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Official publication of the Wisconsin Medical Society

Analyzing Wisconsin's environmental health landscape

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COVER THEME
Analyzing Wisconsin's environmental health landscape

The articles in this issue of the Wisconsin Medical Journal *demonstrate how environmental health touches many areas of Wisconsin and those living in Wisconsin. From a report ranking environmental health to a review of the use of honey for diabetic foot ulcers, these articles illustrate the range of Wisconsin's health landscape.*

Cover design by Mary Kay Adams-Edgette.

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

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Service to others defines 2008 honorees for Wisconsin Medical Society Physician Citizens of the Year

Steve Busalacchi

For most hard-working people, retirement is a time to exhale from a busy work life and relax a bit. But James Allen, MD, a retired ophthalmologist from Madison, chose another route. Doctor Allen not only contributes professionally to Wisconsin Medical Society activities, but he chose to embark on a long, challenging and ultimately successful quest to convince the US Congress to do the right thing on behalf of blind veterans.

And while Scott Walker, MD, of Fennimore, is not retired, he is cut from the same cloth as Dr Allen. In addition to his full-time medical practice, Dr Walker serves as medical director of a free clinic. He inspires his patients and his colleagues alike in his selfless dedication to serving those in need.

> *"It was very motivating to get a tangible reminder that the Wisconsin Medical Society cares about serving the underserved. If I can show direction and provide ideas for involvement, perhaps more people will pick up the lead and move forward."*
>
> *— Scott Walker, MD*

Perhaps you now have a better idea of why the Wisconsin Medical Society was unable to select just 1 doctor to honor for humanitarian service this year. The Physician Citizen of the Year Award has traditionally been bestowed upon 1 physician who demonstrates a commitment to his or her community through volunteer or charitable activities.

"[But] we had a good problem this time in selecting our 2008 Physician Citizen of the Year," said outgoing Wisconsin Medical Society President Clarence P. Chou, MD, at the April 11 presentation ceremony in Madison. "There were too many fine candidates."

Allen sees an injustice

Doctor Allen learned that one of his patients who had recently lost vision in his remaining eye after previously suffering total vision loss while serving in the U.S. military would not receive additional benefits. He saw a need and began investigating what could be done about this, seeking the help of Congresswoman Tammy Baldwin.

"The 7-year journey we are here to commemorate, known as the Dr. James C. Allen Veteran Vision Equity Act, was not the result of partisan bickering or cable pundits duking it out," said Baldwin aide Brett Watson, during a May 6 presentation before the Dane County Medical Society, "but rather a testament to American democracy and the perseverance of 1 caring and informed person to create change from the bottom-up."

Doctor Allen is responsible for helping to change federal law so disabled veterans who lost their vision in one eye because of their military service may get enhanced benefits should they lose vision later in the other eye.

"Doctor Allen can truly be said to be the one person behind this new law. Furthermore, he always has been a model of the public-spirited physician," said Jay Gold, MD, of Madison, who nominated Dr Allen for the award. "I believe Dr Allen provides a model to the medical community of how physicians

Family physician Scott Walker, MD, of Boscobel was named a 2008 Physician Citizen of the Year for his work establishing and running a free clinic.

James Allen, MD, a retired ophthalmologist, accepts one of two 2008 Physician Citizen of the Year Awards from Clarence P. Chou, MD, at the Wisconsin Medical Society Annual Meeting. Also pictured is Thomas Luetzow, MD. Doctor Allen was the force behind the Dr. James C. Allen Veteran Vision Equity Act.

can dedicate themselves to the common good over and above the good they do in direct clinical care."

As Dr Chou said during the formal awards presentation, "Doctor Allen may be a formally retired ophthalmologist, but he's never stopped working on behalf of patients."

Walking the talk

Scott Walker, MD, also goes beyond providing compassionate care to his patients, but to residents who can't afford to be traditional patients, as well. Doctor Walker, who practices family medicine, allergy, and obstetrics at Bluff Street Clinic-Boscobel, saw the increasing need in the community for a free clinic and took charge of the effort to establish and manage it.

Doctor Walker wasted no time in delving into this enterprise shortly after he began practicing at the clinic in 2006. He immediately began work with a group of dedicated volunteers to secure access to health care for uninsured patients.

"Doctors like Scott Walker help keep our health care system functional, as we try to reform it so we may more effectively serve patients," said Dr Chou. "Achieving health system reform has proven to be a difficult challenge indeed, but we are inspired to keep working at it because of the dedication of physicians like Dr Walker who roll up their sleeves and treat those in need rather than waiting for politicians to reach an agreement. That level of decency, generosity and empathy cannot be overstated."

Doctor Walker is equally admired by his partners in Boscobel. "Doctor Walker has a real passion for the uninsured," said Kurt Wilhelm, MD. "In fact, Scott was one of the first guys to sign up and volunteer. He's really championed the cause."

Doctor Walker is quick to share credit for the clinic's success. "At first, (the attention) was a bit embarrassing as it was a whole lot of people who made the free clinic possible, and this award should be shared many ways," he said, adding that the In Health Community Wellness Free Clinic went "from nothing to doors open in 6 months," largely due to the fundraising acumen of Robin Transo, a retired school teacher and community activist.

"It was very motivating to get a tangible reminder that the Wisconsin Medical Society cares about serving the underserved," said Dr Walker. "If I can show direction and provide ideas for involvement, perhaps more people will pick up the lead and move forward."

Where we live affects our health

John J. Frey, III, MD
Medical Editor, Wisconsin Medical Journal

None of us would argue with the idea that the context in which we live—family, neighborhood, schools, work, government, social services—affects our health. The social determinants of health have long been the focus of research in health policy, public health, and, increasingly, in applied population health. Those of us who provide health care know that our patients leave our hospitals and offices and return to daily life where they are challenged or supported to stay healthy or get better. The corollary of that notion is that those same forces that can keep people healthy can also contribute to illness or prevent them from getting well. The report in the May issue of the *Wisconsin Medical Journal* (Journal) on social determinants which affect the health of the citizens of Wisconsin showed that there is growing public awareness that things beyond hospitals and doctors' offices affect health in increasingly important ways (Public views on determinants of health, interventions to improve health, and priorities for government. *WMJ.* 2008;107(3):124).

The current issue of the *Journal* contains an important study that will undoubtedly be widely discussed in the state. Athens, Bekkedal, Malecki, et al report the results of their statewide study of environmental health factors associated with risks of poor health outcomes (Measuring the environmental health of Wisconsin's counties. *WMJ.* 2008;107(4):161). They consider information about the health effects of built environment (commuting, housing stock, lead levels) and the design of the communities in which we live, in addition to the traditional environmental health factors such as air and water quality. The study serves as a "report card" on a broad list of things that can—and should—be the focus for health improvement in communities statewide. As in most report cards of this type, the idea is to give counties that have increased risks an incentive to improve, and those that have lower risks to keep doing what they do well. This is not the final grade.

Environmental health factors seem beyond our control as individuals and as physicians. "How can I do anything about the air where I live?" "What can I do about streets and buildings?" Through events such as Earth Day, through environmental protection laws, and by a life of public service, Gaylord Nelson taught the world that there were, in fact, things that individuals could do to change their neighborhoods and communities in small but important ways. Public transportation, recycling, anti-smoking laws, decreased use of pesticides, local agriculture purchasing, and many other changes that have affected air and water in the cities and towns we live in came from a combination of public involvement and concern and the legislative process. Being an informed citizen does make a difference.

The report in this issue of the *Journal* is unlikely to cause all of Dane County (ranked no. 72), where I live, to move to Bayfield County (ranked no. 1), although most of the people in Dane County do seem to spend a lot of time "up North" in the summers. It is not clear if this migration is for the air and water or the just the muskies.

This environmental health report is a starting point. The public health and practicing sectors throughout Wisconsin can use the data from the report to begin conversations that should improve health risks in communities. The medical community obviously can't do this alone. By partnering with neighbors and talking together about health problems in the local environments, communities will become healthier through those conversations.

WISCONSIN MEDICAL JOURNAL

Measuring the Environmental Health of Wisconsin's Counties

Jessica Athens, MS; Marni Bekkedal, PhD; Kristen Malecki, PhD; Henry Anderson, MD; Patrick L. Remington, MD, MPH

ABSTRACT

Introduction: Environmental factors—such as air and water pollution, lead exposure in homes, or aspects of urban design—influence the health of a community. Monitoring these environmental health influences is a core function of public health, making it necessary to identify critical priorities and effectively target outreach and intervention efforts. This paper reviews the methods used to develop a summary measure of the environmental health of Wisconsin's 72 counties and the city of Milwaukee.

Methods: We collected publicly available data on 9 indicators of environmental health, divided into 3 constructs—air quality, water quality, and the built environment. We looked at how the counties ranked in each construct and then combined the estimates into a summary measure of environmental health. We ranked the summary measure from lowest to highest risk, with higher representing a worse physical environment.

Results: In 2007, Wisconsin regions with major metropolitan areas had the worst environmental health risk. In contrast, the 10 counties with the best environmental health were all located in rural areas of the state.

Conclusion: Publicly available data can be used to compare and contrast environmental health in Wisconsin's communities. Although the measures used to collect these data could be improved, the results can still be used in community health planning and improvement efforts.

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INTRODUCTION

The relationship between the physical environment and population health has long been documented.[1-3] In particular, individual contaminants found in the air, water, and residential dwellings are all attributes of the physical environment that lead to population exposures with negative health outcomes.[4-6] A growing body of literature also highlights the relationship between the built environment—particularly urban design—and health.[7] Environmental health includes all factors, both natural and human-made, that directly affect human health or the ecological balance necessary for long-term human health.[8]

Because of the relationship between environmental exposures and health outcomes, measuring and monitoring environmental health has long been a core function of public health. Environmental health influences are unique in that they require knowledge about the sources and distribution of hazards, potential for population exposures, and subsequent health effects. Further complicating matters, environmental and health agencies are often fragmented, and efforts to develop methods, data, and tools to assess the true impact of environmental factors are inadequate.[9-11]

In the Wisconsin County Health Rankings (Rankings), the University of Wisconsin Population Health Institute creates and ranks summary measures of population health outcomes. These are based on mortality and health-related quality of life, as well as health determinants, including summary measures of health care, health behaviors, socioeconomic factors, and the physical environment.[12] The goal of this paper is to review measures derived to assess the environmental health of communities in Wisconsin. The strengths and limitations of the existing physical environment measures are discussed, as well as future directions to improve assessment of the physical environment and its effect on health.

METHODS

Three constructs were developed to measure the health of a community's environment—air quality, water quality, and the built environment—in the 2007 Wisconsin County Health Rankings. The 9 physical environment indicators included in this report were selected based on their public availability for all 72 counties. Public availability refers to the ability to impute values for all counties from publicly available data, the frequency with which they are updated, and their known health effects.[13] Each construct contributes 33% to the overall summary measure. Table 1 lists the constructs and their indicators, as well as the weights each individual indicator contributes to the summary measure of the physical environment. For indicators with data available yearly, such as ozone and fine particulate matter, we averaged the 3 most recent years of data.

Air Quality

The air quality construct is measured with 4 indicators: cancer risk (cases per million); the respiratory hazard index, both from the US Environmental Protection Agency (EPA) and National Air Toxics Assessment (NATA); measures of fine particulate matter, defined as particulates smaller that 2.5 micrometers in diameter (<2.5 µm, $PM_{2.5}$); and ozone from the Bureau of Air Management, Wisconsin Department of National Resources (DNR). Several of the pollutants measured by NATA are known carcinogens that contribute to cancer incidence, including benzene, arsenic compounds, and carbon tetrachloride; noncarcinogenic pollutants include acrolein, chlorine, and formaldehyde. The pollutants measured in the respiratory hazard index, fine particulate matter, and ozone all contribute to decreased lung function, chronic bronchitis, asthma, and other adverse pulmonary effects.[3-4]

To determine the cancer and noncancer respiratory hazard risk due to air pollutants, NATA models exposure data for 33 air toxics considered most harmful to human health. The cancer risk measure estimates lifetime cancer risk attributable to these air toxics given a lifetime (approximately 70 years) of continuous exposure and is reported as the incidence of cancer per 1 million people. The respiratory hazard index measures the lifetime risk of non-cancer respiratory conditions also based on modeling of emissions data. If the hazard index is ≤1, no adverse health effects are expected. A hazard index >1 suggests a greater risk of respiratory conditions due to exposure to air pollutants. We used NATA's most current cancer risk and respiratory hazard index values (1999) for the 2007 Rankings.

Data on fine particulate matter and ozone are collected through the Wisconsin DNR's Air Monitoring Network in accordance with federal code established by the EPA.[14] As of March 2007, the DNR has 35 monitoring sites in 29 Wisconsin counties. Data for the 2006 Rankings are based on 3-year averages from 2003–2005. Average yearly values of fine particulate matter ($PM_{2.5}$), reported as µg/m^3, are based on data collected from sites in 18 Wisconsin counties. Each county was assigned an average yearly $PM_{2.5}$ value based on monitoring site results. For counties with more than 1 monitoring site, an average of the county site values was used; for counties without monitoring sites, an average value for counties in their region was used.

Ozone values, reported as parts per billion (ppb), are collected from sites in 29 Wisconsin counties; our data represent the 2004–2006 annual average design values. As with $PM_{2.5}$, ozone values for counties with more than 1 monitoring site are based on an average of the monitoring site values. To create the regions within Wisconsin, a boundary was drawn between counties exceeding the allowable limit for ozone (≥85 ppb), and those who were near the limit (75–84 ppb). Another boundary was drawn between the borderline counties (75–84 ppb) and those with a low risk of exceeding the limit (<75 ppb). These regions coincided with geographic location in the state, with the higher risk counties on the coast bordering Lake Michigan. Most counties without a monitoring site fell in the low risk group. Counties without measurements were assigned a value equal to the average of the counties within their region.

Water Quality

The water quality measure is comprised of 1 indicator: nitrate levels in water. Exposure to nitrates in drinking water is most notably associated with blue baby syndrome, but increasing studies suggest birth defects and cancer are among other potential negative health effects.[15-16] This indicator, created with 2006 data from the Bureau of Drinking Water and Groundwater, Wisconsin DNR, measures the percentage of the population on both private and municipal water supplies exposed to water with nitrate levels that exceed the EPA Preventive Action Limit (PAL) of 2 mg/L. Identification of wells exceeding the PAL allows intervention that ideally controls contamination before these water sources reach or exceed the Enforcement Standard (ES) of 10 mg/L.

The Built Environment

The last construct, the built environment, includes 4 measures. To provide a proxy for lead exposure, we include 2 indicators: percent of housing with increased

Table 1. Measures of the Physical Environment

Construct	Physical Environment Measures	Physical Environment Summary Measure Weight (%)
Air quality	Air quality cancer risk *Attributable risk of cancer due to inhalation of air pollutants (cases per million)*	8.3
	Air quality hazard index *Risk ratio for adverse, noncancer health effects due to inhalation of noncarcinogenic air pollutants*	8.3
	Fine particulate matter (<2.5 µg/m3)	8.3
	Ozone level (ppb)	8.3
Water quality	Nitrate levels in water *Percent of population exposed to water with nitrate levels >2 mg/L*	33.3
Built environment	Pre-1950s housing *Percent of housing stock built before 1950*	5.6
	Lead poisoned children *Percent of children tested positive for lead poisoning*	5.6
	Radon risk *Percent of homes tested with radon levels >10 pCi/L at the basement level*	11.1
	Commuting method: Driving alone *Percent of the labor force (age 16+) that reports driving alone to work*	11.1

lead risk (pre-1950s housing stock), available from the 2000 US Decennial Census, and percent of children under age 6 that tested positive for lead poisoning in 2006, provided by the Wisconsin Department of Health and Family Services (DHFS). In severe cases, lead poisoning is associated with cognitive and behavioral problems in children;[17-18] among adults, lead poisoning is associated with fertility and neurological problems.[6] The federal Lead-Based Paint Poisoning Prevention Act was not passed until 1973, but the Rankings uses a measure of pre-1950s housing stock since manufacturers began voluntarily limiting the use of lead as an additive after 1950.[19] In reference to the lead poisoning indicator, it is important to note that the figure is not from a random sample of children and should be interpreted with caution. Children in the cities of Milwaukee and Racine are tested more thoroughly; children elsewhere are tested only if they are determined to be at high risk of lead exposure.[13] Furthermore, a child must have a blood lead level of at least 10 µg/dL to qualify as "poisoned,"[20] though blood lead levels of 5-10 µg/dL can also result in decreased cognitive ability among children.[21] Since the Rankings rely on publicly available data, children with lower (<10 µg/dL) but potentially significant blood lead levels are not included in the sample.

In 2007, we added 2 new indicators to the built environment construct: radon risk and method of commuting. Radon exposure is the second leading cause of lung cancer, and the risk increases at greater radon concentrations. According to the EPA, the risk of lung cancer with lifetime exposure (approximately 70 years) to radon levels of 4 pCi/L is 4 in 1000 people for never smokers, and 6 in 100 for current smokers. The radon risk indicator uses 2006 data from DHFS and represents the percent of homes screened that have radon levels greater than 10 pCi/L. We selected this indicator because radon concentrations that exceed 10 pCi/L at the basement level of a residence correlate to a level of at least 4 pCi/L in the upper levels of the home. The EPA, based on the National Academy of Sciences' 1999 report on the health risks of exposure to radon, recommends that radon concentrations in occupied spaces of a residence not exceed 4 pCi/L.[22] As with the indicator percent of children screening positive for lead poisoning, the radon measure is not from a random sample of homes and should be interpreted with caution.

The last indicator included is the method of commuting to work, which comes from the 2000 US Census. This indicator is calculated as the percent of the labor force, age 16 and over, that reports driving alone to work. We use this measure to assess the quality of the built environment, as the ability of community members to walk, bicycle, or use public transportation depends heavily on design factors. The advantages of alternative transportation for environmental health are clear: car emissions result in non-point source pollution of air and water and also contribute to an urban heat island effect. Alternative methods of commuting, including walking, bicycling, car-pooling, and public transportation result in reduced levels of air and water contamination; bicycling and walking also improve health through increased physical activity.[7]

Composite Scores and Ranks—Physical Environment Summary Measure

To rank Wisconsin's counties and the city of Milwaukee on the physical environment, we used a method to standardize each county's value so that we could combine them into a single summary measure. We first calculated Z-scores for each county and the city of Milwaukee on each of the 9 measures: Z-score=(measure – mean value for 72 counties)/(standard deviation of measure). Z-scores rescale all measures according to a normal (Z) distribution, allowing for the creation of composite scores across a range of measures.[23] Z-scores >3.0 and <–3.0 were truncated at 3.0 and –3.0, respectively, so outlier values did not overly influence the composite measure ranks. The Z-scores for each measure were adjusted by their weight listed in Table 1 and added to create a summary Z-score for the physical environment for each jurisdiction. Lower Z-scores ranked better and higher Z-scores ranked worse. If counties' Z-scores tied for a particular measure, they each received the same rank. Subsequent counties were ranked as if the tied counties were in order (eg, if 2 counties were ranked first, the county following the tie was ranked third, not second).[13]

For the purposes of this paper, we also ranked the counties on each construct of the physical environment summary measure: air quality, water quality, and the built environment. ArcGIS software (version 9) was used to map the counties' ranks by quartile for the physical environment summary measure and each construct.

RESULTS

Major metropolitan statistical areas in the state had the worst measures of environmental health. In contrast, the rural areas of Wisconsin had the best environmental health, with northern counties such as Bayfield, Menominee, Sawyer, Vilas, and Iron ranking in the top 10 counties overall for the physical environment. Similar clustering occurs with ranks for the constructs of air, water, and lead risk.

For air quality, counties in the eastern part of the state generally revealed worse measures of air quality, with counties in the southeastern part of the state comprising the counties with the lowest air quality. In contrast, the northeastern region has the best air quality in the state.

For water quality, the counties in the central and south central parts of the state had the worst quality, whereas counties distributed along the northern and eastern borders of Wisconsin had the best water quality.

Finally, counties clustered in the southeast and central region of the state had the worst measures of the built environment, with the notable exceptions of Florence and Douglas counties (Table 2, Figure 1).

DISCUSSION

The Wisconsin County Health Rankings have reported measures of environmental health since they were first released in 2003. The physical environment summary measure, in particular, has undergone significant revisions since the first edition of the Rankings. In the 2003 edition, the only measure of the physical environment included was the percent of children who tested positive for lead poisoning. Physical environment measures were expanded significantly in 2004, and in 2006 included multiple indicators over 3 constructs: air quality, water quality, and lead risk. Finally, in 2007, we created a new construct, the built environment, by adding 2 new indicators—radon and commuting method—to our lead risk measures.

