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THE GUNDERSEN MEDICAL JOURNAL

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EDITOR’S MESSAGE

Welcome to the Gundersen Medical Journal. This is an especially significant issue because in addition to our regular research reports, we feature essays from colleagues and graduates of the surgical residency program honoring Dr Thomas H. Cogbill, surgeon, author, researcher, leader, and long-time director of Gundersen Medical Foundation’s general surgery residency. Dr Cogbill has left an indelible mark on our organization and on the many who had the privilege of learning under his deft hand.

This issue has 4 reports of original research. Standup paddleboarding has become a popular sport in the Coulee Region, and it is the subject of the article by Jessica Andres and her University of Wisconsin-La Crosse colleagues and mentors. Our second offering is by Mouhammed Kabani, MD, and his research team and reports their assessment of stroke knowledge in the Gundersen Health System service area population. Mary Ellen Stolder, PhD, RN, and a group of nurse educators and researchers from Viterbo University, Western Technical College, and Gundersen Health System report the results of their study of nurse and nursing student attitudes toward current and future utilization of research in their practice. Finally, Dr. Erik Munson and colleagues, Marquette University, present the results of a statewide Wisconsin study of antimicrobial resistance, a topic of increasing concern across the country.

We also are pleased to include a number of fine case reports in this issue. Drs Nashed, Jacobs, and Hagen describe a case of chronic positional cough. Obstetricians Paul Silva and Dana Benden present a case of large nabothian cysts obstructing a woman’s urinary outlet tract. Brugada syndrome is a potentially dangerous condition, a case of which Drs Klipsic and Witcik ably describe. Drs Walker and Mutgi present a case that they believe to have been myotonic dystrophy type 2. We thank Drs Jacobs, Eickstaedt, and Driscoll for their report of a case that is exciting in a couple of ways. First, with the recent approval of low-dose computed tomography lung cancer screening, we expect that lung cancer will be detected earlier; second, the woman in this case report underwent the screening and was found to have multiple primary lung cancers, which were successfully treated using stereotactic body radiation. Our final case report, the work of Drs Chiang, Pokhrel, and Bilbisi, describes the case of a young hockey player who developed a potentially fatal condition, Lemierre syndrome, perhaps as the result of a seemingly unconnected hockey injury.

In recognition of the Journal’s 25th year of publication, our Reprise features an article from the first issue of the Gundersen Medical Journal. “A Cross-Cultural Study of the Oath of Hippocrates: Living a Dedicated Life—Has It Any Meaning?” was contributed by David A. Freed, MD, who practiced family medicine in West Union, Iowa, until July of 1992.
Finally, I am stepping down from both my roles as the Director of Medical Research and as the Editor of the Gundersen Medical Journal. I have now been in the practice of Internal Medicine, Infectious Disease, and Director of Microbiology for more than 40 years, with the last 17 years as the Director of Medical Research and 3 years as Editor of this medical journal. During these years, I have watched and, as much as my limited skills allowed, contributed in the growth of the Gundersen Health System as it developed into a full-fledged academic medical center. Currently the Gundersen Health System’s level of patient care is exceptional. And, our system is continually adding to the next generation’s needs with an outstanding medical educational curriculum while adding to new knowledge with a level of research well beyond most other health centers of our size—all done while we diligently work to improve the surrounding community’s health. Our Gundersen Health System is second to none. Much has been achieved. WOW!

But the work of improving our collective health will never be complete; it will be forever our challenge. Part of that work, actually a sacred part (recall the word physician is Greek for teacher), is that we need not only to constantly strive for improvement of our care, but also to pass on our improvements and new knowledge to others in the health care professions.

In no small part, that is the role of the Gundersen Medical Journal. With the intellectual contributions of our Managing Editor, Ms Cathy Fischer, and Dr Julio Bird who recently has “taken the baton” of Director of Medical Research, I expect to read many interesting Gundersen Medical Journals in the future.

Sincerely,
William A. Agger, MD, FACP, FIDSA
Researcher, Gundersen Medical Foundation
and Former Director of Research, Gundersen Medical Foundation, and Editor,
Gundersen Medical Journal
A Tribute To

Thomas H. Cogbill, MD
Reflections on an Extraordinary La Crosse Surgeon:

A Tribute to Thomas Hull Cogbill, MD, FACS

The Cogbill History Pre-dating the Gundersen Health System

During Dr. Thomas Hull Cogbill’s surgical training at the University of Colorado Medical School, his mentors included some giants in twentieth-century surgery, including Thomas Starzl, Ben Eiseman, and Ernest E. (Gene) Moore, recognized as world leaders in transplantation, military, trauma, and general surgery. Dr. Cogbill packed some of their best traits into his personal suitcase when he moved to La Crosse.

I first met Dr. Cogbill 36 years ago in Denver, at an elevation a mile high, in the middle of the night covering the pediatric surgical intensive care unit (PSICU) at Colorado General Hospital. At that time, he was still in his surgical training program, and he was providing care to the sickest of the sick in the PSICU.

Having completed my medical school academic requirements early, I had the privilege of acting (literally “acting”) as an intern, assigned to the Pediatric Congenital Heart Surgery division. Tom was assigned to the Pediatric Surgical Team. He was caring for a toddler. As near as I could tell, the toddler’s worried mother never left the bedside. Neither did Tom. Tom’s patient was having daily set-backs after a complex repair of congenital abnormalities. I witnessed him deal with resuscitation, airway, and line access problems day and night. Across the room, I was caring for a premature orphan baby having daily episodes of hypotension and seizures after her sixth heart surgery. As a result, I had the opportunity to observe Dr. Cogbill a lot. In this Western states referral center, there were many other patients in this PSICU who were just as complicated as our 2 patients. We both still remember their names.

We had incredible nursing support, but there were challenges to optimizing patient care during this time. There was an absence of the ancillary services that are standard of care in La Crosse. For Tom, there were no orderlies, phlebotomists, or electrocardiograph technicians. There were no radiologists to “over-read” films at night. The resident inserted the urinary catheters and nasogastric tubes, and was even in charge of troubleshooting the monitors.

Tom and I were both recently married but rarely left the hospital, sometimes remaining in house for more than 3 days. And there was no food at night. Tom lived in the ICU, and he was fueled by soft drinks (brand name Coke, of course). I lived on Pedialyte. We had no complaints. There was plenty of excitement, and we were both doing what I think we were meant to do.

I did not know Tom or his family personally at this time. I also did not know how strong his scholarship was—that came later. I knew him only as a remarkably competent and considerate surgeon in training who was friendly with and liked by the support staff. Certainly, these were traits I thought worthy for me to adopt.

In honoring Dr. Cogbill, I want to make clear my purpose in providing this pre-Gundersen history of him. How Dr. Cogbill understood and reacted to the stress of caring for the most critically ill and vulnerable patients in an environment bereft of work-hour restrictions, surrounded by sleep deprivation, and with limited structural support—and how he succeeded in delivering some of the finest care that I have ever witnessed with scant attending staff supervision—speaks volumes. From the beginning, Tom was compassionate, effective, capable, untiring, and kind to everyone. His communication skills with family, nurses, and consultants were commendable, as were his technical skills. Thus it came as no surprise to me that in his subsequent career he became a masterful surgeon, educator, and leader, and that his actions were awarded with many leadership positions. For me, from the perspective of a senior medical student who had already worked with at least 40 other residents, during his residency Dr. Cogbill “stood out.”
Gundersen History

About 3 years later, I next saw Dr. Cogbill seated in the back of the Rasmus Center during a morbidity and mortality (M&M) conference. He was “Colorado” relaxed, wearing a jean jacket, and he had come to La Crosse to interview for a position as a staff surgeon. Although he was relaxed, I don’t believe that he was yet carrying his funny child’s “stick pony” with him. Perhaps he was uncertain how well his quirky sense of humor would be accepted by Wisconsinites. After all, our hospital was only a block from the river that separated us from the state with Lake Wobegon. Later, after he accepted the staff position, he was more unfiltered and allowed us to participate in his amusing view of the world from a New Englander and Ivy League graduate’s perspective. Humor, as demonstrated by Dr. Cogbill, was never ribald or inappropriate; rather, he used it as a powerful positive adjunct, providing necessary relief from stress, distraction from over-reflecting on bad surgical decisions or outcomes, and even to defuse potentially emerging confrontational dialogue between providers of care or teachers and students. With alacrity and lightning-quick cleverness, he also used it to enhance surgical education in the clinic, in the OR, and during surgical M & M. No one did it better.

After moving to La Crosse, I had the privilege of sharing many patients with Dr. Cogbill for more than 30 years. I witnessed no surgeon care for patients with more professionalism than what I saw with Dr. Cogbill. He is a true doctor, in the old-time sense. He is absolutely committed to compassionate and evidence-based best care, reflecting the patient’s preferences and values. He was there for the patient, day or night, if needed. Rich or poor, farmer or CEO, professor or not, patients were the same to Tom. (No wonder that he was a great fit for Gundersen’s General Surgery Department, which had this viewpoint and reputation before either Dr. Cogbill or I came to La Crosse.)

Apart from patient care, Tom has gained notoriety and name recognition for his insightful and impactful clinical research. Consequently, years from now—and appropriately so—Dr. Cogbill will be referenced in many publications. Academically, he will remain well known into the next century. More importantly, at least to me, and I believe for his patients too, we will first think of him as a great provider of care. As members of the same Surgery Department, I will also remember Dr. Cogbill as a great partner.

Skill Set as a Surgeon, Educator, Scholar, Partner, and Person

Dr. Cogbill is a superb surgeon and partner. With Tom, there was absolute trust for cross-coverage, hand-offs, and persistent commitment to provide good care. The value of this behavior is not limited to the patient: It provides better quality of life for the partners’ time away with their family. Knowing that your partners, like Dr. Cogbill, will provide high-quality compassionate care to your patients in your absence is a gift that keeps coming on a regular basis.
As a surgeon, no one leads a trauma or shock resuscitation better than Dr. Cogbill. He has savoir-faire and is diplomatically able to discern, direct, triage, and divide responsibilities within the shock-trauma team. Dr. Cogbill is the face I would want to see if I or a member of my family were the patient. For those of us who have seen him in action, it is easy to understand why he has been repeatedly selected to author chapters in trauma textbooks. The team that he commands rarely has missed injuries or postoperative complications.

Surgeons should copy and paste Dr. Cogbill’s skill set for operations into their personal toolbox. First, don’t operate on everyone sent to you for an operation; calculate the benefit-to-risk ratio. Second, if you schedule surgery, be comprehensive in your preoperative cognitive planning (from anesthesia issues to blood banking, and from patient positioning to intra-operative imaging and equipment). Third, rank safety and intraoperative efficiency over speed. Minimize wasted motion and remember what worked for you in the past. Here is an example. Technically, there are different ways to lyse adhesions (open vs laparoscopic, sharp vs finger dissection, knife vs scissors, scissors vs specialized dissecting instrument, other). Dr. Cogbill has a method. It works. As measured by personal observations, as well as decades of observation of M & M presentations, I believe that Dr. Cogbill may hold the benchmark for national best practice for unplanned enterotomy rates in patients undergoing laparotomy who have a history of previous abdominal surgery. During lysis of adhesions, he practiced safety and precision, not speed. The following have never been found in Dr. Cogbill’s toolbox: attempting to be flashy, never asking for help, exchanging your usual operative strategy for speed, and hoping a deviation from your usual safe past practice won’t result in inadvertent injury. Lastly, do not disrespect anyone in the operating room. To do so, melts the safety culture. Embrace the team assigned to assist you that day.

Dr. Cogbill has unselfishly distinguished himself as an educator at the state, local, and national levels. I could not count the hours that he must have spent in his efforts to improve surgical and trauma systems’ education and competency, most recently through his efforts with the American Board of Surgery during his tenure on their Board and later as their Chairman. His accomplishments in these domains probably comprise more than 10 pages of print, but my goal today is to provide a more personal account of the surgeon, partner, and person that I know.

Dr. Cogbill does not fatigue and, seemingly, does not need as much sleep as most of the rest of us require. I wish he could export this trait. He often reads, writes, edits, and thinks while the rest of us are sleeping. In addition, when he is awake, running road races, practicing surgery, and multi-tasking, Dr. Cogbill does not tire easily. Without exception, I have yet to see a surgeon who better maintains humor and professionalism (with patients, consultants, and residents) or who functions more effectively than Tom after caring for patients all day, all night, then some more the following day. On many occasions, I remember him “untroubled,” good-humored, and sharp, all the while continuing to make evidence-based decisions and operate safely. If afforded the opportunity during these busy times, such as waiting for an OR start time, it would not be uncommon for Tom to edit a manuscript, run 6 miles, plan M & M conference (which he led for more than a decade), or to correspond with one of his many national co-investigators for multi-institutional trauma research projects.

