briefly describing the context and the types of information exchanged, as well as the emotions they felt and why. Facilitators then guided students to briefly summarize their critical incident inside their small group (6 to 8 students and a facilitator), and a few were shared with the large group, allowing time for questions.

A lecture-discussion on the risks of poor handoffs followed, featuring both a well-publicized story of a failed handoff and a physician's detailed and personal "near miss" story and its impact on his role/responsibilities. Next, the model of the 7 PRIMARY care transition mnemonic elements created by the STEP team was presented, emphasizing reciprocal provider communication during successful care transitions: <u>People involved</u>, <u>Reason</u> for the handoff, <u>Input by the handoff receiver</u>, <u>Medical course</u>, <u>Assessment</u>, <u>Recommendations and responsibilities</u>, and <u>Your</u> turn—a chance to resolve any remaining issues.^{8,9} Students were told that the freely available PRIMARY mnemonic pocket cards (available at their tables) had been disseminated and discussed with primary care residents, faculty, and practicing physicians in southeastern Wisconsin and elsewhere.⁸

To provide students with hands-on practice applying the PRIMARY mnemonic in a safe, nonclinical setting, students re-presented their critical incident in their small group, applying each of the PRIMARY elements. Faculty facilitators were

Table 1. Session Outline: Patient Care Transition Intersession				
Format/Activity	Duration	Purpose		
Lecture/introduce care transitions	20 min	Present goals, significance, schedule.		
Small group/critical incident report (part 1)	20 min	Students reflect on, write and discuss critical incident, eg, where, when, who.		
Lecture-discussion/care transitions + PRIMARY	15 min	Present risks of poor handoffs and a model for inperson handoffs (PRIMARY).		
Small group/practice PRIMARY + interactive	40 min	Students use the handoff model, trying out new approaches to their critical incident.		
Small group/CI report (part 2)	15 min	Reflect on and write intersession influence on learning (critical incident-related) and reactions.		
Large group summary, wrap-up, session evaluation	10 min	Guide students to other resources/next steps.		

Major elements of Medical College of Wisconsin's intersession on patient care transitions for third-year medical students. Minutes are approximate, allowing for questions, transitions between small and large groups, etc.

Abbreviations: PRIMARY, People involved, Reason for the handoff, Input by the handoff receiver, Medical course, Assessment, Recommendations and responsibilities, and Your turn.

Table 2. Themes That Emerged From Medical Student Responses on "What, if Anything, Would You Do Differently"

Categories	% Coded	Illustrative Student Response
Align change to PRIMARY mnemonic	38	"Clarify each other's roles and what each person is going to do to set the plan in motion." (P = people involved).
Improve overall communication	34	"I will speak up more and ask more questions."
Greater awareness or a new attitude	14	"I saw how important it is to have both teams agree."
Would not do anything different	14	"These things happenthis [care transition] was a learning experience."

In part 2 of the critical incident worksheet, after their discussion and small group practice, students were asked to write "What if anything would you do differently?" In the table are Categories determined by the study team, percentage of the total number of student entries (173 entries from 193 students), and representative responses in each category.

equipped with 1 "sender" and 1 "receiver" table card, and students volunteered to be the "sender" of the handoff described on their worksheet. Another student in their group was the designated handoff "receiver." Senders and receivers were instructed to consider the PRIMARY model and adjust any handoff details to improve its outcome and not get hung up about missing language or unknown clinical details.

Group members not in sender/receiver roles were observers who tracked the use of the PRIMARY mnemonic. After each interaction, group members joined in a debriefing about the presence and strength of various PRIMARY elements used and proposed new language to the sender or receiver to improve the transition exchange. The duration of these sender-receiver exchanges ranged between 3 and 5 minutes, after which the facilitator requested new volunteers, cycling through as many of the student-authored incidents as time permitted.

After the PRIMARY exercise, each student completed part 2 of the critical incident worksheet, which directed students to reconsider their critical incident and describe what, if anything, they would do differently based on the intersession experience. Next, presenters made closing remarks that included opportunities for students to continue care transition discussions postintersession. Students then completed all evaluation materials.

There were 2 modifications in the intersession curriculum between 2010 and 2014. Starting in 2011, facilitators were given information on support services appropriate for referrals if students wished to continue to discuss an issue raised during the intersession. Starting in 2014, brief introductions of other hand-off tools that students were likely to come into contact with were briefly discussed and materials provided.

Evaluation Methods

For the intersession years 2010 through 2014, students completed an institutional evaluation form with Likert scale items focusing on quality of the session and the value of activities relative to time spent. Specific items included "did the critical incident enhance learning," "how effective was your small group," and the overall intersession grade.

Steps to analyze our critical incident worksheets have been detailed elsewhere,^{8,9} and were adapted from prior intersession studies.^{13,14} Our study team, composed of MD and PhD faculty, used qualitative methods to examine 2 areas of student responses: the emotional content of students' critical incidents, and what, if anything, students intended to do differently if faced with a similar care transition in the future. We analyzed all critical incident worksheets from the 2010 intersession using a constant comparative method to arrive at coding categories.¹⁵ Using this method, we compared new data (student-generated text) with existing data, and coding was refined by team members until agreement on codes and data was reached. This method resulted in the formation of agreed-upon categories, counts, and percentages of items in each category.

RESULTS

An average of 191 students completed the intersession and evaluation each year from 2010 through 2014. Ratings were positive, with an annual average of 92% rating their small-group experience as "very good" or "excellent," and 78% rating "agree" or "strongly agree" that the critical incident component of the intersession enhanced their learning. Students graded each year of the intersession as "high pass" (scale: fail, low pass, pass, high pass, honors).

A detailed, qualitative analysis was conducted on all students' (n=193) critical incidents from the 2010 intersession. On a critical incident worksheet, each student first described a care transition he or she observed that evoked a strong emotional response. This item analysis is summarized here and more fully described elsewhere.⁹ One or more emotions were identified in 121 of 193 (63%) of critical incidents. A large percentage of emotional responses (92%) were coded as negative with 80% including frustration, anger, annoyance, or a combination (frustrated/angry). A total of 12% of all coded emotions were categorized as "disturbing," and these included feelings of regret, fear, and helplessness. Positive emotions were identified in 8% of all critical incidents, with appreciation and pride mentioned most often.

In part 2 of the worksheet, students responded to the question "what, if anything, would you do differently" if faced with a future, similar care transition incident. For this question, 173 of 193 students (90%) responded with a worksheet entry. The most often cited intention (38% of responses) was to incorporate a behavior clearly aligned with the PRIMARY model taught during the intersession. The next largest category of student responses (34%) involved their intention to improve overall communication. In 14% of responses, students reported their intention to express a new attitude or awareness associated with handoff communication. Finally, 14% of students indicated that they would do nothing different. (See representative coded entries in Table 2.)

DISCUSSION

We have delivered the care transitions intersession annually since 2010, and each year it has been evaluated positively by students. From our qualitative analysis, we have learned that a high percentage (86%) of students reported intentions to incorporate positive intersession lessons in future care transitions. Student-authored critical incidents were a focal point of the intersession, and 78% of students agreed or strongly agreed that they enhanced their learning. There was a high percentage (92%) of critical incidents associated with negative student emotions, deserving of additional comment.

Care transitions are crucial times for emphasizing patient safety because they are often associated with communication errors.¹ Medical student roles as care transition observers and clinical team members bring them into close contact with patientfocused communication and related learning opportunities. But without appropriate preparation, care transitions may be a source of frustration and distress, which may compromise professionalism and add to a culture some call the "hidden curriculum" of medical education.¹⁶

If medical students are not safeguarded with proper training and tools, strong negative emotions associated with care transitions may contribute to their detachment, burnout, and compassion fatigue.¹⁷ Strong negative emotions can contribute to nonconscious stereotyping, leading to bias in health care providers' choices and behaviors.¹⁸ These negative emotions may compromise the doctor-patient relationship and could lead to poor patient care.¹⁷ However, efforts to prepare students for these emotions and prevent their distress may "have an amplified effect by benefitting their future patients as well."¹⁹ We support the recommendation that improved medical trainee curricula are sorely needed to address these gaps^{4,17,18} and applaud the new ACGME and AAMC emphases on patient safety and quality.^{2,3}

A majority of students recorded what they would do differently if presented with a similar, future care transition. As noted earlier, 86% of students reported that they acquired a new approach or attitude about care transition communication. The largest percentage of these responses (38%) aligned directly with elements of the PRIMARY model. While this is a highly positive intersession outcome, it may reflect our students' recent exposure to the model. Another large percentage of those who responded to this item described approaches to improve overall communication or gained an overall greater awareness of the options and positive attitudes needed to improve care transitions. We believe that these positive findings were enhanced by 3 factors. First, the care transitions that students worked on were theirs-witnessed or experienced by them. This seemed to add a higher level of commitment to work together-a richness of strategies and ideas. Second, a care transition model was used that emerged from local primary care faculty and practices, a mnemonic which students identified as a highlight of the intersession. Finally, we believe that having supportive and clinically experienced faculty facilitators inside each intersession discussion group contributed to a learning environment where new ideas and communication approaches could be safely tested.

Limitations

There were limitations to this study. Student ratings of the intersession and critical incident component were equally high through all 5 years of data collection, but the indepth qualitative analysis we report was conducted on all critical incidents collected in 1 year. While authors agree that intersession methods and outcomes changed only minimally during the 5 years of the intersession reported here, a different critical incident sampling method may have discovered year-to-year differences. A second possible limit involves the critical incident method that asked

each student to select 1 handoff experience that evoked a strong emotional reaction. We advise caution about generalizing from reported incidents, as they were not intended to represent the range, intensity or frequency of our students' or other students' handoff experiences. We asked students what, if anything, they would do differently in the critical incident they reported, but it wasn't required that the reported incident was recent or even that the student participated. This may have introduced bias in our results due to confusion on the part of students who may have been in the role of clinical team member or bystander. Additionally, this analysis was completed by a team of clinicianeducators, all of whom had a role in the curriculum design and delivery, which may have biased our results. Another possible limitation is that the PRIMARY mnemonic was designed to meet the needs of primary care providers, but as reported elsewhere, only 8% of our students' reported incidents originated in an outpatient setting.9

This study did not assess students' sustained learning or behavior change. These would be important emphases for follow-up or future studies. Finally, this project focused on a single educational intervention at 1 institution, which may limit its use elsewhere.

CONCLUSION

We were encouraged by the project's outcomes and have sustained this intersession annually at the Medical College of Wisconsin. We have recommended trials of this curricular approach and the PRIMARY mnemonic at other institutions. Because of the complexity of care transitions—especially in the broad range of primary care setting—we have encouraged adaptation and revision, such as implementing the curriculum within a clinical setting rather than a classroom, involving interprofessional learners, and applying the tools as part of quality improvement projects.

Acknowledgements: We thank the many Wisconsin primary care clinicians who provided input on the challenges of care transitions. We acknowledge Medical College of Wisconsin Care Transition Intersession group facilitators for expertly guiding student discussions. Special thanks to our colleagues and members of the STEP Collaborative whose work contributed to this report: Paul Koch, MD; Nancy Havas, MD; Kristin Guilonard, MD; Angie Zikos, MD; David Klehm, MD; Emily Densmore, MD; Michael Weisgerber, MD; Linda Meurer, MD, MPH; Douglas Bower, MD; Paula Palma-Sisto, MD; Geoffrey Lamb, MD; Laura Currey, MS; and Tess Chandler.

Funding/Support: This project was supported by grant #D55HP00093 from the Health Resources and Services Administration, US Department of Health and Human Services.

Financial Disclosures: None declared.

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Medical Student Mock Interviews to Improve Residency Interviewing and Match Success

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ABSTRACT

Purpose: Using a quasi-experimental approach, we examined student and faculty satisfaction with a mock residency interview program. We also examined whether self-selected participants had match rates that differed from nonparticipants.

Methods: Interviews were arranged on a specified evening between students and a physician in the specialty to which the student wished to apply. Interviews were structured as similarly to residency interviews as possible, but included 10 minutes of verbal feedback and subsequent written feedback to all students. Students completed surveys indicating their satisfaction with the mock interview immediately following the interview and 5 months later (after their actual resident interviews). Faculty feedback to students and their satisfaction with the program also was collected. Out of 189 (55%) students in the senior class, 104 volunteered to participate.