This study demonstrates that publicly available data can be used to measure the health of the environment of Wisconsin's communities, and that environmental health risk varies across the state. According to our summary measure, counties in southern and southeastern Wisconsin have worse measures of environmental health. Although rural areas have better measures of environmental health, they commonly have lower socioeconomic status, worse health care access, and worse health behaviors. These confounders affect the relationship between current health outcomes and physical environment.

A complication of measuring environmental health is that the effects of environmental exposures on overall health may not result in poor health outcomes immediately, but may evolve over years or even decades. The logic model on which the Rankings are based derives from a framework described by Kindig and Stoddard to portray the relationships among policies and interventions, patterns of health determinants, and health outcomes.[24] In our formulation, a county's rank in health determinants theoretically represents its future health outcomes. A complication of this approach is that the latency between environmental exposures and their effects on health vary greatly or are unknown. Within the physical environment measures, this problem is acute. Though estimates are available for the latency period for negative health effects from individual contaminants, each of our measured pollutants have multiple health effects and different thresholds and latencies for those effects. The NATA measure for cancer risk and its noncancer respiratory hazard index exem-

Table 2. Rankings of Wisconsin's 72 Counties and the City of Milwaukee on Physical Environment Measures

County	Air Quality	Water Quality	Built Environment	Physical Environment Summary
Adams	29	57	6	28
Ashland	2	15	9	6
Barron	27	42	26	23
Bayfield	7	1	3	1
Brown	67	11	42	39
Buffalo	10	41	37	25
Burnett	13	22	8	9
Calumet	52	65	50	69
Chippewa	41	69	52	65
Clark	15	64	19	36
Columbia	53	50	49	55
Crawford	19	59	24	32
Dane	64	72	14	72
Dodge	51	21	71	42
Door	58	52	36	58
Douglas	49	1	43	20
Dunn	35	53	31	35
Eau Claire	54	37	44	40
Florence	3	1	56	16
Fond du Lac	60	32	59	52
Forest	8	30	4	11
Grant	44	40	35	29
Green	50	43	55	46
Green Lake	28	49	46	34
Iowa	14	46	48	30
Iron	5	1	10	5
Jackson	23	36	23	19
Jefferson	55	28	65	51
Juneau	31	34	15	17
Kenosha	71	9	61	59
Kewaunee	56	26	40	37
La Crosse	47	71	38	67
Lafayette	9	29	47	21
Langlade	26	48	64	44
Lincoln	39	63	62	63
Manitowoc	61	27	53	45
Marathon	48	54	73	68
Marinette	33	14	32	14
Marquette	30	58	2	27
Menominee	11	1	5	3
Milwaukee (city)	72	1	29	49
Milwaukee (county)	72	1	54	61
Monroe	38	68	20	48
Oconto	21	19	12	10
Oneida	37	20	22	13
Outagamie	63	1	60	43
Ozaukee	69	33	39	53
Pepin	22	38	27	22
Pierce	40	55	30	38
Polk	32	44	28	26
Portage	42	73	45	71
Price	4	16	16	8
Racine	70	18	67	62
Richland	25	45	18	24
Rock	66	70	69	73
Rusk	17	25	17	12
Sauk	43	66	34	54
Sawyer	12	12	1	2
Shawano	36	56	51	47
Sheboygan	68	24	63	57
St. Croix	46	67	41	56
Taylor	6	31	21	15
Trempealeau	24	51	33	31
Vernon	18	39	13	18
Vilas	1	17	7	4
Walworth	57	23	58	41
Washburn	16	10	11	7
Washington	59	47	70	70
Waukesha	65	35	66	66
Waupaca	34	61	72	64
Waushara	20	60	25	33
Winnebago	62	13	68	50
Wood	45	62	57	60

plify this problem—by combining multiple toxins that result in a variety of conditions, it is nearly impossible to identify what the effect of improving these measures would be on overall health outcomes in the short term. Furthermore, acute exposures to nitrates are associated with blue baby syndrome among young infants, but long-term exposure at low levels may also affect cancer in adults. These disparate outcomes and exposure scenarios are not equally correlated with broad population health determinants.

Limitations exist in the quality of these data, and should be acknowledged when interpreting the results. For instance, the NATA data are based on modeling of emissions, and new estimates are only available periodically. The ozone and $PM_{2.5}$ measures are particularly problematic because of the dearth of air quality monitors in the northern and western regions of the state. Our measures for counties such as Chippewa, Sawyer, and Eau Claire, for example, are based on ozone and $PM_{2.5}$ values from neighboring or even non-contiguous counties. Similarly, though nitrate data are routinely collected for municipal water supplies, testing for private wells is inconsistent. Because Wisconsin is largely a rural state and private well use is common, our

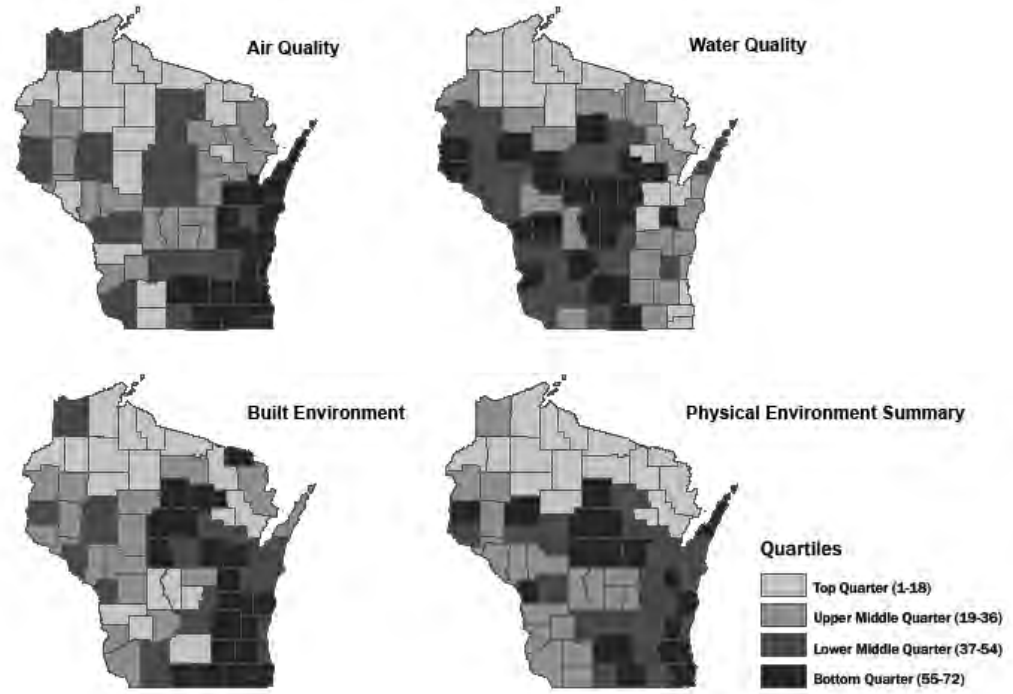

Figure 1. Air quality, water quality, the built environment, and the summary measure of the physical environment, by quartile. These maps represent the ranking of Wisconsin's 72 counties in the 3 physical environment constructs, and for the physical environment summary measure. Once ranked, the counties were divided into quartiles, with the top quartile (ranks 1-18, shaded in light gray) representing better environmental quality and the bottom quartile (ranks 55-72, shaded in black), representing worse environmental quality.

estimates of exposure to nitrates in drinking water in excess of 2 mg/L may not be accurate, and contaminants of primary health concern in more urban areas are not captured with the measure. Two measures, the percent of children testing positive for lead poisoning and the percent of homes with radon levels >10 pCi/L, do not represent random samples. As a result, these indicators may penalize counties that have high-quality screening programs.

Clearly, the availability of good quality and timely public data affect the validity of our environmental health measure. However, the use of publicly available data underscores our focus on applied research that can directly inform policy. The Rankings are intended to serve as a model for local public health agencies mandated to perform community health assessments; reliance on non-public data sources for which we could better control data quality and timeliness would prevent local agencies from using our method as a template. The constraints we face in developing a summary measure of physical environment therefore mirror those faced by local public health agencies. These constraints point to the need for improved data collection on environmental health measures for the purposes of public health assessment, research, and policy development.

The limitations of the physical environment summary measure in terms of data quality and availability do not undermine its usefulness in the policy arena. One goal of the measure is to show where disparities are in environmental health risk in order to inform policy designed to address these disparities. We have also intended the Rankings to highlight well-performing counties as models for counties with poorer environmental health. While the Rankings send a strong message that resources need to be committed to improve the health of poorer, rural counties, our summary measure of the physical environment also gives rural counties the opportunity to demonstrate their strengths.

Improving the Summary Measure of the Physical Environment

Though we believe our physical environment measures for the 2007 Rankings are vitally important constructs to consider, we continue to look for ways to improve the validity, accuracy, and utility of the physical environment summary measure.

The physical environment summary's most limited measure is water quality, which is comprised only of nitrates exposure data. Expanded water quality measures could possibly include results from the Women Infants

and Children (WIC) program that tests well water quality in homes with newborns, the number of boil water orders per county, or expanded measures of chemical or bacteria contaminants in municipal water supplies. Unfortunately, as with nitrate data, most of these measures require assumptions to impute values for counties with limited or no data. However, an expansion of the measures we use to assess water quality would better represent the multiple exposures and health risks that result from compromised water supplies.

Though we have begun to measure the built environment in the 2007 edition of the Rankings, we intend to expand our indicators in the future. As noted earlier, the design of the built environment can significantly affect air and water quality as well as personal health behaviors.[7] Percent of municipalities in a county with sidewalk coverage or bike paths and trails, parks and green space per capita, or the percent of local zoning boards that include a public health representative are measures that could be relatively easy to incorporate in future editions of the Rankings.

CONCLUSION

Despite its limitations, the physical environment summary measure in the Wisconsin County Health Rankings has great utility for providing information in a concise format about the health of Wisconsin's communities. Increasing use of these measures by public health professionals will continue to drive revisions in the methods and demonstrate the need for additional data and improved access to data by those who can use the information to make community improvements. We see strong potential for monitoring the quality of the natural and built environments in Wisconsin with hopes of influencing policies that promote more healthful, sustainable communities.

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WISCONSIN MEDICAL JOURNAL

Administration of Tissue Plasminogen Activator for Acute Ischemic Stroke in a Rural Wisconsin Hospital

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ABSTRACT

Background: Tissue plasminogen activator (tPA) has provided a means to improve functional outcome of patients in the treatment of acute ischemic stroke.

Methods: A retrospective chart analysis of ischemic stroke patients presenting from January 1995 to April 2007 to a particular hospital emergency department located in Ladysmith, Wis was conducted. The following factors were analyzed: door-to-tPA time, National Institutes of Health Stroke Scores (NIHSS) at admission and discharge, complication rates, disposition status, contraindications for receiving tPA, and specialties of physicians involved with stroke care.

Results: During this time period, data was available for 108 patients diagnosed with ischemic stroke treated by physicians in 3 specialties (family practice, internal medicine, and emergency medicine). Of these patients, 18 were treated with tPA for an overall tPA administration rate of 16.2%. Onset of symptoms >3 hours prior to presentation was the most common contraindication to tPA administration. Door-to-tPA time was <60 minutes in 38.9% of cases. Patients treated with tPA were more likely to be discharged home and were less likely to expire within the following month; however, these differences did not reach statistical significance.

Conclusions: This study provides evidence that tPA can be safely administered in rural hospitals. Physicians working in rural emergency departments are able to diagnose and manage acute ischemic stroke within the guidelines established by the National Institute of Neurologic Disorders and Stroke (NINDS) without increased complication rates. Making tPA available in rural communities increases access to treatment and improves outcomes of patients with acute ischemic stroke.

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INTRODUCTION

Acute ischemic stroke affects over 500,000 Americans each year.[1] In Wisconsin alone, over 81,000 individuals have suffered from stroke.[2] Annually in Wisconsin, 14,000 patients are discharged from hospitals with the diagnosis of stroke, and 3400 patients die; the majority of these strokes are ischemic in etiology.[2] The introduction of tissue plasminogen activator (tPA) for the treatment of acute ischemic stroke is a way to improve functional outcome of these patients.[3] Although initial clinical trials of tPA were conducted at larger university hospitals, subsequent trials have shown that tPA can be used in community hospitals with similar results.[4-6] Our study varies from previous studies in the resources available for the treatment of ischemic stroke as outlined below.

The hospital in this study is a 41-bed acute care hospital located in northwestern Wisconsin. The hospital's emergency department sees approximately 15 acute ischemic stroke cases annually. A standard ischemic stroke and tPA administration protocol was introduced in 1995. Family practice, internal medicine, and emergency department physicians staff the emergency department. Twenty-four hour computed tomography (CT) is available. CT images are read via teleradiology in Eau Claire, Wis, which is approximately 60 miles away. Neurologists are not on staff at the hospital in this study; however, consultation is available via telecommunication with neurologists in Eau Claire and Marshfield, Wis. The nearest neurosurgeons are located in Eau Claire.

Through our chart analysis, we sought to show that tPA has been successfully and safely administered in a rural hospital staffed by physicians in a variety of subspecialties where an acute ischemic stroke and tPA

administration protocol is in place. The availability of 24-hour CT scanners, teleradiology, and telecommunication makes local treatment of acute ischemic stroke possible for rural communities who have staff radiologists or neurologists available on a limited basis. Given the need to administer tPA within 3 hours of onset of symptoms, many individuals located in rural areas would not have access to tPA unless it is provided by smaller hospitals. In this retrospective analysis, we sought to analyze the efficacy of tPA administered in a rural Wisconsin hospital.

In addition to assessing the efficacy of administration of tPA at this hospital, we also sought to assess the limitations for the administration of tPA. Previous studies have documented rates of tPA administration of <5%.[7] By looking at the amount of time between when the patient walked through the door to when tPA was administered (door-to-tPA times) and contraindications cited in patients not receiving tPA for acute ischemic stroke, we sought to assess improvements that could be made at our institution and in the community for the treatment of acute ischemic stroke.

METHODS

A retrospective chart analysis of ischemic stroke patients presenting from January 1995 to April 2007 to a particular hospital emergency department located in Ladysmith, Wis was conducted. During these years, a tPA protocol was established and utilized. Charts with the following ICD-9 codes were analyzed: 434.00 (cerebral thrombosis without mention of cerebral infarction), 434.01 (cerebral thrombosis with cerebral infarction), 434.10 (cerebral embolism without mention of cerebral infarction), 434.11 (cerebral embolism with cerebral infarction), 434.90 (cerebral artery occlusion without mention of cerebral infarction), 434.91 (cerebral artery occlusion with cerebral infarction), 997.02 (iatrogenic cerebrovascular infarction or hemorrhage), E934.4 (adverse effects of fibrinolysis-affecting drugs), and 436 (acute but ill-defined cerebrovascular disease). This study included charts that pertained only to those presenting to the emergency department for the initial evaluation and treatment of stroke regardless of time of onset. All patients' CT scans were read by teleradiology. For patients who received tPA, we assessed the following factors: door-to-tPA time, NIHSS at admission and at discharge, complications from tPA, and disposition status of patients receiving tPA. For patients presenting with ischemic stroke who did not receive tPA, we examined NIHSS at admission and at discharge, contraindications for receiving tPA, and disposition status. The specialties of physicians involved with stroke care and the frequency of use of neurology consultation was also examined for all cases.

Table 1. Demographics

	tPA	Non-tPA	*P*-value
N	18	90	–
Age (mean±SD)	71.6±11.3	77.1±12.1	0.0819
Male (%)	61.1	51.5	0.6060

N=number of patients.

Descriptive statistics, including percentages, means, standard deviations (SD), and standard errors (SE), were computed for the following outcomes: demographics, door-to-tPA time, NIHSS, disposition, tPA administration, complications, and inpatient mortality. In addition, Chi-square or Fisher's exact test was used to evaluate the differences in gender and disposition between tPA and non-tPA groups. A 2-sample t-test was used to compare age and NIHSS at admission between the 2 groups, while a matched-sample t-test was applied to analyze the change in NIHSS for the tPA group from admission to discharge. Complication rates and inpatient mortality rates were compared to those rates documented by Hess et al using Fisher's exact test, and a 95% confidence interval (CI) was calculated for overall rate of tPA administration. All statistical analyses were performed using SAS version 9.1.

RESULTS

Demographics

Data was available for 18 patients in the tPA group and 90 patients in the non-tPA group (Table 1). In the tPA group, 61% of patients were male (39% female), and 51.5% of the patients in the non-tPA group were male (48.5% female). The difference between the groups was not statistically significant (P=0.60). The mean age of the tPA group was 71.6±11.3 years, and the mean age for the non-tPA group was 77.1±12.1 years. This difference was not statistically significant (P=0.08).

The most common contraindication to the use of tPA was onset of symptoms >3 hours prior to presentation to the emergency department (Figure 1). In addition, unknown time of symptom onset and an International Normalized Ratio (INR) or prothrombin time (PT) >1.5 accounted for 73.8% of contraindications cited.

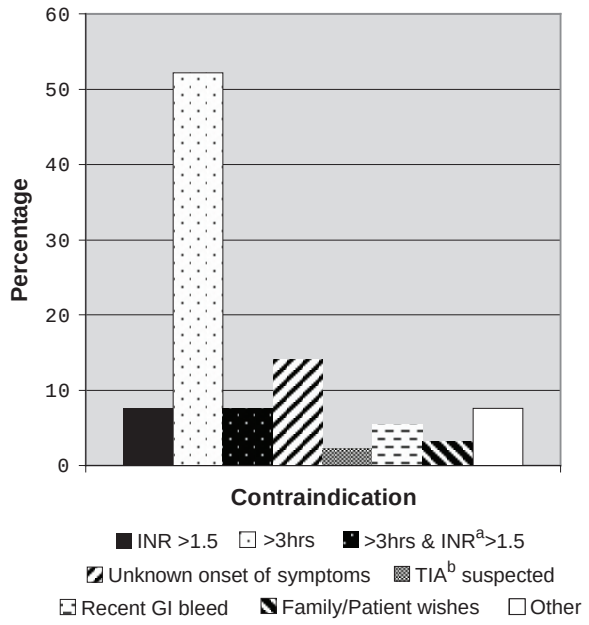

Figure 1. Contraindications for tissue plasminogen activator (tPA) use cited by physicians.
[a] International Normalized Ratio
[b] Transient ischemic attack

Door-to-tPA Time
Mean door-to-tPA time was 79.2±6.7 (mean+SE) minutes. There were 38.9% (7 of 18) with door-to-tPA time of <60 minutes.

NIHSS
At both admission and discharge, 6 patients in the tPA group received NIHSS. The mean NIHSS at admission was 12.83±2.48 (mean+SE), and the mean NIHSS at discharge was 7.33±2.62. This difference is statistically significant (P=0.02).

NIHSS at admission was available for 14 of 18 patients in the tPA group (mean±SE=15.07±2.14), and available for 18 of 96 patients in the non-tPA group (mean±SE=11.22±2.11). The difference in NIHSS at admission between the 2 groups was not significant (P=0.22).

Disposition
Patients receiving tPA had higher rates of discharge to home, transfer to swing beds, and transfer to other facilities than patients not receiving tPA. Fewer patients in the tPA group expired (mortality related to the patient's recent stroke) within 1 month than in the non-tPA group (Figure 2). However, contingency table analysis using Fisher's exact test did not reveal these differences to be significant (P=0.1225).

Specialty of Physicians Treating Ischemic Stroke Patients in the Emergency Department
Physicians representing 3 specialties (family practice, emergency medicine, internal medicine) evaluated ischemic stroke patients in the emergency department during the study period. Of these physicians (28 total), 11 administered tPA. A total of 111 patient charts were available for review, and the proportion of patients assessed and treated with tPA by specialty are as follows: family practice physicians assessed 42 patients and treated 7 (16.7%) with tPA, internal medicine physicians assessed 42 patients and treated 7 (16.7%) with tPA, and emergency department physicians assessed 27 and treated 4 (14.8%) patients with tPA (Figure 3, Table 2). An overall rate of tPA administration was 16.2% (18/111; 95% confidence interval=9.3%, 23.1%), which was significantly higher than other documented rates of 1.6-6.3% (P<0.05).[5-6,8]

Complication Rates
The complication rate of intracerebral bleed for the tPA group was 5.2% (1/19). Using Fisher's exact test, this rate is not significantly different from the documented rates of 0.0% (0/30) reported by Hess et al (P=0.375).[4] This patient had symptoms present for over 3 hours, and tPA was administered after the increased risk of hemorrhage was explained to family members and informed consent was signed. The patient developed cerebral hemorrhage and died.