Dr. Cogbill knows scholarship. He is a prolific reader of surgical journals. Academically, he inspires. He is a prodigious investigator. No surgeon in the history of the Gundersen Health System has been more successful than Tom as a clinical researcher, as measured by number of presentations, publications, citations, or by practice-changing impact. His research interests are remarkably varied, ranging from occupational farm and veterinarian injuries to vascular and geriatric surgery, from trauma and trauma systems to seminal work that details how to optimize and measure the success of training new surgeons. On the day of this essay, I count 153 publications credited to him on PubMed. More important than numbers of publication is their impact. How impactful are some of Dr. Cogbill’s publications? For brevity, I will cite just one that describes a national effort that he chaired (Cogbill TH, Malangoni MA, Potts JR, Valentine RJ. The General Surgery Milestones Project. Journal of the American College of Surgeons. 2014;218(5):1056-1062. doi: 10.1016/j.jamcollsurg.2014.02.016. PMID: 24680571). In this article, Dr. Cogbill outlined the General Surgery Milestones Project, a multi-authored, multiple-
year project that laid the foundation and blueprint for how to train the next generation of surgeons. As such, it will directly and indirectly influence surgical competency and its downstream effect on patient surgical outcomes into the next century. For sure, Tom has been a real force in surgical education. Furthermore, his interest in clinical research was the primary catalyst for many of his Gundersen partners and residents, including me, to develop their own research projects. His legacy of research will therefore be long lasting.

Dr. Cogbill demonstrates scholarship not just by publications. He has paper lists, and he has intracranial lists. Always with a twinkle in his eye, he freely shares these lists of facts, different treatment options, and differential diagnosis algorithms with his students and residents by quizzing them, sometimes publicly at M & M. His general fund of knowledge and his retention of facts are quite extraordinary. Not wanting to be outdone, his protégés often return in kind, trying to stump Tom. This is not an easy task.

Dr. Cogbill is fun. His sense of humor makes me smile as I pen this commentary. I recall a story of his beloved huskies, when they were adolescents, gnawing their way through the back seat of his Subaru station wagon, filling the car with seat “stuffing.” When Tom and Jan returned to the car after a nice dinner, the huskies were sitting in the front seat. I guess the Subaru engineers did not anticipate that the dogs’ urge to be in the front bucket seats was so strong that they would just “tunnel” through the back seat, beneath the metal dog gate, like into a snowdrift.

At work, and maybe only surgeons would think this, the most “fun” I recall with Tom was the night he was on call and there were 3 ruptured aneurysms presenting to our Emergency Department in 3 hours. Dr. Gall operated on the first patient, who had a ruptured thoracic aneurysm. Dr. Cogbill, on call, next took a patient with a freely ruptured abdominal aortic aneurysm (AAA) to the OR, and then had a nurse call me at home to operate on another patient, also with a freely ruptured AAA. Never before had I participated in a team with such a degree of a sense of common interests and responsibilities, such esprit de corps, as when these 3 true emergencies presented simultaneously. All 3 patients eventually went home. Fun doesn’t just mean a joke and a laugh; for surgeons, and especially for Tom and me, fun is sense of community, partnership, good outcomes, and a personal feeling that you are doing something meaningful.

Tom and I have been blessed to be part of this community at Gundersen, and without doubt, I am a better surgeon and scholar as a result of my interactions with Dr. Cogbill.

Jeffrey Landercasper, MD
Surgeon
Gundersen Health System
Dr. Cowbell

What a pleasure to work with Dr. Cogbill for the past 34 years! Not only is he a highly skilled and respected surgeon, but he also offers a wonderful sense of humor. It was always fun to attend resident graduation during the years he was program director. His presentation of the vascular surgery graduates was guaranteed to be entertaining!

Over the years, we would chuckle about patients mispronouncing his name. In our later communications, he became Dr. Cowbell, Dr. Cogdill, Dr. Cogbell, and so forth. Call him whatever you like—he will be missed by many!

Cindy Calogero—or, as Dr. Cogbill calls me, Lucinda
Vascular Registrar
Gundersen Health System

Dr Cogbill—shown here with Traci O’Heron, daughter of Dr Cogbill’s right hand in medical education, Colette O’Heron—is always willing to take a moment to offer insight and encouragement.
My Surgical Hometown

Gundersen Lutheran is a special and unique place for surgical education. When talking with medical students and residents, I often describe where you do your residency as your “surgical hometown.” Becoming a surgeon is like a second childhood in that there are so many new skills to learn and knowledge to master in that 5 years of early development. The medical faculty and staff become your new childhood friends, and the residents and mentors in the program become a second family.

As often is the case, I did not appreciate how lucky I was to train at Gundersen with the faculty and co-residents during my 5 years until after I left my surgical hometown. The rich history of medical education at Gundersen is well documented, and the success of the surgery residency is exemplary. More important, the environment created by Dr. Cogbill during his time as residency director expanded on the rich tradition started by the likes of Dr. Sigurd Gundersen Jr. and Dr. William Kisken. It was demanding but not abusive. He and the other faculty set high expectations for our education but also taught us “how to be a surgeon,” not just “how to operate.” This came in the form of emphasis on treating patients, families, and the hospital staff with respect and kindness, taking responsibility for your own actions through the weekly M&M conference, which emphasized education rather than being punitive, pursuing research to improve patient outcomes, and developing a well-rounded life outside of medicine. We were treated as we were expected to act, as professionals.

This shared respect is especially impressive given Dr. Cogbill’s own surgical training history. He trained at the University of Colorado and Denver General Surgical residency in the 1980s. The reputation of this program was that of one of the best surgical residencies in the country. The list of people he trained under and with is a “Who’s Who” for surgery giants, yet one became aware of this only through subtle discussions because Dr. Cogbill was never good at name dropping. It was also one of the most brutal and competitive pyramid programs in existence. Each year residents were in competition with each other to maintain a spot in the residency. This environment was a far cry from what we experienced at Gundersen. Collaboration and fellowship among not only the surgical residents but also with the visiting residents from podiatry, transitional year, and other programs was emphasized. Good teachers can replicate the learning environment to which they are accustomed, but it takes a great teacher to recognize what was bad about his or her own education and discard it to be better. Because of this, Dr. Cogbill was the perfect fit to lead this residency.

His immense contributions to surgery through research, leadership in the American Board of Surgery, and publications can easily be found through a MEDLINE search, and I am sure those accomplishments will be summarized by others in this journal. I decided to focus my short portion of this project on some of the things that are not as easily found but well known by those who trained under him and practiced with him. Some of these are my personal experiences and others are a collective experience shared by many.

Personally, I owe Dr. Cogbill a great debt for some of the best things in my life. I had very little knowledge of La Crosse, Wisconsin, or the Gundersen Clinic (circa 1996) when I was in medical school and trying to navigate the world of the match and surgery residencies. It was through an interaction with one of the people training at Gundersen at the time that I became interested in the program. After spending a few days visiting the program and then interviewing, I was convinced that this was the place for me. I ended up ranking Gundersen as my top program in the match mainly due to the personal interaction with Dr. Cogbill. I actually knew very little about his tremendous reputation and accomplishments in the surgical world but was so impressed by how easily he interacted with his residents, how much they raved about him, and how down to earth he was. The 5 years I spent in La Crosse are the source of some of my fondest memories. I met great people who were staff physicians, co-residents, nurses, techs, assistants, and patients who impacted my life tremendously. I met my wife, Karla, while at Gundersen and have spent the past 19 years in awe of the person she is and the family I gained due to my time at Gundersen. Words cannot express the gratitude I have for these opportunities that came about because of the chance Dr. Cogbill took on choosing me for a residency spot.
Here are some of the unique characteristics I recall about Dr. Cogbill from my time in the residency. They are common knowledge to those who have trained under him as a program director and mentor, but they may be new to others.

1. First of all, he was an avid runner. He ran ALL the time. Think of him as Forrest Gump with a pager and 1990s-era cell phone. Every resident had the experience of calling him from the ER to have him answer huffing and puffing somewhere in the Coulee region. It was not unusual to be told, “Ok, call the OR and I will run in” and he would RUN in. His love of running was shared by several other attendings at the time (Dr. Sig 3, Dr. Landercasper, and Dr. Brekke to name a few). This shared passion eventually led to the first Staff versus Resident relay race in 2001. Staff won and celebrated with an inappropriately large trophy, which Dr. Landercasper unveiled at our Monday afternoon resident conference. This event became a great bonding experience for the residents, faculty, and their families and continues today with an annual competition that involves physical activities in addition to running to encourage participation.

2. He kept track of everything in his little black book. We all were given small black calendar books each year to keep track of our cases. This was a practice into which Dr. Cogbill indoctrinated us as residents and I still do today in my practice. His little book was filled with cases but also columns in the margins in which he recorded his miles run per day—not too unusual, except these were subdivided by the pair of shoes he wore! He could honestly tell you the exact mileage each of his shoes had logged.

3. He had a desk drawer full of Hershey’s with Almonds wrappers. Why with almonds? “Because of the selenium.” Still don’t know what that means, and I also still don’t really know why he kept the wrappers.

4. Old Paint. Surgery residency can be tiring and stressful at times. The periods of quiet reflection when you realize you will never be able to learn all this stuff you need to know to pass boards and feel competent are interrupted only by the periods of terror trying to keep people alive on the operating room table. It was often during the end of one of these stressful times on call with Dr. Cogbill as you were placing bandages on the last patient of the night that he would quietly disappear only to emerge “riding” past the OR windows on his broomstick horse named “Old Paint.” That’s when you would realize that you had put your entire career and life in the hands of a grown man riding a broom horse …and felt good about it.

5. He loves dogs more than residents, but he values your surgical education above everything. This became evident right before you did one of the “Dog Trauma Labs.” This was an incredible learning experience and truly the best “Simulation Lab” I have ever experienced. The goal was to keep the dogs alive and fix their injuries. Unfortunately, it did require these animals to be anesthetized, prepared for the live lab, and then euthanized. Each time before entering the lab, we received a talk in the hall outside explaining how important this was for our education BUT if anyone showed any disrespect for the animals, you would be dismissed from the program immediately and without remorse or option to return. My intern year, I was never more afraid to enter a room in my life.
6. He tells the graduates to call him “Tom,” but most of us can’t. I have had the privilege of working with him on a few projects since I graduated, and every time I see him or talk to him, he has to correct me. I have spoken to several of the residents with whom I trained, some of them his partners, and they have the same issue. The respect we have for him makes it hard to believe we can refer to him as an equal.

There is no doubt that Dr. Cogbill’s retirement is well-deserved and earned. However, I would be lying if I did not also say I am a little sad to know he will not be at Gundersen taking care of patients and training residents. I know the program is in great hands with the current faculty and will continue to flourish. A part of me hopes that a few times a year he will be invited to make an appearance on Old Paint, simply because that’s what makes surgical training at Gundersen unique and special.

Thanks for everything and happy retirement, Dr. Cogbill—I mean Tom.

Robert Cuff, MD, FACS
Class of 2002
Program Director for Integrated Vascular Residency
Assistant Professor of Surgery
Michigan State University College of Human Medicine
A Teacher of Surgeons

Tom Cogbill became the Gundersen Medical Foundation surgery residency program director in 1990. At that time, the program had remarkable challenges with the Accreditation Council for Graduate Medical Education (ACGME). One of his earliest and most imperative decisions was that of hiring Colette O’Herin as the residency program coordinator. As a team, they revamped the residency program to meet ACGME standards—gaining full accreditation with a maximal review cycle by 1999. He established a level of excellence in training and research that was reinforced by a tremendous Department of Surgery and dedicated Medical Foundation support.

The relationship between the Department of Surgery and the Residency is unique in that both are housed in the same facility and all teaching faculty are expected to be integral to the teaching program. Dr. Cogbill established research requirements that far exceed many university programs—guiding junior faculty and maturing residents in their quest to become scientifically minded general surgeons. His dedication to the promotion of rural general surgery has been steadfast over the years, and he has frequently noted that he is most proud of those residents who have chosen independent practice in rural settings, owing to the remarkable resource they represent and the patient care challenges they are willing to face in their careers.

Dr. Cogbill’s longstanding commitment to excellence in resident education established our institution as a nationally known residency program for broad-spectrum general surgery training and the preparation of confident general surgeons. He has demonstrated untiring commitment to the general surgery residents even after stepping away from the program director position in 2010.

As a mentor to me in resident education, Dr. Cogbill has taught me to constantly seek change and improvements in our program, to be committed to each individual resident, and to be humble and persistent in the promotion of independent surgery residency programs and the training of general surgeons.

On a personal note, Dr. Cogbill is an outstanding human being—thoughtful and caring about all those he encounters; an outstanding husband and father—dedicated to his wife, children, and grandchildren; a formidable athlete—having completed numerous triathlons, Birkebeiners, and a variety of other endurance events; and a terrific friend.

“What we do in life echoes in eternity,” said Maximus in the movie Gladiator. Dr. Cogbill will be heard, remembered, referenced, and thought of for many years to come.

Benjamin Jarman, MD, FACS
General Surgery Residency
Program Director
Gundersen Medical Foundation
Reflections

In June 1985 I made the decision to partner with Dr. Thomas Cogbill and assist with Surgical Research in the Department of General and Vascular surgery. I continued in that position until October of 2006. By then I had co-authored over 30 articles with Dr. Cogbill. He was always certain to acknowledge everyone who had been involved in his many projects. Knowing that it was a rather difficult transition from patient care to research, Dr. Cogbill invited me to accompany him on hospital rounds at least one day a week to keep me involved in the acute care world in the hospital.