Results: Immediately following the mock interview, over 90% of students who participated either strongly agreed or agreed that the interview feedback was helpful, seemed realistic, and helped them identify strengths and weaknesses. Responses collected 5 months later were still favorable, but less positive. Faculty identified 7 students who they believed had poor interview techniques and an additional 13 who interviewers believed would be unlikely to match in their specialty. Final match results for the group participating in the mock interview showed a primary match rate of 99%, which was higher than students who did not participate (94%, *P*<.001).

Conclusion: In a self-selected group of students who chose to participate, mock interviews were useful in improving student match success compared to students who did not participate in the mock interview program. Because all students were not required to participate, it is unclear whether this tactic would be successful for all students.

INTRODUCTION

As a response to predictions of future physician shortages, in 2006 the Association of American Medical Colleges called for medical schools in the United States to increase their enrollment by 30%.¹ Medical schools have risen to that challenge by

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expanding class sizes and adding regional campuses.² According to data from the National Residency Match Program,^{3,4} between 2005 and 2014 the number of US allopathic medical school seniors participating in the match has grown from 14,709 to 17,374, an increase of 18%. While the increase of 2665 graduating seniors is sizeable, these students represent only about a third of the overall growth in noninternational applicants attempting to secure residency training positions through the annual match process. Over the same time period, the number of prior US allopathic medical school graduates re-entering the match has increased by 30%, while US osteopathic graduates participating in the match has increased by 80%. The largest growth in match participants is among US citizens who attend international medical schools. This pool of applicants grew by 3045 between 2005 and 2014, an increase of 145% and nearly 400 more than the absolute growth in US allopathic medical school seniors over the same time period.

While the number of medical school graduates has increased substantially over the past 10 years, the number of residency slots has not kept pace. In 2004, there were 24,012 residency positions in the United States.⁵ In 2014, this grew to 30,212.⁶ As a result, in the 2015 residency match there were 41,334 registered applicants competing for one of the 30,212 available positions. In short, the match has become highly competitive due to forces that are largely outside students' control.

Personal interviews and interpersonal skills are considered highly important in evaluating residency applicants. According to a survey of nearly 1800 residency directors, interactions with faculty during the interview and visit and interactions with house staff during the interview and visit were the first and third most commonly cited factors, respectively, in evaluating a candidate.⁷ These responses suggest that assisting students in improving their interview skills could favorably influence their chances at securing a position through the match. Despite the personal interview being a vital step in the consideration of residency applicants, rarely do medical schools engage in any formal preparation of students for this activity. In our review of the literature, we were not able to identify any previous studies or even descriptions of such a program.

At the Medical College of Wisconsin, we implemented a mock residency interview program in 2014 to assess students' interviewing skills and provide targeted feedback both on interviewing techniques and competitiveness for a specific discipline identified by the student. The mock interview program was voluntary, paired students with a faculty member in a specialty that they identified as their first choice, and provided timely feedback to students. This paper describes the experiences of the students and faculty members during these interviews and provides data on the match success of students who chose to participate.

METHODS

Study Sample

Students participating in the mock interview sessions were members of the fourth-year class at the Medical College of Wisconsin in August 2014. Students were contacted by e-mail and asked if they wished to participate in a mock residency interview to be held in September 2014. Students also were asked for their preferred medical specialty so that they could be matched to a physician from that discipline who was knowledgeable about residency selection criteria.

Faculty members who had experience interviewing residency candidates for their specialty's training program were recruited to perform the interviews. Faculty members were recruited selectively from the same specialty areas that students indicated an interest in pursuing so that students could be matched with someone familiar with the student's intended field. Other than refreshments, faculty members were provided no incentive to participate. There were no incentives provided for students.

This project was reviewed and approved by the Medical College of Wisconsin Human Subjects Committee.

Intervention

Mock interviews were conducted in the evenings to minimize any conflicts with students' clinical education responsibilities. Students were paired with a faculty member in their preferred specialty, although in 4 cases this was not possible and a physician from a related specialty conducted the interview. Students were instructed to bring their medical school transcript, personal statement, and a draft of their medical school performance evaluation (dean's letter) for review by their interviewer.

Interviews were scheduled to last 20 minutes, with an addi-

tional 10 minutes for direct feedback to the student. Faculty members were given 5 minutes to review the documents related to their student prior to the interview. Faculty members were given no specific questions or protocol for the interview; they were asked to interview the student who was applying for a position in their own program.

Measures

To assess initial satisfaction with the program, students were asked to complete a paper questionnaire distributed to them immediately following their interview. At this time, students had received verbal feedback from faculty members, but had not been given written feedback. In addition, a follow-up questionnaire was distributed via e-mail using a Web-based survey tool in January 2015, after the students completed their actual residency interviews. Both questionnaires asked the students whether they believed the interview helped them identify their strengths and weaknesses, whether the faculty feedback was helpful, and whether the interview seemed realistic. The first questionnaire also asked whether the interview helped assess their competitiveness for that specialty, while the follow-up questionnaire asked if students had used the interview to help decide their specialty choice. Students also were asked about their satisfaction with the process, and whether they would recommend it to students the following year.

In addition to providing verbal feedback, faculty members completed an assessment form after each interview. Faculty members were asked to assess the student's interviewing skills on a 4-point Likert scale (ranging from 1 = poor to 4 = excellent) as well as predict where the student would likely be ranked on his or her residency program's rank order list. For the rank order question, faculty members were given choices of "top third," "middle third," "bottom third," "unlikely to be on list," and "unlikely to obtain an interview." Faculty also provided an estimate of where on their rank list their residency program usually filled given choices of "top third of list," "middle third," "ranked anywhere on list," and "good chance to obtain spot in Supplemental Offer and Acceptance Program® (SOAP)." This allowed us to assess the student's likely competitiveness based on where the faculty member felt they would fall on their program's list compared to where they usually matched.

Student match success for students who participated in the mock interview program and those who did not was obtained through the results of the National Residency Match Program in March 2015, as well as early match data from the military, ophthalmology, and urology matches in January/February 2015.

Analyses

Student and faculty survey responses were analyzed using simple descriptive statistics. For faculty member assessments of competi-

	September 2014 Following interview (N = 93)	January 2015 After residency interview (N = 49)
Mock Interview Helpe	d Identify Strengths and W	leaknesses
Strongly agreed	74 (79.6%)	23 (46.9%)
Agreed	19 (20.4%)	25 (51.0%)
Disagreed	0	1 (2%)
Strongly disagreed	0	0
Interview Feedback W	as Helpful	
Strongly agreed	83 (89.3%)	26 (53.1%)
Agreed	10 (10.8%)	22 (46.9%)
Disagreed	0	1 (2%)
Strongly disagreed	0	0
Interview Seemed/Wa	s Realistic	
Strongly agreed	64 (68.8%)	21 (42.9%)
Agreed	28 (30.1%)	23 (46.9%)
Disagreed	1 (1%)	3 (6.1%)
Strongly disagreed	0	2 (4.1%)
Mock Interview Helpe	d Assess Competitiveness	for Selected Area
Strongly agreed	54 (58.1%)	Not asked
Agreed	28 (30.1%)	Not asked
Disagreed	11 (11.8%)	Not asked
Strongly disagreed	0	Not asked
Mock Interview Helpe	d Me Decide Which Specia	Ity to Apply to ^a
Strongly agreed	Not asked	9 (19.1%)
Agreed	Not asked	5 (10.6%)
Disagreed	Not asked	27 (57.4%)
Strongly disagreed	Not asked	6 (12.8%)
Would Recommend to	Next Year's Students ^a	
Strongly agreed	86 (92.5%)	20 (44.4%)
Agreed	7 (7.5%)	15 (33.3%)
Disagreed	0	9 (20.4%)
Strongly disagreed	0	1 (2.2%)

tiveness, students who fell within the usual rank list parameters identified by a faculty member were deemed to have a high likelihood of matching; those who a faculty member felt would not match based on their prediction of where they would be ranked were considered at high risk of not matching.

For match rates based on participation, the proportion of those obtaining a position in the initial match (ie, prior to SOAP) was compared for those who participated in the mock interview program with those who did not using chi-square analysis.

RESULTS

A total of 189 students were eligible for the mock interviews, and of these 104 participated (55%). Of the students who participated in the mock interview process, 93 (89%) returned surveys after the initial interview. Forty-nine (49%) completed the follow-up interview in January. As shown in Table 1, students' responses were very positive immediately following the mock interview. Students strongly agreed that fourth-year students in the subsequent class should participate in the program. When

Table 2. Faculty Interviewer Assessments of Student Interview Skills		
	N (%)	
Assessment of Student Interviewing Skills		
Excellent: no further practice needed	35 (41%)	
Good: would benefit from practice	43 (51%)	
Fair: definitely needs coaching and feedback	6 (7%)	
Poor: if not improved, will hurt chances of match	1 (1%)	
Would Recommend to Next Year's Students		
Strongly agreed	61 (82.4%)	
Agreed	13 (17.6%)	
Disagreed	0	
Strongly disagreed	0	
Based on Record and Interview, Student Likely to Match	in That Specialty	
Alignment between program and student on rank list	70 (84%)	
Non-alignment between program and student on rank list	13 (16%)	

surveyed after completing their actual residency interviews, student responses were still positive, although less positive than in their initial responses. Although the total number of students who "strongly agreed" and "agreed" were about the same for many questions, there were many more responses in the latter category than immediately after their interview. Additionally, following their residency interviews, almost a quarter of students said they would not recommend this program for students in the following year.

A total of 93 (89%) faculty members returned their assessments following the interviews (Table 2). Like the students, faculty members immediately following the interviews would recommend this experience to students in subsequent years. Additionally, faculty identified 7 students whose interviewing skills were rated as fair or poor and who would benefit from coaching and practice before participating in their actual interviews. Based on faculty members' predictions of where students would rank and where their own program usually went on their match list, we also identified an additional 13 students who would be predicted not to match based on where faculty members felt they would be ranked.

Finally, we examined the success at an initial match for students who participated in the program compared to those who elected not to participate. Of those students who did mock match interviews, 1 student out of the 104 did not have an initial match (1%). For the 85 students who did not participate, 8 did not match (9%, P<.001) when compared to program participants. Because the faculty comments were de-identified, we could not assess whether this student was judged to be at risk based on his or her interview.

DISCUSSION

These data suggest that a mock interview experience for students will help identify those students who may need additional coaching or mentoring when interviewing for residency positions, and could improve their chances of successfully matching. A small number of students who did not perform well on their interviews were identified by faculty members, as well as a larger set of students who did not appear to be competitive for a residency spot in a specific specialty. Based on these predictions alone, it would be anticipated that up to 20 students would have difficulty with their interview process and be at high risk of not matching. This suggests that students were able to improve their interview skills and/or shift their specialty choices to improve their match success.

The data also show that the group that participated in the mock match interview matched at a rate higher than those who elected not to participate. Some of this may have been feedback provided during or after the mock interview, but the difference in success rates also could be influenced by volunteer bias. Students who took the time to participate in the mock match program may have been more motivated to succeed than the students who chose not to invest the time in this session. It should be noted, though, that several students who failed to participate had expressed a desire to have a mock interview, but were unable because of scheduling conflicts, including many who were engaged in out-of-town rotations. Finally, it also is possible that our instrument overestimated the risk that students would not match, so this group are "false positives." Additional data with more students in a situation where we could track the predictions and outcomes of individual students would be helpful.

Our results also demonstrate that the program was well received by students and faculty members. Nearly all participants agreed that future student classes should participate in a similar program, although after their real-life residency interview experiences, the students' recommendations were less positive. In reviewing student comments provided in the follow-up phase of the survey, many suggested that the mock interview was more intense than their actual interviews.

While supportive of a mock match program, the results should be interpreted in light of several limitations. First, the participants were self-selected, which may have produced volunteer bias resulting in a qualitative difference between participants and nonparticipants. Secondly, predictions regarding students' risks of not matching may not be as robust as those during an actual interview because the opinion was based on a single evaluator rather than an entire residency program team. Finally, the follow-up comments from students in January may have been affected by both volunteer and recall bias.