Inpatient Mortality
As mentioned previously, 1 patient who received tPA died prior to discharge from the hospital. The inpatient mortality rate of 5.3% (1/19) for the tPA group was not significantly different from the 7% rate documented by Hess et al (P=1.000).[4]

DISCUSSION

The administration rate of tPA (16.2%) at this rural Wisconsin hospital was higher than other previously documented rates. Studies in other rural communities have documented rates of 1.6-6.3%.[5-6,8] The comprehensive training provided to the physicians and staff at this hospital regarding acute stroke management and tPA administration may explain the higher rates of tPA administration. All physicians employed at this hospital emergency department are required to successfully complete training on the tPA protocol, including the stroke management training components established by the American Heart Association Advanced Cardiac Life Support Courses and the American Stroke Association's NIHSS Course.[9]

For the patients in this study, the average door-to-tPA time approached the 60-minute guideline. Other rural medical facilities have also documented door-to-

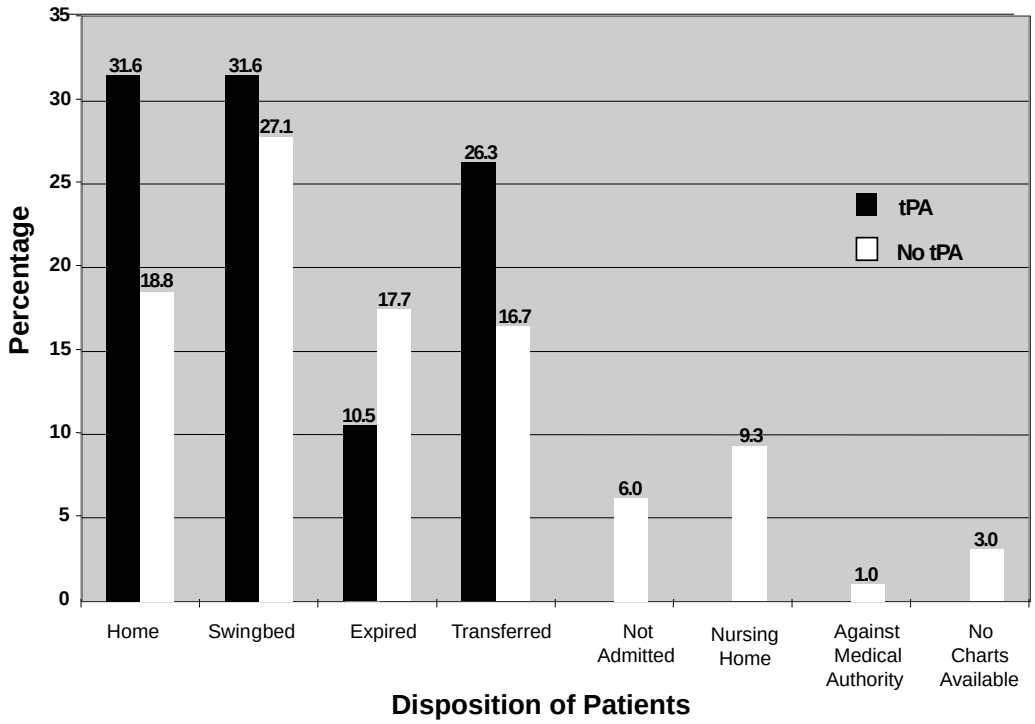

Figure 2. Disposition of patients treated with tissue plasminogen activator (tPA) versus no tPA for acute ischemic stroke.

tPA times comparable to this hospital.[6,8] These results indicate that the evaluation of stroke by physicians in rural communities can be achieved within a timeframe similar to other institutions.[7,10-11]

When compared to other published studies on tPA administration in rural communities, the complication rate of intracerebral bleed was not significantly different (5.6%).[4] The only case of intracerebral bleed in our study occurred in a patient receiving tPA outside the optimal window of administration time. Patients in the present study who received tPA within the recommended timelines experienced no intracerebral hemorrhages.

Although patients in our study who received tPA had a higher rate of discharge to home versus patients not receiving tPA, the difference was not statistically significant. This may be due to the small sample size (N=19 patients treated with tPA).

In Wang et al's study, 54% of stroke patients treated with tPA were discharged to home, compared to 31.6% in this study. Given the significant improvements in NIHSS, final disposition to home likely reflects the improvement in disability that is possible after administration of tPA. The NINDS Study Group showed tPA resulted in a 12% increase in the number of patients without disability or with minimal disability.[3] The effects of tPA in decreasing disability in stroke patients accounts for increased rates of discharges to home.

Inpatient mortality of patients treated with tPA was lower than those not treated with tPA. Hess et al documented an inpatient mortality rate of 7% in patients treated with tPA; a rate similar to the 10.5% rate in this study. The NINDS Study Group did not document a mortality advantage in patients treated with tPA.[3] It is possible that the lower rate of inpatient mortality documented in the present study is due to confounding factors. Physicians may be more likely to administer tPA to patients whose NIHSS are lower. The physicians may assume the risk of administration as being greater than the functional improvement to be achieved by tPA in those with higher NIHSS.

Interestingly, patients receiving tPA were more likely to be transferred than those not receiving tPA. The reasons for transfer ranged from desire for rehabilitation at a designated stroke rehabilitation center to management of cardiac issues that developed while an inpatient. No patients were transferred due to complications directly related to tPA administration.

Onset of symptoms of >3 hours prior to presentation to the emergency department was the most common contraindication to tPA administration. Other rural communities treating stroke patients have also cited this as the most common reason tPA cannot be given.[4] Specific barriers to achieving this time goal that are pertinent to patients in rural communities include the time to travel to hospitals, which for some

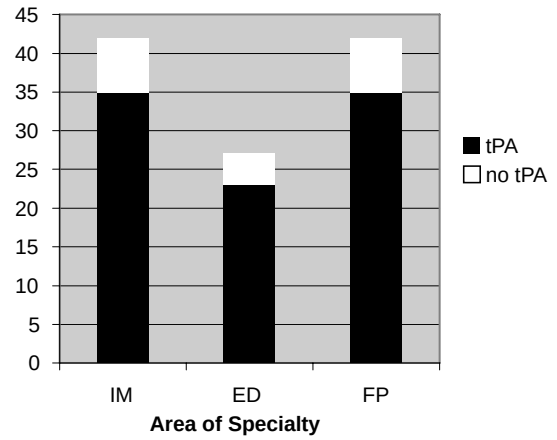

Figure 3. Number of patients assessed and treated with tissue plasminogen activator (tPA) for acute ischemic stroke by specialty. IM=Internal medicine; ED=Emergency department; FP=Family practice.

Table 2. Specialty of Physicians Treating Ischemic Stroke Patients in the Emergency Departments with Either tPA or No tPA

	Internal Medicine	Emergency Department	Family Practice
tPA (N)	7	4	7
Non-tPA (N)	35	23	35
tPA (%)	16.7	14.8	16.7

N=number of patients

individuals in this location may be an hour drive, and public education on symptoms of stroke.

We believe the initial and critical response to acute ischemic stroke care relates to patient education focusing on recognizing the signs and symptoms of stroke and the need for rapid medical care. Patients with acute ischemic stroke should be transferred to medical centers with established acute stroke protocols in order to meet the time guidelines for the potential administration of tPA. Rural emergency medical technicians, first responders, and dispatchers need to be knowledgeable of the signs of acute ischemic stroke and direct patients to health care centers where tPA protocols are established.

We believe that this retrospective study further supports expansion of acute stroke protocols in rural hospitals, so more patients can receive tPA within the recommended time window. By limiting tPA to urban centers, the added burden of reaching a hospital with an established tPA protocol within 3 hours of an onset of symptoms is placed on either the patient or the emergency medical response teams in rural communities. Furthermore, given the data that indicates that the number 1 contraindication for tPA administration is symptom onset of >3 hours, the problem of meeting time guidelines may be compounded if tPA is limited to urban centers.

This study, as well as others, has provided additional evidence that tPA may be safely administered in rural hospitals. Physicians working in rural emergency departments are able to diagnose and manage acute ischemic stroke within the guidelines established by NINDS without increased complication rates. By making tPA available in rural communities, access to treatment is increased and the outcomes of patients with acute ischemic stroke will improve.

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The Influence of Double-Credit Evidence-Based Continuing Medical Education on Presenters and Learners

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ABSTRACT

Background: Medical specialties are adopting methods to improve continuing medical education (CME). A "double credit" option, sponsored by the American Academy of Family Physicians, is now available for presentations submitted and approved as evidence based (EB).

Purpose: To compare usual and double-credit CME presentations to determine differences in preparation resources and time, and to compare conference attendees' satisfaction. Those not submitting double-credit applications were asked about perceived barriers.

Methods: Three pretested, written surveys were administered at a 2.5 day CME conference held annually in Southeastern Wisconsin. Subjects were 38 presenters and 172 attendees, mostly primary care physicians.

Results: Twelve presentations were approved for double-credit; these presenters used a greater percentage of on-line EB resources to prepare their talks (64% versus 23%), and preparation required an additional 4.75 hours on average. Over 90% of attendees perceived greater conference quality due to the EB emphasis. Top barriers to double-credit EB applications were time limits and perceptions that topics were inappropriate.

Conclusions: Double-credit presenters use a greater percentage of EB resources, while their counterparts used more professional experience to prepare CME presentations. Attendees reported improved quality and value with increased EB CME. Time is a perceived and real factor in preparing double-credit applications.

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INTRODUCTION

In 2005, the American Academy of Family Physicians (AAFP) began offering double credit to family physicians attending evidence-based (EB) continuing medical education (CME) activities that had been documented, reviewed, and approved by the AAFP.[1] There were several reasons for offering these additional credits. It was perceived as a way to differentiate the credits granted to topics with strong evidence from topics such as complementary and alternative medicine for which the supporting evidence base was less established. Extra credit for EB CME also was viewed as a method of supporting the interests of state medical licensing boards that depend on CME to assure that their physicians are competent to practice and maintain adequate performance.[2-3] Finally, awarding double CME credit was a way to encourage CME faculty to employ increasingly accessible EB recommendations and guidelines in their presentations. The goal of double credits for EB CME was to ensure the validity and reliability of CME clinical content, leading to improved medical practice and patient outcomes.[4]

To qualify for an AAFP-approved EB presentation, CME presenters submit an application to the CME provider that includes documentation of supportive evidence from approved EB resources targeted to the proposed medical topic. Sources of approved evidence include Institute for Clinical Systems Improvement (www.icsi.org), US Preventive Services Task Force (www.ahrq.gov/clinic/uspstfix.htm), National Guideline Clearinghouse (www.guideline.gov/), and the Cochrane Database of Systematic Reviews (www.cochrane.org/index.htm). After the application is reviewed by the AAFP, the CME provider is notified about the approval status of the application. If approved, double-credit designation is granted. If submitted materials are not approved, an explanation accompanies the reply and the CME pro-

vider can contact the presenter about the option to revise the application and resubmit the materials.

The pilot study was designed to address 3 questions: (1) What are differences in the resources and time used by EB versus non-EB presenters in order to prepare their CME presentation? (2) Do CME learners rate EB versus non-EB session satisfaction differently, and does the presence of EB sessions impact attendee perceptions of the overall value and quality of the CME conference? (3) For presenters who don't submit EB CME applications, what are their perceived barriers to doing so?

We asked these questions in the context of a regional Midwestern CME conference in January 2006. This study protocol was reviewed and approved by the Medical College of Wisconsin Institutional Review Board.

METHODS

The Winter Refresher Course (WRC) is a regional, 2.5-day CME conference held annually in southeast Wisconsin during late January and early February. The 2006 conference marked the 36th year for this event, which is sponsored by the Department of Family and Community Medicine, Medical College of Wisconsin, with joint sponsorship by the Wisconsin Academy of Family Physicians. Vendor support for this conference occurs exclusively by their rental of booth space in a conference room separate from the educational program. The conference closely follows standards that concern identifying and resolving conflicts of interest as set by the Accreditation Council for Continuing Medical Education.

The WRC format offers 3 simultaneous presentations in different conference suites, allowing attendees to choose according to their educational needs. Conference topics originate through needs assessment and emphasize clinical content and skill development. Over several years prior to 2006, 16 prescribed (P) CME credit hours were reviewed and approved by the AAFP for this conference.

For the 2006 WRC, conference planners decided to pursue double credit as an added value for attendees and as a quality indicator for faculty presenters. Eight months prior to the program, all presenters were called and asked to apply for EB CME credits. Approximately 6 months prior to the program, lead presenters were mailed a follow-up request and specific instructions for double-credit applications, along with offers of administrative support. Honoraria are offered for the conference's 3 keynote presenters each year. No honoraria or other special incentives were offered for EB sessions.

The 38 lead presenters at the 2006 WRC were the subjects for our 2 main study questions. Of these presenters, 24 were male. All presenters were practicing physicians, and all but 3 had a primary faculty appointment at the Medical College of Wisconsin. Two presenters were from the University of Wisconsin-Madison, and 1 was from the AAFP. WRC attendees (n=172) were also subjects for the study. They completed evaluations of the specific sessions they attended as well as evaluations of the overall meeting. Attendees were health professionals (over 95% doctors, physician assistants, and nurse practitioners) from the Midwest, representing Wisconsin, Illinois, Indiana, Michigan, Minnesota, and South Dakota.

Three instruments were used for data collection, each completed anonymously. The presenter survey was designed and pre-tested prior to this study, and presenters were asked to complete it at the conference site immediately after their presentation. When turned in, the presenter survey was sorted into EB and non-EB folders based on researcher knowledge of who the AAFP had given double credit. All presenters were also given a small ($5) book gift card when they were given the survey.

The presenter survey asked subjects: "how much did you depend on" various types of listed resources "to prepare your Winter Refresher presentation?" The question was followed by a list of resource types such as "my own medical practice and experience," "in-person discussions with colleagues or consultants," "text books, CDs, audiotapes, or journals," and "EB medicine Web sites." For each resource type, subjects were asked to enter a percentage so the percentages totaled 100%. Next, presenters who had submitted their presentation for AAFP approval were asked to report the additional time spent researching resources and completing the required documentation for the AAFP. Finally, presenters who did not submit EB CME applications were asked to list any barriers that prevented their completion of AAFP materials.

The second instrument, the session evaluation survey, was directed to all conference session attendees. This survey was adapted from a pre-existing WRC survey that asked each attendee to rate each session on its content (eg, clear, current, comprehensive, best evidence), the presenter (eg, clear, interactive, organized), and overall, whether "this session was a good use of my time." Attendees were asked to use a Likert-type

rating for each item (1=excellent, 5=poor). All session attendees were asked to complete these post-presentation evaluations for all sessions they attended. These questionnaires were located in the registration packets and were preprinted with presenter names and topics for all sessions.

The third and final data collection instrument was the end-of-conference survey, also located in the registration packet. This instrument was based on the existing WRC survey and included 2 questions about the degree to which EB CME presentations were important to their perceptions of the WRC's overall value and quality. Registrants were asked to complete this survey at the end of the conference using Likert-type ratings from "very important" to "not at all important." Attendees were asked to drop both the session-specific surveys and the end-of-conference survey in a secure bin near the registration desk.

Data analysis for all instruments was performed using descriptive statistics (eg, means, standard deviations) and content analysis of text data, which required inter-rater agreement on response categories.[5] Where comparisons were made between means, one-way ANOVA was used with SPSS software.[6]

RESULTS

Meeting and Subjects

For the 2006 WRC for Family Practice, the AAFP approved 12 sessions for double EB CME credits. This resulted in family physician attendees having the opportunity to obtain up to 27.25 (P) credits for participation, an increase from the prior years' totals of 16 (P) credits.

Of the 38 primary presenters, 36 (95%) completed the presenter survey. Presenters' medical disciplines included family medicine, cardiovascular medicine, internal medicine, OB-GYN, pediatrics, radiology, and physical medicine and rehabilitation. Of the 36 responders, 12 (33%) submitted their application materials and were approved by the AAFP as an EB CME presentation. One of the 36 responders had applied for AAFP credit but was not approved. The remaining 23 (64%) did not submit their materials for double-credit review. Therefore, 35 presenter surveys were analyzed; 12 EB CME presenters and 23 non-EB presenters.

Of the 12 approved EB presentations, topic areas included acute allergic reaction, the febrile infant, dyslipidemia, and preventive services guidelines. Among the 23 non-EB sessions were 19 clinical topics in areas such as hospice care, diabetes therapy, seizures and epilepsy, and limping in children. The remaining sessions were about system or practice improvement topics—such as measuring performance quality—and methods of office coding.

The 172 conference registrants completed 1363 end-of-session surveys, an average of 36 evaluations for each of the 38 sessions. End-of-conference surveys were completed and returned by 107 of 172 registrants (62%). These survey returns by attendee practice types were consistent with the rates of conference attendees overall.

Study Questions

Question 1 asked what types of sources were used by EB versus non-EB presenters to prepare for their WRC presentation (Figure 1). EB presenters reported that their most relied-upon resources were EB medicine Web sites, which accounted for 33% of their preparation resources, compared to 10% for non-EB presenters. EB presenters reported that 31% of their preparation was done through full-journal Web sites such as Medline, compared to 13% for non-EB presenters. Non-EB presenters reported greater dependence on "my own professional practice and other professional experience," which accounted for 32% of their preparation resources, compared to 16% for EB presenters. The next most used resource for non-EB presenters was "textbooks, CDs, audiotapes, paper journals," which accounted for 22% of preparation, compared to 7% for EB presenters. The third most relied on resource for non-EB presenter preparation was "in-person discussions with colleagues and consultants," which averaged 15%, while these in-person contacts accounted for 2% of EB presenters' reported preparation.

EB presenters were asked to report the time required for preparing a successful EB application and the extra time needed to search and document EB resources. They reported requiring an additional 3.5 hours to research their source citations and an additional 1.25 hours to complete the required application materials for AAFP review. On average, 4.75 hours of additional time was needed for double-credit EB CME preparation.

Question 2 asked about differences in attendee ratings of EB sessions compared to non-EB sessions and whether attendees perceived that the presence of EB sessions raised the value of the meeting overall. The average of attendees' EB session ratings was 1.65 for quality/appropriateness of content, 1.69 for quality and style of presenter, and 1.66 for the overall session (1=excellent, 5=poor). Session ratings were almost identical for those given to the 23 non-EB sessions, where

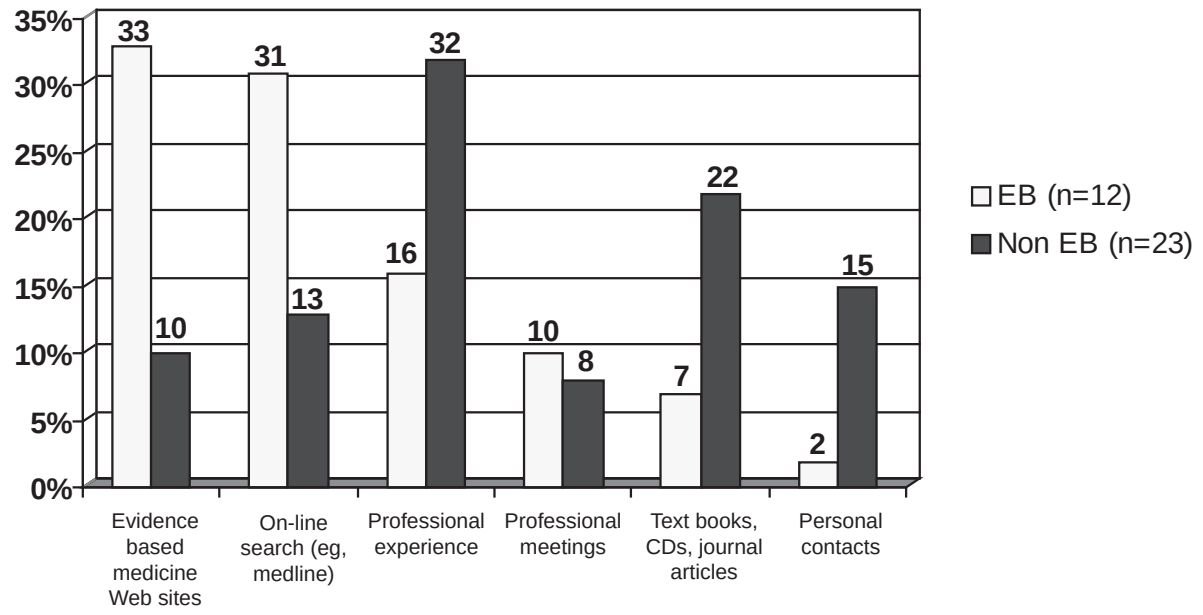

Figure 1. Resource types relied on by continuing medical education (CME) faculty to prepare for presentations given at the 2006 Annual Winter Refresher Course. Subjects (n=35) were CME faculty who reported the resources they depended on (by percentage) to prepare their conference presentations. Evidence-based (EB) presenters (n=12) applied for and were approved by the American Academy of Family Physicians for double credit, while non-EB presenters (n=23) did not apply.

content was rated 1.68, presenters 1.65, and the overall session rated an average of 1.67. In the end-of-conference instrument, attendees rated the importance of EB CME in quality and value; 93% reported EB CME as "important or very important" to improved meeting quality, and 61% reported that EB CME was an "important or very important" addition to the overall value of the conference.