When I started in research, there were no computers in the department. Eventually, one computer arrived with a printer that had to be enclosed in a wooden box because it was so loud. One secretary in the department learned how to use the computer to type manuscripts. We had no database or spreadsheet program available then. All data were collected on paper forms while abstracting from a 100% paper medical record. Dr. Cogbill advised me to always write in ink on the datasheets so that nothing could be erased. We typically spent one day a week working on statistics. We created our own spreadsheet by hand on the back side of the months of desk calendars. Most of our statistics were completed using a calculator.

Dr. Cogbill developed the research program in the Department of Surgery with requirements for the surgical residents. Each resident was charged to complete 2 manuscripts for publication and present at 2 regional or national meetings during their 5-year residency. He mentored many residents with their projects and encouraged them to aspire to higher levels of investigation.

One trip that we took to Chicago in October of 1989 was memorable. Dr. Gwen Martin was selected to present her work before the American Association for the Surgery of Trauma. Dr. Cogbill, Dr. Marilu Bintz, Dr. Martin, and I flew to Chicago via Minneapolis. We had a short layover in Minneapolis. Dr. Martin and I got off the plane to stretch our legs. Drs. Cogbill and Bintz opted for a little liquid refreshment. Dr. Martin and I reboarded the plane. They announced the last call for the plane, closed the door, and we departed—minus Dr. Cogbill and Dr. Bintz. They watched the plane take off out of the window of the airport.

Upon arrival in Chicago, Dr. Martin and I gathered our things. We also collected Dr. Cogbill’s and Dr. Bintz’ books and hanging bags. And then we waited. Dr. Cogbill and Dr. Bintz were able to catch the next flight to Chicago, however their plane was not allowed to taxi to the gate for quite a while. When they finally arrived, Dr. Cogbill immediately rushed to the attendant to inquire about his hanging bag. He was afraid it had continued East on the previous plane. Apparently the bag contained some merchandise that needed to be returned to a store in Chicago. Dr. Martin and I finally told them that we had all of their things. It was getting rather late by that time and we were very overdue for the dinner reservations that we had.

Nevertheless, we went to the restaurant with our luggage in tow. Dr. Cogbill had to borrow a suitcoat in order to dine at that restaurant since we hadn’t had time to change. One of his friends had waited there for hours for us to arrive. After a very lovely dinner, we went to attempt to check into our hotel rooms. Again, we were very late. Although we had late arrival confirmation for our rooms, the rooms had been given away to a football team that came into town. They were able to find places for us to sleep that night—some in anterooms—and moved us to regular rooms in the morning.

After all of that excitement, Dr. Martin delivered a flawless presentation at the meeting and fielded numerous questions and comments on her topic.

Pam Lambert, BSN, RN
The Natural Teacher

Dr. Tom Cogbill is a natural teacher. I define this as one who can't help but teach, no matter what the topic. Sure, he did his job teaching surgery very well. I learned about vascular and trauma surgery, and the care of these patient groups. I learned in a nurturing environment, one without ridicule or judgment. Dr. Cogbill made hard work seem fun and interesting, and somehow he was able to motivate all residents to work to the fullest of their capabilities. All this alone should be any academic surgeons’ goal to achieve, and Dr. Cogbill made it look easy.

I was also educated in several other aspects of life, many of which I didn’t realize until later. I can categorize these groups as the 3 Fs: Frugality, Foreign languages, and Fitness.

**Frugality.** Defined by Dictionary.com as “the quality of being prudent in saving, the lack of wastefulness,” Dr. Cogbill lives and breathes this attribute. Let me give you a few examples. Every week, when the Sunday newspaper came out, he would take all the coupons for the week, go through them, and cut them out for future use. And while my first thought upon seeing this activity was, “do they not pay him enough for this job?” I came to understand that for Dr. Cogbill, it was more a matter of principle: Don't pay more for ANYTHING than you have to. He was excellent at extending the longevity of any article of clothing. Not only would he wear ties until that style was back in vogue, he would use a black Sharpie to “polish” his black shoes where there was a scuff. “Good as new!” he’d say. And darn it, he was right! I know. I've done it myself. Dr. Cogbill taught frugality in the operating room. He was the first to point out that if I will need an instrument or suture, ask for it a few seconds ahead of when it is actually needed, to eliminate waiting, to not waste time. I now teach this principle to our residents.

**Foreign languages.** Dr. Cogbill speaks both French and Mainer. I learned the former in school and could practice with Dr. Cogbill, and the latter I learned directly from him. Ayuh, if you are from away, the Maine dialect may seem wicked hawd, but all the while we wah in the O Ah, I'd be learnin' how to chout for them dee-ah at dusk on Route 1. One time I looked so natural, a CRNA student leaned ovah the drape and asked me, “Are you from Maine?” I told her, “Hawd tellin', not knowin’,” and at that moment, I felt wicked smart.

**Fitness.** Dr. Cogbill always found time to run. While this was an activity I said I would never do, I found it to be the most efficient form of exercise when working 100+ hours per week. I learned from the best how to sneak in a run. One night when on call with Dr. Cogbill, I was informed that a ruptured abdominal aortic aneurysm was going to arrive. I called Dr. Cogbill to let him know. “OK, thanks,” he said. “I’m only 2 miles out from home. I’ll be in.” And he was. Running also gave Dr. Cogbill the opportunity to combine fitness with frugality (see above): While running, he would pick up any money and any Coke rewards bottle tops. Years later, after making fun of him for doing this, I find myself screeching my bike to a halt on my way home from work, only to pick up a dime, or even a penny. We learn from our teachers. Some things are intentionally taught and learned, and other things are just absorbed by paying attention. I’m grateful for ALL that Dr. Cogbill has taught me.

Melissa Najarian, MD
Class of 2004
Essentia Health
Duluth, Minnesota
Why on Earth Would Anyone Want To Be
A Residency Director?

It is hard to believe that the vibrant and ever-so-active Dr. Cogbill is actually going to retire. As a resident, I just assumed that Dr. Cogbill would be at Gundersen forever, always there for advice and guidance whenever needed. Although I have not called him often, knowing he was there, just in case, gave me great comfort. I am sure he does not know how many times I thought of him in the operating suite, guiding my hands with his always calm voice in my head. To this day he reminds me to: spread in the direction of the vessel, make sure I can obtain proximal and distal control prior to starting a dissection, prep wider just in case, and, of course, follow the curve of the needle. In the middle of the night, when everyone in my operating room is tired and cranky, I think of Dr. Cogbill and his imaginary horse riding around to lighten the mood. That memory still makes me smile when I feel like doing anything but.

Of course, “Desmoplasia,” the word just rolls off of your tongue, was one of his favorite medical terms. I believe that he may have wanted to name a daughter Desmoplasia. Thank goodness Jan had a say in that! Those of us who left many years ago must wonder if he still has a little notebook in the breast pocket of his white coat that meticulously recorded each and every mile stepped on his running shoes, or did he convert to storing that ever so-important-data on his phone somewhere? There must be a drawer somewhere in his office with hundreds of those little notebooks.

One of the best teaching tools he provided for us was the simulation labs, especially the trauma lab. He painstakingly created clusters of known injuries, repaired them, ran us through the scenario, and coached us through, until it was apparent that we had to operate, and then removed the sutures hidden through the skin, giving us the closest thing to dealing with real trauma that can be imagined. Those vivid memories and scenarios have guided me through years of trauma and helped me save the lives of countless patients. At that time I knew of no other residency with such a high-quality lab.

At our last reunion, my daughter had the opportunity to trial the new state-of-the-art simulation lab, proof that his vision has lived on. So why on earth would anyone want to be a residency director? One would have to deal with stubborn residents who thought they knew everything, until they realized how much there is to know, patients who worry about their own care and whether the resident will be properly supervised, regulatory bodies, USMLE exams, not to mention manage one’s own practice and take care of patients and be a human and have a life outside of work. Why would anyone want to work so hard?

All anyone needs to answer that question is to look at the residents who came from Dr. Cogbill’s program. Take a look at the map of the United States with a pin for each of us; really look at where we are. We are in major cities, rural communities, general surgical practice, and subspecialty care. Dr. Cogbill has reached across this country and cured cancers, improved quality of care, and saved so many more lives than he could have individually because he cared enough to educate us and set such a great example.

Thank you, Dr. Cogbill, from all of us, the communities we serve, our patients, and their families. You have made a definite difference!

Paula M. Rechner, MD
Class of 2000
War Memorial Hospital Advanced Surgical Care
Sault Ste. Marie, Michigan

Graduates of Gundersen’s surgical residency practice across the country.
A Role Model Surgeon

Dr. Cogbill created an ideal atmosphere for quality patient care, education, and research. His contribution to each will continue to be admired, implemented, and shared.

As a surgeon, he treated his patients with geniality and compassion. He approached each patient not just as a disease but as a person. An encounter was never too long. When you were in his presence with a patient, it felt as if that patient was the only patient he was caring for.

As an educator, he was approachable, knowledgeable, and admired. Starting on my first day at Gundersen, Dr. Cogbill was very welcoming. His office door was often found open where he could be approached for personal and educational advice. There were many 5-minute discussions that provided a sense of calmness as a resident despite all the bustle of caring for patients in the hospital or the stress that a surgery resident would endure. This feeling of tranquility carried over to my experience in the operating room. Even with the most critical patients in the direst of situations, Dr. Cogbill would remain calm while maintaining the utmost attention to detail. This experience taught me that, even in the most chaotic times in your personal life or in your surgical practice, you can always remain calm and composed.

As a residency director, Dr. Cogbill challenged each resident every day of residency. Whether it was on the ward, in the OR, or at conference, the surgery residents and medical students strove to be ready to learn from his experiences and knowledge base. Often besides studying on their own, the surgery residents would rally together to study in order to be ready for Dr. Cogbill's M&M. Despite their attempts, he would already be "all-knowing" or would have out-studied them the night before.

Dr. Cogbill understood the importance of producing quality independent general surgeons. Furthermore, he believed it was important to produce rural general surgeons. He ensured that each resident was prepared for the broad spectrum of surgery. He expected each of his trained surgeons to be confident, to possess the necessary surgical skill sets, and to be up to date in the latest in surgery, surgical literature, and emerging technology. The surgery residency he oversaw stressed the importance of being lifelong learners. He understood the difficulties of being a rural surgeon and was aware of the growing shortage of rural surgeons. His work with the ABS and his motivation to keep rural general surgery training a forefront topic is invaluable to the current and future field of rural general surgery.

As a research mentor, Dr. Cogbill was one of the best and was always there to help. He actively sought research topics that would fit the needs of his residents and would then guide them through the research process. He was very receptive to suggestions for research and provided assistance with critical thinking. I was most appreciative of his willingness to proofread all my manuscripts. I did not always appreciate how much red ink he would consume on each page. Dr. Cogbill would partially apologize for how much red ink he would use and often would remind me that his upbringing stressed grammar perfection. Fortunately, with each revision, there was less and less red ink until either no further revisions were required or he ran out of red ink.

Besides being a research mentor, Dr. Cogbill wrote many articles to improve the surgical literature and to improve surgical education. There were many stories of him overtaking his living room with data sheets and articles. He would utilize all the space on the floors, couches, and tables as part of his method to produce a new manuscript. From such work, he has made many great contributions to the surgical literature, including those for trauma, vascular surgery, and surgical education.

He was looked upon as a role model surgeon providing a balance between surgery and family life. As a friend, he would provide memorable advice in balancing both. Since graduating from Gundersen, I have tried to emulate that same balance and his professionalism. He has taught me not just the importance of dedication to high quality patient care, but also how to balance a busy practice with family life.
I am very fortunate to have been mentored under Dr. Cogbill’s guidance and wisdom. He has made a tremendous impact on healthcare. While operating or teaching residents, I find myself reflecting upon his mentorship to guide my career and provide advice to my trainees. His teachings will continue to be passed on through the residents he has mentored.

Kevin Riess, MD, FACS
Class of 2008
Essentia Health
Virginia, Minnesota
Musings on the Man

It is with great pleasure that I share some thoughts, feelings, and experiences that I have had with Dr. Cogbill. I knew that my interview at Gundersen was going well when, in the middle of the day, Dr. Cogbill pulled me aside to show me a picture of his land in Driggs, Idaho. We talked a lot about the West and Wyoming that day, a part of the country we both love. That was the first time that I met the man I would come to respect, emulate, and admire. It was not, however, the first time I had heard or seen his name. At one of my other interviews, one of the interviewers recommended that I apply to “Tom Cogbill’s program in Wisconsin.” Lucky for me, I already had an interview scheduled. Training with Dr. Cogbill was awesome.

I can’t share all the things I learned or experiences we shared. I really enjoyed talking with him in the operating room (OR). He told stories of his days as a DJ, hitchhiking across the country, and tales of his residency time in Denver. I would love to have seen him then in his, as he described it, “self-made bandolero jacket” that he used during rounds to carry supplies for dressing changes. I can only imagine him as a resident. I am sure that he was a standout.