Overall, these preliminary results suggest a value in providing mock match interview experiences for our students. Future applications of the program might benefit from a requirement of the exercise and more structure in both interview and feedback from faculty.

Prior Presentation: This work was presented as a poster at the AAMC Central Group on Educational Affairs/Central Group on Student Affairs 2015 Spring Meeting in Columbus, Ohio, April 9-12, 2015.

Funding/Support: None declared

Financial Disclosures: None declared.

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Bowel Perforation Associated With Infliximab Use in a Pediatrics Patient

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ABSTRACT

Crohn's disease (CD) is an idiopathic inflammatory disease of the gastrointestinal tract and typically causes inflammation with granuloma formation. Biologic agents like infliximab (IFX) that target tumor necrosis factor alpha (TNF- α), have emerged as important medications for treating refractory CD. With increasing use, there also are reports of rare but potentially fatal complications associated with exposure to TNF- α , such as bowel perforation. We present a case report of spontaneous bowel perforation in a child with Crohn's while on IFX therapy, and a review of the current literature. The purpose of this report is to alert physicians to this rare association, especially in pediatric patients with intestinal strictures.

INTRODUCTION

Crohn's disease (CD) is an idiopathic inflammatory disease of the gastrointestinal tract. It is believed to result from environmental triggers in a genetically susceptible patient and may involve any site of the gastrointestinal tract in a segmental or focal distribution. Classic CD typically causes transmural inflammation with granuloma formation. Biologic agents like infliximab (IFX) that target the inflammatory cytokine, tumor necrosis factor alpha (TNF- α), have emerged as important medications for treating refractory CD. With increasing use, there also are reports of several rare adverse events associated with exposure to the medication. We present a case report of spontaneous bowel perforation in a child with CD while on IFX therapy.

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CASE PRESENTATION

An 11-year-old boy with a 4-year history of CD presented with sudden onset of abdominal pain and nonbloody, nonbilious emesis, 1 week after completing a third dose of IFX. The patient had been treated with 100 mg of azathioprine daily for the previous 2 years. He had further received several courses of steroids during intermittent flares. His weight-to-height ratio declined from the 50th percentile when he was first diagnosed to the 10th percentile before ini-

tiation of IFX. Magnetic resonance enterography (MRE) of the abdomen before the start of IFX therapy revealed moderate contiguous wall thickening and abnormal enhancement along a long segment of distal ileum indicating active CD.

The patient's symptoms improved considerably following IFX, with improvement in height-to-weight ratio as well. One week after completing his third dose of IFX, the patient had acute abdominal pain, nausea, and vomiting. Physical examination was significant for abdominal rigidity and guarding. Abdominal radiograph revealed air fluid levels with possible colitis and ileus consistent with intestinal obstruction. A computed tomography scan of the abdomen and pelvis (Figure 1) revealed a long segment of abnormally dilated and thickened distal ileum with multiple tiny interloop abscesses, as well as a significant amount of free fluid in the pelvis. Complete blood count was remarkable for leukocytosis (21.2x103/uL; range 4.5-13.5x103/uL), with leftward shift. C-reactive protein was slightly elevated at 1.8 mg/ dL (range 0-1.0 mg/dL) on admission, which further increased to 24.2 mg/dL in 48 hours. Liver function tests and blood electrolytes were within normal limits. Blood culture was obtained, which was negative after 5 days.

The patient was started on metronidazole and piperacillin/ tazobactam along with supportive care. A nasogastric tube was placed to achieve gastric decompression, and total parenteral nutrition was started. This resulted in significant symptomatic improvement; however, he continued to have high nasogastric output, suggesting ongoing intestinal obstruction. An MRE after 1 week of antibiotics revealed persistent terminal ileal stricture (Figure 2). The bowel inflammation and interloop abscesses showed interval resolution.

A consult with pediatric surgery was obtained because of persistent intestinal obstruction. The patient underwent laparoscopic-assisted ileocecectomy with primary staple anastomoses to repair the bowel perforation. He recovered well postoperatively without further complications.

DISCUSSION

TNF- α is a potent pro-inflammatory cytokine with a prominent role in inducing inflammation in CD. TNF- α stimulates recruitment of inflammatory cells to local tissue sites of inflammation, induces edema, and activates coagulation and granuloma formation.¹ Stool and serum TNF- α concentrations were found to be significantly increased in children with active CD.^{2,3} IFX is effective in mediating mucosal healing, induction and maintenance of remission, improvement in extra-intestinal manifestation, and growth in children.⁴ Currently there are 3 anti-TNF therapies approved for treatment of CD in the United States: IFX, adalimumab, and certolizumab pegol. Compared to the other 2 agents, IFX has demonstrated greatest efficacy for induction of remission.⁵

Several adverse effects have been reported in association with IFX therapy. A retrospective cohort study conducted by Vermeire et al⁴ evaluated the safety of IFX in patients with inflammatory bowel disease over a 14-year period and reported an increased risk for malignancies and serious infections. In another study,⁶ serious infections, infusion reaction, autoimmune phenomenon like arthritis, drug-induced lupus, autoimmune hemolytic anemia, optic neuritis, skin eruptions were noted, with 15 malignancies and 8 nonmelanoma skin cancers reported. Bowel perforation was not reported in any of these patients.

In a case control study by Eshuis et al,⁷ higher occurrence of free perforation, defined as intestinal perforations necessitating emergency surgical intervention, in CD patients was revealed with anti-TNF therapy compared with those without anti-TNF therapy (OR 4.1, 95% CI, 1.1-16.).⁷ The study population did not include pediatric patients. Since a larger number adults are reported with perforation after anti-TNF therapy, it raises an important question of whether cases are being underreported in the pediatrics population.⁷

The first case of ileal perforation was reported in a 30-yearold heart transplant patient who presented with an ileal perforation after IFX treatment for CD. This patient also received other medications including corticosteroids, mycophenolate mofetil, and cyclosporine A.⁸ An elderly smoker diagnosed with ankylosing spondylitis developed lung cancer during treatment, further complicated by perforation of a metastasis to the sigmoid colon.⁹ Among the pediatric population, free perforation 13 days after an Figure 1. Computed Tomography of the Abdomen and Pelvis With Oral and Intravenous Contrast



The coronal image shows thickened and dilated distal small bowel loops. The arrow indicates the site of a small bowel wall defect and an adjacent small contained abscess.

Figure 2. Magnetic Resonance Enterography





initial dose of IFX for CD was reported in a 17-year-old girl.¹⁰ To our knowledge, ours is the second case of spontaneous perforation reported in a pediatric patient.

While the mechanism associated with bowel perforation and IFX therapy remains largely unclear, it is postulated that IFX prevents activation of the inflammatory cascade and recruitment of neutrophils in the bowel wall, physiological pathways very important to sealing of the perforation. Since TNF- α also acts as a growth factor, neutralization by IFX may reduce the inflammatory mass formation that usually encapsulates imminent perforations.¹¹ It is also postulated that increase in oral intake after IFX therapy results in further dilation and increase in the pressure inside the bowel segment proximal to the stricture. A combination of decreased inflammatory cascade and increased pressure and dilation of proximal bowel may lead to perforation.¹²

Most CD patients develop a mild chronic disease pattern. The relapsing nature of the disease leads to bowel occlusion, fistula, and abscess formation. A significant number of patients will require surgical treatment within a 10-year time frame.¹³ Syed et all⁴ analyzed a cohort of CD patient to compare postoperative complications following intra-abdominal surgery in patients exposed and unexposed to anti-TNF agents. It was observed that use of TNF- α therapy less than 8 weeks before abdominal surgery was independently associated with an increase in infectious and surgical complications. However, this association might be biased, since TNF- α is used in sicker patients who are more likely to have postoperative complications. Prevention of postsurgical recurrence of CD is an important task. However, there is data that IFX administration after surgery prevents recurrence. Low dose IFX post surgically seems to be a safe and cost-effective strategy in the long term management of CD patients.15

CONCLUSION

Spontaneous bowel perforation is a rare but potentially fatal complication associated with IFX therapy in patients with CD. The purpose of this case report is to alert physicians to this rare association, especially in pediatric patients with intestinal strictures. Severe abdominal pain, protracted emesis, and abdominal distension in patients on IFX therapy with intestinal strictures should raise suspicion. **Acknowledgments:** The authors thank the Marshfield Clinic Research Foundation's Office of Scientific Writing and Publication for assistance in preparing this manuscript.

Funding/Support: None declared.

Financial Disclosures: None declared.

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Removal of Endobronchially Placed Vascular Self-Expandable Metallic Stent Using Flexible Bronchoscopy

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ABSTRACT

Self-expanding metallic stents (SEMS) are commonly placed in malignant airway obstruction and sometimes in benign obstruction. Complications from SEMS placement are common, especially after 30 days from deployment. SEMS removal can be complicated and often involves significant resources. We report a case of a 78-year-old man with small cell carcinoma who underwent placement of a Luminexx endovascular stent in his right main stem bronchus, complicated by stent migration after initiation of chemotherapy. Stent removal was performed by flexible bronchoscopy, utilizing forceps inserted via a working channel, as well as a goose neck snare operated parallel to the bronchoscope. The patient was discharged the same day with no complications.

INTRODUCTION

Self-expanding metallic stents (SEMS)are used frequently in palliative therapy of lung cancer patients with poor prognosis and poor response to therapy. SEMS also are employed in airway strictures after lung transplantation and in certain benign airway diseases.¹⁻⁴ Most common complications include stent migration, infection, and granulation although bleeding, stent fracture, tumor ingrowth, and restenosis occur as well. Most recent case series estimate the SEMS complication rate at 20% to 30%.⁵⁻⁶ Most complications occur after 30 days, and as such are more common in benign stenosis given patients' survival. The relative ease of SEMS placement created a large population of patients presenting with subsequent complications. Complications of SEMS removal have been described in literature.⁷⁻⁸ Removal of SEMS is usually more difficult than their placement. They can

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be removed with rigid or flexible bronchoscope, although rigid bronchoscope is utilized in the majority of published cases.⁹ With granulation and stenosis, debulking with neodymium-doped yttrium aluminium garnet (Nd:YAG) laser or argon plasma coagulation, cryotherapy and balloon dilation are usually effective.

CASE PRESENTATION

This is a case of a 78-year-old man who presented to a primary physician's office

with worsening dyspnea. A computerized tomography (CT) scan showed significant narrowing of the right main stem bronchus secondary to a tumor in the right upper lobe. The patient was referred to interventional radiology from the primary care physician's office. Under fluoroscopic guidance, a noncovered SEMS Luminexx 14 mm x 4 cm stent (BARD Peripheral Vascular, Tempe, Arizona) was placed in the right main stem bronchus with improvement in patient's dyspnea.

Subsequently, the patient was referred to a pulmonologist who performed bronchoscopy. An endobronchial stent was noted in the right main stem bronchus. Malignant tissue was obtained by endobronchial biopsy performed on the tissue squeezing through the stent into the lumen. A diagnosis of small cell carcinoma was made; the patient was referred to oncology and started chemotherapy.

The patient then presented to ICU with neutropenic fever and worsening cough. A chest x-ray obtained on admission showed the stent migrating into the trachea with a significant decrease in the tumor size in the right upper lobe. Neutropenic fever was treated with antibiotics and Neupogen, and the patient was discharged a few days later.

Given the stent migration, the patient was taken to the operating room (OR) by pulmonary service in an outpatient manner 35 days after stent placement. Rigid bronchoscope was available Figure 1. Luminexx Stent Migrating From Right Main Stem Bronchus Into the Trachea









if needed. Moderate sedation with propofol was administered, and the patient was intubated with a size 10 endotracheal tube (ETT). An Olympus 1-T180 bronchoscope (Olympus Medical Systems, Tokyo, Japan) was inserted via ETT into the trachea and the stent was visualized (Figure 1). Olympus FB-211D forceps were used via the working channel to grasp the prongs. Next, an Amplatz Goose Neck snare (ev3 Endovascular Inc, Plymouth, Minnesota) was inserted into the ETT parallel to the scope in order to squeeze the proximal portion of the stent into a more conical shape. The stent's prongs were guided into the snare with forceps. Next, the stent was slowly advanced into the distal end Figure 3. Trachea and Carina After Reintubation



of the ETT and the bronchoscope; the ETT and the stent held by the snare and forceps were removed in toto (Figure 2). The patient was then reintubated and the bronchoscope was reinserted with only minimal bleeding noted at the stent site (Figure 3). Cryotherapy was applied to the right upper lobe tumor. The patient was then awakened and extubated, and he was discharged home on the same day.