Study Question 3 asked about perceived barriers that prevented CME presenters from seeking EB approval. A total of 20 of 23 who did not submit their presentation for EB CME review provided comments. Using a method of content analysis,[4] all 3 authors agreed the comments formed 4 principal categories. The greatest number of comments (9 of 20) dealt with presenters perceiving that the EB approach "did not apply" to their topic. Representative quotes from this set of comments were "didn't think my topic qualified after reviewing the [AAFP Web] site," "my presentation did not fit into the format," and "was difficult to make applicable for my topic." The next most cited barrier concerned a "lack of time" for completing the extra work presenters felt would be required (n=5). The final 2 categories of barriers were each noted by 3 non-EB respondents. One category concerned the process of application, which "seemed too complicated." In the final category, presenters felt they lacked information that applying for double credit was an option.

DISCUSSION

This study explored a double-credit initiative that is part of a larger movement of reform in all medical specialties to stimulate greater CME quality and to more closely link CME with improved practice performance and clinical outcomes.[5] This pilot study was conducted at a longstanding Southeastern Wisconsin CME event focused on family medicine. This study is the first to examine the influence of EB CME on presenter behaviors and conference attendee reaction.

The first of 3 study questions concerned the resources used by CME presenters while preparing their talks. Findings show that EB CME presenters used a different mix of resources to prepare than non-EB presenters, with much higher reliance on Web-based EB and Web-based journal resources. EB presenters utilized EB medicine Web resources <3 times more frequently than non-EB presenters. In part, these differences could be due to perceptions by non-EB presenters that their topics (eg, practice management or behavioral medicine) would not be represented in EB literature or on-line resources. But preparation for all topics could have included appropriate EB and other on-line searching. For example, Sackett and colleagues note the evidence-base for social, public health, and community interventions "rivals or swamps" available evidence-bases of medical impact.[8] On the other hand, the resource profile for non-EB presenters showed a heavier reliance on per-

sonal experience, print or other fixed-content resources, and in-person contacts. We conclude from our data that the double-credit EB application process stimulated presenters to seek and use EB resources. When CME presenters use EB Web sites, there is a greater likelihood that their teaching will reflect current practice recommendations and improve the recommended alignment of CME with practice guideline updates.[9]

EB CME presentations required time, and EB CME presenters reported an additional 3.5 hours to tap source materials, and an additional 1.25 hours to complete the required application. Some authors have discussed ways to build EB search efficiency and accuracy with specially prepared librarians or "informationists" to connect clinicians to best evidence,[9] a function that could be expanded to benefit CME speakers as they access and synthesize updated information. Because these time and resource costs are significant, they need to be factored into EB CME planning for both presenters and their sponsors.

The second study question examined conference attendee reactions. We found that ratings of EB CME and non-EB CME presentations showed no significant differences in satisfaction with content, presenters, or the "overall" session. This is not surprising, because factors such as presenter reputation and instructional methods can strongly influence learner satisfaction.[10] While session ratings did not indicate a positive benefit in favor of EB sessions, overall conference evaluations did: 93% of attendees reported that EB CME was important or very important to improved meeting quality, and 61% reported that EB CME was important or very important to added value. These data indicate that conference attendees appreciated the presence of an EB emphasis, even though the comparison of satisfaction across session types was inconclusive.

Our third main finding was regarding the question of "barriers perceived by presenters who did not apply for EB CME credit." Of the 23 non-EB CME presenters, the largest barrier was the perception that an EB approach was not appropriate for the presenters' specific topic, likely because of their emphasis on practice management. As noted above, this barrier appears to be false, as there are no explicit criteria that exclude such EB search topics. Medicine's evidence-base is constantly growing, and practice management topics (eg, group visits for chronic illness) have been approved for double-credit. "Time constraints" was the second largest barrier. As noted above, this concern should be addressed by increasingly efficient application and preparation processes for EB presenters.

This pilot study has several limitations. It relied on self-report data from a limited number of presenters and attendees at 1 CME meeting, which may have introduced bias into these findings and limited their generalizability. Presenters' resource and time use may be influenced by factors other than EB approach, such as their prior experience teaching a specific topic or the direct assistance of others not accounted for in this study. Another limit is the study's focus on perceptions and on-site reactions to CME—it was beyond the scope of this study to examine the possible association between EB CME experience and performance improvement. Study authors dropped the 1 presenter who submitted a double-credit application but was not approved from the analysis. Future studies should consider using different methods to explore the experiences and learning of these unsuccessful double-credit applicants. Finally, this study does not propose that double-credit approved CME assures high-quality instruction, but we believe it demonstrates that a higher, more transparent standard has been met for research and practice recommendations.

In conclusion, this study shows that EB CME presenters prepare their talks using resources that are likely to consist of current EB information—consistent with the goals of the AAFP. We found there were real and perceived investments of time for presenters who prepare EB presentations for double-credit. We also found that CME conference attendees perceive that EB CME improves overall conference quality and value. By this double-credit innovation, the AAFP is positively contributing to CME conference quality. We recommend further research on EB CME, possibly adapting these study methods in a different specialty or larger venue. Future studies should also be designed to examine the influence of EB instruction on clinician performance and patient outcomes.

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WISCONSIN MEDICAL JOURNAL

Practical Considerations of Using Topical Honey for Neuropathic Diabetic Foot Ulcers: A Review

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ABSTRACT

Context: It is increasingly important to identify and use low-cost effective dressings for treating diabetic foot ulcers as medical costs and rates of diabetes continue to rise. Honey is an inexpensive moist dressing with antibacterial and tissue-healing properties that has shown promise in the medical literature. Many clinicians are unfamiliar with its use, but patients with diabetic foot ulcers may wish to try honey therapy or discuss it with their physicians. The purpose of this review is to familiarize physicians with practical aspects of using honey to treat diabetic foot ulcers.

Evidence Acquisition: The authors have experience using topical honey and are currently conducting a randomized controlled trial of its effectiveness in treating diabetic foot ulcers. In this review, the authors summarize evidence of honey's effectiveness, its hypothesized mechanism of action, potential risks and benefits, the types of honey available, and the nature of its application. Critical aspects of ulcer care are also reviewed.

Conclusion: Honey is a low-cost topical therapy with important potential for healing. Its use may be considered in diabetic foot ulcers after a discussion of risks and benefits and in conjunction with standard wound care principles.

INTRODUCTION

There has been resurgence of interest in the use of topical honey to treat diabetic foot ulcers,[1-4] reflecting a growing awareness of the cost and burden of diabetic foot ulcers and the need for cost-effective therapies. However, clinicians unfamiliar with honey therapy may feel uncomfortable initiating such treatment or responding to patient questions. This review is a practical guide to the use of topical honey for diabetic foot ulcers (DFUs) for primary care physicians from physicians experienced in the treatment and currently conducting a double-blind randomized controlled trial of its effectiveness.

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General Considerations

A comprehensive approach to DFUs must address 3 critical aspects of care: assuring adequate blood supply, eliminating pressure on the ulcer, and assessing for infection.

Poor blood supply is not a contraindication to a trial of honey therapy, but no topical therapy is likely to be successful unless the vascular supply is adequate. Prior to initiating honey therapy, an assessment of the vascular supply to the affected limb should be done. If pulses are palpable, the vascular supply can be presumed adequate.[5] If pulses are not palpable, patients should undergo an Ankle-Brachial Index (ABI). An ABI <.9 is abnormal; an ulcer associated with an ABI <.6 is considered more than moderate risk[6] and may require surgical bypass or vascular stenting in order for the ulcer to heal.

Any pressure on the ulcer is detrimental to healing.[7] Many options for off-loading DFUs are available, including Podus boots, CAM and Crow walkers, and Peg assist insoles. Some patients need complete immobilization with a wheelchair or crutches to ensure that pressure is not put on the wound. Wounds with surrounding callus should be debrided to the outer edge of the hyperkeratotic tissue.[8]

Infection often complicates DFUs and slows wound healing. Redness, swelling, and warmth may be absent in diabetic patients due to a suppressed immune response, thus complicating diagnosis.[9-10] As a result of diabetic peripheral neuropathy, pain is often absent even in the presence of severe infection. A quantitative bacterial load of $>10^5$ bacteria/g tissue on deep tissue

biopsy is diagnostic of infection, as is a positive wound culture from a curettage of the base of the wound performed after debridement.[9] A deep tissue swab after debridement is also acceptable; superficial swabs are unreliable and should not be used. Infected wounds should receive prompt antimicrobial therapy with broad spectrum antibiotics covering Gram positive, Gram negative, and anaerobic bacteria.[9] DFUs should be probed and, if they reach bone, evaluated for osteomyelitis.

Patient Acceptance of Honey

Some patients may be drawn to honey because of its low cost or as an "alternative" therapy that has been used since Ancient Egypt.[11] Others may feel uncomfortable applying a sticky food substance to their ulcer. A review of 40 patients using honey for venous ulcers showed both positive outcomes and high patient acceptance.[12]

EVIDENCE OF EFFECTIVENESS

Honey is a plausible intervention for diabetic foot ulcers as it has been shown to promote healing in animal models,[13-16] and to eradicate a wide variety of pathogens in the laboratory, including Methicillin-Resistant Staphylococcus Aureus (MRSA) and pseudomonas.[17-20] There are impressive case reports of healing in the literature,[21-24] although the number and quality of randomized controlled trials are limited. Reviews of the evidence have been largely positive.[1,25]

Mechanisms of Action

Honey is hyperosmolar, containing <20% water. The low water content draws fluid both from the edematous wound (improving circulation), and from the bacteria within it, effectively dehydrating them. Honey's antibacterial properties are not entirely due to hyperosmolarity, however. It is acidic (pH 3.5-5) and contains the enzyme glucose oxidase, which produces a small amount of hydrogen peroxide that kills bacteria without damaging tissue. Flavanoids and phenolic acids isolated from honey further contribute to its antibacterial activity.[26] Since honey's antibacterial activity is multi-factorial, bacteria are unlikely to develop resistance to it.

In addition to its antibacterial properties, honey has demonstrated tissue-healing properties. It keeps wounds moist, permitting epidermal migration, and provides trace nutrients that may assist healing.[27] Also, recent research has shown that honey stimulates inflammatory cytokines (eg, TN-α, IL-6, IL-1β) by macrophages.[28-30]

Risks and Benefits

The primary benefits of honey therapy include low cost and potentially accelerated healing.

The most common risk associated with honey's use is a burning or stinging sensation due to its low pH.[27] This concern may not be relevant for neuropathic diabetic foot ulcers that result from a lack of sensation.

The most serious potential risk of honey's use is that of wound infection from spores present in honey, such as *Clostridium* or *Bacillus*.[31] These spores do not germinate in honey but could theoretically result in wound infection if the honey is diluted with wound exudate. This risk appears to be low, and possibly nonexistent. Honey has repeatedly been shown to prevent growth of a wide variety of organisms, even when diluted 10-fold or more.[32] *Clostridium* spores are easily suppressed by the presence of other bacteria with which most diabetic foot ulcers are plentifully colonized. Conditions necessary for the growth of *Clostridium* spores,[33-35] which are absent in honey-treated wounds, include (1) lack of competing bacterial flora, (2) low acid environment, (3) high moisture content, and (4) sugar content <56%. Moreover, over 2000 case reports of topical honey therapy in the medical literature have not yielded a single instance of wound infection caused by these spores.[31]

WHICH HONEY TO USE?

If, after a discussion of risks and benefits, the patient wishes to proceed with honey therapy, the next step is to choose the type of honey. Options are based on both the plant from which the honey is derived and the type of processing used.

All types of honey appear to be effective for wound healing. Honey from different sources has varying antibacterial properties: Manuka or jellybush honey from *leptospermum scoparium* and Jambhul honey from India exhibit particularly high levels of in vitro bacterial suppression.[36-37] Rarely, honey from certain plants can be toxic when ingested ("mad honey intoxication" associated with honey from *Rhododendron ponticum* grown in Turkey, Japan, Nepal, and Brazil;[38] liver problems or teratogenicity[39] associated with honey from *Senecio jocobaea* or other plants containing pyrrolizidine alkaloids), but these concerns do not extend to honey's external use.

Processing is different for raw, commercial, and medical grade honeys. Raw honey is minimally processed. It is the least regulated form of honey and has been used in the majority of case reports in the literature.

Supermarket-variety honey is attractive because of its low cost and wide availability, and FDA regu-

lation deeming it safe for ingestion by children and adults. It has proven effective in case reports and the authors' professional experience, and is currently being used in a randomized controlled trial conducted by the authors. As part of the commercial process, honey is typically heated to 110°F for over 8 hours, then flash heated to 175°F before being filtered. Cost range is similar for raw and supermarket honey: under $15 for 32 ounces.

Two types of medical-grade honey have recently received FDA approval for wound treatment. Medical honey is typically filtered and may or may not be heated; gamma-irradiation is sometimes used to inactivate spores. Honey-impregnated calcium alginate dressings cost $12 per 2"x2" dressing and $28 per 4"x5"dressing; gamma-irradiated manuka honey costs about $64 for 32 ounces.

How Should Honey Be Applied?

The medical literature reports that honey has been applied from 1 to 4 times daily. Honey dressings are designed to be changed even less frequently. There is no evidence to direct optimum frequency of dressing changes. In the authors' current trial, patients apply honey twice daily. A generous amount of honey (enough to cover the wound completely with a thick layer) is placed on a gauze or nonstick dressing, which is then directly applied to the ulcer. Cling gauze is then used to wrap the dressing.

How Soon Should Results Be Apparent?

Wounds should be meticulously measured before beginning treatment, and weekly thereafter. Multiplying the largest length in any direction by the largest perpendicular width is a recommended measurement technique that has proved reliable, especially when performed by the same examiner.[40] As with any therapy for DFU, if the wound is not improving in size and appearance after 2 weeks of therapy, the treatment strategy should be modified.[41] Hyperbaric oxygen therapy and maggot therapy are other options that have proved successful in randomized controlled trials.[42-43] In our experience of using honey, improvement is typically seen in wound appearance and size after 2 weeks of twice daily.

CLINICAL EXPERIENCE

APPLYING HONEY

All patients with adequate blood supply and no evidence of osteomyelitis are candidates for honey therapy. Patient interest and suboptimal response to standard therapy have been the most common reasons to initiate honey therapy. The authors typically provide written material when reviewing the risks and benefits with patients, but do not insist on a formal consent form unless patients are hospitalized or participating in the authors' research protocol. Off-loading and debridement are continued during therapy, although antibiotics are often discontinued. (In the trial, antibiotic use is determined by the patient's primary care physician or the study podiatrist, both of whom are blinded to topical therapy.) The authors typically see patients every week for the first few weeks and then every 2-4 weeks thereafter, depending on the severity of the ulcer. The authors measure the wound and/or trace it on acetate to monitor wound progress over time.

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WISCONSIN MEDICAL JOURNAL

Successful Treatment of Aggressive HIV-associated Multicentric Castleman's Disease: A Case Report

Magdalena Flejsierowicz, MD; Mohamed S. Ahmed, MD, PhD; Petio Kotov, MD; Yee Chung Cheng, MD

ABSTRACT

Background: Multicentric Castleman's disease (MCD) in human immunodeficiency virus (HIV)-infected patients is an aggressive form of lymphoproliferative disorder that usually has a rapidly fatal outcome. Overall mortality is 70%-85%, and median survival is only 8-14 months. No standard or optimal therapy for MCD has been established.

Case: A 49-year-old man with HIV infection presented with 1-week duration of low-grade fever, night sweats, left sided abdominal pain, and generalized weakness. Physical examination revealed a supraclavicular, anterior cervical and axillary lymphadenopathy, and splenomegaly. Excisional biopsy of the left axillary lymph node confirmed the diagnosis of an angiofollicular hyperplasia, or MCD, hyaline vascular type with CD20 positivity. Treatment included a combination of the chemotherapy regimen of cyclophosphamide, doxorubicin, vincristine and prednisone (CHOP) with the monoclonal anti-CD20 antibody rituximab. The chemotherapy was administered in parallel with highly active antiretroviral therapy (HAART). At a 3-year follow-up, the patient remains in complete remission and his HIV parameters have normalized with continued HAART.

Conclusion: This is the second publication describing the use of an aggressive combination of chemotherapy with rituximab in HIV-associated MCD. For an HIV patient with MCD, an aggressive treatment with full CHOP regimen combined with monoclonal anti-CD20 antibody rituximab should be considered, and the use of HAART does not need to be discontinued.

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INTRODUCTION

Castleman's disease (CD) is a rare, lymphoproliferative disease that was first described in 1956 by Benjamin Castleman and his colleagues about a group of patients with localized hyperplastic mediastinal lymphadenopathy.[1] Three histopathologic subtypes of Castleman's disease were identified: the hyaline vascular variant, the plasma cell variant, and the mixed subtype.[2] Hyaline vascular type is the most common variant. Clinically, patients with CD are classified according to either of 2 presentations: unicentric (UCD), which is a localized, or multicentric (MCD), which is a systemic disease manifested with generalized lymphadenopathy, organomegaly, and constitutional symptoms. Patients with UCD usually have a benign course and are highly curable through surgical resection. Those who are not surgical candidates can get a similar positive result from radiation therapy.[3] Patients with MCD can have variable clinical courses that can range from rapidly progressive to chronic persistent.[4]

MCD in human immunodeficiency virus (HIV)-infected patients is an aggressive form of lymphoproliferative disorder that usually has a rapidly fatal outcome. Overall mortality is 70%-85%, and median survival is 8-14 months.[5] Patients tend to be young and present with multiple systemic signs and symptoms. Symptoms include fever, hepatosplenomegaly, lymphadenopathy, weight loss, respiratory symptoms, and peripheral edema, while laboratory findings include anemia, pancytopenia, polyclonal hypergammagobulinemia, and elevated levels of C-reactive protein. Causes of death are usually fulminant infection, multi-organ failure, and associated malignancies such as Kaposi's sarcoma and lymphoma. The pathogenesis of CD is unclear, however; HIV-associated MCD is strongly linked with HHV-8 (Human Herpesvirus 8).[6] It is believed that

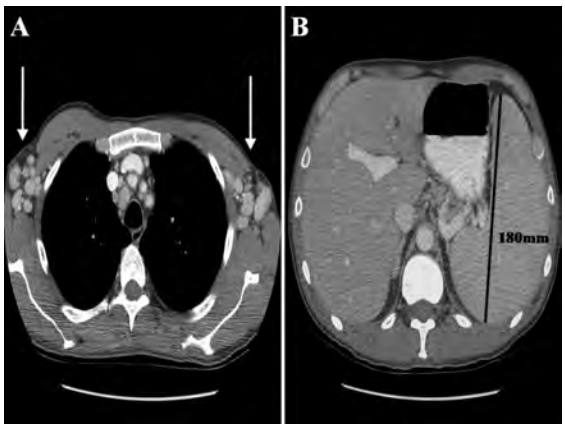

Figure 1. Computed tomographic (CT) scan of the chest and abdomen showing multiple bilateral axillary Lymphadenopathy (A) (white arrows) and splenomegaly (B) at presentation of Multicentric Castleman's disease (MCD).