I will always remember the first time I saw his office. The man who would eventually become the chairman of the American Board of Surgery worked from an office without a door or a window. He did not have a dedicated secretary through whom people would have to work to get an appointment with him. His door was always open to the residents, mainly because there wasn’t one. He always made us feel welcome and important. His personality and extreme competence as a surgeon commanded our respect and admiration. He did not need the pomp and circumstance that often surround men of his stature and position. That was and is one of my favorite things about him.

I could speak for hours about the many experiences I had with Dr. Cogbill in the OR. We all know that he is a great surgeon, so I will share one experience. During my chief year while on trauma service with him, we had a patient who developed appendicitis on post-trauma day 2. Dr. Cogbill and I took him to the OR for a laparoscopic appendectomy. During the case it became clear to everyone in the room that Dr. Cogbill’s amazing ability to fix aortas or clean out carotids did not immediately translate into proficiency as a camera operator. I know that I completed an appendectomy that day, but I am confident that I saw only about half of the operation with him running the camera. It was long and patience-testing, but any day in the OR with Cogbill was still a good day.

When I think about all of the lives that have been saved or made better because of Tom Cogbill, either at his hand, or at the hands of the many surgical residents who he trained, it is amazing. His life as a mentor to future surgeons will surely be immortalized in his surgical posterity, proving that the only things that you get to keep forever are the things you give away. In this case, it is his knowledge, technique, and judgment. I, for one, will be forever grateful to have been touched by this master’s hand. Thank you for being you, Dr. Cogbill.

Blaine Ruby, MD
Class of 2007
Johnson County Healthcare
Buffalo, Wyoming

PS: One thing I will always wonder about Dr. Cogbill is how he could squeeze his hands into those size 6 1/2 gloves and still have feeling in his fingers at the end of the case.
If All the Docs Were Like Cogbill…


Tom proved many bits of conventional wisdom wrong:

If you go to a small non-medical school center, you will have trouble publishing, or being recognized, or getting placed in national positions of influence and responsibility.
Wrong on all counts. He did all those things with enormous impact.

If you try to teach and take care of patients and help with administration, you will be weak at one of them.
Wrong on all counts. Tom is a great teacher who also had measurably great outcomes, in addition to being a great admin partner.

People from the Northeast eventually evolve and get DNA shifts resulting in Midwestern-ness.
Not much evidence of that. He still is cheap on little things, bold on big things—proudly independent in thought and with a wicked sense of humor.

You ask how could this kid have accomplished all these things? Many years of preparation, enormous talent and work ethic, and Jan keeping him in bounds.

Life lessons helped. Attention to detail learned by recording every mile he ever ran in a series of little books, by tallying up the miles for each pair of shoes (although none would last that long) year after year. Soooooo many miles. Such durability. He would show that throughout his practice, publication, and admin activities.

Skied the hardest stuff any time anywhere. Courage despite the risk—calculated Courage. Courage needed in the OR and as an admin leader taking on transformation of the medical staff from old-world rules to the new environment.

Balancing the family time, family vacations with this tremendous list of accomplishments took extraordinary discipline. Discipline to follow his commitments, to follow his values … but not always to follow the rules.

Tom is gracious and caring to those for whom he is responsible, but he does not suffer fools lightly. Fast brain and Sharp wit can combine to have a bit of sting if you are in his sights. It did cause problems—the wit, anyway, even if his brain was a bit numb. Not known to most of the staff was a request by the then-CEO and board chair to have Drs. Cogbill, Bird, and Thompson not sit next to each other at board meetings. Two of the three for sure would have been on call recently and a note passed . . . or an under-the-breath comment, 4 hours into a rather dull meeting would result in the three adolescents bursting into laughter. Poor form, indeed.

Teaching, leading, and caring for all within his reach with courage, discipline, and durability. Monumental contributions from a modest person. An enormous factor in our rising to many levels of national distinction. We, and many others, are far better off because of Tom Cogbill.

Jeff Thompson, MD
CEO Emeritus
Gundersen Health System
Lessons

Author's Note: I am Jason D. Walsh, MD, FACS, CWS (Major USAR, resigned Veteran OEF, OIFx2) Resident Gundersen Lutheran General Surgery 1997 to 2002. Married to Christy for 22 years (so far), and father of Thomas (no accident), 14, and Andrew, 10. A general surgeon in my home town of Scottsbluff, Nebraska since 2006. We are a Level 2 trauma center. I do vascular, thoracic, minimally invasive, endocrine, wound care, trauma, and oncologic surgery. I try to work out most days—but no more running, secondary to degenerative joint disease. I go to several professional meetings each year. I race cars and torment my family with my tireless pursuit of fairness and the wish to do our best every day. Enough about me.

I credit Thomas Cogbill for much of my and my family's success. I must share one more bit of information: I Love the man who was and is my program director. Below are some of the lessons I learned, with a few stories along the way.

Lessons Learned from Dr. Thomas H. Cogbill

Challenges are the name of the game. Surgery residency is a life-changing experience for the family, I remember Brad Thaemert and Thomas Cogbill in radiology on my first week in residency at some late hour and the chief (Brad) tells the Intern (me) to go back to the floor and round while he went home. I did feel somewhat defeated, but Dr. Cogbill said something to make me feel better. It was the first time, but by no means the last. He always made me feel better when I was picked on or challenged.

Keep a positive attitude. When all hope was apparently lost late in the night with surgery woes and a big day ahead (prior to any talk of an 80-hour work week), you sometimes found yourself in a rodeo with a hobby horse—riding vascular surgeon. He did this only a couple of times through my 5 years of residency, but it was very effective. Even now when I am working really late, short on hope, and need to keep my spirits up to help the patient, I see Dr. Cogbill spanking Old Paint in the hind quarter around the OR (I giggle every time).

If you think of it, do it. This almost always related to an intervention for the patient to help treat or diagnose. Used often to the benefit of patients.

Mental health is very much related to physical health. So much so that, as residents, we ran against staff in races that were always designed to keep the staff ahead.

Life is not fair. Never was nor will it be. I don't know that he said this directly, I just remember being referred to as “Thomas Paine.” I wanted to make life, residency, and diseases fair.

You have to have interests outside of medicine. I remember him clipping coupons and running and picking up cans to buy running shoes. I also remember the times he would go on vacation with his family and support them in whatever they wanted to do.

Build into your team to get the most out. If I ever went to tell him about the failures of someone else, he would listen, let me vent, then encourage me in ways that would be appropriate to deal with my situation. Usually, I had already done the wrong thing and needed someone to bail me out. He always did. He always said we could call him if we ended up in jail. I had to apologize to the mayor only once to avoid that call. Thanks again, Dr. Cogbill.

Dr. Cogbill told me once about driving across Wisconsin wearing a football helmet to protect against head injury. I don't know if that is true, but it is definitely a great visual. I think he is a real pioneer, and I can't understand why that hasn't caught on.

My gratitude to all of my mentors and people who make Gundersen Lutheran a great place for great patient care.

Jason D. Walsh, MD, FACS
Class of 2002
Regional West Physicians Clinic
Scottsbluff, Nebraska
The Mentor I Needed

My heart pounding; my neck tie feeling too tight; my hands sweaty. I was about to be interviewed by the program director, Dr. Tom Cogbill. This was, quite possibly, the most important interview of my life. I was so nervous, however his disarming charisma certainly helped as did the appearance of his office: either he had a hoarding problem or someone had ransacked his office looking for something valuable. It took merely a few minutes to discover that Gundersen was where I belonged and he was the mentor I needed to have. (It took me much longer to discover that there was organized chaos in that office of his!)

As in any “apprenticeship” situation, the apprentice seeks a teacher with outstanding skills in the craft. Dr. Cogbill is an excellent surgeon. A true surgeon’s surgeon. A mere glance from him during a challenging distal bypass was enough to know that that last suture could have been placed better—not in a demeaning or frightening way, but in a quiet way that was nurturing. You knew that you could have performed better. He, most certainly, had high expectations of you, but not higher than he cultivated you to have in yourself.

An accomplished and prolific published author, well known member and leader in the American College of Surgeons, amazing marathoner, technically skilled surgeon, educator extraordinaire, father, husband…a true renaissance man. He has a brilliant mind. He could find a paper he had written in 1975 or his second half split for the 1984 Boston marathon within a minute among the piles in that trash pit of an office of his!

While educating so many different surgeons over the years, he had a keen grasp of the individual needs of each of the residents—personally and professionally. Each of us received the individual training we each needed. In reflection, I think that having confidence in my abilities was the most important hurdle for me. I was placed in situations that allowed that to mature—never alone, but in situations that allowed me to grow in this regard. Performing an ED thoracotomy and placing intra-atrial IVs while massaging the heart had me focused, yet more anxious than I ever recall being—seemingly alone, but looking up and seeing Dr. Cogbill (who had just run 50 miles) in a tank top and his 1970s running shorts put me at ease…as if no matter what happened, everything was going to be OK (that actually happened).

He has a unique way of incorporating humor into the daily lives of the residents. Whether it is meticulously planned or spontaneous, it does make the burden of training a bit easier and more enjoyable. I often felt that a day in my life was more like an episode of Scrubs than Grey’s Anatomy (both popular shows at the time of my training).

Dr. Cogbill embodies all of the qualities of an outstanding mentor. He is honest, diplomatic, fair, compassionate, funny, intelligent, genuine; the list goes on. Nothing I write can do justice to what he has meant to me and the dozens of the surgeons he has trained. I consider myself truly fortunate to know Dr. Cogbill and call him mentor and friend.

I finish this letter with a smile on my face as I imagine him riding off in to the sunset on his valiant steed, Silver….

Heartfelt gratitude for everything, Tom.

Brian P. Watkins, MD
Class of 2004
University of Rochester Medical Center
Rochester, New York
leadership of Gundersen Lutheran Medical Foundation's surgical residency program has been in the capable hands of Thomas Cogbill, MD, FACS, since 1990. During his tenure as program director, Dr. Cogbill has done more than teach the technical aspects of surgery, both in and out of the operating room. His approach to teaching these future surgeons about the art of talking with patients and families, and how to interact with people in general, is infused with profound regard for the golden rule: treating others as you'd want to be treated. “I really do feel that surgery and medicine in general are a privilege to be a part of,” Cogbill says with his characteristic enthusiasm. “It is something to be appreciated, and not taken lightly.”

Great teachers can often trace aspects of their successful teaching style back to their own mentors or teachers. Like Dr. Cogbill, is no exception. As a medical student and resident at the University of Colorado, Cogbill was influenced by four surgeons who each made a distinct contribution to his own approach to teaching. The first, a senior cardiothoracic surgeon, shared his gift for relating to families with compassion and honesty, for telling the truth even when it’s tough. The second, also a cardiothoracic surgeon, emphasized operating room precision and technique, and the value of doing things right the first time. The third, a pediatric surgeon, was famous for delivering memorable, off-the-cuff fireside chats outside the operating room. The fourth, a trauma surgeon, taught Cogbill about thinking on his feet.

Incorporating these influences into his own teaching philosophy, Cogbill developed an appreciation for the opportunity to shape a teaching legacy of his own. “I think it is possible to achieve a sort of immortality that goes on beyond your own career, and your own life,” Cogbill says. “If your students take those points from you, then some characteristic of yourself lives on.”

“Don’t be afraid to be close to families,” is something Dr. Cogbill emphasizes with his surgical residents; achieving a sense of closeness is something he also strives for in his relationship with residents. “Our faculty and residents in general interact very well and very closely,” observes Cogbill. He cites an annual long-distance relay run which teams residents against staff as something uniquely emblematic of the Foundation’s residency program and the closeness it fosters between the teachers and the students. That reputation may be one reason the surgical residency attracts so much interest; this year 105 applications were received for just two positions. Cogbill will modestly concede, “That’s a nice position to be in, because it allows us to be pretty selective on an academic level and also, even more importantly, on a personal level. We want to make a good match to ensure a person who comes here is compatible with this kind of a program.”

If there is one aspect of the Foundation’s support of the surgical residency program for which Dr. Cogbill is most grateful, it is Colette O’Heron, program coordinator. “She gives a personal touch to this residency that is second to none,” says Cogbill. “She knows the residents, and is there for virtually every request and need. I could not do my job without her.”

Like the best teachers, Dr. Cogbill continues to learn valuable lessons from his students and credits them with constantly renewing his surgical knowledge. “By their inquisitiveness and their terrific enthusiasm at the beginning of a career, residents instill life and curiosity in you as a teacher. They keep you sharp, and feeling invigorated about your own career. That’s a wonderful thing.”
Why do Gunderson Lutheran Surgical Residents think so highly of Program Director Thomas Cogbill, MD, FACS? "He is unique in that he knows every one of the residents on a personal level and interacts with each of us differently based on things that are important to us," says third-year resident Dr. Rhame Ruby, pictured above left, with physician assistant student Marc Hampl, center, and Dr. Cogbill, right. "His door is always open and he is always willing to take time for you. He is more interested in being a good person and doing the right thing than in doing what is easy. Everything he does, he does well and with conviction."
**Physiologic Responses to Standup Paddleboarding**

**ABSTRACT**

**Introduction:** Standup paddleboarding (SUP) has become an increasingly popular recreational water sport over the past several years. Questions have been raised regarding whether or not SUP provides sufficient exercise to be considered a beneficial exercise activity. The purpose of this study was to determine the energy expenditure (kcal/min) and heart rate (HR) responses of SUP.