The patient underwent a follow-up bronchoscopy 3 days later. An airway exam showed patent right main stem bronchus, and the cryotherapy-treated tissue that sloughed off was suctioned out.

At 10 months after the procedure (November 2015), the patient is alive and doing relatively well, considering his diagnosis.

DISCUSSION

SEMS have seen an increase in their use with broader access to flexible bronchoscopy and ease of deployment compared with silicone stents. SEMS are easily deployed even by an inexperienced operator. This is in contrast to SEMS removal, where difficulty of removal has been recognized and well described. Increased numbers of SEMS placements possibly also results in a number of SEMS deployed without right indications. Because of these concerns, proposed algorithms outlining indications for stent placement have been published by experts in the Interventional Pulmonology field, British Thoracic Society Guidelines and jointly by European Respiratory Society and American Thoracic Society.¹⁰⁻¹² Additionally, in case of benign obstructions, the indications are even narrower. This led the Food and Drug Administration (FDA) to issue a black box warning recommending restraint in placing SEMS in benign obstructions.¹³ That warning stems from patients with benign obstructions living long enough to experience these complications. However, even in cases of malignant obstructions, airway stents are not cure-all, save-all devices, and they carry significant risk of complications even when managed at experienced medical centers.

In the case described above, the Luminexx vascular stent, which is not an airway stent, was placed by a physician with little experience in airway stenting, without fiberoptic guidance or debulking with tissue diagnosis that ordinarily are part of the guidelines for airway stent placement. The stent's structure differs from the dedicated pulmonary SEMS such as Ultraflex (Boston Scientific) or AREO (Merit Endotek) that have a built-in suture that, when pulled, facilitates easier removal by elongating the stent into a more conical shape. This approach was not possible in this particular case, as the Luminexx stent's prongs protrude outward. In fact, once deployed the stent is not designed for removal at all.

It is not the intention of this case report to discuss the events leading to the stent placement. Rather, we present an approach to a stent removal by an addition of a goose neck snare that was inserted parallel to the bronchoscope. The goose neck snare allowed for improved maneuverability and positioning of a stent that had no dedicated removal system and outward-pointing prongs. This facilitated squeezing the stent into a more conical shape for safe removal. The traditional approach to SEMS removal involves rigid bronchoscopy and considerable resources in terms of OR time, hospitalization, and need for general anesthesia. This can potentially lead to SEMS being left in place, since rigid bronchoscopy might not be readily available or the medical center might lack experienced clinicians.

There are only a limited number of reports describing the use of flexible bronchoscopy for SEMS removal.¹⁴⁻¹⁵ All of these publications report no adverse events and show that, with careful planning, flexible bronchoscopy can be a reasonable first step in SEMS removal. Even when faced with a stent that was not designed to be retrieved, the removal proved to be relatively easy and the patient experienced no complications. This suggests that a dedicated endobronchial SEMS is potentially easier to remove, especially in the short term.

In addition, this and other reports show that the relative ease of the SEMS removal in the very short term with a flexible bronchoscope supports the potential use of these stents as a bridge to a more definite therapy such as chemotherapy or radiation, with an intent of removing SEMS before anticipated complications occur after the 30-day period. If SEMS removal is not anticipated, a patient's predicted survival should play a major role in the decision whether to place the stent in the first place. Patients also should be made aware of the potential complication risks and their frequency, as well as the medical center's experience with airway stenting. Finally, the best way to avoid SEMS complications is to avoid placing the stent in the first place if alternative therapies are available.

CONCLUSION

Removing an endobronchial self-expanding metallic stent can reasonably be approached with flexible bronchoscopy as the initial attempt. Use of a tool such as a goose neck snare inserted parallel to the bronchoscope might provide additional benefit in maneuvering and securing the stent. In addition, a similar technique could be adopted in retrieval of other foreign bodies that might prove difficult to grasp with a single tool such as a basket or forceps. SEMS placement should only be considered after all other alternatives have been exhausted.

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Small Cell Carcinoma of the Gall Bladder

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ABSTRACT

Small cell carcinoma of the gall bladder (SCCGB) is a rare condition, with only 53 prior cases reported in the world literature when our case was first diagnosed. Our patient was found to have limited stage disease and was treated with sequential laparoscopic cholecystectomy, eto-poside/carboplatin chemotherapy followed by consolidating loco-regional radiation therapy. She is alive and well without evidence of disease more than 132 months since diagnosis. We describe here our experience in the diagnosis, staging workup, treatment, and surveillance of a case of SCCGB and review the published literature. Treated aggressively with currently available methods, patients with limited stage SCCGB can have an excellent prognosis. The authors' intent is to provide a reasonable plan of treatment for other physicians facing such an unusual patient.

CASE PRESENTATION

Our patient is a white woman who was 63 years old when she presented to the emergency department with chief complaints of extreme abdominal pain and emesis. Her social history was remarkable for smoking cessation 3 years earlier. An evaluation including ultrasonography showed her to have cholelithiasis and cholecystitis as well as a thickened area within the lumen of the gall bladder (Figures 1 and 2).

Laparoscopic cholecystectomy was performed the following day, after which she made an uneventful recovery. The significant pathologic findings were: a 7.1 x 4.5 x 2.6 cm tan-red, hemorrhagic mass lying primarily within the body of the gallbladder and extending into the infundibulum, cholecystitis, cholelithiasis, and a small perforation of the gall bladder. The histology is shown in Figure 3. The cystic duct was involved and the serosa had been perforated by the tumor. Lymphovascular invasion also was noted.

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With regard to surgical margins, tumor was present on the serosal surface of the gall bladder, but the cystic duct margin was negative for tumor. Two gallstones were found within the gall bladder. On immunoperoxidase staining, the tumor cells were positive for synaptophysin, AE1-AE-3, cytokeratin CAM5.2, high molecular weight cytokeratin and cytokeratin 7. The tumor cells were negative for chromogranin, carcinoembryonic antigen, cytokeratin 20, epithelial membrane antigen (EMA) and vimentin.

In order to complete her tumor staging,

a positron emission tomographic (PET) scan with fused computerized axial tomographic (CT) imaging was performed (Figures 4 and 5). Two lesions in the gastrophepatic ligament measuring 3.7 x 2.3 cm and 1.5 x 1.6 cm were noted. They had maximum standardized uptake values (SUV) of 17.2, while lesions posterior in the head of the pancreas had a maximum SUV of 14.2. These maximal SUV values strongly suggested a malignant etiology rather than an infectious or inflammatory process. There was no evidence of distant metastases.

Chemotherapy was initiated 30 days after the operation. It consisted of 4 courses of etoposide (100 mg/m2 daily x 3) + carboplatin (area under the curve [AUC] x 6) beginning on day 1 of each 21-day cycle. Following completion of the chemotherapy, she received consolidation radiation therapy. The plan was designed to deliver 45 Gray units (Gy) while sparing appropriate volumes of kidney mass, liver, and spinal cord to keep the likelihood for normal tissue toxicities to a negligible level. This was very well accomplished. Forty percent of her right kidney received > 18 Gy; about 35% of the left kidney received > 18 Gy; 40% of her liver received > 30 Gy. Her clinical target volume received 45 Gy.

The patient experienced expected side effects of nausea and fatigue. However, her nausea was not effectively controlled with aggressive antiemetics until the daily dose was reduced to 1.25 Gy. After that, her tolerance was excellent and she completed therapy without significant impact on her weight or oral intake.



At the conclusion of therapy, she had no uncontrolled toxicities, no significant pain, and was taking oral nourishment and fluids well. She did not require readmission to the hospital for symptom management. She was followed with physical examination, complete blood count, and comprehensive metabolic profile every 3 months for the first 2 years, and every 6 months for the next 3 years, then annually. CT scanning was repeated at those same intervals. Her surveillance computerized axial tomographic scans have remained normal. She remains alive and asymptomatic more than 132 months from diagnosis.

DISCUSSION

Small cell carcinoma of the gall bladder (SCCGB) is rare. A search of the English medical literature showed only 53 reported cases.¹ The prognosis is poorer than that of differentiated carcinomas of the gall bladder. It tends to affect an older patient population occurring at a median age of 65 years, with a female preponderance of 76%.² It is frequently associated with chole-lithiasis. Metastasis to lymph nodes occurs in 88%, liver 88%, lung 23%, and peritoneum 19%.² The 5 patients treated with surgery and chemotherapy by Moskal et al² had a median survival of 13 months. This represents an improvement over historical reports. Those with pure small cell tumors had a median survival of 9 months, while those with mixed tumors had a median survival of only 4.5 months.²

Pathologic characteristics may include large size at diagnosis, extensive necrosis, and propensity for submucosal growth. Histologically, these tumors are composed predominately of small round cells usually mixed with spindle cells, both of which have hyperchromatic nuclei, inconspicuous nucleoli, and scan cytoplasm. The growth pattern is usually diffuse. However, focal nesting or festoon patterns can be seen. Most of these tumors show neuroendocrine differentiation by immunohistochemistry Figure 2. Transverse Ultrasound of the Gall Bladder Showing the Intraluminal Mass





rated the serosa (hematoxylin-eosin, original magnification x200). The cystic duct margin was negative for tumor. Lymphovascular invasion was present. The cells demonstrated positivity for synaptophysin, AE1-AE3, cytokeratin CAM5.2, high molecular weight cytokeratin and cytokeratin 7. It was negative for chromogranin, carcinoembryonic antigen, cytokeratin 20, EMA and vimentin.

such as synaptophysin, chromogranin, or neuron-specific enolase. Immunoperoxidase stains showed focal carcinoembryonic antigen in 3 of 11 tumors studied by Albores-Saavedra et al.³ Molecular changes have been identified as well. On electron microscopy, neurosecretory granules are sometimes present.⁴ Significantly, frequent occurrences of p53 (75%), p16INK4a (33%), and K-RAS codon (17%) mutations have been identified.^{4,5}

Our experience demonstrated that this disease can exhibit FDG hyper-avidity on PET scanning (Figures 4 and 5).

As recently as the year 2000, Mithal et al reported a case in

Figure 4. PET Scan of Gall Bladder Bed Showing Area of Intense Uptake





The multiple areas of 2,3-fluorodeoxyglucose avidity were interpreted to be areas of likely gastrohepatic ligament involvement by the carcinoma. That finding coupled with the absence of distant spread on the PET scan led to the conclusion that the patient had limited stage disease.

Reference	No. Cases	No. LTD/No. EXT	Responders/ Total No. Treated	Type of Chemotherapy and Radiation Therapy (RT)	Survival (months)
Fujii et al ¹					
Case	1	0/1	1/1	cis-DDP + VP-16 no RT	12+
Review	35	12/23	2/19	no chemotherapy specified	7/13
Albores-Saavedra et al ³	19	1/18	2/19	CAV + nitrososurea, no RT	7, 13
Lane et al ⁷	1	0/1	1/1	carbo + VP-16, 45 Gy in 25 fractions	11
Okamoto et al ⁸	1	0/1	1/1	cis-DDP + gem, no RT	7
Bahadur et al ⁹	2	0/2	1/1	cis-DDP + VP-16, no RT	5, 9
Pavithran et al ¹⁰	1	0/1	1/1	5FU + cis-DDP—>docetaxel + carbo, No RT	13
Ron et al ¹¹	1	0/1	1/1	cis-DDP + VP-16, no RT	6+

Abbreviations: LTD, limited stage disease; EXT, extensive stage disease; cis-DDP, cis-Platinum; CAV, cyclophosphamide, doxorubicin (Adriamycin), vincristine; carbo, carboplatinum; gem, gemcitabine; VP-16, Etoposide; 5FU, 5-fluorouracil; Gy, Gray.

a 25-year-old woman.⁶ They asserted that chemotherapy is not known to improve survival. Our patient has shown a totally different possibility. Her therapy was based upon principles of treatment promoted by the National Comprehensive Cancer Network guidelines. We chose to apply consolidating radiation therapy after the course of chemotherapy out of concerns for increased hepatotoxicity from simultaneous application of these modalities. It appears that, just as in the treatment of small cell carcinoma of the lung, only patients with limited stage disease are capable of complete remission and long-term survival.