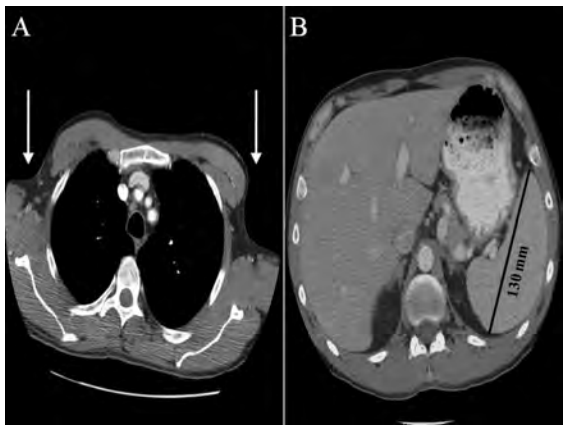

Figure 2. Computed tomographic (CT) scan of the body done 2 weeks after the last cycle of chemotherapy revealed a complete resolution of splenomegaly and lymphadenopathy in the neck, axilla, mediastinum, and retroperitoneum. The figure shows the complete resolution of bilateral axillary lymphadenopathy (white arrows) (A) and regression of splenomegaly (B).

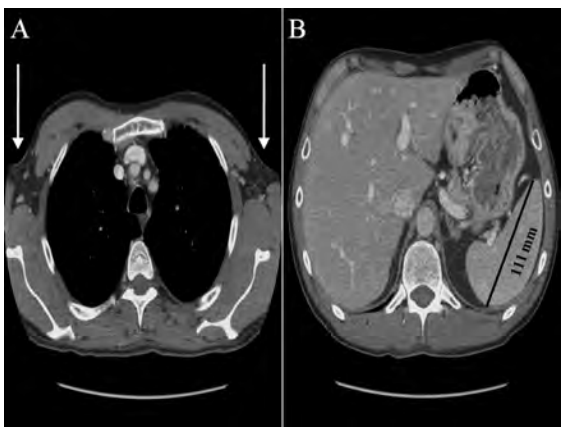

Figure 3. Computed tomographic (CT) scan at 3-year follow up showing normal findings in the chest (A) and further resolution of splenomegaly (B).

HHV-8 induces vascular endothelial growth factors, which subsequently stimulates the production of several cytokines. The cytokines, particularly IL-6, have been shown to be responsible for the histopathologic changes of the involved lymph nodes and the systemic inflammatory symptoms.[7-8] No standard or optimal therapy for HIV-associated MCD has been established. The role of concomitant use of highly active antiretroviral therapy (HAART) during active chemotherapy treatment is also not clearly defined. In this report, the authors share the treatment of a patient with HIV-associated MCD.

CASE REPORT

A 49-year-old man with HIV infection presented with low-grade fever, night sweats, left sided abdominal pain, and generalized weakness with a 1-week duration. The patient was diagnosed with HIV approximately 7 years before the onset of MCD symptoms. A community physician treated him with HAART. (The specific combination was unknown to the researchers in this study.) Apparently, the patient became less responsive to his regimen of antiviral agents and subsequently transferred his care to our hospital. He was started on a new HAART regimen consisting of viread, epivir, videx, visodex, and fuzeon. The CD4+ counts from his blood test were 244 and quantitative polymerase chain reaction (PCR) for HIV was >400,000 copies per ml at the diagnosis of MCD. Physical examination revealed a multiple bilateral anterior cervical, supraclavicular, and axillary lymphadenopathy, the largest measuring 3 cm. The liver was not enlarged but the spleen was palpable at the left subcostal margin. There was no evidence of Kaposi sarcoma lesions.

Laboratory tests showed normocytic anemia and normal white blood counts with differential. Liver function test and electrolytes were within normal limits. Qualitative study of the patient sera showed the presence of anti-human herpes virus-8 (HHV-8) antibodies and HHV-8 DNA. Computed tomographic (CT) scan of the chest, abdomen, and pelvis revealed multiple enlarged lymph nodes in the neck, axilla, mediastinum, retroperitoneum, as well as the presence of markedly enlarged spleen (Figure 1). An excisional biopsy of the left axillary lymph node confirmed the diagnosis of an angiofollicular hyperplasia or MCD, hyaline vascular type with CD20 positivity. The patient then received a combination chemotherapy (CHOP) composed of cyclophosphamide, doxorubicin, vincristine, and prednisone together with the monoclonal anti-CD20 antibody rituximab (CHOP-R). The dose of CHOP-R

regimen was cyclophosphamide at 750 mg/m^2, doxorubicin at 50 mg/m2, vincristine at 1.4 mg/m^2 (maximum 2 mg), and prednisone at 100 mg daily for 5 days. Rituximab was given at 375 mg/m^2 on the same day prior to the CHOP-R regimen. Treatment was repeated every 21 days for a total of 6 cycles. The chemotherapy was administered in parallel with HAART; the patient experienced no major adverse events except for the development of 1 episode of neutropenic fever, which was resolved with intravenous antibiotics. Repeat CT scan of the body 2 weeks after the last cycle of chemotherapy revealed a complete resolution of splenomegaly and lymphadenopathy in the neck, axilla, mediastinum, and retroperitoneum (Figure 2). At a 3-year follow-up, the patient remains in complete remission (CR) (Figure 3), and his HIV parameters have normalized with continued HAART.

DISCUSSION

Over the past few years, a newly diagnosed HIV-associated MCD has been recognized as an aggressive form of disease in which most of the patients develop progressive lymphadenopathy and B-symptoms, usually with a rapidly fatal course. The treatment outcomes of MCD in HIV patients are generally unfavorable.

Management of MCD involves mainly systemic chemotherapy; the only exception is splenectomy for temporary symptomatic relief.[3] Steroids have been used with about a 60% response rate, but no durable remission is reported.[9] Use of neutralizing antibodies against interleukin-6 (IL-6) or monoclonal antibody blocking the IL-6 receptor has demonstrated some clinical efficacy but again with no durable response.[10] Single agent chemotherapy with cladribine induced durable CR, but it was found to accelerate its transformation to highly aggressive non-Hodgkin's lymphoma (NHL).[11] Intensive treatment with full CHOP regimen has been tested in the past, but only a few cases of long-term remission have been reported.[12] Monoclonal anti-CD20 antibody rituximab alone was shown to induce durable CR in some MCD patients.[13]

Optimal therapy for HIV-associated MCD is not well defined; no double-blind, randomized prospective studies have been conducted to compare different therapies. Because CD20 is expressed by HIV-associated MCD lymphoma cells, anti-CD20 monoclonal antibody may be of interest for the management of HIV-associated MCD. Recently, CHOP-R has become the standard treatment for aggressive NHL. This combination of chemotherapy with monoclonal antibody regimen has shown a better remission rate and event-free survival than CHOP regimen alone in NHL.[14] More recently, 4 patients with HIV-associated MCD were successfully treated with CHOP-R.[15] Since HIV-associated MCD is a form of systemic aggressive lymphoproliferative disease that also demonstrates typical B cell markers, including CD20, this study suggests CHOP-R would be effective in this poor-risk patient population. In this case report, our patient was given an intensive chemotherapy regimen, CHOP-R, which resulted in rapid resolution of clinical symptoms, generalized lymphadenopathy, and splenomegaly. The treatment was also demonstrated to be safe and well tolerated with only 1 significant side effect (neutropenic fever). Although a previous report suggested that initiation of HAART could lead to a worse outcome in MCD, this remains to be confirmed.[16] The patient in this study was able to continue HAART throughout the intensive chemotherapy treatment without any major complications. This is the second publication about the use of the aggressive combination of chemotherapy with rituximab in HIV-associated MCD.

In conclusion, for HIV patients who present with MCD, an aggressive treatment with full CHOP regimen combined with monoclonal anti-CD20 antibody rituximab should be considered, while the use of HAART does not need to be discontinued. This case report provides some useful observation on the successful application of intensive chemotherapy in addition to HAART in HIV-associated MCD.

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Proceedings from the 2006 Annual Meeting of the American College of Physicians, Wisconsin Chapter

INTRODUCTION

The Wisconsin Chapter of the American College of Physicians held its annual meeting in Waukesha, Wis, September 6-8, 2006. Internal Medicine residents from each of Wisconsin's 5 residency programs (Gundersen Lutheran Health System, Marshfield Clinic, the Medical College of Wisconsin, University of Wisconsin Hospital and Clinics, and University of Wisconsin Milwaukee Clinical Campus [Aurora Sinai Medical Center]) presented their research and/or unusual clinical experiences via posters and vignettes. Text versions of the research can be found below. The next Annual Meeting for the Chapter will be held September 12-14, 2008, at the Wilderness Resort in Wisconsin Dells, Wis.

PRESENTED POSTERS

Persistent Left Superior Vena Cava (PLSVC)—An Incidental Finding During Pacemaker Placement: Clinical and Diagnostic Considerations

Sabha Bhatti, MD, Abdul Hakeem, MD, Su Min Chang, MD, Peter Kosolcharoen, MD, Maher Malik, MD; University of Wisconsin, Madison, Wis

Case: An 86-year-old man with history of coronary artery disease and chronic atrial fibrillation presented with worsening dyspnea and syncopal episodes. An electrocardiogram (EKG) was consistent with a complete heart block. During lead placement for the pacemaker, a left subclavian approach was unsuccessful. Multiple attempts to locate the left subclavian vein percutaneously in the usual subclavicular fashion under fluoroscopic guidance were not successful. A left angiogram was performed through the brachial vein that demonstrated a left vena cava. The diagnosis was confirmed with echocardiography using a bubble study and also a chest computed tomography (CT). The anatomy was unique as there was anomalous left hepatic vein drainage into the right atrium.

Discussion: The case provides a deep insight into the diagnostic modalities and clinical considerations of this unusual thoracic venous anomaly. Persistent left superior vena cava (PLSVC) is very rare yet the most commonly described thoracic venous anomaly in medical literature. It has a 10-fold higher incidence with congenital heart disease. Generally of no major clinical significance, it becomes apparent and hence quite important when an unknown PLSVC is incidentally discovered during central venous line placement, intracardiac electrode/pacemaker placement, or cardiopulmonary bypass where it may cause technical difficulties and life threatening complications. Another relevant clinical implication is the association with disturbances of cardiac impulse formation and conduction including varying degrees of heart blocks, supraventricular arrythmias, and Wolff Parkinson White syndrome.

Severe Hypocalcemia with QT Prolongation

Bhavin Shastri, MD, James Findling, MD; Aurora Sinai Medical Center, Milwaukee, Wis

Case: A 26-year-old woman who was previously healthy presented to the emergency department complaining of chest pain. It lasted 5-6 minutes and was associated with dizziness and tingling of both extremities. Her past medical history was significant for preeclampsia. She was not on any medication and her family history was unremarkable. Vitals were within normal limits, however she developed Trousseau sign while her blood pressure was being measured. Chvostek's sign was negative. The rest of the examination was unremarkable. Her EKG showed QT prolongation with QTc, or heart rate corrected QT, of 493. Her laboratory analysis revealed low potassium of 2.9, severely low calcium of 4.8 with a normal albumin level, marginally decreased vitamin D level of 25, magnesium of 1.3, phosphorus was 5.3, and intact Parathyroid Hormone (PTH) was 238. In the absence of the characteristic somatic phenotype, the patient was diagnosed as having pseudohypoparathyroidism (PHP) type Ib or type II. She was treated with several vials of calcium gluconate and vitamin D. Her potassium and magnesium were also replaced. Her QT prolongation and chest pain resolved. On examination, Trousseau sign became negative. Her

family members have normal calcium levels. Patient was discharged home on calcium carbonate 1000 mg, 3 times a day.

Discussion: PHP is a rare but well-documented disorder. In 1942, Fuller Albright introduced the term PHP to describe a condition in which patients presented with parathormone-resistant hypocalcaemia and hyperphosphataemia. Three types of PHP have been identified. They are mainly due to defects in the GNAS1 gene that lead to decreased expression of stimulatory G protein. Type Ia PHP (also termed Albright's Hereditary Osteodystrophy [AHO]) is often suggested by occurrence of several coexisting skeletal abnormalities including short stature and shortened first, fourth, and fifth metacarpals. Type Ib and II include subjects who lack features of AHO and who have normal expression of G proteins in accessible tissues. The PTH infusion test remains the most reliable test available for the diagnosis of a variant of PHP syndrome. Here we also wish to emphasize the importance of QT prolongation as a useful emergency department (ED) tool when rapid laboratory assessment of serum calcium level is not possible. Interestingly, hypocalcemia-induced QTc prolongation generally involves iatrogenic causes such as aggressive diuresis or dialysis. Primary calcium metabolism abnormality is a rare etiology of QT prolongation.

White Hot Red Cells

Rasmus Hoeg, MD; Gundersen Lutheran Medical Center, La Crosse, Wis

Case: A 63-year-old woman presented to the emergency department with 2 weeks of increasing shortness of breath, diaphoresis, and exertional chest tightness. Physical exam was essentially unremarkable. Labs revealed a white blood count of 1.0 K/uL, an absolute neutrophil count of 0.32 K/uL, a hemoglobin of 8.6 g/dl, a platelet count of 45 K/uL, and a mean corpuscular volume of 112.9 fl. The nucleated red cell count was 148 per 100 nucleated white cells. A peripheral smear revealed severe macrocytosis with anisopoikilocytosis and markedly dysplastic red cells. Bone marrow biopsy revealed 2% myeloid blasts. The red cells demonstrated multinucleation, karyorrhexis, nuclear bridging, and nuclear budding.

Discussion: A review of the literature revealed that such overwhelming erythroid infiltration of the bone marrow was consistent with Di Guglielmo disease, also known as true erythroleukemia or erythremic myelosis. Di Guglielmo disease is a very rare disease entity. By modern classifications, it is usually categorized as a myelodysplastic syndrome (subtype: refractory anemia). The relatively few published cases of Di Guglielmo disease, however, demonstrate that life expectancy is just a few months, contrasting with the life expectancy of several years seen in refractory anemia. Historically, a 3-phase clinical course has been described: an erythremic phase with abnormalities in the red cell line only, a phase with erythroid and myeloid abnormalities, and, finally, a phase indistinguishable from acute myeloid leukemia. The validity of this clinical course has been disputed; some authors believe this syndrome should be considered a form of acute leukemia, despite the absence of myeloid blasts.

Misleading Presentation of a Pulmonary Artery Sarcoma

Muhammad Bakr Ghbeis, MD, William G. Hocking, MD, FACP; Marshfield Clinic, Marshfield, Wis

"You can't fool all of the people all the time."—Abraham Lincoln

Case: A 48-year-old woman presented with increasing exertional dyspnea over 4 weeks. She had a persistent nagging dry cough 5 weeks earlier following a slowly resolving cold. She reported right calf pain 2 weeks earlier, for 2-3 days. She saw her primary care provider who performed a chest CT scan, indicated by an elevated D-Dimer. The scan was interpreted as a "massive pulmonary arterial embolus." Subsequently, she was admitted to our critical care unit. There was no evidence of hemodynamic instability. Physical examination revealed no abnormalities except for obesity and superficial varicosities in the lower extremities. The patient was started on anticoagulation therapy with unfractioned heparin and warfarin. She was discharged 6 days later, with instructions to continue low-molecular-weight heparin and warfarin. One day after discharge, the patient returned to the emergency department for increasing breathlessness. A repeat CT scan was interpreted as a persistent massive clot in the pulmonary arterial tree. There was again no evidence of hemodynamic instability. Bilateral lower extremity venous Doppler ultrasonography showed no evidence of thrombosis. The abdominal and pelvic CT scan showed no evidence of malignancy or thrombosis. Despite active anticoagulation for 14 days, a repeat CT scan demonstrated no improvement, and the possibility of alternative diagnoses were considered. Positron emission tomography/CT imaging showed no evidence of hypermetabolic lesion in neck, chest, abdomen, or pelvis. The patient underwent a thoracotomy via a midline sternotomy. A mass was found arising in the main pulmonary artery, extending to both left and right pulmonary arteries. The pulmonary artery wall and the anterior pulmonary valve leaflet were grossly invaded by the tumor. A subtotal resection was performed with reconstruction of the pulmonary valve. Pathology showed a high-grade intimal sarcoma. The patient is recovering from surgery. Chemotherapy is planned and is to be followed by radiation.

Discussion: Pulmonary artery sarcomas are rare neoplasms; they often cause symptoms suggestive of recurrent pulmonary emboli. A diagnosis of pulmonary artery sarcoma is virtually never considered initially. In patients with presumed thromboembolic disease, certain clinical and imaging characteristics may suggest the alternative diagnosis of pulmonary artery sarcoma.

A Case of Deglutition Neurocardiogenic Syncope

Mark V. Jordan, MD, Johan Aasbo, DO, Hakan Paydak, MD, Marilyn D. Ezri, MD; Medical College of Wisconsin, Milwaukee, Wis

Case: A 50-year-old woman with a past medical history of anoxic encephalopathy secondary to cardiac arrest while drinking liquids in 2004, presented to the hospital after being found by her parents at home unconscious with labored breathing. The patient's parents had noted several episodes of the patient "suddenly falling asleep" and being unresponsive during meals over the last several years. In the ED, the initial exam showed the patient to be hypotensive, bradycardic, hypoxic and comatose. She was intubated in the ED and transferred to the intensive care unit. Chest radiograph revealed bilateral lower lobe infiltrates suspicious for aspiration pneumonia, and empiric intravenous antibiotics were started. CT of the head ruled out significant intracranial pathology. Dopamine was initiated for hemodynamic support. The patient continued to improve and was extubated and dopamine was discontinued. During her hospitalization, the patient was noted to have periods of sinus bradycardia with AV nodal block and several seconds of ventricular asystole when swallowing food or liquids. The patient had mild lightheadedness during these episodes. Echocardiography demonstrated normal biventricular structure and function. A swallow study and upper GI study excluded esophageal pathology, and a CT of the chest and neck was negative for a mediastinal mass. With correctable causes of her periodic hypervagotonia excluded, implantation of a dual chamber permanent pacemaker was performed to prevent recurrent syncope.

Discussion: Deglutition neurocardiogenic syncope refers to the uncommon phenomenon of presyncope or syncope associated with deglutition. The classic symptoms include dizziness, lightheadedness, or fainting on swallowing. Cardiac monitoring may reveal sinus bradycardia, AV block, and periods of ventricular aystole upon swallowing, which is vasovagally mediated. Esophageal and mediastinal evaluation may identify potentially treatable secondary causes. Barium swallow and intraluminal esophageal dilatation in conjunction with simultaneous rhythm monitoring may be used to identify specific areas of esophageal dysfunction. If an esophageal abnormality is identified, surgical correction may be curative. If treatable secondary causes are excluded, permanent pacemaker implantation is effective.

Coronary Steal Due to Bilateral Internal Mammary Artery (IMA)—Pulmonary Artery (PA) Fistulas—A Rare Cause of Chest Pain after Coronary Artery Bypass Grafting

Abdul Hakeem, MD, Sabha Bhatti, MD, Su Min Chang, MD, Peter Kosolcharoen, MD, Tim Biring, MD; University of Wisconsin, Madison, Wis

Case: A 54-year-old man with history of coronary artery bypass grafting (CABG) presented with chest pain and on workup was found to have a non-ST elevation myocardial infarction. Left heart catheterization with coronary angiography showed a 100% occlusion of the right internal mammary artery (RIMA)-right coronary artery graft in its mid segment and a patent LIMA-left anterior descending graft. An unusually large extensive fistulous collateral formation was observed between both the RIMA and LIMA to the pulmonary arterial system, effectively causing a left-right shunt. His angina was attributed to the significant coronary steal caused by the shunt. The patient refused any further intervention or surgery and opted for medical treatment.

Discussion: IMA-PA fistula is an extremely rare complication of CABG. Thus far there have been over 20 cases reported; however all but 1 described were unilateral IMA-PA fistula. This is the second reported case to date of a bilateral IMA-PA fistula post CABG. IMA-PA fistula must be considered in the differential of patients presenting with chest pain after CABG and should be diagnosed by selective angiography of the IMA grafts.

The Mysterious Case of the Abdominal Cocoon

D. Thompson, MD, J. Treisman, MD; Aurora Health Care, Milwaukee, Wis

Case: A 33-year-old woman presented with intractable nausea, vomiting, and weight loss. This was preceded by a 2-year history of peptic ulcer disease with perforation. Prior surgical procedures included gastroduodenostomy and gastrojejunostomy with vagotomy. Esophagogastroduodenoscopy (EGD) was negative. Exploratory laparotomy revealed a thick fibrotic peel overlying the small bowel, best described as an abdominal cocoon. CT scan showed sclerosing mesenteritis as well as multiple blastic bone lesions in the pelvis and spine; uterus and adnexa were negative; no lympadenopathy was appreciated. Bone marrow biopsy showed signet ring cell adenocarcinoma, most likely gastric primary. Mammogram was

negative. CT guided biopsy of the peritoneum was negative. EGD was repeated and showed large friable masses in the residual afferent and efferent loops of bowel created during the previous surgical procedures. Biopsies revealed signet ring cell adenocarcinoma, gastric primary.