**Methods:** Sixteen recreational paddleboarders completed three open-water trials of SUP at rating of perceived exertion (RPE) levels of 11 (fairly light), 13 (somewhat hard), and 15 (hard). HR was measured via radiotelemetry and expired air was collected in mylar bags for later analysis.

**Results:** It was found that HR was between 67% and 89% of age-predicted maximal HR and energy expenditure was between 9 and 13.9 kcal/min, depending upon RPE level.

**Conclusion:** These data indicate that SUP meets American College of Sports Medicine guidelines for providing a cardiorespiratory training benefit and positively affecting body composition.

In the 1940s, Hawaiian surf instructors began creating the modern version of standup paddleboarding (SUP). The instructors found that standing up on surfboards allowed for a better view of their student’s surf technique and they used a paddle to navigate the waves and change directions. Additionally, surf photographers began standing on their boards to get better picture angles. The popularity of SUP soared in 2003, when SUP racing became an event at a world-renowned surfing competition, The Buffalo Big Board Classic, held in Makaha, Hawaii.

Standup paddleboarding remained mostly a Hawaiian activity until a Vietnam veteran, Rick Thomas, brought a board back to California. The activity became an overnight sensation. Standup paddleboarding is defined as the use of a long narrow board that propels riders over water in a standing position by means of a single-bladed paddle. The beauty of SUP is that it allows people of different ages and skill level to enjoy the water. Even experienced surfers have found that SUP has a few advantages over surfing, such as the increased distance they could safely travel to remote surf locations, increased exercise time in the ocean, and a better view of local scenery and wildlife. In addition to ocean use, SUP has become a popular alternative to kayaks and canoes on lakes and rivers. Standup paddleboards are recognized by the United States Coast Guard as navigation vessels, requiring the use of safety flotation devices while in use.

Despite the growth in popularity of the sport, only one study has evaluated the energy expenditure of SUP. Wiley and colleagues estimated the energy cost of moderate-intensity SUP to be 10.4 kcal/min. However, energy cost was not directly measured; rather, it was estimated from laboratory-derived prediction equations. The study concluded that the energy demand of SUP is comparable to moderate-intensity rowing, canoeing, and kayaking. The purpose of our study was to directly measure the energy cost and heart rate (HR) responses to 3 bouts of SUP at set rating of perceived exertion (RPE) levels of 11, 13, and 15.

**METHODS**

**Subjects**

Subjects for this study were 16 apparently healthy college-aged men (n=8) and women (n=8) who regularly participated in recreational activity. Each subject provided written informed consent prior to any participation in the study. This study was approved by the Institutional Review Board for the Protection of Human Subjects at the University of Wisconsin-La Crosse.

**Procedures**

Each subject participated in SUP practice sessions until his or her skill level was considered proficient by the principal investigator. Proficiency was defined as demonstrating sufficient ease of balance on the board to allow paddling with varying degrees of intensity. The number of practice sessions varied from 1 to 5 for each participant. Testing took place on a small bay located off the main channel of the Mississippi River. Subjects paddled on a 10’6” SUP (Surftech, Santa Cruz, CA) using a BIC sport Aluminum ML Stand Up Paddle (BIC Sport, Vannes, France). Subjects wore a US Coast Guard–approved life jacket for all practice and testing sessions.
On testing day, subjects were required to complete 3 trials of SUP at RPE values corresponding to 11 (fairly light), 13 (somewhat hard), and 15 (hard) on the BORG 6-20 Rate of Perceived Exertion Scale (RPE). For each trial, the subject paddled for 3 minutes in order to reach steady-state exercise. During the last 30 seconds of each trial, expired air was collected into a 200-mL EconoGrab Tedlar Sampling Bag (Zefon International, Ocala, FL). The bag was strapped onto the subject’s back using adjustable hook-and-loop straps (Figure 1). A J-valve was used to connect the bag to a standard Hans-Rudolph mouthpiece. The subject was prompted to turn the J-valve, effectively opening the valve and allowing expired air to enter the bag. At the conclusion of the 30-second collection period, the subject was prompted to quickly turn the valve again to block air from entering or escaping. A separate numbered bag was used for each data collection trial.

Heart rate was recorded immediately at the end of each trial using a Timex Ironman watch with a Timex HR chest strap, and speed was recorded by mirroring the paddleboarder’s speed with the data collection boat. Speed was averaged over 3 speedometer readings during each trial. In order to minimize the effect of the current, each trial started from the same section of the bay, and each paddleboarder was directed to paddle toward the same area of the bay.

**Gas Analysis**

Following completion of the 3 trials, the gas collection bags were taken into a temperature-controlled climate and allowed to cool to room temperature. Expired gas was analyzed using a PARVO Medics 2400 gas analyzer. Each bag was first connected to the PARVO analyzer for 10 seconds to measure expired gas concentrations of oxygen and carbon dioxide. The bag was then connected to a Parkinson Cowan gas spirometer to measure the volume of expired air in each bag. The air was carefully pushed out of the collection bag to ensure that no air was left in the bag. Equations established by Egan were utilized to determine total VO₂ for each trial. Caloric expenditure was calculated from the VO₂ data assuming a constant of 5 kcal/L of oxygen consumed.

**Statistical Analysis**

Standard descriptive statistics were used to characterize the subject population and to summarize the physiologic responses to SUP. Differences across RPE levels and between men and women were analyzed using 2-way analysis of variance (ANOVA) with repeated measures. The α level was set at P < .05 to achieve statistical significance. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS, version 22; SPSS Inc., Chicago, IL).

**RESULTS**

Descriptive characteristics of the subjects are summarized in Table 1. Physiological responses of paddleboarders at RPEs 11, 13, and 15 are summarized in Table 2. All variables increased significantly across RPE levels. Equations established by Egan were utilized to determine total VO₂ for each trial. Heart rates for men and women were similar at all RPEs, but absolute VO₂ and energy cost (kcal) were statistically greater for men than for women at all RPE levels. Additionally, relative VO₂ at an RPE of 15 was statistically greater for men than for women.

There was no significant difference in paddling speed between men and women at any RPE. Average speed at RPEs 11, 13, and 15 were 2.6 ± .45, 3.3 ± .50, and 4.0 ± .51, respectively. A graph of percentage of maximal HR at each RPE level is presented in Figure 2, and average caloric expenditure for men and women at each RPE level is presented in Figure 3. The relationship between speed and energy expenditure is presented in Figure 4.

**DISCUSSION**

The purpose of this study was to determine the energy cost and HR responses to 3 bouts of SUP at set RPE values of 11 (light), 13 (somewhat hard), and 15 (hard). We also examined relative exercise intensity in order to determine whether SUP
PHYSIOLOGIC RESPONSES TO STANDUP PADDLEBOARDING

Figure 3. Average caloric expenditure at RPE levels 11, 13, and 15.

Figure 4. Relationship between speed and energy expenditure.

The estimated energy expenditure of SUP to be 10.4 kcal/min when burned an average of 228, 282, and 327 kcals, respectively. Women performing SUP at RPEs of 11, 13, and 15 would burn an average of 312, 369, and 507 kcals, respectively. At all RPE levels, men expended more energy than did women. The differences in energy expenditure can be attributed to the fact that the men weighed significantly more than women. Energy expenditure of the paddleboarders at RPEs of 11, 13, and 15 were 9.0, 10.9, and 13.9 kcal/min, respectively. When extrapolated to 30 minutes of exercise, men performing SUP at RPE levels of 11, 13, and 15 would burn an average of 312, 369, and 507 kcals, respectively. Women performing SUP at RPEs of 11, 13, and 15 would burn an average of 228, 282, and 327 kcals, respectively. The values were similar to those found by Wiley et al, who found metabolic equivalents (METs) are commonly used by ACSM to describe exercise intensity. At rest, a person's energy expenditure is equal to 1 MET. Moderate intensity is considered 3 to 6 METs, and vigorous intensity is greater than 6 METs. Paddleboarding at RPE levels 11 and 13 resulted in average energy expenditure values of 6.3 and 8.8 METs, which is considered vigorous-intensity activity. During RPE of 15, MET levels reached 9.1 and 12.2 for women and men, respectively. These levels are equivalent to running at an 8- to 10-minute-mile pace, which is considered a very vigorous-intensity activity level. It is unrealistic to expect untrained paddleboarders to maintain an RPE of 15 for an extended period, but those levels of energy expenditure are attainable.

The study had several limitations. The bags used in the current study allowed for only 30 seconds of expired air to be collected. Furthermore, at RPE 15, 2 men had room in the bag to collect only a 20-second sample due to the high volume of expired air, which we related to increased body size. In the future, larger bags should be considered due to the space restraint during the expired gas collection. Initially a GPS watch was used to collect speed, but it failed to accurately measure speed over such short distances. Therefore, the speed was collected using a speedometer on the testing boat. In future testing, a more accurate way to record speed should be used.

CONCLUSION

The results of this study suggest that SUP meets ACSM guidelines for improving cardiorespiratory endurance and positively affecting body composition. Exercising at RPE levels of 11 to 13 would appear to be most appropriate for recreational SUP. The relative exercise intensity at RPE level 15 fell into the very vigorous range. Participating in SUP can be a fun and unique alternative to traditional cardiovascular endurance sports such as jogging, biking, and swimming, while still achieving an intense workout.

REFERENCES

Stroke is a common cause of death and disability for thousands of Americans every year and can be devastating emotionally and financially to patients and their families. Early emergency action is critical to survival and to minimize stroke's long-lasting effects. Intravenous administration of recombinant tissue plasminogen activator (rt-PA) plays a major role in successful outcomes for stroke patients and has the potential to save thousands of dollars per patient treated. If rt-PA is administered within 4.5 hours of stroke onset, disability can be greatly decreased. The most significant barrier to effective use of rt-PA is a delay from onset of stroke onset, disability can be greatly decreased. The most significant barrier to effective use of rt-PA is a delay from onset of stroke symptoms to hospital arrival and treatment ("onset to needle"). In 2014, 10% of stroke patients received rt-PA upon arrival at hospital more than 3 hours after the onset of symptoms, placing them outside the recommended window of time in which rt-PA should be administered. Use of rt-PA ranges from poor to modest in the United States, with just 3% to 8% of patients who come to the hospital with a stroke receiving rt PA.

Others have found stroke knowledge to be moderate, varied among certain groups within communities, and not associated with taking emergency action when symptoms appear. In an effort to increase our community's awareness of stroke and the importance of calling 911 immediately, Gundersen Health System promotes the acronym B.E.F.A.S.T. (Balance, Eyes, Face, Arm, Speech, Time), but the effectiveness of that campaign had not been evaluated. Therefore, the objectives of our study were to assess our community's knowledge about stroke and to compare knowledge by sex, age, educational attainment, and residential location.

METHODS

This study was reviewed and approved by the Gundersen Clinic, Ltd. Human Subjects Committee/Institutional Review Board. Participants received no remuneration.

A 15-item stroke awareness questionnaire was developed by the researchers to assess stroke knowledge in 5 main areas: (1) risk factors, (2) signs and symptoms, (3) emergency action, (4) acronym B.E.F.A.S.T., and (5) clot-busting treatment. Exposure to stroke education, interest in attending stroke education, and barriers to attendance were also captured, as were age, race, sex, educational attainment, and zip code of residence (Appendix).

The questionnaire was distributed online, at local businesses, and in public venues in the Gundersen Health System stroke alert region (Figure 1). A link to the online questionnaire was sent to a contact person within each participating business. Each contact person then emailed the questionnaire to the employees of his or her business for completion. Online questionnaires included a statement of implied consent with completion. Questionnaires were also completed in hard copy at local businesses, public venues, and special events in the Gundersen Health System stroke alert region between June 1, 2015, and July 31, 2016. Passersby were invited to complete the questionnaire on a voluntary basis. Participants scored 1 point for each correct response and lost 1 point for any incorrect response or unmarked responses from the number of correct responses, with a highest possible score of 26. Total scores were compared between demographic groups using the Wilcoxon rank sum test, and question-level comparisons were made using χ² or Fisher exact tests. Geographic information system (GIS) technology was employed to identify any geographic relationship to knowledge levels across our region.

Results: Stroke knowledge was low in 85% of 1118 participants, defined as an overall score of <69% accuracy (medium = 69%-88%; high >88%-100%). Isolated pockets of higher knowledge in outlying areas were found. Awareness was highest among women, middle-aged adults (36-55 years), those with post–high school degrees and those with previous formal stroke education. Older adults (56+ years) reported that they would not be likely to call 911, and only 21.6% of participants were likely to attend stroke education.

Conclusions: Stroke knowledge in our community is low. People are not interested in attending formal stroke education outside of their regular day. Efforts must be made to raise awareness about stroke symptoms and the importance of early treatment in order to increase more positive outcomes following stroke.

Assessing Stroke Knowledge in Adults: A Community-Based Study

ABSTRACT

Background: Delayed arrival at the hospital following the onset of stroke symptoms is a significant barrier to early treatment of stroke with recombinant tissue plasminogen activator (rt-PA), a clot-busting treatment. Community knowledge about stroke risks and symptoms is moderate at best and not parallel with an appropriate response upon the onset of symptoms. Our aim was to determine the level of knowledge in our healthcare system's service area.