A summary of the different chemotherapy regimens and radiation therapy employed is shown in the Table. The most commonly used regimens employed a platinum derivative plus VP-16. This is currently typical treatment of small cell carcinoma of the lung. The stage of disease was not apparent in the other patients. The addition of local, consolidating radiation therapy after completion of the chemotherapy may be a discriminating difference between our patient and others reported. Had extensive stage disease been present at the time of diagnosis, then we would not have applied radiation therapy with curative intent. Based upon our experience, a patient with SCCGB should undergo rigorous staging to include PET/CT scanning. If localized or even loco-regional disease allows a designation of limited stage disease, we recommend sequential chemotherapy with VP-16 and carboplatin followed by loco-regional radiation therapy with curative intent. This approach can offer hope to these rare patients. Since so little literature exists regarding this disease, our report is offered in the spirit of providing guidance and cautious optimism to physicians faced with the dilemma of treating such an unusual patient.

Acknowledgments: Dr Haid would like to thank Dr Al Benson III of Northwestern University and Dr Bernard Levin, formerly of M.D. Anderson Cancer Center (Houston, Texas), for graciously discussing this case when the diagnosis was first made.

Funding/Support: None declared.

Financial Disclosures: None declared.

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Proceedings from the 2015 Annual Meeting of the American College of Physicians, Wisconsin Chapter

The following abstracts were presented during the 60th Annual Meeting of the Wisconsin Chapter of the American College of Physicians in 2015. Internal medicine residents from each of Wisconsin's 5 residency programs presented their research and/or unusual clinical experience via case- and research-based vignettes and posters. All of the vignettes as well as the winning posters are published here. Additional poster presentations are available online in an appendix and can be accessed at https://www.wisconsinmedicalsociety.org/_WMS/publications/wmj/pdf/115/2/15_ACP_Abstract_Book_PRINT.pdf

CASE-BASED VIGNETTES

A Case of Cardiac Sarcoidosis

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Definition: Sarcoidosis is a multisystem disorder of unknown etiology characterized by the accumulation of T lymphocytes, mononuclear phagocytes, and noncaseating granulomas in involved tissues, usually the lungs. Cardiac involvement can range from a benign, incidentally discovered condition or a life-threatening disorder causing sudden death.

Introduction: Autopsy studies indicate that cardiac involvement is present in up to 70% of cardiac sarcoidosis, depend on the location and extent of granulomatous inflammation, and can include conduction abnormalities, arrhythmias, cardiomyopathy, congestive heart failure, and sudden cardiac death (SCD).

Case: This case involves a 33-year-old woman with history of presumed sarcoidosis 4 years ago when she presented with salivary gland enlargement and noted to have bilateral hilar adenopathy. More recently, she was hospitalized for deep vein thrombosis and bilateral pulmonary emboli. She was incidentally found to have Mobitz I atrioventricular block and ejection fraction (EF) 35%. She subsequently endorsed intermittent substernal nonradiating chest pain associated with dyspnea and was transferred for further care.

During her hospitalization, cardiac magnetic resonance imaging (MRI) showed biventricular dysfunction, chamber dilation with left ventricular aneurysmal changes, and delayed gadolinium enhancement consistent with cardiac sarcoid (linear midmyocardial enhancement as well as patchy areas) and also a prior lateral transmural infarct. She was treated with biventricular internal cardio-defibrillator (ICD) placement, beta-blockers, angiotensin-converting enzyme inhibitors, high-dose prednisone, and methotrexate.

Discussion: In patients with systemic sarcoidosis, cardiac involvement is a common but often asymptomatic phenomenon. Clinical manifestations of cardiac sarcoidosis include conduction disease, arrhythmias, SCD, heart failure, valvular disease, and myocardial damage simulating infarction. Ventricular arrhythmias resulting in sudden death are common, and risk stratification for primary prevention of SCD should be performed in all patients with cardiac sarcoidosis regardless of left ventricular EF. Cardiac sarcoidosis should be on the differential for young patients who present with new arrhythmias, conduction disease, or heart failure. Patients with extracardiac sarcoidosis should undergo evaluation for clandestine cardiac involvement.

Catastrophic Multiple Organ Dysfunction Syndrome From a Mysterious Source

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Introduction: Multiple Organ Dysfunction Syndrome (MODS) can present with an apparent cause, but a poor historian with lack of follow-up presents as a challenge for both work-up and prognosis.

Case: A 49-year-old man presented with clouded mental state, bilateral lower limb swelling/pain, loose stool, and oral bleeding with a medical history of atrial fibrillation, mitral and tricuspid valve annuloplasty, polysubstance abuse, and a questionable diagnosis of schizoaffective disorder. Exam showed gingival bleeding, irregular heart rhythm, and absent pulse in left lower extremity. Labs showed acute renal failure, coagulopathy without schistocytes or microangiopathy, and anion gap metabolic acidosis-all of unclear cause. Arterial ultrasound revealed occlusion of left profunda femoris, posterior tibial and dorsalis pedis arteries; chest x-ray and chest computed tomography (CT) confirmed loculated right pleural effusion and multifocal airspace opacities. Antithrombin III, plasminogen, factor assay results showed factor VIII high, ruling out disseminated intravascular coagulation (DIC); working diagnosis had shifted towards catastrophic antiphospholipid antibody syndrome. Further studies included auto-platelet antibodies positive, anticardiolipin antibodies negative. Renal

biopsy was completed after stabilization to evaluate potential small vessel vasculitis, but results were inconclusive. This patient's course was complicated, and in light of emergent diagnosis, plasmapheresis and high-dose methylprednisone was initiated, followed by 1 week intravenous immunoglobulin (IVIG), dabigatran for arterial thrombus of the left leg, and rituximab for idiopathic thrombocytopenic purpura (ITP) as well as possible autoimmune disease. After initial stabilization of septic shock, respiratory failure, acute renal failure, and biventricular heart failure with EF of 9%, patient deteriorated and died from cardiac arrest during recovery. The final working diagnosis was catastrophic small vessel vasculitis.

Discussion: This case illustrates difficulty in diagnosis and management of catastrophic small vessel vasculitis where MODS develops quickly and without clear cause. Restrictions with biopsy and time course for antibody reaction further delay diagnosis. High index of suspicion should be maintained in cases MODS of unclear etiology.

A Curious Case of Cardiac Arrest

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Introduction: Anomalous coronary artery origin and hypertrophic obstructive cardiomyopathy (HOCM) are the most common causes of sudden cardiac death (SCD) in young people. Here we describe a case of SCD in a patient who had both conditions.

Case: A 28-year-old African American man was lifting weights when he had a sudden syncopal episode and went into cardiac arrest. He was in ventricular tachycardia and shocked back into rhythm following 5 rounds of cardiopulmonary resuscitation (CPR). He was taken to an outside facility where an echocardiogram revealed asymmetric septal hypertrophy diagnostic of hypertrophic obstructive cardiomyopathy (HOCM). He was started on amiodarone drip and transferred to our facility.

Upon arrival he was alert and asymptomatic. The electrocardiogram showed a right bundle branch block and Q waves in the inferior leads. An angiogram was performed and showed an anomalous origin of the right coronary artery (RCA). A cardiac CT angiogram revealed the RCA originating from the left sinus of Valsalva and running a dangerous interarterial course between the pulmonary artery and the aorta. Regional compression of the RCA resulted in a slit-like vessel with a 15 mm course. Cardiothoracic surgery was consulted and performed a surgical unroofing procedure to decompress the RCA.

Discussion: Coronary artery anomalies are rare with an incidence of 0.3% to 1% based on angiogram and autopsy studies. Anomalous RCA arising from the opposite coronary sinus is associated with the highest percentage of SCD. Anomalous coronary arteries arising from opposite sinus (ACAOS) with an interarterial course that also have an intramural course are associated with worse outcomes.

The association of HOCM and anomalous RCA is very rare with only 3 to 4 cases reported in the literature. This combination appears to multiply the risk of SCD during physical exertion. Physicians should maintain a high index of suspicion for such conditions in young patients who present with sudden cardiac arrest.

1st Place Epstein Syndrome—A Rare Case of Thrombocytopenia

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Introduction: Epstein syndrome is one of the four clinical manifestations of a group of disorders known as myosin heavy chain 9 [MYH9]-related platelet disorders (MRPD). Here, we present challenges faced to arrive at MRPD diagnosis.

Case: A 36-year-old woman, gravida 1, para 0, was referred to the hematology clinic for persistent thrombocytopenia during pregnancy. Complete blood count (CBC) showed a platelet count of <10K. The patient previously was diagnosed with ITP at age 16 when she presented with menometorrhagia, thrombocytopenia, and giant platelets on peripheral smear. She was treated with steroids and IVIG with no response and underwent splenec-

tomy and rituximab infusions, despite which the platelets remained low. During this whole time she was on oral contraceptive pills for menorrhagia and therapeutic platelet transfusion support. Two years later she presented with renal failure, hematuria, and proteinuria and underwent renal transplant. Around that time, patient noted blurred vision and difficulty hearing and was diagnosed with cataracts and sensorineural hearing loss respectively. The diagnosis of her thrombocytopenia was then attributed to a congenital defect related to Alport's syndrome due to the constellation of findings noted above. No pertinent family history on her mother's side but the patient was unaware of the family history on her father's side. On the basis of refractory macrothrombocytopenia and syndromic features (renal failure, hearing loss, cataracts), the patient was offered genetic testing. Gene sequence analysis revealed that she had a mutation of myosin heavy chain-9 (MYH9) consistent with Epstein's syndrome.

Discussion: This case illustrates the challenges encountered in arriving at a diagnosis of MRPD. Genetic syndromes should be an important differential in younger persons presenting with thrombocytopenia. Early recognition of this disorder is vital to avoid erroneous interventions due to incorrect diagnoses.

3rd Place

Fulminant Hemophagocytic Lymphohistiocytosis Triggered by Epstein-Barr Virus

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Introduction: Hemophagocytic Lymphohistiocytosis (HLH) is a life-threatening hyperinflammatory syndrome with high mortality even with appropriate treatment. The low incidence and nonspecific constellation of presenting symptoms makes HLH a diagnostic challenge.

Case: A 36-year-old man with a history of rheumatoid arthritis (RA) presented to a local emergency department (ED) with a diffuse desquamative rash, oral ulcerations, and intermittent high grade fevers after recent initiation of Leflunomide therapy for RA. He

was treated with broad-spectrum antibiotics for presumed sepsis as well as gancyclovir for cytomegalovirus (CMV) colitis but continued to decompensate, thus was transferred to a tertiary care center.

On admission, the clinical diagnosis of drug rash with eosinophilia and systemic symptoms (DRESS) syndrome was made based on fever, facial edema, desquamative rash, peripheral eosinophilia, diffuse left anterior descending coronary artery (LAD), and acute hepatitis. Treatment was initiated with highdose intravenous (IV) corticosteroids, however, he became progressively pancytopenic on hospital day 3, at which anemia workup revealed severely elevated ferritin (>6k) and lactate dehydrogenase (LDH) and infectious workup was notable for positive Epstein-Barr virus polymerase chain reaction (PCR). The patient became increasingly hypoxic and encephalopathic ultimately necessitating intubation on hospital day 4. Bone marrow biopsy was performed revealing Epstein-Barr virus-encoded small RNA-positive cells but no evidence of hemophagocytic cells. Endoscopic biopsies from the outside hospital arrived on hospital day 5, which were reviewed and demonstrated phagocytosis of hematopoietic elements consistent with HLH likely triggered by EBV reactivation. Thus, corticosteroids and gancyclovir were continued and ultimately tapered as ferritin levels and serum EBV levels decreased. He was discharged to a rehabilitation facility but then readmitted near the end of his steroid taper with systemic inflammatory response syndrome (SIRS) concerning for recurrent fulminant HLH. During the admission, IL-2 levels were noted to be high, thus the diagnosis of macrophage activation syndrome (MAS), a variant of HLH was considered. He ultimately failed therapy with high-dose corticosteroid and rituximab thus treatment with etoposide chemotherapy was initiated.