Gastric adenocarcinoma typically metastasizes to liver, lung, bone, and adrenal glands. While this patient presented with many of the usual symptoms of gastric carcinoma (nausea, vomiting, and weight loss), the finding of an abdominal cocoon is rare and unusual. To our knowledge, this may represent the first case of gastric adenocarcinoma presenting with bowel obstruction secondary to abdominal cocoon.

Discussion: Abdominal cocoon, also known as sclerosing encapsulating peritonitis (SEP), is a rare condition of unknown etiology involving dramatic thickening of the peritoneal membrane, often associated with fatal bowel occlusion. It was first described in 1978 in adolescent girls living in the tropics. About 50 cases have been described since that time. The cocoon typically contains loops of small bowel and sacs of ascites. Other organs such as the mesentery, stomach, liver, pancreas, spleen, gall bladder, pelvic organs, and abdominal wall may be affected by sclerosis. The most affected areas may form a mass, described with the term "abdominal cocoon." The classic morphologic appearance is that of a thick, white membrane encasing the bowel in a concertina-like fashion. Findings on diagnostic imaging include bowel wall thickening, loculated ascites, circumscribed masses of bowel loops, and delayed bowel transit. SEP has been associated with chronic ambulatory peritoneal dialysis, luteinizing ovarian thecomas, practolol use, and intraperitoneal chemotherapy. SEP has rarely been associated with gastrointestinal carcinomas.

When the Treatment is Worse than the Disease: A Case of Methotrexate-Induced Lymphoma

Vanessa Z. Riegert-Johnson, MD; Gundersen Lutheran Medical Center, La Crosse, Wis

Case: A 67-year-old man presented with 1 month of upper respiratory illness symptoms as well as new swelling in his left upper extremity and groin. He also complained of fatigue, night sweats, fevers, and cough. He denied weight loss. His past medical history was significant for seronegative rheumatoid arthritis (RA) diagnosed in 1999 with no extra-articular disease. Methotrexate (MTX) therapy was initiated in September 2001, with an estimated total dose of 2600 mg. His medications included Prednisone and Celebrex daily and MTX therapy once a week. Physical exam was significant for multiple, tender, enlarged lymph nodes throughout his body, the largest measuring 4 x 6 cm in the left axilla. There was no hepatosplenomegaly. Extremity exam found a left upper extremity edematous from the hand to the mid-bicep with palpable brachiocephalic lymph nodes. Initial laboratory showed normal complete blood count (CBC), liver and renal function tests, and serum protein electrophoresis (SPEP). His LDH was 326 IU/L (0-300 normal range). He underwent left axillary lymph node biopsy and was seen in hematology. Pathology was consistent with large B-cell lymphoma (DLBCL). PET-CT imaging showed diffuse disease. Initial treatment included empiric discontinuation of MTX and close monitoring for possible initiation of chemotherapy. The patient's symptoms rapidly resolved over the following 6 weeks. Repeat PET imaging at 6 weeks showed marked reduction of disease. To date, the patient has not required chemotherapy.

Discussion: Patients with RA are at increased risk for non-Hodgkin's lymphoma (NHL), approximately 2- to 20-fold. MTX therapy has been linked to lymphoproliferative disease development, but a definitive causal relationship has yet to be established. The frequency of developing lymphoma on MTX therapy is not known. The strongest evidence of MTX as an etiologic agent is regression of tumor upon cessation of therapy. Sixty percent of reported cases have shown at least partial regression in response to withdrawal of MTX, with the majority of responses occurring in EBV-positive cases. In patients who develop DLBCL, 40% regress, while 60% require chemotherapy. Overall survival is approximately 50%.

Severe Hemolytic Anemia Following Mitral Valve Repair

Ravi Mareedu, MD, Anupama Inaganti, MD, Shereif Rezkalla, MD, Paul Pearson, MD; Marshfield Clinic, Marshfield, Wis

Case: We report an 82-year-old man who presented with nausea, vomiting, and fatigue. His past medical history included a history of coronary artery disease and ischemic mitral regurgitation. Coronary artery bypass grafting and posterior mitral valve annuloplasty with "Edwards Life Science annuloplasty band" was performed 2 months prior to admission. Exam was noncontributory. Patient had slowly developed anemia since surgery, with labs consistent with a hemolytic anemia. Hemoglobin was 7.2 gm/dl. There was an increased reticulocyte percentage at 3.95 (normal 0.5-1.77); haptoglobulin was less than 8 m/dl (normal 41-230mg/dl) with LDH of 1973 U/l and presence of schistocytes, teardrops cells, and ovalocytes in peripheral smear. Patient also had evidence of pigment nephropathy with urine positive for hemoglobin, but negative for any RBCs, and a creatinine of 2.0. A transthoracic echocardiogram obtained a month after repair showed evidence of mild to moderate mitral

regurgitation. Based on the clinical presentation, patient was diagnosed with microangiopathic hemolytic anemia secondary to the regurgitant blood jet against his annuloplasty ring. He underwent urgent mitral valve replacement with porcine heart valve. Subsequently he improved with improvement of hemoglobin to 11.3 gm/dl in a week and return of renal function to baseline with creatinine of 1.3.

Discussion: Though the development of hemolytic anemia after mitral valve replacement is not uncommon, the development of hemolytic anemia with pigment nephropathy after mitral valve repair is rare. Recognition of this rare complication is important, and the best way to correct it is by a surgical removal of the ring and a valve replacement.

Pulmonary Cement Embolism

Aditya Kasarabada, MD, MPH, Amol Patil, MD, Aaron Dall, MD; Medical College of Wisconsin, Milwaukee, Wis

Case: A 76-year-old woman presented with progressive dyspnea and severe chest pain. The chest pain was mainly along the right sternal border, and she denied cough, fevers, falls, orthopnea, previous episodes of chest pain or any radiation of the pain elsewhere. The patient had been discharged from the hospital 2 days previously after undergoing kyphoplasty for her vertebral compression fracture. Her past medical history was significant for multiple myeloma with secondary osteoporosis and multilevel vertebral compression fractures treated with 5 vertebroplasties. On physical exam, she was an elderly lady in obvious discomfort and mild tachypnea but otherwise had stable vital signs. She did not have jugular venous distention, cyanosis, or clubbing. Her cardiac exam was positive for exquisite precordial pain. Her cardiac enzymes were negative, and EKG was unchanged from her last one. Her chest X-ray was reported as "unchanged," and she underwent a pulmonary embolism protocol CT that revealed hyperdense emboli in the distal right pulmonary artery and multiple new and old subsegmental hyperdense emboli. Revaluation of her chest radiograph revealed hyperdense emboli misread as calcification. Based on these findings, she was diagnosed with pulmonary cement emboli.

Discussion: Acrylic cement or Polymethylmethacrylate (PMMA) is being increasingly used for treatment of compression fractures with vertebroplasties. Cement embolism is an underreported complication of this common procedure. Patients can remain asymptomatic or can rapidly develop fatal respiratory distress during the procedure. Patients can also present 24-48 hours after these procedures with chest pain and progressive dyspnea. Attributing the chest pain to the expected discomfort after vertebroplasty may significantly delay the diagnosis. A chest radiograph after all vertebroplasties and arthroplasties is recommended and can be diagnostic under a high index of suspicion. Treatment is largely supportive with anticoagulation due to PMMA's highly thrombogenic nature. The ideal treatment and duration of anticoagulation remain under debate.

The Other Flu

Jessica Wallace, MD, Kurt Pfeifer, MD; Medical College of Wisconsin, Milwaukee, Wis

Case: A 39-year-old man presented with a 3-week history of progressive, nonproductive cough, dyspnea, fever, chills, and malaise. He had no recent sick contacts or prior surgeries or illnesses. His lung exam was significant for egophony, bronchial breath sounds, and dullness to percussion in the right lung base. Chest radiograph confirmed a right lower lobe pneumonia, and treatment was started with ceftriaxone and azithromycin. On hospital day 2, his blood cultures came back positive for nontypeable *Haemophilis influenzae*. Despite therapy, the patient had persistent chest and back pain with a progressive right pleural effusion that required thoracoscopy with decortication for drainage.

Discussion: Nontypeable *H. influenzae* strains colonize up to 80% of individuals. Bacteremia and invasive disease associated with nontypeable *H. influenzae* are rare but have a significant mortality rate (up to 50%). Patients at risk for invasive *H. influenzae* infection include those with asplenia, sickle cell disease, complement deficiencies, Hodgkin disease, congenital or acquired hypogammaglobulinemia, and those with T-cell immunodeficiency states (ie HIV). Advanced age, alcoholism, malignancy, cystic fibrosis, and asthma are also risk factors. The severity of infections caused by nontypeable *H. influenzae* requires aggressive treatment, and patients are best treated with an intravenous third-generation cephalosporin.

Several case reports of patients with nontypeable *H. influenzae* sepsis have been reported, but most had underlying medical conditions, such as diabetes mellitus, or a significant history of smoking or alcohol abuse. This case is unique for a patient with no predisposing risk factors developing severe, invasive infection with *H. influenzae.*

Rhabomyolysis in an 82-Year-Old Man on Lipid-Lowering Therapy

DF Hannah; University of Wisconsin School of Medicine and Public Health, Madison, Wis

Case: An 82-year-old veteran with past medical history significant for coronary artery disease status post (s/p) angioplasty times 2 and an upper gastrointestinal bleed presented with complaints of progressively worsening generalized weakness and mild

myalgias for the past 3-4 days. At the time of admission, the patient reported he was unable to lift himself up to a standing position. Loss of appetite preceded his weakness by 1 day. Review of systems was otherwise unremarkable. Exploration of the patient's medical record showed that he had been discharged approximately 1 month earlier after placement of a stent in his mid- right coronary artery (RCA). At that time, his cardiac medications were optimized, including an increase in simvastatin from 40 mg to 80 mg daily, and an order for discontinuation of his gemfibrozil. However, the patient was unsure of his current medications and thought that he may still be taking gemfibrozil at the time of presentation. Physical exam was unremarkable, except for mildly decreased strength in lower extremities. Labs at time of admission showed signs of renal failure with elevated blood urea nitrogen (BUN) and Cr, hyperkalemia, and urinalysis with granular casts, elevated liver enzymes, and most notably, a creatinine kinase of 17,776. Patient was diagnosed with rhabdomyolysis and acute tubular necrosis as an adverse effect of his increased dosage of statin medication and probable concurrent fibrate use.

Discussion: It has been shown that use of statins for lipid control comes with a risk of myopathic syndromes including myalgias, myositis, and rhabdomyolysis. The risk of rhabdomyolysis due to statin use is dose dependent, with an average incidence of 0.44 per 10,000 patient years. When statins are used in conjunction with fibrates, the risk of rhabdomyolysis increases 12-fold over statins alone. It is thought that deficiencies in products of the HMG CoA reductase pathway can cause membrane instability and dysfunctional electron transport, contributing to muscle cell injury.

Treatment of drug-induced rhabdomyolysis includes discontinuation of the offending agents and prevention of complications such as acute tubular necrosis due to the nephrotoxic effects of myoglobin. In our patient, aggressive IV fluids were given with goal urine output of 200-300 ml/hour to prevent progression of acute tubular necrosis (ATN). The patient's creatine kinase level and liver enzymes were monitored, with slow normalization of these values.

This case highlights the importance of patient education on medications after discharge and guidelines for the safest combination of lipid lowering drugs when monotherapy fails.

DISPLAYED POSTERS

Stress Testing Does Not Accurately Identify Coronary Artery Disease in Patients with Chronic Kidney Disease

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Case: Although stress testing is routinely performed as part of the pre-transplant evaluation of patients with chronic kidney disease (CKD), its accuracy for identifying coronary artery disease (CAD) in this population is unclear. Subjects were identified from 99 patients with CKD enrolled in an intensive pre-transplant cardiac evaluation program at our institution. Significant CAD was defined as >75% lumen narrowing of a major (>2 mm) epicardial coronary artery by angiography. Values below are medians (interquartile ranges). Fifty patients (56% white, 72% male) underwent stress testing and angiography. They were 57 (51-62) years old, 72% had type II diabetes mellitus, and 72% were on dialysis. Significant CAD was identified in 32 patients. Stress test modalities were adenosine sestamibi (52%), treadmill sestamibi (30%), dobutamine echo (8%), and treadmill echo (10%). Ischemia was identified on 15 tests and infarct on 4 tests. Of 31 patients with completely normal stress tests, 19 (61%) had significant CAD. For ischemia or infarct, the sensitivity of stress testing was 41%, specificity 67%, positive predictive value 68%, negative predictive value 57%, (positive likelihood ratio 1.12, negative likelihood ratio 0.95) for CAD. For ischemia only, the sensitivity of stress testing was 31%, specificity 72%, positive predictive value 59%, negative predictive value 59% (positive likelihood ratio 1.12, negative likelihood ratio 0.95) for CAD.

Discussion: Stress testing is not reliable for detecting clinically significant CAD in patients with advanced CKD. Traditional paradigms of stress testing before angiography may not apply to modern renal transplant candidates who are older, have a higher prevalence of type II diabetes, and have a higher pretest likelihood of CAD.

Post Colonoscopy Splenic Rupture

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Case: A 70-year-old man was transferred from an outside facility for management of hypotension and shock. He underwent a screening colonoscopy earlier that day. He was noted to have an episode of emesis during conscious sedation for the colonoscopy. Colonoscopy showed normal findings. Later that day he experienced increasing dizziness and generalized weakness. Physical exam on arrival showed a pale and diaphoretic male with BP of 73/47 and heart rate (HR) of 147. Intravenous fluid bolus and norepinephrine were started with no improvement in blood pressures. With radiographic evidence of right lower lobe pneumonia, levofloxacin was given, and the patient was transferred to our facility for further management. Upon admission, BP 83/49,

HR 127, rest rate (RR) 20, temparature 95.7ºF. Lungs were clear to auscultation. Heart was tachycardic with regular rhythm and normal heart sounds. Abdomen was tender diffusely with decreased bowel sounds. No neurological deficits were noted. There was a significant drop in his hemoglobin to 5.6 g/dL from 12g/dL measure 1 month prior. CT scan of chest, abdomen, and pelvis showed splenic rupture with a large hematoma and active bleeding. There was blood in bilateral paracolic gutters and pelvis. Incidental findings of massive mediastinal adenopathy, right upper lobe pleural based parenchymal mass, and L3 vertebral collapse suggested possible malignancy. Considering patient's comorbities and personal wishes, comfort-focused care was pursued and patient expired the following day.

Discussion: Splenic rupture is an uncommon but potentially fatal complication after colonoscopy, presenting with both early and delayed presentation. A high index of clinical suspicion is necessary for early diagnosis. There are reports of favorable outcome with selective splenic artery embolization and emergent surgery based on hemodynamic status and size of hematoma.

Pheochromocytoma-Induced Cardiomyopathy

Jeffrey R. Cook, MD, Anupama K. Rao, MD, Michael Goldrosen, MD; University of Wisconsin-Madison, Madison, Wis

Case: A 41-year-old man with a history of untreated hypertension and recently discovered Raynaud's phenomenon presented with several weeks of exertional shortness of breath, progressing to orthopnea. On further questioning, the patient also noted profound weight loss, mottling and diaphoresis of his extremities, and profound fatigue. He was heard to say, "I feel an itch deep in my chest." On hospitalization, physical exam revealed an ill-appearing, cachectic male with prominent jugular venous distention (JVD), bibasilar rales, and a loud S3. Hypertension was present on the order of 160/112. There was no evidence on ECG or Troponin-I evaluation to suggest acute coronary disease. The chest X-ray revealed bibasilar pleural effusion, proven to be transudative after thoracentesis. A cardiology consult and transthoracic ECG were obtained, revealing profoundly reduced systolic function and ejection fraction of 15%. Further imaging, including abdominal magnetic resonance imaging (MRI) and CT-scans were obtained, in an effort to uncover a secondary cause for hypertension. These revealed bilateral adrenal masses congruent with pheochromocytoma (PCC). Catecholamine studies confirmed the diagnosis.

Discussion: A review of the literature intimates that PCC behaves in many ways with respect to the myocardium, though PCC-induced cardiomyopathy itself is rare. Postmortem studies show some histopathologic changes in most patients, though case studies of living patients suggest clinical heart failure in far less than half of those with PCC. More commonly dilated, but also hypertrophic cardiomyopathies are described, with a plethora of mechanistic hypotheses to explain them. These mechanisms may include direct inflammatory effects of catecholamines to the myocyte structure, pathologic changes in membrane permeability to calcium, detrimental afterload effect (macrovascular constriction), and "micro-infarctions" (microvascular constriction), all of which may coexist as part of a spectrum. Different myopathic patterns may result from the relative contribution of specific catecholamines norepinephrine and epinephrine, which vary from case to case. Of particular interest is the widely reported reversibility of the cardiac dysfunction upon resection of the culprit PCC. At the time of this writing, our particular patient is many months post-resection, and has yet to undergo repeat echocardiography.

Reversible Left Ventricular Dysfunction Secondary to Probable Cardiac Contusion

Anupama Inaganti, MD, Ravi Mareedu, MD, Shereif H. Rezkalla, MD, FACP; Marshfield Clinic, Marshfield, Wis

Case: We report a 74-year-old man who presented following a motor vehicle accident with mild dyspnea and chest discomfort. Physical examination was significant for mild tenderness to palpation over the sternum, decreased breath sounds over both the lung fields and a 2/6 systolic murmur at the left sternal border. Initial laboratory evaluation revealed elevated Troponin I at 1.3 and 0.9 (normal <0.1 ng/ml), leukocytosis with bandemia and renal insufficiency. ECG monitoring showed runs of non-sustained ventricular tachycardia. CT scan of the abdomen/pelvis revealed extensive consolidative changes in the right lung, suggestive of pulmonary contusion. A 2D-ECG on arrival showed akinesis of inferior wall, hypokinesis of the remaining left ventricular segments with an ejection fraction (EF) of 25%. Angiography revealed only mild to moderate coronary artery disease. The degree of left ventricular dysfunction was out of proportion to coronary artery disease. Intravenous amiodarone and metoprolol controlled the arrythmia. Lisinopril and furosemide were started orally for after load reduction and oral metoprolol was also continued. A diagnosis of probable cardiac contusion with significant left ventricular dysfunction was established. At follow up 2 months later, the patient was asymptomatic. Repeat 2D ECG showed remarkable improvement with normal left ventricular systolic function, EF in 50-60s and no regional wall motion abnormalities.

Discussion: This case demonstrates a completely reversible left ventricular dysfunction secondary to probable cardiac contusion and should always be considered in the differential diagnosis of such cases. Cardiac contusion has to be suspected in patients with blunt chest trauma and nonspecific cardiac symptoms.

ORAL VIGNETTES

An Unsual Cause of Hypoglycemia

Nilay Kumar, MD, MPH, Walter Hogan, MD, Kurt Pfeifer, MD; Medical College of Wisconsin, Milwaukee, Wis

Case: A 52-year-old man presented with a 6-month history of large volume, greasy diarrhea and recurrent, tonic-clonic seizures preceded by neuroglycopenic symptoms. His symptoms started within 6 weeks of laparoscopic Nissen fundoplication, and his past medical history included hypertension, gastroesophageal reflux disease, and sleep apnea. He had an extensive neurology and cardiology evaluation that was completely normal but had a witnessed hypoglycemic episode in the hospital. Laboratory studies drawn at that time revealed insulin of 186, proinsulin of 41.9, and C-peptide >7, suggesting a profound internal burst of insulin release. To discern the source of the patient's hyperinsulinemia, mesenteric intra-arterial calcium stimulation with venous sampling was performed, which confirmed excessive insulin secretion from the entire pancreas, consistent with noninsulinoma pancreatogenous hypoglycemic syndrome (NIPHS).

Discussion: NIPHS is a novel syndrome recently described and seen more commonly in patients after gastric bypass procedures. The proposed mechanism is the increased delivery of nutrients to the hindgut causing increased production of glucagon-like protein 1 (GLP1), which in turn increases propagation of pancreatic beta cells. This syndrome is the counterpart of nesidioblastosis commonly seen in infants and characterized by hypertrophy of beta cells with enlarged islets. Treatment options include octreotide and sandostatin, but our patient did not respond well to these. He has been switched to exanetide (GLP1 receptor agonist) and is using preventive measures to watch his symptoms and prevent hypoglycemia. He is stable with this therapy and awaiting possible gradient-guided pancreatectomy—the only treatment shown to provide significant palliation of symptoms. To our knowledge, this is the first case of NIPHS reported after Nissen fundoplication.