Methods: Participants recruited from local businesses and public venues completed a 15-item stroke awareness questionnaire, either online or in hard copy. The questionnaire also captured demographic data. Scores were calculated by subtracting the number of incorrect or unmarked responses from the number of correct responses, with a highest possible score of 26. Total scores were compared between demographic groups using the Wilcoxon rank sum test, and question-level comparisons were made using χ² or Fisher exact tests. Geographic information system (GIS) technology was employed to identify any geographic relationship to knowledge levels across our region.

Results: Stroke knowledge was low in 85% of 1118 participants, defined as an overall score of <69% accuracy (medium = 69%-88%; high >88%-100%). Isolated pockets of higher knowledge in outlying areas were found. Awareness was highest among women, middle-aged adults (36-55 years), those with post–high school degrees and those with previous formal stroke education. Older adults (56+ years) reported that they would not be likely to call 911, and only 21.6% of participants were likely to attend stroke education.

Conclusions: Stroke knowledge in our community is low. People are not interested in attending formal stroke education outside of their regular day. Efforts must be made to raise awareness about stroke symptoms and the importance of early treatment in order to increase more positive outcomes following stroke.
RESULTS
Participants
A total of 1118 individuals completed the stroke awareness questionnaire. Sample sizes for demographic questions vary due to incomplete questionnaires. Participants were predominantly white (1024/1085, 94%), female (647/1087, 60%), and had relatively equal representation of young (18-35 years), middle-age (36-55 years), and older adults (56+ years). Most (705/909, 78%) reported some level of post–high school education. (Table 1).

Stroke Knowledge
Overall stroke knowledge was low in our sample, with nearly 90% of participants scoring less than 18 of 26 points. Most (935, 84%) indicated that they knew the risk factors for stroke, but only 28% (309) of participants correctly identified all of the risk factors (Table 2). The most commonly missed risk factors included race (680, 61%), excessive alcohol consumption (432, 38%), and diabetes (416, 37%). When the risk factor race was excluded from the analysis, the percentage of people knowing all the other risk factors increased to only 38% (425). Similarly, 86% (954) of participants believed that they knew the signs and symptoms of stroke, but only 30% (337) correctly identified all of them. A sudden and severe headache and vision abnormality were
ASSESSING STROKE KNOWLEDGE IN ADULTS: A COMMUNITY-BASED STUDY

The symptoms most often missed (408 [37%] and 337 [30%], respectively). Interestingly, 30% (332) of participants incorrectly chose chest pain as a sign of stroke, but 786 (70%) did not (Table 3).

Only 60% (667) of respondents selected calling 911 as the appropriate action to take when someone is believed to be having a stroke. One-third answered that driving the person to the emergency department would be the appropriate action. Very few (39, 4%) participants knew all components of the B.E.F.A.S.T. acronym, while 9% (100) knew the F.A.S.T. portion of the acronym. Few participants (418, 37%) indicated knowledge about clot-busting treatment. Figure 2 provides an overview of questionnaire responses for the study population.

Only 212 (19%) respondents reported any form of previous education about stroke, 199 of whom reported where they received that education. When previous education did occur, the most commonly reported setting was at work (112/199, 56%), with school close behind (74/199, 37%). Respondents were allowed to mark multiple settings. Three-quarters of respondents indicated that they would not be likely to attend stroke education, with time of the day (687/1118, 62%) and location (298/1118, 27%) the barriers to attendance most often cited.

**Knowledge and Demographic Correlates**

Respondents who were women, middle-aged (36-55 years), or had higher levels of education had higher overall knowledge about stroke (Table 4). The specific areas in which women scored higher than men were symptoms ($P=.005$), identifying B.E.F.A.S.T. ($P=.001$) and knowledge about clot-busting treatment ($P=.01$). Middle-aged and older adults were more likely than young adults to know the symptoms of stroke ($P<.001$), and older adults were more aware of clot-busting medication ($P<.001$). However, older adults were less likely than those in the other age groups to call 911 when experiencing or observing stroke signs ($P=.001$). Participants who had received previous stroke

Table 3. Symptoms of Stroke Recognized by Participants, N=1118

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Recognized Symptom n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech</td>
<td>1066 (96)</td>
</tr>
<tr>
<td>Numbness</td>
<td>1051 (94)</td>
</tr>
<tr>
<td>Balance</td>
<td>966 (86)</td>
</tr>
<tr>
<td>Eyesight (vision changes)</td>
<td>781 (70)</td>
</tr>
<tr>
<td>Headache</td>
<td>710 (63)</td>
</tr>
<tr>
<td>Chest pain</td>
<td>332 (30)*</td>
</tr>
</tbody>
</table>

*Note: 70% of participants correctly did not choose chest pain as a sign of stroke.

Figure 2. Questionnaire responses by item.

Table 4. Mean Scores Stratified by Characteristic Group*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (%)</th>
<th>Mean Score (SD)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (n=1087)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>440 (40)</td>
<td>12.4 (6.6)</td>
<td>.001</td>
</tr>
<tr>
<td>Women</td>
<td>647 (60)</td>
<td>13.8 (7.1)</td>
<td></td>
</tr>
<tr>
<td>Age, y (n=1068)</td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>18-35</td>
<td>337 (32)</td>
<td>12.1 (6.7)</td>
<td></td>
</tr>
<tr>
<td>36-55</td>
<td>313 (29)</td>
<td>14.1 (6.8)</td>
<td></td>
</tr>
<tr>
<td>56+</td>
<td>418 (39)</td>
<td>13.6 (6.8)</td>
<td></td>
</tr>
<tr>
<td>Race (n=1085)</td>
<td></td>
<td></td>
<td>.001</td>
</tr>
<tr>
<td>White</td>
<td>1024 (94)</td>
<td>13.4 (6.8)</td>
<td></td>
</tr>
<tr>
<td>Non-White</td>
<td>61 (6)</td>
<td>10.8 (6.9)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Education (n=909)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school degree or less</td>
<td>204 (22)</td>
<td>10.2 (6.5)</td>
<td></td>
</tr>
<tr>
<td>Some college or technical school</td>
<td>308 (34)</td>
<td>12.5 (6.6)</td>
<td></td>
</tr>
<tr>
<td>Post-high school degree</td>
<td>397 (44)</td>
<td>15.0 (6.7)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: SD, standard deviation.

*Sample sizes vary due to incomplete questionnaires.

Table 5. Stroke Knowledge of Participants Stratified by Previous Stroke Education*

<table>
<thead>
<tr>
<th>Knowledge Category</th>
<th>No n=906</th>
<th>Yes n=212</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All risk factors</td>
<td>221 (24)</td>
<td>13.6 (6.8)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>All signs</td>
<td>251 (28)</td>
<td>86 (41)</td>
<td>.0002</td>
</tr>
<tr>
<td>B.E.F.A.S.T</td>
<td>23 (3)</td>
<td>16 (8)</td>
<td>.0003</td>
</tr>
<tr>
<td>Call 911</td>
<td>525 (58)</td>
<td>142 (67)</td>
<td>.016</td>
</tr>
<tr>
<td>Clot-busting treatment</td>
<td>256 (28)</td>
<td>111 (52)</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

*Data are presented as number of participants (%).
education demonstrated significantly higher knowledge in all 5 stroke knowledge areas (Table 5) than those who had not.

GIS Mapping

Mean stroke knowledge by zip code was mapped for the stroke alert region. Level of knowledge was low throughout most of the Gundersen Health System stroke alert region, with isolated pockets of higher knowledge in outlying areas (Figure 3). When the household income layer was added to the map (Figure 4), level of knowledge and income level did not appear to be associated.

DISCUSSION

Residents of the Gundersen Health System stroke alert region have low levels of stroke knowledge. The patterns of knowledge found in our study are consistent with the patterns of levels of stroke knowledge found in previous studies across the country.5-7 with women and more highly educated individuals demonstrating more knowledge about stroke symptoms and clot-busting treatment.3 Middle-aged adults also tend to have the highest levels of stroke knowledge among all age groups.5,6,8 Many people know a single symptom or risk factor, but a small percentage of people can recognize all or list at least 3 symptoms.5-8 Chest pain is commonly and incorrectly believed to be a symptom,6 which was reflected in our sample.

Universally low knowledge is common and concerning because this lack of knowledge may be a primary reason why many stroke patients do not take emergency action sooner. Although our community's awareness of stroke symptoms and risk factors seems consistent with levels of awareness around the country, the percentage of ischemic stroke admissions arriving at our institution within the treatment window and treated with rt-PA is higher than published estimates (10% versus 3.0%-8.5%).9,10 To increase the number of people eligible for treatment with rt-PA, we must educate our community and improve stroke awareness. We found that those who had previous stroke education have higher levels of knowledge than those who did not, supporting the importance of stroke education. Unfortunately, a majority of participants expressed no interest in attending formal stroke education.

Only one-quarter of participants had heard of the B.E.F.A.S.T. acronym, and only 4% knew what all of the letters of the acronym stand for. Therefore, the type of education we implement must consider the lack of interest in attending education as well as the low success of the acronym. Furthermore, reviews of stroke education studies have found that although education increases awareness of symptoms, it does not consistently achieve a change in behavior.11-13 An intensive, targeted stroke education program focused on identifying symptoms and calling 911 did increase the intent to call an ambulance.14 In order to be successful, education must be easily accessible and culturally appropriate.15 Our intervention should aim to pair recognition of symptoms and an immediate 911 response in an accessible format.

Limitations of our study include the homogenous nature of our community's population (but potentially consistent with other referral communities of our size), a lack of clarity for some questions, and questions not posed. The questions were closed-ended rather than open-ended, so participants' level of awareness may be inflated. Previous stroke education was not specifically defined, so participant responses to this question may be subjective. Study personnel who observed the participants' completion of the surveys anecdotally reported that participants often answered "no" to the question "Have you heard of B.E.F.A.S.T.?” only after attempting to fill out the acronym. These questions should be redefined with more specificity in the future. Finally, we did not ask whether participants worked in healthcare or had a close family or friend who had ever suffered from a stroke. Both of these questions could allow for further exploration into how well-informed healthcare workers are and how much information people receive or retain after a loved one experiences a stroke.
CONCLUSIONS

It is essential that we build on our findings for future studies and community involvement. Because we learned that stroke education is valuable—yet not a priority—to community members, actions should be taken to incorporate stroke awareness sessions into work and school wellness programs. Targeting the young with stroke education could be another constructive way to build community knowledge. By teaching children about strokes in school, that education could realize a 2-fold effect: not only would children recognize the signs of a stroke and know to call 911 for a parent or grandparent exhibiting those symptoms, but they might also share the information they learned with their parents and grandparents, who in turn would learn to recognize the signs and take appropriate action. With such low levels of knowledge in our community, improving stroke awareness could greatly increase people’s ability to recognize the signs of a stroke, react to the emergency, and receive critical care more quickly.

ACKNOWLEDGMENT

This research was supported in part by Gundersen Medical Foundation.

REFERENCES


Appendix. Stroke awareness questionnaire.


Nursing research involves ongoing dynamic relationships between evidence-based clinical practice, academic centers, and professional dissemination activities. As complexity of our health care system continues to evolve, nurses may not perceive the importance of their role in the research process. Historically, nurses’ perceptions of research may affect their direct involvement in effective, proactive, meaningful research projects that support progressive change.1,2 These perceptions may include actual or unclear barriers that can be addressed.3,4 A recent integrative review conducted by Scala, Price, and Day5 reported that the literature is replete with enumeration of barriers to engaging nurses in the conduct of research, with the lack of time, insufficient knowledge, and perceived lack of organizational leadership support identified most often.
NURSING RESEARCH UTILIZATION: IMPLICATIONS FOR BEST PRACTICES

STUDY PURPOSE

The first purpose of the study was to determine perceptions and attitudes toward research utilization among nurses functioning in direct and nondirect patient care roles. Although the level of nurses’ education as a determinant for engagement in clinical research has been studied, knowledge about whether the practice role of the clinical nurse facilitates research utilization is limited. The second purpose was to identify endorsers and barriers to research utilization among both practicing nurses and nursing students. Although an abundance of literature exists regarding barriers perceived by practicing nurses, less is known about the attitude and intentions of nursing students toward involvement in nursing research.

METHODS AND DESIGN

The study was conducted at the 2015 Nursing Research on the Green (NROTG), a regional nursing conference attended by practicing nurses, as well as undergraduate and graduate nursing students. In 2001, a local medical foundation established the annual Dahlberg Scholar Nursing Lectureship. Each year, a nationally recognized nurse leader with research and evidence-based practice expertise is chosen to receive the Dahlberg Scholar Award and to deliver the NROTG keynote address. Poster displays of research projects conducted by graduate nursing students, nursing research fellows, and nurse contributors from the nearby healthcare organizations and academic institutions are featured at the annual event. Over the years, partnering nursing representatives from the local Sigma Theta Tau chapter, regional healthcare organizations, and academic institutions have come together to plan the event.