This case illustrates the diagnostic challenge of HLH, primarily attributable to its nonspecific constellation of symptoms and rarity. Early consideration and detection based on revised HLH criteria is critical to reducing morbidity and mortality in this hyperinflammatory syndrome.

Hepatitis B Prevalence in the Milwaukee Hmong Community

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Background: Although the United States is considered a low endemicity region for hepatitis B and has had low hepatitis B prevalence rates (0.3%) since the implementation of routine vaccination for newborns in 1991, the Hmong population in the United States has rates of up to 20%, according to prior studies in California, making hepatitis B one of the greatest ethnic health disparities in the Hmong-American community. Based on the 2010 Census, the Hmong population in the Milwaukee-Waukesha-West Allis area numbers 11,904, making it the fourth-largest Hmong population of all major metropolitan areas in the nation. However, prior to our efforts, there had never been an attempt to determine the prevalence of hepatitis B in the Milwaukee Hmong community. Our aims were two-fold: to conduct Milwaukee's firstever series of free hepatitis B screening and education events in the Hmong community, and to determine the prevalence of hepatitis B in this high-risk population.

Methods: From 2013 to 2015, we organized a total of 5 hepatitis B screenings in the Milwaukee Hmong community. We utilized various locations such as local Hmong markets, churches, and festivals in order to maximize our number of screening participants. To advertise the screenings, we posted fliers at local restaurants/markets and aired hepatitis B segments on the local Hmong radio station. At the screenings, participants filled out a personal information and demographic form, answered a survey about basic hepatitis B knowledge, received a 10 to 15 minute educational session from a health care provider or trained coordinator, and had their blood drawn. All blood samples were centrifuged onsite and sent to LabCorp in Chicago to be tested for hepatitis B surface antigen (HBsAg) and hepatitis B surface antibody (HBsAb).

Results: In total, 176 participants were screened over 5 events. Eighteen participants (10.2%) who tested positive for hepatitis B infection (HBsAg +, HBsAb -). 51 (29%) were nonimmune and designated "susceptible" to infection (HBsAg -, HBsAb -). One hundred two (58%) were immune (HBsAg -, HBsAb +) and 5 (2.8%) were designated as "gray zone" (HBsAg -, low HBsAb titers).

Discussion: Based on our screening results, the prevalence of hepatitis B in our screening population was 10.2%. Although lower than the 20% prevalence rate documented in prior studies, there is still a disproportionately high prevalence of hepatitis B in the Milwaukee Hmong community compared to the general US population. Equally important, 29% of our screening population was still susceptible to being infected with hepatitis B. Given these data, it is clear that hepatitis B is an important health disparity worth addressing in the Milwaukee Hmong community, and efforts to promote hepatitis B awareness and education should be continued.

Reactive Spondyloarthropathy After Infection With Chikungunya Virus

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Introduction: Chikugunya virus is an arthropod-borne virus transmitted by mosquitos. The virus has since spread to Southeast Asia, and with globalization and commerce, to Europe and the Americas. We describe here a case of reactive spondyloarthropathy affecting the axial skeleton in a patient with serologically confirmed Chikungunya disease.

Case: The patient is a 21-year-old woman who presented with a chief complaint of right buttock pain that radiated to the back of the thigh. She initially was able to walk with only minor pain but now was unable to move her leg in bed without having pain. The patient revealed that she was given a clinical diagnosis of Chikungunya virusrelated arthralgias 6 months prior while she was residing in Jamaica. During admission to our hospital, serological studies were sent and Chikungunya IgG was found to be positive, and IgM negative. She was started on ketorolac and oxycodone as needed. Upon discharge, the patient reported improvement in symptoms and she was sent home with meloxicam and oxycodone. She was seen in rheumatology clinic for follow-up and reported progression of pain. She was then started on prednisone 40mg daily and meloxicam was increased to 15mg daily. On telephone follow-up, patient reported her pain was significantly improved with a new medication regimen.

Discussion: Chikungunya relapses are characterized by joint pain and edema. Typically, the joints affected during the chronic phase are those that were affected during the acute phase. This case highlights a potentially novel finding associated with Chikungunya disease. Our patient was thought to have reactive spondyloarthropathy related to her history of Chikungunya infection. Even though no definite connection can be made with her symptoms and history of recent Chikungunya infection, her MRI findings were consistent with an infectious versus inflammatory disease process. Treatment for Chikungunya is based on symptom management with antiinflammatory drugs. There are no drugs to treat infected persons and no vaccines for prevention. Our patient initially was treated with NSAIDS but then required steroids due to worsening of symptoms. After treatment with prednisone, her symptoms improved. We do not know whether our patient would have benefited from a trial of prednisone initially or with another anti-inflammatory. With increasing world travel and global spread of this disease, there is an increasing need to recognize this infection and its possible long-term effects. In addition, clinicians should be familiar with treatment options to manage the persistent and often debilitating arthralgia.

Severe Hypothyroidism Precipitating Compartment Syndrome

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Introduction: Severe hypothyroidism was once a common diagnosis in the upper Midwest and was most commonly due to iodine deficiency. Some of its major clinical manifestations included goiter and cretinism. Since the advent of iodine supplementation, the incidence of severe hypothyroidism has fallen dramatically. Yet, cases of severe hypothyroidism are still seen occasionally. The most common cause in the 21st century is iatrogenic, ie, radioiodine ablation with subsequent inadequate thyroid supplementation. Clinical presentations are variable, and rarely are extreme cases seen (eg, myxedema coma).

Case: We present a case of a 51-year-old woman with previously diagnosed and treated hypothyroidism who presented with weakness, falls, and leg pain. She was subsequently diagnosed with bilateral anterior and lateral lower extremity compartment syndrome, necessitating urgent bilateral fasciotomies. She had no apparent cause for her compartment syndrome to include traumatic, thrombotic, or infectious; however, at presentation she was found to be severely hypothyroid: thyroxine $(T_4) < 0.10$ ng/dl, and thyrotropin (TSH) >100 uU/mL. She admitted to discontinuing her levothyroxine at least a few months prior to presentation. Thus, the ultimate cause of her compartment syndrome was felt to be tissue-related changes due to prolonged elevation of TSH. The pathophysiologic consequences of elevated TSH are well elucidated, and in her case likely included severe tissue hypertrophy and glycosaminoglycan deposition with consequent fluid retention, all in a person whose compartment morphology was probably susceptible. Despite compartment release and thyroid supplementation with liothyronine (T_3) and levothyroxine, she suffered significant myonecrosis and peripheral nerve damage, and has been left with significant functional deficits that include chronic neuropathic pain and limited strength and sensation in her lower extremities.

Thyrotoxic Periodic Paralysis: A Case Report

Vidita Divanm, MD, Samuel Godana, MD, Elaine Drobny, MD; Aurora Health Care Internal Medicine Residency Program, Milwaukee, Wis

Introduction: Thyotoxic periodic paralysis is a muscle disease characterized by abrupt onset of hypokalemia and flaccid muscle weakness.

Case: A 28-year-old Hmong-speaking woman presented with quadriparesis, more pronounced in lower extremities of few hours duration. Weakness started in early morning and patient was unable to walk by time of presentation. She has history of intermittent bilateral leg weakness in the last 6 years but with much less severity. She also endorses palpitation.

Physical exam was significant for thyromegaly, smooth skin, tachycardia, and proximal muscle weakness with muscle strength 3/5 in lower extremities and 4/5 in upper extremities. Labs were remarkable for potassium – 1.8, Mg 1.5, urine potassium - 4.6 mmol/L, TSH – <0.008 mcU/ml, T4 – 3.9 ng/dl, T3 – 18.7 pg/ml, TR Ab – 13.8 (<1 U/L), thyroid stimulating immunoglobulin – 2338. Weakness and tachycardia were resolved with potassium supplements and propranolol.

Discussion: Thyrotoxic periodic paralysis is most common among Asian population with a male predominance. Incidence is 2% in patients with thyrotoxicosis of any cause. Precipitating factors include high carbohydrate diet, infection, emotional stress, trauma, alcohol ingestion, and medications including insulin, corticosteroids, ß agonists, and diuretics. Mechanisms include sudden intracellular influx of potassium mainly in muscles, mutation of skeletal muscle, specific inward rectifying potassium channel, and increased sodium and potassium ionstimulated adenosine triphosphatase (Na,K-ATPase) activity directly by hyperthyroid state and indirectly by hyperinsulinemic and hyperadrenergic state. Treatment is replacement of potassium and nonselective beta blocker. Treatment with potassium supplements and nonselective beta blockers should be initiated upon diagnosis and the serum potassium level should be frequently monitored to prevent rebound hyperkalemia.

2nd Place An Unusual Case of Fever of Unknown Origin

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Introduction: Q fever is an uncommon disease caused by *Coxiella burnetti*, a Gramnegative intracellular bacterium. The organism can cause both acute and chronic illness in humans; the most common presentation of chronic Q fever is endocarditis in a patient with underlying valve disease. The disease presents a diagnostic challenge due to its vague symptoms and variable presentations.

Case: An 84-year-old woman presented for evaluation of persistent fevers occurring several times per week for 2 years. She had a

bovine mitral valve replacement for mitral regurgitation 6 years prior. The patient had no exposure to farm animals, but previously had owned dogs, raccoons, and rabbits. The patient had been evaluated multiple times for fevers and work-up had included unremarkable transthoracic and transesophageal echocardiography, bronchoscopy, bone marrow biopsy, temporal artery biopsy, positron emission tomography (PET), multiple CT scans of the head, chest, abdomen, and pelvis, and multiple negative blood cultures. One year prior to admission, she was found to have worsening mitral regurgitation and underwent repeat mitral valve replacement. One month after this, the patient was admitted with acute mitral valve regurgitation due to a flail mitral valve leaflet and again underwent mitral valve replacement. After undergoing extensive work-up for infectious, malignant, and rheumatologic etiologies of her fever, the patient was found to have elevated Q fever phase I and phase II antibodies. The diagnosis of Q fever was made, and the patient was started on doxycycline and hydroxychloroquine. Unfortunately, the patient died 4 months later from complications of progressive heart failure.

Discussion: Q fever is primarily a zoonotic disease caused by Coxiella burnetti. Dogs, goats, and sheep are the most common hosts, and humans acquire the disease through inhalation of aerosols from contaminated soil or animal waste. In the acute phase, the disease presents with fever, hepatitis, or pneumonia and is typically self-limited. Fewer than 5% of infected persons will develop a chronic form of Q fever, which develops months to years after the initial infection. Endocarditis is the most common form of chronic Q fever, compromising 60% to 70% of cases. Endocarditis occurs almost exclusively in patients with preexisting valvular disease. These patients may experience repeated prosthetic valve failure, as did our patient. Other manifestations of chronic Q fever include osteomyelitis, chronic hepatitis, chronic vascular infections, and chronic pulmonary infections. Routine blood cultures are negative in chronic Q fever, and valvular vegetations are rarely present. Diagnosis is based on the serological testing for antibodies against Q fever phase

I and phase II antigens. Treatment of Q fever endocarditis is an 18-month course of doxycycline and hydroxychloroquine. While the mortality for acute Q fever is low (<2%), Q fever endocarditis has a mortality of 19% with appropriate treatment and is uniformly fatal if untreated.

An Unusual Case of 'High' Creatine Kinase

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Introduction: Rhabdomyolysis is a rare but serious side effect of synthetic marijuana compounds that is not currently well documented in the literature. We report a case of rhabdomyolysis induced by the use of synthetic marijuana in a young African American man that led to subsequent hospitalization.