Bilateral Facial Nerve Palsy in a 20-Year-Old Male

RJ Maggiore, MD; University of Wisconsin Medical School, Madison, Wis

Case: A previously healthy 20-year-old man presented to our ED for worsening left, progressing to bilateral, facial weakness, and difficulty swallowing with associated night sweats, dyspnea with pleuritic chest pain, intermittent arthralgias, and anorexia. He had obvious peripheral-origin facial nerve palsy on exam, L-sided tympanic effusion, bilateral ankle swelling, petechial rash, and scattered nasal septal ulcers on direct nasopharyngoscopic exam without any sinusitis, hepatosplenomegaly (HSM), or left anterior descending coronary artery (LAD). The remainder of his neurologic exam was unremarkable. A chest X-Ray revealed bilateral pulmonary cavitary nodules in the upper lobes. CT and MRI of his head and neck revealed changes consistent with tymapnomastoiditis, facial nerve and geniculate ganglion enhancement, and chronic R-sided maxillary, and ethmoid sinusitis. Routine laboratory examination revealed only a mild leukocytosis. Urine studies showed mild hematuria. Inflammatory markers were significantly elevated. Blood, urine, sputum, tympanic fluid, and cerebrospinal fluid (CSF) cultures were all negative. Given concern for possible sarcoidosis versus Wegener's granulomatosis, a tissue diagnosis was paramount. Antinuclear antibody (ANA) and anti-neutrophil cytoplasmic antibody (ANCA) titers were obtained and the c-ANCA was significantly elevated at >1:1280, with anti-PR3 at 163 units. Biopsies of 1 of the pulmonary nodules revealed a necrotizing inflammatory reaction with giant cells consistent with Wegener's granulomatosis.

Discussion: Wegener's granulomatosis is a vasculitis of small-to-medium-sized blood vessels characterized by granulomatous inflammation and oftentimes necrosis of affected vessels in the renal glomerula, nasopharynx, sinuses, and lungs. Although c-ANCA positivity, usually of anti-PR3 antibodies, supports the diagnosis, Wegener's ultimately remains a histopathological diagnosis, requiring biopsy material from the affected organ or organs to confirm the diagnosis. Although otologic manifestations tend to be common, rarely does facial nerve palsy, especially bilateral involvement, manifest itself as the chief presenting sign of Wegener's and only a handful of such cases are reported in the literature. Prior to evolution of current treatment strategies, Wegener's granulomatosis posed itself as a veritable death sentence for many patients. However, this patient achieved clinical remission after 3 months of prednisone and cyclophoshamide as initial therapy and then changed to methotrexate for maintenance therapy. After 4 months of therapy, his facial nerve function had significantly improved and he regained his ability to smile. He remains in remission 6 months out from his diagnosis.

Cat Gave Me an Ulcer?

Sumit Bector, MD, Nalini M. Guda, MD; Aurora Health Care, Milwaukee, Wis

Learning Objective: To recognize other non nonsteroidal anti-inflam-

matory drug (NSAID), non *H. pylori* causes of gastric ulcers.

Case: A 53-year-old white woman presented to the emergency department with sudden onset of abdominal pain localized to epigastric/right upper quadrant region associated with nausea and coffee ground emesis. She was evaluated for abdominal pain at a different facility 24 hours prior to this episode and was released after abdomen CT was unremarkable. A repeat CT of abdomen revealed thickened antropyloric region. Past medical history was significant for irritable bowel syndrome. No prior history of NSAID use or similar symptoms. She had a pet cat at home. Vital signs were stable and physical exam revealed epigastric tenderness. All laboratory testing was normal. Upper gastrointestinal endoscopy revealed a circumferential ulcer in the antrum with white base and no active bleeding. Biopsies from the margins of the ulcer were obtained and revealed gram negative rods consistent with *Helicobacter heilmanii*. She was treated with Clarithromycin, amoxicillin, and proton pump inhibitors for 2 weeks and subsequent endoscopy at 6 weeks showed complete healing of the ulcer and eradication of the organism on biopsy.

Discussion: H. heilmannii infections are uncommon in human beings. *Helicobacter heilmannii,* formally known as *Gastrospirillum homins*, is a gram-negative rod with tightly coiled corkscrew appearance, measuring 3.5 to 7.5 µm in length. Prevalence of *H. heimannii* infection in United States is 0.3% in the general population. Colonization of stomach with *H. heilmannii* species is thought to be result of close proximity to animals and pets, based on some retrospective European studies. There have been few case reports of clinically significant *H. heilmanni* infections in humans. Symptoms are usually non-specific with dyspepsia, abdominal pain, nausea, and vomiting. Organism usually causes chronic gastritis but there have been associations noted with peptic ulceration, gastric carcinoma, and mucosa-associated lymphoid tissue lymphoma. Diagnosis of *H. heilmannii* is made by the detection of its characteristic morphology in gastric biopsy specimens. Because of variable expression of urease, 13C-UBT, and urease test are thought to be less sensitive than in *H. pylori.* Successful eradication with triple therapy has been achieved in most case reports.

Gastrointestinal Sarcoidosis

Laura Lizakowski, MD; Marshfield Clinic, Marshfield, Wis

Case: A 40-year-old man was admitted to our facility with left upper quadrant abdominal pain. This was his third admission for abdominal pain within 5 months. The onset of the abdominal pain occurred after eating, and he also had 1 episode of vomiting. The pain was worse with standing and movement, and there were no alleviating factors. He described the pain as a sharp knife-life pain and rated it a 10/10. He had been having intermittent abdominal pain, which usually occurred during defecation, about twice weekly since his last discharge. Physical exam revealed an obese young male in obvious pain. He was afebrile and his vital signs were unremarkable. Abdomen was obese and soft with good bowel sounds. He had tenderness across the right and left upper quadrants and had voluntary guarding with deep palpation. Laboratory evaluation revealed a normal urinalysis, complete blood count (CBC) with differential, basic metabolic panel (BMP), liver enzymes, and pancreatic enzymes. Chest and abdominal X-rays were unremarkable. CT of the abdomen showed a 4x3 cm cystic-appearing lesion of the mid pancreas consistent with a pancreatic pseudocyst or postoperative fluid collection. It also revealed adenopathy in the gastrohepatic, periportal, and periaortic regions, along with moderate splenomegaly. Stool studies returned negative. Celiac panel was negative. Hepatitis panel was negative. An esophagogastroduodenoscopy (EGD) revealed normal appearing gastric mucosa; however, a biopsy revealed granulomatous gastritis. A colonoscopy showed edema of the sigmoid colon but biopsies revealed normal colonic mucosa. Because of the CT findings and perisistent abdominal pain, he underwent an open lymph node biopsy, which showed a non-necrotizing granulomatous inflammation consistent with the diagnosis of gastrointestinal (GI) sarcoidosis.

Discussion: Clinically recognizable GI system involvement occurs in <1% of patients with sarcoidosis. The GI symptoms are fairly nonspecific and include heartburn, generalized abdominal pain, diarrhea, nausea, vomiting, and possibly GI bleeding. The nonspecific symptoms and an absence of multisystem involvement make the diagnosis difficult to establish. Treatment involves using steroids for approximately 6 months.

"A Cause for the Pause"

Jennifer Mattingley, MD; Gundersen Lutheran Medical Center, La Crosse, Wis

Case: A 68-year-old white man with past history of hypertension, hyperlipidemia, and stage T1N1M0 squamous cell carcinoma of the tongue status post hemiglossectomy, radical neck dissection, and radiation therapy presented with recurrent syncope. He collapsed at home and was found to be pulseless. Cardiopulmonary resuscitation (CPR) was initiated and the patient regained consciousness within a few minutes. He was evaluated at an outside facility and was found to have a negative head CT and a normal ECG. He was treated for presumed hypovolemia and discharged to home. The next day he again was found unresponsive and pulseless. CPR was initiated, and after several minutes he regained consciousness. He was evaluated in

the emergency department and found to be in a junctional bradycardia and subsequently had a 3-second pause in which he temporarily lost consciousness. He was admitted to the hospital and a full workup for syncope was initiated. He then also complained of dysphagia, which he related to his previous radiation therapy. Given this complaint, the patient did have an esophogram, which revealed an irregular, proximal esophageal stricture. Esophagogastroduodenoscopy was performed that revealed no intrinsic stricture. He then underwent a CT scan of his neck, looking for a possible extrinsic cause for his dysphagia. The CT scan revealed an ill-defined mass, measuring 2.3x2.7x1.7 cm within the carotid sheath, surrounding the left internal and external carotid arteries. This was felt to be the "cause for the pause," and pathology was consistent with squamous cell carcinoma.

Discussion: Carotid sheath tumors are a very rare cause of syncope. Head and neck cancers account for 4%-5% of newly diagnosed cancers in the United States. Neurologic complications are relatively uncommon. Two unique neurologic sequelae include glossopharyngeal neuralgia and syncope. Glossopharyngeal neuralgia usually presents with acute unilateral head or neck pain preceding a syncopal event. Syncope may also arise from tumor compression of either the nerve to the carotid sinus or the carotid sinus itself. Pacemaker placement may be beneficial if a cardio-inhibitory-type syncope predominates, whereas it is of little benefit in a vasodepressor-type syncope. Ultimately, chemotherapy may be used to shrink the mass effect, which can alleviate symptoms. Other proposed treatments include atropine, carbamazepine, and radiation.

A Brain Teaser

Ruchika Batwara, MD, David Fisk, MD; Medical College of Wisconsin, Milwaukee, Wis

Case: A 59-year-old white man presented with a 3-month history of progressive forgetfulness, slurred speech, gait imbalance, and memory problems. His past medical history was significant for Lyme arthritis treated with doxycycline 7 years ago, diabetes, and a shrapnel injury. He was a Vietnam War veteran and reported exposure to Agent Orange. Neurological exam revealed significant dysarthria, ataxic gait, right upper extremity weakness, and poor short-term memory. The rest of his physical examination was unremarkable. Initial labs, including complete blood count and basic metabolic panel, were normal. Head CT with and without contrast revealed a diffuse hypoattenuating lesion extending through the white matter in his left temporal, parietal, and occipital lobes. There was no mass effect or enhancement with contrast. A brain biopsy was performed, and the pathology was consistent with a demyelinating process. In situ hybridization studies for John Cunningham virus (JCV) were positive, thus confirming the diagnosis of progressive multifocal leukoencephalopathy (PML). Evaluation for an underlying immunosuppressive state revealed a CD4 cell count of 132/mm3 (14%) with normal CD8 counts, complement, and immunoglobulin levels. Human immunodeficiency virus (HIV) and human T-lymphotropic virus (HTLV) polymerase chain reaction (PCR) tests were negative. A bone marrow exam was within normal limits, as was a lymph node biopsy, for possible lymphoma. Thus, in addition to having PML, he met Centers for Disease Control and Prevention (CDC) criteria for a diagnosis of idiopathic CD4 lymphopenia. The patient has received treatment with biweekly cidofovir infusions for the last 6 months and has shown subjective and objective clinical improvement.

Discussion: Progressive multifocal leukoencephalopathy is a demylinating disease of the brain caused by JCV. It primarily affects immunocompromised people and can present with any constellation of neurological symptoms and signs. The pathognomonic features seen on biopsy are considered diagnostic. Treatment options are limited, with highly active antiretroviral therapy (HAART) being the most effective therapy in HIV-positive patients.

A Case of Candida Albicans Endocarditis Secondary to AICD Device

Babak Haddadian, MD; Aurora Health Care, Milwaukee, Wis

Case: A 61-year-old woman presented with fever, leukocytosis, and tachypnea. Her past medical history included activation-induced cell death (AICD) placement status post (s/p) sudden cardiac death (5 months ago), nonischemic cardiomyopathy, pulmonary embolism status post inferior vena cava (IVC) filter placement, subtotal gastrectomy s/p gastric ulcer, cardiovascular accident (CVA), and smoking. Upon admission, she had a temperature of 105°F, rest rate of 33/min, blood pressure of 146/60mm/Hg, heart rate of 82/min and pulse oximetry of 95%. Physical examination showed a 3-4 cm jugular venous distention (JVD) at 30°, a systolic murmur with a grade of II-III/VI in the apex and a left-sided hemiplegia. There was no swelling or erythema over the implanted cardiac defibrillator (ICD) pocket area. Laboratory workup revealed white blood count: 22400 (91% neutrophils) and hemoglobin: 8.7. The patient continued running fevers despite being on broad-spectrum antibiotics for bacterial coverage. On day 3, one of the blood cultures became positive for *Candida albicans*, so Caspofungin and subsequently Fluconazole were initiated. A transesophageal echocardiogram (TEE) revealed a large mass attached to the atrial lead of the AICD moving in and out of the right ventricle with each diastole and systole. The device was extracted successfully

via open-heart surgery. The culture from the device was also positive for *C. albicans.* Before this, she underwent an esophagogastroduodenoscopy because of anemia. The biopsy of the margin of gastriojejunostomy was also positive for *C. albicans*.

Discussion: AICD lead endocarditis caused by *Candida* is a rare but serious complication of this device. The most common infective organisms are still *S. aureus* and coagulase negative staphylococcus. Underlying conditions such as malnutrition, diabetes, malignancy, steroids, or anticoagulant therapy predispose the patients with an ICD device to infection with *C. albicans.* It has a very high mortality rate even with proper treatment. Hematogenous seeding of the device from distant sites of infection has been reported but not with *Candida* species. Our case is the third reported case of AICD *Candida* endocarditis, although there have been 7 reported cases of pacemaker *Candida* endocarditis so far. TEE has advantages over transthoracic echocardiography (TTE) in diagnosis of a fungal ball. Treatment includes early lead extraction and long term antifungal therapy, preferably amphotricin B.

Conclusion: Fungal endocarditis should be suspected in any patient with implantable electrophysiologic cardiac device who presents with fever and leukocytosis. Antifungal therapy and lead extraction are the mainstay of the treatment.

A Peculiar Case of New Onset Ascites

Shawn Hancock, DO; University of Wisconsin Hospital and Clinics, Madison, Wis

Case: A 34-year-old African American man presented with abdominal pain, increased abdominal girth, fatigue, and weight loss. He had no past medical history and took no medications. He drank 12 beers a week for 15 years, but quit 1 year ago. He had a 5-pack-per-year smoking history. He had no family history of liver disease or malignancy, and no known risk factors for viral hepatitis or tuberculosis. On physical exam he was cachectic. His abdomen was distended and tense with no organomegaly. He had bilateral pedal edema. Bilirubin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), and international normalized ratio (INR) were normal. Alk Phos was 263 and gamma glutamyl transferase (GGT) was 122. Paracentesis revealed a serum-ascites albumin gradient of 0.6, suggesting a non-portal hypertensive cause. Ascites fluid had 103 nucleated cells with 60% lymphocytes, 7% neutrophils. Ascites gram stain and culture were negative, including mycobacterial culture. Other ascetic fluid tests, including adenosine deaminase, mycobacterium polymerase chain reaction (PCR), cytology, and flow cytometry, were negative. CT of the abdomen revealed hepatosplenomegaly and massive lymphadenopathy throughout the abdomen. The patient then underwent a laparoscopy, which revealed a peritoneum densely covered with small white nodules. The liver had a similar appearance with multiple small white nodules. Biopsy of the peritoneal nodules and liver both revealed non-caseating granulomas. Stains of biopsy specimens for acid fast bacteria were negative, as were tissue cultures for mycobacteria and fungi. The patient was discharged with a diagnosis of sarcoidosis and started on prednisone. Two months following discharge his symptoms had improved and his ascites had nearly resolved.

Discussion: Sarcoidosis is a systemic granulomatous disease of unknown etiology with the potential to affect multiple organs. Peritoneal involvement is extremely rare. A recent review cited only 18 reported cases in the literature. Nonetheless, it should be considered along with tuberculosis, fungal infections, carcinomatosis, and lymphoma in cases of non-portal hypertensive ascites with lymphadenopathy. New onset ascites in the absence of risk factors for liver disease has a broad differential diagnosis and can pose a diagnostic challenge. A systematic approach to new onset ascites, including accurate assessment of ascitic fluid and factoring in associated findings—in this case the presence of profound lymphadenopathy—narrows the differential diagnosis and guides appropriate diagnostic and therapeutic interventions, even with the rarest of diagnoses.

Plasma Induced Acute Lung Injury

Sreelatha Chalasani, MD, MPH, William G. Hocking, MD, FACP, Mark R. Hennick, MD, FACP; Marshfield Clinic, Marshfield, Wis

Case: We report a 39-year-old woman who was transferred to our facility for change in mental status and acute renal failure. Physical examination was unremarkable except for confusion and agitation. Initial laboratory evaluation revealed microangiopathic hemolytic anemia, thrombocytopenia, elevated lactate dehydrogenase (LDH), and elevated creatinine. The clinical diagnosis of thrombotic thrombocytopenic purpura (TTP) was made, and the patient was treated with plasmapheresis and steroids. On day 16, toward the end of plasmapheresis, the patient developed acute respiratory distress requiring ventilatory support. Chest X-ray was suggestive of bilateral pulmonary edema and the central venous pressure (CVP) was low. Transfusion related acute lung injury (TRALI) was diagnosed. Two of the 7 donors in the plasma pool were found to have positive HLA antigen screens. She had a rapid recovery and was extubated within 48 hours.

Discussion: TRALI presents as a spectrum of transfusion reactions that range from mild respiratory impairment to severe fulminant and fatal pulmonary injury. Diagnosis of TRALI should be considered when

dyspnea, hypoxemia, and pulmonary infiltrates occur during or within a few hours after transfusion of any blood product containing plasma. It is the leading cause of transfusion-related mortality in the United States, which is approximately 4-6 per 10,000 patients. Cases of TRALI reported may represent just the tip of an iceberg, and transfusion may play an important role in more cases of acute lung injury than currently realized. This has been largely unrecognized because of a lack of appreciation of the clinical picture and difficulties in diagnosis. The pathogenesis of TRALI has been attributed to the interaction between the donor anti-granulocyte antibodies and the recipient granulocytes. Management is mainly supportive care and most patients recover completely with in 48-96 hours. Patients can receive additional blood products in the future.

Something Fishy

Brian Matysiak, MD, Carol Wood, MD; Medical College of Wisconsin, Milwaukee, Wis

Case: A 51-year-old woman with a past medical history of sarcoidosis was admitted to the inpatient internal medicine service after her primary care physician (PCP) had tried unsuccessfully for 2 months to cure multiple, painful, purulent, red lesions on the patient's right arm. The patient initially presented to her PCP with a warm, indurated, exquisitely painful, and erythematous lesion on her right index fingertip. Within several days, more lesions arose on her hand and distal forearm, some of them becoming purulent. Her pain was restricted to the lesions with no radiation. Prior evaluations focused on an initial diagnosis of erythema nodosum. Prednisone, gatifloxacin, dicloxacillin, nafcillin, and gentamicin were tried separately at various times, but provided minimal improvement. In the hospital, she was thought to have superficial thrombophlebitis and started on broad-spectrum antibiotics after performing biopsy and culture of a representative skin lesion. Bacterial cultures from this biopsy eventually demonstrated *Mycobacterium marinum*. With appropriate antimycobacterial therapy, her lesions resolved over the next several days.

Discussion: Fish tank granuloma is caused by *Mycobacterium marinum*, an atypical *mycobacterium* that inhabits the water and marine organisms. Human infection occurs after trauma to the body in water, such as through fish spine punctures or through an open wound coming in contact with swimming pools, aquariums, lake/sea water, or water fleas. Wounds usually contain few bacteria, making it difficult to detect. Although not rare, there has been no consensus on treatment. Current treatments involve a multiple drug regimen continued for at least 2 weeks.

What Happens in Papua New Guinea May Not Stay in Papua New Guinea

DA Deming; University of Wisconsin Medical School, Madison Wis

Case: A 29-year-old male student presented with progressive chills, nausea, and weakness for 6 days. His symptoms seemed to progress one day and subside the next, only to worsen again the following day. He denied fever, pain, respiratory symptoms, change in bowel movements, and urinary complaints. He related these symptoms to the beginning stages of a case of influenza. His past medical history was significant for *Plasmodium vivax* malaria 8 months prior. This was acquired 2 months before diagnosis, while on a trip to Papua New Guinea. This was treated according to previous recommendations and assumed cured on follow-up. He denied travel out of Wisconsin since his trip 10 months ago. Prior vital signs were within normal limits. Sclera were non-icteric. Heart and lung exam were within normal limits. Non-tender splenomegaly was appreciated. Testing showed white blood count of 7.3, hemoglobin of 12.8, platelets of 106, electrolytes and liver function tests were within normal limits. On the night of admission he became febrile to 103.7°F. Malaria smears were performed on presentation and were positive for malarial forms later found to be a relapse of his previously treated *Plasmodium vivax*. This patient was treated with quinine, clindamycin, and an increased dose of primaquine per the recommendation of a Centers for Disease Control and Prevention (CDC) malaria expert.