This study used a descriptive cross-sectional design, with all data collected the day of the NROTG conference. All necessary institutional review board approvals were obtained; informed consent was implied by participation and completion of the questionnaire. Using a convenience sampling method, data were collected either by electronic software (QuestionPro) that assigned each participant a study number or by hard copy paper and entered manually via the electronic software into a single dataset. No identifying data were requested. All data were kept in a protected computerized data file on a partner institution share drive to which respondents are provided. Of the 443 conference attendees, 93 completed the questionnaire—a 21% participation rate. Thirty-three respondents identified themselves as undergraduate nursing students, and 60 identified as nurses. Demographic and nursing role data for the respondents are provided in Table 1.

Internal consistency reliability was statistically determined for each subscale using Cronbach coefficient $\alpha$. Each subscale demonstrated excellent reliability: attitude toward research ($\alpha = .88$), research use in daily practice ($\alpha = .89$), and availability and support to implement research findings ($\alpha = .81$).

RESULTS

Response Rate

Of the 443 conference attendees, 93 completed the questionnaire—a 21% participation rate. Thirty-three respondents identified themselves as undergraduate nursing students, and 60 identified as nurses. Demographic and nursing role data for the respondents are provided in Table 1.

Table 1. Demographics and Identified Roles of Study Participants, N=93 (60 Nurses and 33 Undergraduate Nursing Students)

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of respondents (%)</th>
<th>Mean (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>91*</td>
<td>36.69 (20–68)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>8 (8.6)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>85 (91.4)</td>
<td></td>
</tr>
<tr>
<td>Nursing Role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate students</td>
<td>33 (35.48)</td>
<td></td>
</tr>
<tr>
<td>Direct care nurses</td>
<td>23 (24.73)</td>
<td></td>
</tr>
<tr>
<td>Nondirect care nurses</td>
<td>37 (39.79)</td>
<td></td>
</tr>
<tr>
<td>Years in nursing</td>
<td>59†</td>
<td>18.73 (1–47) years</td>
</tr>
</tbody>
</table>

*Two respondents did not provide age.
†One nurse respondent did not provide years in nursing.

INSTRUMENTS

A demographic questionnaire captured age, sex, student status, highest level of degree or certification, work setting, current nursing position in relation to direct patient care, length of employment, years of experience, and number of hours worked per week. Participants were asked to identify their professional status/role. A direct care nurse was defined as one whose self-identified primary responsibility involved the provision of clinical or bedside nursing care. The definition for nondirect patient care status category (eg, administration, management, education, research coordination, case or project management) was delineated by the study’s principal investigator (ACFO).

The Research Utilization Questionnaire (RUQ) was administered to both practicing nurses and nursing students. Research utilization issues were measured within 3 subscales: attitude toward research (12 items), research use in daily practice (9 items), and availability and support to implement research findings (8 items). Both positive and negative items are included in the instrument. This tool is a clinically feasible, reliable, and validated 29-item instrument employing a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree, that has been administered to both practicing nurses and recent nurse graduates. Responses are summed to produce a total scale score.

In a systematic review that considered 14 instruments used to measure nurses’ attitudes toward research utilization, 4 key structural research utilization concepts emerged: direct, indirect, persuasive, and overall. Direct utilization refers to the application of research findings in clinical practice. Indirect utilization denotes the influence of research findings to alter thinking or attitudes about one’s clinical approach in a specific situation. Persuasive utilization represents the ability of nurses to influence decision makers to make changes to improve practice. And overall utilization signifies the use of research findings that affect any facet of the nursing role. Although the RUQ does not measure persuasive utilization, it can be used to collect data relevant to the other 3 concepts. This RUQ was 1 of 8 reviewed instruments that did not designate a specific theoretical framework; however, in terms of psychometric properties, this adapted instrument is ranked the highest in reliability of its subscales.
The next section presents findings from the RUQ. Responses of nurses in direct care compared with those in nondirect care are summarized in Table 2. One attitude toward research subscale questionnaire item, *I wish to change my practice to make it based on research*, statistically compared the responses of nursing students with those of all nurses and is discussed in text. In addition, significant study findings are compared with related literature within each subscale statement subsection.

### Table 2. Differences in Research Utilization Questionnaire Responses Delineated by Role of Nurse Participant (Direct vs Nondirect), Excluding Undergraduates (P ≤ .05)

<table>
<thead>
<tr>
<th>Item measured</th>
<th>No. of respondents</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude Toward Research</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I wish to change my practice based on research</td>
<td>59^</td>
<td>.07</td>
</tr>
<tr>
<td>I want to base my practice on research</td>
<td>59^</td>
<td>.15</td>
</tr>
<tr>
<td>Clinical practice should be based on research</td>
<td>59^</td>
<td>.15</td>
</tr>
<tr>
<td>Participating in research is a waste of time (All reported “Disagree”)</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Understanding research helps me professionally</td>
<td>59^</td>
<td>.39</td>
</tr>
<tr>
<td>I think research is interesting</td>
<td>60</td>
<td>.16</td>
</tr>
<tr>
<td>Research is stimulating</td>
<td>60</td>
<td>.18</td>
</tr>
<tr>
<td>Research is understandable</td>
<td>60</td>
<td>.031*</td>
</tr>
<tr>
<td>Research is a dull, boring project</td>
<td>60</td>
<td>.34</td>
</tr>
<tr>
<td>It is not relevant to use research finding in my day-to-day practice</td>
<td>60</td>
<td>.99</td>
</tr>
<tr>
<td>Basing clinical practice on research is time-saving</td>
<td>60</td>
<td>.99</td>
</tr>
<tr>
<td>Research findings are too complex to use in practice</td>
<td>60</td>
<td>.99</td>
</tr>
<tr>
<td><strong>Research Use in Daily Practice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I base my practice on research</td>
<td>59^</td>
<td>.29</td>
</tr>
<tr>
<td>My clinical practice is based on research</td>
<td>56^</td>
<td>.64</td>
</tr>
<tr>
<td>I do not use research in my day-to-day practice</td>
<td>59^</td>
<td>.017*</td>
</tr>
<tr>
<td>I do use research in my day-to-day practice</td>
<td>56^</td>
<td>.003*</td>
</tr>
<tr>
<td>I apply research in my clinical practice</td>
<td>56^</td>
<td>.16</td>
</tr>
<tr>
<td>I help others to apply research in clinical practice</td>
<td>59^</td>
<td>.029*</td>
</tr>
<tr>
<td>I use research to guide my clinical practice</td>
<td>55^</td>
<td>.17</td>
</tr>
<tr>
<td>I cannot apply research in my clinical practice</td>
<td>55^</td>
<td>.99</td>
</tr>
<tr>
<td>I seek out research related to my clinical practice</td>
<td>57^</td>
<td>.18</td>
</tr>
<tr>
<td><strong>Availability and Support to Implement Research Findings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The clinical team that I work with supports research utilization</td>
<td>56^</td>
<td>.30</td>
</tr>
<tr>
<td>My unit manager supports research utilization</td>
<td>51^</td>
<td>.053*</td>
</tr>
<tr>
<td>The quality of research is not so good that it can be used in practice</td>
<td>58^</td>
<td>.011*</td>
</tr>
<tr>
<td>I have access to research findings where I work</td>
<td>57^</td>
<td>.15</td>
</tr>
<tr>
<td>I have time to read about research while I am on duty</td>
<td>57^</td>
<td>.034*</td>
</tr>
<tr>
<td>Research is performed in my work place</td>
<td>59^</td>
<td>.07</td>
</tr>
<tr>
<td>Research is performed in my community</td>
<td>60</td>
<td>.34</td>
</tr>
<tr>
<td>Education in research is carried out in the community</td>
<td>60</td>
<td>.23</td>
</tr>
</tbody>
</table>

*a Results significant based on P ≤ .05
*a One indirect care nurse did not answer
*b Four indirect care nurses did not answer
*c Five indirect care nurses did not answer
*d Three indirect care nurses did not answer
*e Nine indirect care nurses did not answer
*f Two indirect care nurses did not answer
Attitude toward Nursing Research

Statement: I wish to change my practice based on research.

Of those who responded to this question, 86.44% of nurses (51/59) and 59.38% of undergraduate nursing students (19/32) indicated a desire to change their nursing practice based on research (P = .012).

In a study by Tsai, Cheng, Chang, and Liou,10 an interactive teaching strategy was implemented in an undergraduate research course to stimulate interest and motivate utilization of research. This teaching strategy included an activity called the “cookie experiment”, which had the purpose of examining student nurse attitudes toward nursing research. A pre- and posttest design was utilized to evaluate this study. The authors’ findings showed that students agreed that the teaching strategy had a positive impact on their attitude toward nursing research.

Of note, Sweden has issued standards of practice for research that nursing students are expected to incorporate into their practice upon graduation. In the 26 Swedish schools of nursing studied by Florin and colleagues,11 students endorsed varying levels of confidence for transferring their knowledge into practice. Senior nursing students were tracked in their transition to nursing practice. This study found a gap between student perception and their actual ability to integrate research into their practice. All of the students perceived themselves to be well prepared to apply research; however, the experienced nurses did not have the same perception. Florin et al11 concluded that the educational content related to nursing research between the participating schools was inconsistent; therefore, the authors concluded that common outcomes related to content needed further development in order to meet the national standards of practice.

Statement: Research is understandable.

This statement was endorsed by 64.86% (24/37) of nurses who provided nondirect patient care, compared with 52.17% (12/23) of nurses who provided direct patient care (P = .031). These results are similar to the findings of 2 previous studies. Brown, Wickline, Ecoff, and Glaser,12 and Dahleim, Harthug, Nilsen, and Nortvedt13 reported that nurses found research difficult to understand. To modify this factor, Dahleim et al13 suggested that research needs to be in simple language to be usable. Both studies, although not differentiating between nurses providing direct or nondirect patient care, are in agreement that nurses reporting competence with evidence-based practice (EBP) were more likely to perceive that research is understandable.

Research Use in Daily Practice

Daily practice research use significantly differed on 3 items of the research use in daily practice subscale, with nurses in nondirect patient care roles endorsing research utilization in daily practice.

Statement: I do not use research in my day-to-day practice.

Of nurses who provided nondirect patient care, 97.22% (35/36) were more likely to use research in their daily work compared with 73.91% (17/23) of nurses who provided direct patient care (P = .017).

Statement: I use research findings in my clinical practice.

All (33/33) nurses practicing in nondirect patient care roles were more likely to use research findings in their clinical practice than were nurses who provided direct patient care 73.91% (17/23; P = .003).

The literature supported a positive relationship between attitudes and knowledge about EBP and the effective use of research in daily practice, suggesting that as knowledge about EBP increased, EBP utilization in practice increased.14,15

Statement: I help others to apply research in my clinical practice.

Nurses practicing in nondirect patient care roles were more likely than nurses in direct patient care to help others to apply research in clinical practice: 97.22% (35/36) versus 78.26% (18/23), respectively (P = .029). Shafiei et al15 reported sharing information and ideas with colleagues as an important method to support research in practice.

Availability and Support to Implement Research Findings

Perceived barriers to research utilization differed between nurses in direct versus nondirect roles on 3 items on an 8-item subscale examining availability and support to implement research findings.

Statement: My unit manager supports research utilization.

Twenty-seven of 28 (96.43%) nurses providing nondirect patient care agreed that their unit manager supported research utilization, compared with 17 of 23 (73.91%) nurses providing direct patient care (P = .017).

Earlier studies by Brown et al12 and Kaijermo et al16 identified a lack of support for research utilization stemming from organizational barriers. Without delineating between direct and nondirect care providers, Dalheim et al14 and Williamson, Almaskari, Lester, and Maguire17 reported similar findings regarding administrative/managerial support of research use in practice. Clinical nurses studied by Graue, Bjaerkoy, Iversen, Haugstvedt, and Harris18 identified multiple barriers to doing research: lack of critical appraisal skills, lack of time, structural and organizational problems, and lack of support from leaders. To address the perceived barriers, Graue et al18 reported that an existing diabetes nurse curriculum was modified to illustrate and pilot the process of identifying, interpreting, and utilizing research. At the completion of the course, nurses reported that the pilot process had a positive impact on their attitude toward nursing research.

Statement: The quality of research is not so good that it can be used in practice.

Thirty-one of 35 (88.56%) nurses providing nondirect care disagreed with this statement, compared with 17 of 23 (73.91%) who provide direct patient care (P = .011). Brown et al19 identified inadequacies with research methodology and ambiguous results as barriers to research utilization in their study sample, which included 1301 nurses practicing in both direct and nondirect nursing care roles. However, the authors of this cross-sectional study also reported that these perceived barriers were not highly influential on actual use of research in practice, and encouraged further study to identify and focus on contributory factors to adopting EBP.
Statement: I have time to read about research while I am on duty.

Twelve of 34 (35.29%) nurses providing nondirect patient care agreed with this statement, compared with 4 of 23 (17.39%) providing direct patient care ($P = .034$). Nurses reporting insufficient time to read research while on duty is supported in the literature. Study findings are similar to those of Johansson et al in which the managerial nurses reported encouraging staff members to read research, while acknowledging that there was a lack of time to do so. This is further supported by the studies of Brown et al and Fink et al, in which respondents reported limited time to read research while caring for patients.