Case: In this case, other etiologies such as metabolic, rheumatic, infectious, and traumatic were ruled out. The patient reported no other substance abuse and had not been in a stagnant or resting position for any prolonged period of time. After further discussion with the patient and his family, he admitted to having used the substance known as "K2" in the days leading up to and the day of admission. After vigorous hydration and monitoring, laboratory analysis showed resolution of his initial rhabdomyolysis and the patient was discharged in a stable condition. Follow-up in outpatient clinic assured continued resolution and no other readily available cause could be found for his presenting condition. This case serves as a reminder for physicians that they should consider synthetic marijuana in the list of differential diagnosis for nontraumatic rhabdomyolysis in an appropriate patient profile and clinical setting.

RESEARCH-BASED VIGNETTES 2nd Place

Allogeneic Hematopoietic Cell Transplantation for Multiple Myeloma: Impact of Disease Risk and Conditioning Regimen

Jonathan Kapke, Medical College of Wisconsin, Milwaukee, Wis

Background: Allogeneic hematopoietic cell transplantation remains the only curative

option for multiple myeloma (MM) despite improved survival with novel agents. We analyzed our single center experience of allogeneic hematopoietic cell transplantation (AHCT) in MM over a decade and the factors associated with outcomes.

Methods: We analyzed the outcomes of 78 consecutive MM patients receiving allotransplants from matched sibling or unrelated donors (n = 8) between 2002 and 2013 at our institution. The primary objectives were to compare overall survival (OS), progressionfree survival (PFS), and nonrelapse mortality (NRM) between different conditioning regimen intensities. Sixty patients received allotransplant after nonmyeloablative regimens (regimen 1) - low-dose 200-cGy total body irradiation (TBI) +/-fludarabine (N = 52), while 18 patients received higher intensity conditioning (regimen 2) consisting of fludarabine + melphalan 140 mg/2 (11), myeloablative cyclophosphamide + TBI (6) and highdose melphalan (1).

Results: Patient, disease, and transplantrelated characteristics by conditioning regimens are given in Table 1. Median follow-up of survivors was 49.4 months; 27 (35.1%) had high-risk cytogenetics defined as t (4:14), 17p deletion or t (14:16). On multivariate analysis, older age (heart rate [HR] 1.06, 95% CI, 1.015-1.120, P=0.0112), lack of a complete remission (CR) at allotransplant (HR 0.15, 95% CI, 0.046-0.485, P=.0015 in CR), longer interval from autologous transplant to AHCT (6.0 m vs. 5.2 m) (HR 1.04, 95% CI, 1.008-1.072, P=0.01) and CMV reactivation (HR 3.2, 95% CI, 1.41-7.52, P=0.005) were significant for higher mortality. Complete remission at the time of transplant was significant for superior PFS (HR 0.332, 95% CI, 0.115-0.959, P=0.041 in CR). Increasing age (HR 1.07, 95% CI, 1.001-1.146, P=0.047) and nonremission at transplant (HR 0.164, 95% CI, 0.035-0.770, P = 0.021) were associated with higher nonrelapse mortality. Disease risk by both fluorescence in situ hybridization (FISH) and ISS did not have any effect on the overall survival, progression-free survival, transplantrelated mortality, or disease progression.

Conclusions: Higher intensity conditioning

and non-myeloablative regimens were associated with similar survivals. Young patients in complete remission receiving allotransplants following autotransplant benefited with better progression-free survival. Patients with high-risk FISH or ISS had similar outcomes as those with lower risk suggesting an ameliorating effect on biologic risk. Future trials should address those with high-risk disease and utilize allotransplant in those in remission and earlier in the disease course.

Nutritional Parameters in Pregnant Patients With Inflammatory Bowel Disease

Abby Lochmann-Bailkey, MD, Sumona Saha, MD, MS; University of Wisconsin School of Medicine and Public Health, Madison, Wis

Background: Weight gain recommendations in pregnancy are based on women's prepregnancy body mass index (BMI). Prior research, however, suggests that BMI may not be the best indicator for nutritional status in patients with inflammatory bowel disease (IBD) due to discordances between BMI, percentage of ideal body weight, and the degree of micronutrient deficiencies. The goal of this study was to determine the prevalence of abnormal nutritional parameters among pregnant women with IBD based on their pre-pregnancy BMI.

Methods: We retrospectively reviewed the medical records of women with IBD enrolled in the Pregnancy in Inflammatory Bowel Disease and Neonatal Outcomes (PIANO) registry at the University of Wisconsin School of Medicine and Public Health. Subject demographics, disease characteristics, and nutritional data (serum albumin, folate, vitamin D, vitamin B12, and iron studies) were abstracted from source documents and the medical record. Descriptive statistics were calculated. Logistic regression after adjusting for multiple confounders was performed.

Results: Seventy patients were included in this analysis (Crohn's disease=41, ulcerative colitis=26, indeterminate colitis=3). Forty-three patients (66%) had normal pre-pregnancy BMI, 23 (32%) were overweight or obese, and 4 (6%) were underweight. Thirty-one percent of patients had abnormal albumin levels, 32% of patients had abnormal vita-

min D levels, 30% of patients had abnormal vitamin B12 levels. Twenty-eight percent of patients had abnormal iron levels and 32% had abnormal ferritin levels.

Further statistical analysis will be performed to identify the correlation between pre-pregnancy BMI and nutritional parameters.

1st Place

Reducing Readmission Rates in Acute Pancreatitis Through Patient Education and Risk Assessment

Jordan Vulcano, DO, Anthony Caceres, MD; Aurora Health Care Internal Medicine Residency Program, Milwaukee, Wis

Introduction: Early hospital readmissions are a direct burden on both our patients' wellbeing and health care system as a whole. Acute pancreatitis is a top offender in this category with a consistently higher than average 30-day readmission, around 19%. This quality improvement project/study aims to reduce the rate of acute pancreatitis 30-day readmission rates at several hospitals through patient education and a readmission risk assessment tool.

Methods: Project was conducted out of 3 Aurora hospitals with a total of 18 patients admitted with acute pancreatitis predominantly to the Internal Medicine Teaching Service (IMTS) between February 2014 and October 2014. Patients were seen within 1 to 2 days of admission and provided one-on-one education with handout on acute pancreatitis. In addition, a 30-day pancreatitis readmission predictor (PRP) score was used to classify patient as low (5%), moderate (17%), or high (68%) risk for readmission via Epic "Dot Phrase." Subsequent readmissions, 14 day follow-up, total hospitalizations, and ED visits were tracked through present. This was compared to readmission rates of a randomly selected control group of 18 patients admitted with acute pancreatitis.

Results: Patient had a PRP score ranging from 0 to 4, with an average of 1 (rounded from 0.78). Of the 18 patients in the study group, only 2 were readmitted within 30 days for pancreatitis (11.1%). The control group had 3 readmissions within 30 days (16.7%). Patients with alcohol-related pancreatitis were more likely to have a higher PRP (1.0)

and readmission rate at 20% (2 out of 10).

Conclusion: This quality improvement project, while small in size and scope, was able to reduce readmission rates from 16.7% to 11.1% through simple tools. This project serves as a starting point for reducing readmissions not only in acute pancreatitis patients but potentially other diagnosis-specific readmission initiatives.

PRESENTED POSTERS 1st Place

Flailing at the Diagnosis: An Atypical Presentation of Multiple Myeloma

Richard Martin, MD; University of Wisconsin Hospital and Clinics, Madison, Wis

Although 70% to 80% of multiple myeloma patients present with bone pain, benign musculoskeletal etiologies such as costochondritis or contusion are far more common. Plain films can help detect lytic lesions, however, such lesions are only identified after 30% to 50% of trabecular bone is lost. By the time this degree of bone loss occurs, patients are at high risk for fracture. In the case of rib fractures, this can lead to flail chest and serious pulmonary complications.

Over the course of 7 months, a 56-year-old man with a history of nephrolithiasis and GERD presented several times to his local ED and PCP with 7-9/10, sharp, left-sided chest pain, exacerbated by movements and coughing. Exam was pertinent only for reproducible tenderness to palpation along his left sternum and ribs, with otherwise normal vitals. Labs were notable for the following trends: HgB 13.3, 12.1, 11.8, 11.2; Creatinine 0.96, 1.18, 1.38, 1.75; UA protein 30, hemoglobin 1+, RBC 0-1; Calcium 9.3 and stable. Troponin and d-dimer negative. Imaging included EKG WNL; CXR x3 only notable for progressive bibasilar atelectasis; exercise EKG and nuclear stress WNL. Initial diagnostic impression was costochondritis versus other musculoskeletal injury. Treatments consisted of physical therapy, ibuprofen, tizanidine, hydrocodone, lidocaine patches, gabapentin, and eventual rheumatology referral. Meanwhile, his pain continued to worsen, spreading to his pelvis and thighs and resulting in progressive disability.

Unfortunately, only after developing acute hypoxic/hypercarbic respiratory failure was he found to have multiple lytic rib lesions via full skeletal survey. Kappa free light chain 1100, beta-2 microglobulin 6.38, and bone marrow biopsy with clonal plasma cells >10% verified multiple myeloma, for which he received bortezomib and dexamethasone. After 4 months of ICU care, he eventually achieved stable independent pulmonary functioning, transitioning to inpatient rehabilitation with good recovery.

This case illustrates the importance of keeping a broad differential for musculoskeletal chest pain, particularly when initial treatments fail and when new bone pain locations emerge in conjunction with renal and hematologic abnormalities. In such cases, it is important to obtain a full skeletal survey to maximize the likelihood of lytic lesion detection along with serum and urine protein electrophoresis with light chains to help identify this disease before serious complications occur.

2nd Place

Systemic Lupus Erythmatosis Presenting as Thrombotic Thrombocytopenic Purpura

Kushal Patel, MD, Richard Battiola, MD, Abhay Jella, MD; Aurora Health Care Internal Medicine Residency Program, Milwaukee, Wis

Introduction: Differential diagnosis of thrombotic thrombocytopenic purpura (TTP) is broad and includes idiopathic causes. Many of these idiopathic causes are thought to be a feature of autoimmune disorders like systemic lupus erythematosus (SLE).

Case: A 26-year-old African American woman with a history of an ectopic pregnancy presented to the ED with significant worsening of menstrual bleeding. She had upper and lower extremity petechiae, platelet count of 12,000 that was new, anemia, moderate schistocytes on peripheral blood smear, normal renal function, no mental status change, and was admitted with a diagnosis of TTP. Patient was treated successfully with steroids and plasmapheresis. She was found to have low ADAMTS13 activity of <5%. Two months after this episode, patient was admitted with dyspnea and tachycardia where a CT scan of chest was diagnostic for

pulmonary embolism. Patient was initiated on warfarin for anticoagulation.

Further work-up over the next few months revealed history of fingers discoloration to purple with exposure to cold as well as minor joint pains in hands, knees, and shoulders. Serologic work-up revealed high antinuclear antibody, ribonucleoprotein, Smith antibody, and antichromatin antibodies. Patient was diagnosed with systemic lupus erythematosis and started receiving treatment with hydroxychloroquine.

Discussion: Although rare, there are cases reported of TTP in association with SLE in literature where presentation of TTP had occurred around the time of SLE diagnosis. This raises a notion that autoimmune process like SLE may be responsible for precipitating TTP. Rarity of this phenomenon makes it difficult to study; however, further research needs to be done in this area to explore the relationship between autoimmune diseases and TTP, if indeed there is one.

3rd Place

Thiamine Deficiency Mimicing Diabetic Ketoacidosis

Lara Voigt, Paul Knudson; Medical College of Wisconsin, Milwaukee, Wis

Thiamine Introduction: deficiency, or beriberi, is a disease of malnutrition first described in the Javan population in the late 1800s. Thiamine deficiency has many manifestations, including high cardiac output cardiomyopathy and acute fulminant lactic acidosis. It can also mimic poorly controlled diabetes, as was exhibited in the case discussed below. With the increasing incidence of diabetes, this case is an important reminder that alternative etiologies for refractory diabetics and suspected noncompliance should be considered, including severe thiamine deficiency.