Discussion: According to the CDC, the incidence of malarial infections in United States travelers continues to increase and will require primary care physicians to be more aware of the risks to travelers entering endemic areas. Knowing where malaria is endemic and the local treatment resistance patterns for these areas is required when deciding malaria prophylaxis and treatment regimens. This is especially true of Papua New Guinea, where therapy-resistant malaria is prevalent. In addition, it is also important to understand the biology of the *Plasmodium* species that is infecting the patient. This patient was infected with 1 of the 2 malaria species that can relapse, the other being *P. ovale.* This occurs because these species are the only 2 that contain a dormant hypnozoite form in the liver. The current therapies used to clear the organism from the blood stream are not effective in clearing the hypnozoite form and therefore allow for relapse. Primaquine is commonly used to prevent malarial relapse. In the case presented above, the patient received the previously recommended dose, which has recently been doubled to 30 mg of the base form due to break through infections acquired in New Guinea, relating to the relative resistance of *P. vivax.*

Economic credentialing issues

Brian L. Buchanan, JD

Rather than basing credentialing decisions on qualitative data and a physician's clinical competence, some hospitals are placing emphasis on economic considerations when deciding when to grant hospital privileges. This practice is known as "economic credentialing." The American Medical Association (AMA) is among the groups that have taken exception to this practice, and has asserted that it may be in violation of state and federal laws.

The AMA defines economic credentialing as "the use of economic criteria unrelated to quality of care or professional competence in determining a physician's qualifications for initial or continuing hospital medical staff membership or privileges," and states in AMA Policy H-230.975 (Economic Credentialing), that it strongly opposes such behavior. Economic credentialing can include any practice in which a hospital conditions granting staff privileges on a physician providing a certain volume of services at, or referring a certain number of patients to, the hospital, as well as conflict of interest policies (also known as loyalty oaths), where the physician is not allowed to invest in or own facilities that compete with the hospital.

The Joint Commission Hospital Accreditation Standards state that "decisions on appointments or on granting of clinical privileges must consider criteria that are directly related to the quality of care," and "decisions on reappointment or on revocation, revision, or renewal of clinical privileges must consider criteria that are directly related to the quality of care." *The Physician's Guide to Medical Staff Organization Bylaws* recommends that medical staff bylaws bar credentialing based on any criteria other than education, experience, and clinical competence.

AMA Policy E-4.07 (Staff Privileges) states, "The mutual objective of both the governing board and the medical staff is to improve the quality and efficiency of patient care in the hospital. Decisions regarding hospital privileges should be based upon the training, experience, and demonstrated competence of candidates, taking into consideration the availability of facilities and the overall medical needs of the community, the hospital, and especially patients. Privileges should not be based on numbers of patients admitted to the facility or the economic or insurance status of the patient. Personal friendships, antagonisms, jurisdictional disputes, or fear of competition should not play a role in making these decisions. Physicians who are involved in the granting, denying, or termination of hospital privileges have an ethical responsibility to be guided primarily by concern for the welfare and best interests of patients in discharging this responsibility."

The Department of Health and Human Services (HHS) Office of the Inspector General (OIG) has indicated that economic credentialing by hospitals may violate the federal anti-kickback statute, which prohibits the offering, payment, solicitation, or receipt of any remuneration in exchange for a patient referral or referral of other business for which payment may be made by a federal health care program. The OIG has stated that conditioning privileges on a particular number of referrals or requiring the performance of a particular number of procedures, beyond volumes necessary to ensure clinical proficiency, potentially raise substantial risks under the statute. On the other hand, a credentialing policy that *categorically* refuses privileges to physicians with significant conflicts of interest would not appear to implicate the statute in most situations. Whether a particular credentialing policy runs afoul of the anti-kickback statute would depend on the specific facts and circumstances, including the intent of the parties.

Hospitals' use of economic credentialing has been challenged under different legal theories with varying success. For example, hospitals have primarily prevailed in court cases challenging economic credentialing on antitrust grounds.

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On the other hand, courts have been less permissive when hospitals deny privileges based on claims of conflict of interest. In one case, *Murphy v. Baptist*, the Arkansas Supreme Court ruled that the hospital's conflict of interest policy caused irreparable harm to the physician-patient relationship because it interfered with the physician's referring patterns and ability to provide continuing care.

Economic credentialing may violate the Internal Revenue Code, which requires nonprofit hospitals to have an open staff, ie, "admission to the medical staff must be open to all qualified physicians in the area, consistent with the size and nature of the facilities." Hospitals that engage in economic credentialing may violate this requirement.

Wisconsin Administrative Code Chapter HFS 124.12 (Medical Staff) (4)(c) (Criteria for Appointment) states that criteria for appointment to the medical staff shall include individual character, competence, training, experience, and judgment. Wisconsin Statute § 50.36(3)(a) states that "each individual hospital shall retain the right to determine whether the applicant's training, experience, and demonstrated competence is sufficient to justify the granting of hospital staff privileges." Neither the code nor the statute mentions economic criteria.

Wisconsin Medical Society members who would like to read more about economic credentialing can contact the Society for additional reading material. Physicians who feel they have been excluded from a medical staff based on economic criteria should contact their personal attorney.

Jonathan I. Ravdin, MD

Dean's Corner

Medical College's progress a positive for Wisconsin

Jonathan I. Ravdin, MD
Dean and Executive Vice President, Medical College of Wisconsin

The ability to address the dedicated members of the Wisconsin Medical Society through the *Wisconsin Medical Journal* is one I truly appreciate as I begin my tenure as Dean and Executive Vice President of the Medical College of Wisconsin. First, it gives me the opportunity to thank my predecessor, Michael J. Dunn, MD, whose ideas have appeared on these pages since the inception of the Dean's Corner.

When I visited the Medical College of Wisconsin (College) 9 years ago at Mike Dunn's invitation (we were previously colleagues at Case Western Reserve University), I was surprised and impressed. The institution was somewhat of a national secret, but with great potential. The College was steadily building research infrastructure, recruiting top talent, strengthening the clinical practice and enhancing education programs.

Today, those efforts clearly are the launching pad for the Medical College's acceleration toward being a premier medical school. In the past 10-12 years, total research activities have grown from $49 million to $130 million. The College ranks 42nd in National Institutes of Health funding of 125 medical schools receiving dollars, improved from previous rankings in the mid to upper 50s. The full-time faculty has grown from about 850 to more than 1300, including more than 900 physicians. Patient visits at our affiliate hospitals increased from 700,000 to more than 1 million annually. This was truly outstanding growth for a private, freestanding medical school that was just beginning to draw national attention a decade ago.

Since joining the Medical College after leaving the University of Minnesota School of Medicine in May, I have been fortunate in inheriting an exceptional faculty and well-managed institution with tremendous strength in basic science. Our goal is to build on that foundation to enhance interdisciplinary research programs that span the entire College and our clinical partners. This will result in substantial growth in translational research to help patients in Wisconsin and beyond.

Some major developments that will support this vision have already occurred. The College opened a new Translational and Biomedical Research Center last year, including substantial laboratory space to expand interdisciplinary research programs in cancer, infectious diseases, developmental biology, and children's health. A Clinical and Translational Science Institute was established in collaboration with our affiliated medical centers and other Milwaukee higher education institutions committed to health-related research, such as Marquette University, University of Wisconsin-Milwaukee, and the Milwaukee School of Engineering. This unique citywide consortium will provide the capabilities and faculty talent to support and advance education and research in clinical and translational science. The Froedtert & the Medical College of Wisconsin Clinical Cancer Center opened just a few months ago and provides a state-of-the-art, patient-centered, clinical complement to the College's laboratory-based cancer research activities.

By focusing on high-priority research areas such as cancer, cardiovascular medicine, medical genetics and genomics, developmental and stem cell biology, imaging, infectious diseases, and neurosciences, we seek to focus our resources and integrate faculty across disciplines to maximize scientific impact, growth, and nationally recognized programs that will also have a direct impact on the innovation and quality of clinical care we provide in Wisconsin.

The College's "Advancing a Healthier Wisconsin" endowment, a result of Blue Cross & Blue Shield United's conversion to a for-profit company, provides unprecedented resources for projects to improve

public and community health. These projects capitalize on the strength of community-academic partnerships built through extensive public participation. The Healthier Wisconsin Partnership Program component of the Medical College's endowment has awarded nearly $23.5 million through 4 funding cycles to 102 projects designed to improve the health of Wisconsin residents through health advocacy and disease prevention initiatives. Most recently, 24 grants totaling more than $6.3 million were announced in April and include the participation of 91 community organizations.

This makes Wisconsin a particularly exciting place to be—for citizens and physicians. I take great interest in these efforts. Previously, my career has been dedicated to improving global health, which bears many similarities to community health. Both fields focus on improving the health of populations that are often underserved. There is excellent evidence that students and physicians who have substantial experience overseas are more likely to return home and care for underserved populations in low-resource environments. Both disciplines require a passionate level of commitment to research and population health, long-term academic-community partnerships, and are fertile ground for the education and training of physicians and researchers.

Personally, I look forward to the College's continued leadership in public and community health and the opportunity to engage so many community partners in improving the quality of life in Wisconsin. The College has grown tremendously but is replete with new potential to make a difference—as is the state of Wisconsin—and I am delighted and enthused to now call them both home.

Sean Cote, AIF

Ask questions to better understand investment fees

Sean Cote, AIF

My sister-in-law recently asked me to review her investment portfolio. I asked her if she knew what types of fees and expenses she was paying. "I have no idea," she replied.

This response is common among investors. Fees and expenses vary between investments and, in most situations, they are netted from the rate of return of the investments, leaving them out of sight and out of mind.

Because fees have a direct impact to your rate of return, it is important to understand what types of fees you're paying. Below is a description of common investment fees.

Fees Associated with Mutual Funds

Expense ratio—The expense ratio of a mutual fund pays for the cost of running a fund, which includes portfolio management, administration, sales, and marketing. The average annual expense ratio of all mutual funds is close to 1.25% of total assets. The following factors can affect the expense ratio:

- *The fund's investment category*—In general, specialty funds tend to have the highest expense ratios. Equity funds typically will have higher expense ratios than bond funds and international funds tend to have higher expense ratios than comparable domestic funds.
- *Index fund versus institutional fund*—Index funds and funds available to institutional investors generally have lower expense ratios than other types of funds.
- *The fund's asset size*—As the assets of the mutual fund increase, the expense ratio typically declines.
- *Sales load*—Sales loads typically are used to compensate brokers who sell the funds. A load that is assessed when a fund is purchased is called a front-end load, and a load assessed at the time of sale is a back-end load. Front-end loads typically range from 2% to 6% of the amount invested, with a maximum of 8.5%. Funds with back-end loads will not deduct the load at purchase but will have it deducted when shares are sold back to the fund.

  The most common type of back-end load is the contingent deferred sales load. The amount of this type of load will depend on how long the shares are held. For example, a fund may charge a 5% load if shares are sold within the first year of purchase and will be reduced by 1% per year until it is decreased to 0 after holding the shares for 5 full years. In this example, the fund will typically have a higher expense ratio during the first 5 years.

Fees Associated with Variable Annuities

Management fees of underlying investment options—Variable annuities use underlying mutual funds for investment options in the contract. The management fees are similar to expense ratios and pay the fund companies for portfolio management, administration, and operation of the fund. The average management fee for underlying funds in a variable annuity in 2006 was 0.82%, as calculated by industry source Morningstar.

Mortality and expense (M&E) charge—This fee pays for the insurance guarantee for potential annuity payments, commissions to the selling agent, and administration expenses of the contract. This fee is in addition to the management fees of the underlying investment options and is typically charged on an annual basis as a percent of the average value of the contract. According to Morningstar, the average M&E charge in 2006 was 1.20%.

Surrender charges—Many annuities impose a surrender charge if all or a portion of the contract is liquidated before a set time period. That period tends to range from 1 to 12 years. A common surrender period is one that will charge 7% if the contract is surrendered in the first year of purchase, and declines by 1% per year until it reaches 0.

Sean Cote, AIF, is a Financial Consultant with SVA Wealth Management, Inc., Registered Investment Adviser, an affiliated company of Suby, Von Haden & Associates, SC. For more information contact Wisconsin Medical Society Insurance and Financial Services, Inc. toll free at 866.442.3810.

Fees and charges for other features—There are other options that can be offered by variable annuities, such as death benefits or a guaranteed rate of return. These options typically have additional fees that the contract holder pays. It is important to fully understand what the additional fees are and what terms have to be met to receive the benefit of the option.

Fees When Working with a Fee-Only Advisor

Asset management fee—This fee is charged by fee-only advisors and is normally charged as a percent of assets under management. This fee may start at 1% to 1.5% of assets under management. The percentage typically is reduced when the assets under management increase. A fee-only advisor does not receive commissions from the fund company and is compensated solely by the client. This asset management fee is in addition to any internal fees of the investments recommended by the advisor, such as the expense ratio of a mutual fund and transaction fees.

Flat rate or hourly rate—Advisors may charge a flat rate or hourly rate for providing investment advice or performing financial planning services.

Conclusion

Is my sister-in-law paying too much in investment fees? The answer depends on the scope of services provided, the complexity of the portfolio and the level of service and expertise. To gain a better understanding of her investment fees, she needs to ask her broker or advisor "What are the total fees I'm paying on my investments?", "How are you compensated?", and "What services are you providing for your compensation?"

Reduction of use of potentially inappropriate medications in the elderly

Jay A. Gold, MD, JD, MPH; Bill French, MBA, RHIA, CPHQ, CHPIT; Lee C. Vermeulen, MS, RPh

Introduction

MetaStar recently completed a project designed to reduce the use of potentially inappropriate medications for elderly Medicare beneficiaries.

The Medicare Modernization act of 2003 directs Medicare Quality Improvement Organizations (QIOs) like MetaStar to offer quality improvement assistance pertaining to prescription drug therapy to providers, practitioners, Medicare Advantage organizations, and prescription drug sponsors offering prescription drug plans under the part D drug benefit.

The Centers for Medicare and Medicaid Services (CMS) incorporated this requirement into the following round of QIO contracts and directed MetaStar and other QIOs to conduct a quality improvement initiative utilizing data from the newly implemented Part D prescription drug benefit program. CMS provided a list of topics from which MetaStar was to design a project utilizing Part D data.

The potential topics were:

- Improve prescribing to decrease the use of medications known to pose unnecessary risk in the elderly
- Improve patient self-management through medication therapy management services (MTMS).
- Improve disease-specific therapy using integrated inpatient, outpatient, and prescription drug data
- A quality improvement project of the QIO's design that utilizes Part D data.

Dr Gold is Senior Vice President and Chief Medical Officer of MetaStar, Inc.; Mr French is Vice President of Quality, Review, and Health Information Technology at MetaStar; and Mr Vermeulen is Director of the Center for Drug Policy, School of Pharmacy, University of Wisconsin Hospital and Clinics This material was prepared by MetaStar, Inc., the Quality Improvement Organization for Wisconsin, under a contract with the Centers for Medicare & Medicaid Services (CMS). The contents presented do not necessarily reflect CMS policy.

Project Planning

MetaStar chose the first topic and worked with Wisconsin Physician Services (WPS), a local prescription drug plan; the University of Wisconsin Center for Drug Policy, an advisory group; and a clinical expert panel (CEP) to design and conduct the study.

The advisory group advised MetaStar on the selection of the project topic, the project's objectives, the measurements and feasibility options, and the project's potential impact. The advisory group membership included WPS, the Pharmacy Society of Wisconsin, a community pharmacist, an academic pharmacist, the state Department of Health and Family Services—Division of Disability and Elder Services, the Wisconsin Partnership Program, the Elder Law Center, the Coalition of Wisconsin Aging Groups, CMS Region V, and a Medicare beneficiary.

MetaStar partnered with the WPS prescription drug plan (PDP) to conduct an intervention consisting of beneficiary-specific medication profiles mailed to prescribers and pharmacists.

MetaStar engaged the CEP and the Director of the Center for Drug Policy to design and assist in this project.

The CEP, consisting of Wisconsin clinicians, geriatricians, pharmacists, and geriatric psychiatrists, advised MetaStar on the selection of medications to target and assisted in developing the educational portion of the intervention. The CEP discussed medications on the Beers list of potentially inappropriate medications in the elderly, along with other drugs known to produce negative pharmacologic effects and adverse reactions when administered to elderly patients.

An initial list of 28 potentially inappropriate medications was identified, and the drugs were ranked as high, medium, or low priority. Prescribing frequency for the 28 medications was determined from WPS prescription drug event (PDE) data. Four of the most frequently prescribed high- or medium-priority potentially inappropriate medications were selected: (1) Amitriptyline, (2) Cyclobenzaprine, (3) Glyburide, and (4) Propoxyphene.

A graduate student at the University of Wisconsin-Madison School of Pharmacy prepared intervention materials detailing the adverse effects of the 4 drugs and recommending pharmacologic and nonpharmacologic alternatives to their use.

Intervention

In January 2007, MetaStar and WPS partnered to send beneficiary-specific profiles and intervention materials in separate mailings to Wisconsin prescribers, and to pharmacies that

dispensed medications to Wisconsin beneficiaries. The prescribers and pharmacies were asked to respond to a set of questions to determine if discontinuation of the drug was indicated, or if modifications were indicated to the patient's drug regimen. Questions also were posed to determine if the interventional material provided was useful in modification of the patient's drug therapy.

Results

The following quality indicator measurements were developed to determine if changes in prescription of and use of medications known to pose unnecessary risk in the elderly. Rates using PDE claims were measured before and after the intervention mailings.

Rate of potentially inappropriate medication use by elderly Medicare beneficiaries. This quality indicator approximated medication use among WPS Medicare drug plan enrollees by measuring the percentage of members who were prescribed one of the identified drugs among all members with PDE claims. At baseline, this rate was 8.13%. The final remeasurement rate was 4.67%.

Rate of prescribing of potentially inappropriate medications to elderly Medicare beneficiaries. This quality indicator measures prescribing patterns by Wisconsin prescribers among WPS Medicare drug plan enrollees measuring the percentage of prescribers who had prescribed one of the identified drugs among all prescribers with PDE claims. At baseline, this rate was 12.3%. The final remeasurement rate was 9.46%.

Rate of potentially inappropriate medication use by elderly Medicare beneficiaries who used potentially inappropriate medications in the baseline period. This quality indicator measures the percentage of WPS Medicare drug plan enrollees who were prescribed one of the identified drugs in both the baseline and final remeasurement periods. This rate was 37.2%.

Discussion

The first conclusion to be drawn from the results of this project is that the intervention was associated with a decrease in rates of both use and prescription of potentially inappropriate medications. This, of course, was the purpose of the intervention.

The result on the third indicator, in light of the first 2, leads us to conclude strongly that while the intervention improved prescribing overall, it had little impact on the use of these medications in patients who were taking them before the intervention. It appears that it is more difficult to induce physicians to change existing prescriptions for elderly patients than it is to change prescribing patterns for future prescriptions.

Two lessons can be drawn for further action. First, interventions of this sort can be effective in improving future prescribing. Second, if we wish to improve ongoing treatments, stronger interventions may be necessary.

Of course, in the absence of controls, we cannot rule out the possibility that our results were due to secular trends or to other factors. But in light of the aim of the project—to improve care by reducing the use of medications that are known to pose unnecessary risk in the elderly—we believe that the project justly can be called a success.

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**Under Age 55: $5,000 guarantee issue for new members and existing members if enrolled within the plan introduction period; satisfactory evidence of insurability required for all subsequent enrollments for original members. Members currently receiving any disability benefit are not eligible for guarantee issue. Age 55 and Over: no guarantee issue.*

***Subject to specific criteria and underwriting approval.*

This is a general benefit summary; additional limitations and exclusions may apply, including pre-existing conditions limitations.

Special Introductory Offer for Guarantee Issue* Enroll by October 1, 2008

For More Information Contact:

(866) 442-3810

e-mail: ***insurance@wismed.org***

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