Case: A 50-year-old woman with history of chronic pancreatitis and pancreatic insufficiency secondary to alcohol abuse presented with significant hyperglycemia despite being admitted for diabetic ketoacidosis (DKA) 1 week prior and adherence to her insulin regimen. The week between admissions, she was advised to drastically increase her insulin regimen due to blood sugars (BS) >400mg/ dL, almost doubling both her daily insulin

glargine (from 40 to 60U) and her lispro sliding scale (from a base dose of 14 to 26). Despite these changes BSs remained >500mg/dL. On admission her BS was >800mg/dL with an anion gap metabolic acidosis (AGMA) with ketones on urinalysis. Treatment for DKA was initiated, the AGMA and ketones rapidly resolved, and she was transitioned back to a basal and sliding scale insulin regimen. Within 12 hours, however, her BSs rose from 120 to >600mg/dL. On repeat evaluation urine and blood ketones were negative, but lactate was elevated, and she displayed evidence of high cardiac output cardiomyopathy, hyperesthesia, nystagmus, and mild confusion. She reported a 150-pound weight loss over 18 months despite adequate intake, and reported that she depended on \$14/month in government assistance for food. Suspicion for malnutrition with severe thiamine deficiency arose and intravenous thiamine supplementation was initiated. Within 24 hours her AGMA and lactate levels normalized and her insulin requirements fell drastically. By discharge her insulin regimen had decreased to 14U glargine with a 14+1U lispro algorithm. In this case, dietary thiamine deficiency led to multiple manifestations of thiamine deficiency, including poor glucose uptake due to the inability to carry out key steps in intermediate metabolism, which resulted in hyperglycemia and AGMA due to lactic acidosis.

Discussion: Diabetes is at epidemic proportions in the United States and it is starkly apparent that while ample food is available, the most easily acquired food is lacking in basic nutrients while being calorie dense. It is also apparent that those who need the best nutrition are often least likely to be able to find or afford it. This case is an example of an "old world" disease of malnutrition arising in a culture of abundance. This lack of access can drastically affect not only a patient's development of disease, but their ability to control it. It is important for clinicians to recognize the impact of social and economic hardship on a patient's health; that noncompliance is often evidence of a lack of access, not a lack of insight.





Jeffrey Grossman, MD

Robert N. Golden, MD

One UW Health

Jeffrey Grossman, MD, and Robert N. Golden, MD

n July 1, 2015, University of Wisconsin Hospital and Clinics Authority (UWHCA) and UW Medical Foundation (UWMF) became a single organization, governed by the legislation that created UWHCA in 1996 and branded as "UW Health." As proud members of the academic health center (AHC) that includes the UW School of Medicine and Public Health (UWSMPH), UWMF and UWHCA had compelling reasons to enter into the complex legal arrangement that brought the organizations together.

"The plight of academic health centers in the United States is the plight of the health of our citizens," wrote Dr. Catherine DeAngelis, then editor of *JAMA*, in a May 2000 piece in that journal.

AHCs—especially those that embrace, as the UWSMPH does, a public health mission should support the "public good," the wellbeing of all of our citizens no matter what

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Jeffrey Grossman, MD, is the interim chief executive officer, UW Health, and the senior associate dean for clinical affairs, University of Wisconsin School of Medicine and Public Health (UWSMPH); Robert N. Golden, MD, is dean of the UWSMPH and vice chancellor for medical affairs, UW-Madison. their societal circumstance. AHCs are also, of course, the principal source of health care professional education and training, as well as generators of new knowledge to improve Hospitals and Clinics Authority and UW Medical Foundation. The merger of the hospital and physician components of what we have for years called "UW Health" was very much predi-

The new UW Health affords us the opportunity to create a modern concept for health care delivery and population health. In coming together, we have built a strong foundation for a new perspective that fully focuses on those we serve.

the health of individuals and populations. We embrace these missions, but in doing so, we accept the financial burden of their support. This support must come largely from the clinical enterprise because, at current levels of funding, education, training, and research programs simply cannot pay for themselves.

The extra financial responsibility borne by AHCs is ironic given their deserved reputation as existing at the inefficient end of the health care spectrum. Yet, there is no special dispensation for AHC inefficiency, so we must create as much efficiency as we can in the delivery of health care services. We must strive to be both academic and marketplace leaders.

And so we come to the integration of UW

cated on creating a more efficient infrastructure that would allow us to support the work of the AHC of the future. In creating the merger, we honor the UW Health brand, which for years has represented a "virtually" integrated organization.

UWHCA and UWMF have been highly successful in their own right and have established great collaboration that has evolved since each organization's inception about two decades ago. Ultimately, however, we have been separate organizations with different leadership, governance structures, financial responsibilities, and cultures. We came to realize that fine tuning our organizational alignment was insufficient for long-term success as we navigate the demanding and rapidly changing health care landscape. We think our new streamlined structure will allow us to adapt rapidly, act strategically, respond to value and population health imperatives, and help squeeze waste from our care delivery system.

Looking beyond gains in efficiency, the creation of UW Health affords us the opportunity to create a modern concept for health care delivery and population health. Our merger is not a takeover of the hospital by the doctors or a physician group capitulating to a hospitalcentric world. Viewing the health care world through the lens of either a hospital or physician group creates a limited perspective that would not help us achieve the "Triple Aim" of better care for individuals and better health for the population at the lowest possible cost. In coming together, we have built a strong foundation for a new perspective that fully focuses on those we serve. We are well into our first year of the new UW Health. It has been an exciting and productive time, composed of equal parts reflection on our path forward and action to take us in that direction. In particular, we are focused on creating better pathways for strategic decision making and communication in our large organization, a new model for the "flow" of funds throughout the organization to support clinical and academic excellence, a robust implementation of our commitment to population health, and continuous exploration of expanding relationships in the region.

As UWMF and UWHCA have come together to form the new clinical enterprise, UWSMPH remains an inextricable part of UW-Madison. Our faculty physicians remain dual employees of UW-Madison and UW Health. A crucial goal of our merger was to maintain the proper balance between our academic and clinical missions. We have memorialized UW Health's ongoing support of the UWSMPH through longterm financial agreements, as well as a governance structure that will have the UWSMPH dean serve in alternate terms as the chair and vice-chair of the UW Health Board.

Dr Jim Yong Kim, when he was president of Dartmouth University, said, "In my view, the rocket science in health and health care is how we deliver it." In creating a new UW Health, we have a chance to define our future as a health care delivery system that goes beyond the traditional trappings of medicine, to create new ways of thinking about and caring for each other. We launch this new endeavor with excitement, enthusiasm, and optimism about our ability to serve the state of Wisconsin and beyond.

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Statewide Blood Pressure Improvement Challenge

Jay A. Gold, MD, JD, MPH; Ashley Green, MA

he impact of heart disease in America is staggering. It continues to be responsible for 1 of every 4 deaths in the United States and costs more than \$300 billion each year in treatment and lost economic productivity. Those costs continue to rise. Eighty million US adults have hypertension, and more Americans are dying from complications of it than they were a decade ago. Despite our efforts, the prevalence of hypertension continues to climb, with more than 40% of adults anticipated to have high blood pressure by 2030. According to a 2013 National Health and Nutrition Examination Survey, there are an estimated 1.3 million adults with hypertension in Wisconsin alone, and a little over 53% remain uncontrolled. Of those nearly 700,000 residents of this state who have uncontrolled hypertension, about 40% are unaware of their status.

Many deaths from heart disease and stroke could be avoided with relatively simple measures. Just eliminating the key risk factors leading to chronic disease would prevent at least 80% of cases of heart disease, stroke, and type

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Jay A. Gold, MD, JD, MPH, is Senior Vice President and Chief Medical Officer at MetaStar. Ashley Green is a Project Specialist at MetaStar. This material was prepared by the Lake Superior Quality Innovation Network, under contract with the Centers for Medicare and Medicaid Services (CMS), an agency of the US Department of Health and Human Services. The materials do not necessarily reflect CMS policy. 11SOW-WI-B1-16-13 030116 2 diabetes—not to mention 40% of all cancers.¹ Those leading attributable risks, according to a Wisconsin Department of Health Services report,² are well known to most physicians: high blood pressure, high cholesterol, smoking, and diabetes.

Unfortunately, based on data from the

and Smoking cessation. Million Hearts is not only a clinical push; it convenes a wide range of partners and programs with the goal of helping Americans live longer and healthier lives. The campaign recognizes that its ambitious goal requires a collective effort from a wide variety of stakeholders, including physicians, phar-

Through work with both primary care providers and home health agencies, MetaStar is endeavoring to implement evidence-based practices that support and promote proven intervention measures across the state.

2007-2008 National Health and Nutrition Examination Survey (NHANES),3 nearly 50% of US adults have at least 1 of the 3 preventable risk factors already mentioned: uncontrolled hypertension, uncontrolled high cholesterol, or smoking. To address this public health concern, the Centers for Disease Control and Prevention (CDC) and the Centers for Medicare & Medicaid Services (CMS) established Million Hearts in 2011, a national initiative to prevent 1 million heart attacks and strokes by 2017. The campaign has as its 4 pillars those clinical interventions that have been proven to reduce cardiovascular morbidity and mortality most effectively. These are known as the "ABCS" measures: Aspirin therapy when appropriate, Blood pressure control, Cholesterol control,

macists and pharmacies, community groups, employers, government agencies, and patients themselves.

This national Million Hearts campaign forms the foundation for several cardiac initiatives on which MetaStar and its stakeholder partners are currently collaborating. MetaStar, in its partnership with Stratis Health (Minnesota) and MPRO (Michigan) as the Lake Superior Quality Innovation Network, is funded by CMS to work to improve cardiac health and to reduce cardiac health care disparities. This task focuses on alleviating disparities for cardiac outcomes and care, prioritizing proper blood pressure measurement and control. Through work with both primary care providers and home health agencies, MetaStar is endeavoring to implement evidence-based practices that support Million Hearts and promote a greater focus on the ABCS measures across the state. An AHRQ-sponsored national research project, the Healthy Hearts in the Heartland (H3) consortium likewise focuses on strategies that are advocated by the Million Hearts initiative. This work employs 2 complementary approaches to quality improvement focused on the ABCS measures: point of care (POC) strategies and population management strategies. Finally, MetaStar has been invited by the Wisconsin Department of Health Services (DHS) to participate in the latter's recently awarded Association of State and Territorial Health Officials (ASTHO) Million Hearts Learning Collaborative grant. The focus of this initiative is to build and support sustainable links between health care organizations, public health, and the community that reinforce and enhance the larger goals of the Million Hearts campaign. This current work is ongoing in 3 designated Wisconsin communities: Milwaukee, West Allis, and Green County.

A key entity in this undertaking is the Wisconsin Heart Disease and Stroke Alliance (HDSA), which is convened by the DHS quarterly and brings together stakeholders from Wisconsin's government, nonprofit, and professional organizations to advance the larger goal of improving the cardiac health of Wisconsin's residents. On the basis of the collective momentum of the previously discussed cardiacfocused initiatives across the state, DHS and other HDSA partners including MetaStar, with the support of the national Million Hearts team, has launched a statewide Wisconsin Blood Pressure Improvement Challenge that runs through the end of this year. The primary goal of this Challenge is collecting cardiac health focused success stories that can be distilled and disseminated as new best practices for hypertension control in the state. With already nationally recognized cardiac health champions such as Christopher Tashjian of Vibrant Health Family Clinics in Ellsworth-a 2-time winner of the Million Hearts Hypertension Control Challenge-the HDSA is confident that there already exist other Wisconsin-based organizational efforts and individual successes that only need to be brought to light. Although a critical part of the fight against heart disease takes place in the clinical setting, the challenge recognizes that much of that fight happens well beyond and far upstream of that point as well. MetaStar and its partners in the HDSA strongly encourage health care organizations, clinicians, and their community partners to submit entries for consideration. For additional information on this challenge, please visit The Atrium, Wisconsin's clearinghouse for the Million Hearts Initiative, via the MetaStar website: http://www.metastar.com/providers/ clinics-and-physician-offices/the-atrium/.

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Katherine Sanders has a BS, MS and PhD in Industrial & Systems Engineering from UW-Madison. She specializes in human factors and sociotechnical systems engineering, essentially the health and productivity of people at work. Her academic work as an occupational stress researcher gave rise to a commitment to design programs to support professionals in high burnout occupations. She's one of a small number of PhD systems engineers focused on occupational health, and has a specific interest in the well-being of healers.







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