Statement: Research is performed in my work place.

Although not statistically significant, 91.67% (33/36) of nurses providing nondirect patient care agreed with this statement, compared with 69.57% (16/23) providing direct patient care ($P = .007$). In a study using the BARRIERS Scale, nurse respondents ranked being “unaware of research” as a top perceived barrier. In contrast, Kajermo and colleagues did not find this independent variable to be a significant barrier, suggesting that individual perceptions of research barriers are likely to affect behavior, regardless of whether barriers actually exist.

DISCUSSION

Our findings are consistent with those in the published literature to date. Of note, the literature did not always differentiate between direct and nondirect patient care providers, but findings similar to ours suggest that nurses in managerial and leadership positions report higher use of research. Although not differentiating between direct and nondirect patient care providers, a substantial gap between knowledge of and use of research in practice among nurses was identified by Shafiei et al, Brown et al, Koehn and Lehman, and Upton and Upton. Although nurses have a positive attitude about clinical research, they often lack the knowledge and confidence to become more involved. According to Florin et al, Kessler and Alverson, Moore and Watts, and Shirey, nurse attitudes toward research are positive if nurses and students are educated and supported in the research process. Increasingly, nurse educators play a significant role in challenging students to be critical thinkers and strong believers in research use. These authors and others identified interventions, such as facilitated mentorship, financial support, peer support, and collaboration between educators, practitioners, and nursing management, to promote participation in clinical research. Witzke et al developed a mentorship program pairing experienced nurses with novice nurses to achieve outcomes of increased knowledge and confidence.

In addition to understanding the barriers and facilitators of integrating research and its evidence into clinical practice, this study also supported commonly reported findings addressing the critical need for administrative support within health care organizations. The authors of this manuscript strongly recommend further commentary and study to describe and evaluate perspectives of administrative leaders about supporting dedicated time for nursing staff engagement in the research process.

Limitations

The findings of this study may be unique to this convenience sample. A low participation rate, selection bias using a convenience sample of participants attending a nursing research conference, and the use of an instrument not originally designed to survey nursing students about research utilization practices are other limitations that need to be considered. A lack of qualitative data may also limit the richness of the findings, as only 4 participants provided feedback to the open-ended question. Is there anything else you would like to share regarding nursing research? However, the study findings do align with other research studies that identify important barriers to research utilization.

Final Comments

The research process and findings presented in this paper reflect the passion, efforts, and contributions of its co-authors, who represent strong involvement and commitment to the mission of NROTG. Each of the authors’ partnering organizations offers its nurses and nursing students many varied opportunities for growth in education, leadership, research, and/or academics. The authors appreciate the unique collaboration and professional enhancement that the NROTG partnership inspires. The NROTG partners recognize the challenge of, and are committed to, integrating research-related opportunities into their respective organizational or institutional initiatives. These findings will be considered for further development and study of EBP utilization within these organizations and continued partnering through the vision of Nursing Research on the Green.

REFERENCES


Surveillance of Wisconsin Organisms for Trends in Antimicrobial Resistance and Epidemiology (SWOTARE): epidemiologic correlates for 2016 surveillance isolates

ABSTRACT

Background: The Centers for Disease Control and Prevention advocate data collection and monitoring as one facet of a comprehensive approach to combat antimicrobial resistance in the United States. However, a paucity of such data exists at the local/state level for common disease-causing organisms.

Methods: To begin to characterize epidemiologic correlates of antibacterial resistance in Wisconsin, data analyses were performed with respect to isolates in the Surveillance of Wisconsin Organisms for Trends in Antimicrobial Resistance and Epidemiology (SWOTARE) 2016 collection. In addition to submitting isolates of Escherichia coli, Proteus mirabilis, Pseudomonas aeruginosa, and Streptococcus pneumoniae, participating laboratories were also requested to submit data regarding patient age, specimen source, and location of patient service.

Results: Fifty-five percent of isolates were of outpatient origin (including emergency department). In general, isolates derived from inpatients were more likely to demonstrate higher resistance rates than those from outpatient locations. Upon further stratification, isolates from emergency department encounters generally exhibited higher susceptibility rates than those from outpatient clinics. Sixty-seven percent of isolates emanated from skin and soft tissue or invasive sites. Delineation of specimen source played a minimal role in prediction of antimicrobial resistance. Older patients were more likely to generate isolates of E coli and P mirabilis exhibiting resistance to agents such as fluoroquinolones and trimethoprim-sulfamethoxazole.

Conclusions: SWOTARE facilitates epidemiologic investigations into resistance at the local/state level. Investigations are warranted to further delineate differences in isolates derived from emergency department and outpatient clinic visits. Characterizations at the demographic level could impact local empiric treatment guidelines and antimicrobial stewardship throughout Wisconsin.

The Centers for Disease Control and Prevention (CDC) have recently identified 17 groupings of bacterial and fungal organisms collectively responsible for at least two million annual illnesses and 23 000 deaths on the basis of antimicrobial resistance.3 CDC has additionally advocated a 4 faceted approach to address the paradigm of national antimicrobial resistance, 1 of which involves timely surveillance for the emergence of novel and unique patterns of resistance. The value of such surveillance efforts has been championed by pioneers in the field.3

We have described implementation of the Surveillance of Wisconsin Organisms for Trends in Antimicrobial Resistance and Epidemiology (SWOTARE) program.3 In summary, a centralized microbiology laboratory assesses representative bacterial isolates using a standardized antimicrobial susceptibility testing method. These isolates are submitted by 22 clinical laboratories with widespread distribution throughout Wisconsin. With such infrastructure, we currently have capability of monitoring 3 of the CDC-targeted organism groups.3 Two of these, multidrug-resistant Pseudomonas aeruginosa and drug-resistant Streptococcus pneumoniae, are responsible for 51 000 healthcare-associated infections4 and 4 million general infections,5 respectively, on an annual basis. These infections further translate into resistance rates approximating 13% to 30%,3,6 with annual deaths attributable to resistant strains estimated at 440 (P aeruginosa)7 and 7000 (S pneumoniae).3 Furthermore, collected Escherichia coli can be monitored for evidence of carbapenemase and extended-spectrum β-lactamase (ESBL) production. It is estimated that these resistance mechanisms are responsible for greater than 10 000 healthcare-associated infections in the United States annually, with approximately 700 attributable deaths.3,6-8

An additional component of the SWOTARE program involves submission of isolate-specific epidemiologic data from participating clinical laboratories. Such data may not be readily available in the course of surveillance endeavors strictly involving analysis of antibiogram data.9 Moreover, as part of the CDC-advocated surveillance approach,1 it is recommended that data be collected with respect to risk factors for antimicrobial resistance. This report provides introductory information relative to the epidemiology of antimicrobial resistance in Wisconsin, as generated by the 2016 SWOTARE collection.
SWOTARE Program

Establishment of the SWOTARE surveillance network, along with isolate submission and susceptibility testing protocols/interpretation, has been described. In summary, clinical microbiology laboratories in Ashland, Spooner, St. Croix Falls, and Eau Claire (northwest region); Marshfield, Weston, and Stevens Point (northcentral region); Manitowoc, Sturgeon Bay, and Green Bay (northeast region); Platteville, Prairie du Chien, Viroqua, and La Crosse (southwest region); Fort Atkinson, Janesville, and Madison (southeast central region); Fond du Lac, Neenah, and Appleton (Lake Winnebago region); and West Bend and Milwaukee (southeast region) participated in the program.

Isolates and Demographic Data

Study sites were requested to collect consecutive isolates of E coli, Proteus mirabilis, P aeruginosa, and S pneumoniae identified from in-house culture of clinically significant infection. Laboratories were further requested to supply limited patient demographic information, including age, sex, anatomic source, patient service location, and whether the healthcare encounter involved an intensive care unit stay. Access to protected health information for the purpose of the investigation was granted by the Marquette University Institutional Review Board. Because of the lack of direct involvement in the collection of specimens and because of the utilization of de-identified isolates from routine clinical care, the Review Board did not consider the SWOTARE program to be actively engaged in human subjects research.

Data Analysis

Genus-specific percentage susceptible, intermediate (susceptible-dose dependent for cefepime and Enterobacteriaceae combinations), and resistant values, as well minimum inhibitory concentration (MIC) determinations (MIC₅₀ and MIC₉₀) were generated. Such analyses were applied to statewide isolates as a whole, in addition to characterizations on the basis of patient healthcare encounter location, specimen source, and patient age. Only patient service location, specimen source, and age delineations with n ≥ 25 were utilized for comparisons. The significance test of proportions determined if differences in susceptibility percentage were significant. The α level was set at .05 before the investigations commenced, and all P values are 2-tailed.

RESULTS AND EPIDEMIOLOGIC DISCUSSION

Patient Demographics and Isolate Distribution by Patient Location

One thousand eighty isolates were submitted to the program and tested in 2016. Of this total, complete demographic data were provided for 1055 (97.7%) isolates. Five hundred sixty-one (53.2%) isolates were derived from women. Mean patient age was 62.5 years, with a median of 66. Six general patient service categories (Figure 1) accounted for 94.8% of all patient isolates. As a result of the inclusion of data from long-term care facilities as inpatient data, the percentage composition of inpatient isolates was 45.4%, the largest component of which was internal medicine (25.6% of all isolates). Outpatient data consisted of outpatient clinic-derived isolates (30.0% of all isolates) and those collected from emergency departments (24.6% of all isolates).

Isolate Distribution by Specimen Source

Greater than two-thirds of specimens submitted to the SWOTARE program in 2016 were of skin and soft tissue or invasive origin (Figure 2). Invasive isolates included those derived from blood (354 isolates), cerebrospinal fluid (4), paracentesis fluid (1), hardware (1), bone (1) and bile (1). Sixteen percent of isolates were derived from urogenital (172 urine, 1 Bartholin cyst) sources. Distribution of lower respiratory tract isolates (12.6% of all isolates) included sputum (111), bronchoalveolar lavage (8), endotracheal aspiration (7), bronchial washings (6), thoracentesis fluid (3), and pleural fluid (1). Upper respiratory tract isolates included those derived from ear (18 isolates), nose (9), throat (8), eye (7), and sinus (4) specimens.

Profile by Patient Location

We compared differences in susceptibility rates for antimicrobial/organism combinations as a function of patient care location from which the isolate was derived. Table 1A demonstrates one example of inpatient isolates exhibiting an increased antimicrobial...
resistance profile over that of outpatient isolates. This inpatient *P mirabilis* profile is characterized by a decreased levofloxacin percentage susceptible value, as well as an elevated MIC$_{90}$ value. Further subcategorization of this antimicrobial/organism paradigm is represented in Table 1B. The frank resistance rates and increased MIC$_{90}$ values within this profile, as well as a majority of other antimicrobial/organism profiles (data not illustrated), justify inclusion of long-term care facilities with inpatient data.

Initial insight into differences in susceptibility between isolates derived from emergency department visits (95.6% susceptibility) and those from internal medicine and outpatient clinic encounters (67.2% and 86.2%, respectively) was also observed.

On the basis of achieved $n$ values, subsequent analysis was restricted to internal medicine, emergency department, and outpatient clinics. Greater than 61% of individual *E coli*, *P mirabilis*, *P aeruginosa*, and *S pneumoniae*/antimicrobial combinations revealed susceptibility rates that differed by less than 10% between the 3 healthcare locations (data not illustrated). Noteworthy exceptions included a cefazolin susceptibility difference of 16.1% between emergency department and internal medicine *E coli* isolates and a penicillin susceptibility difference of 22.1% between emergency department and internal medicine *S pneumoniae* isolates.

The potential influence of patient service location on empiric regimen choice is demonstrated in Table 2. For each of the 4 organisms investigated in the surveillance program, a higher proportion of antimicrobials demonstrated greater *in vitro* potency on emergency department–derived isolates when compared with outpatient clinic- and internal medicine–derived isolates. This dichotomy was especially noted with *S pneumoniae*, as 92.3% of antimicrobial/emergency department–derived isolate combinations demonstrated most *in vitro* potency when compared with internal medicine- and outpatient clinic–derived isolates (7.7% and 0%, respectively).

Studies attempting to associate increased antimicrobial resistance with patient service location have often been performed in the context of urinary tract infection. In general, healthcare-
associated urinary tract pathogens possess increased resistance rates when compared with community-acquired agents of urinary tract infection (particularly with respect to *E. coli* resistance to fluoroquinolone agents). Examples of such data emanate from large study collections in international centers that are derived from antibiogram data or from surveillance programs. From a 4-year Swiss antibiogram study, Lamoth et al reported that community-acquired strains of *E coli* and *P. aeruginosa* (irrespective of specimen source) demonstrated higher susceptibility rates when compared to hospital-acquired strains. With respect to *P. aeruginosa*, this group further implied that differences in ciprofloxacin and ceftazidime susceptibility were a function of specific inpatient unit.

Additional investigations have focused on emergency department populations. Zatorski et al compared *E. coli* antibiograms from non-intensive care unit inpatient urine cultures with those derived from emergency department patients and found increased ceftriaxone and ciprofloxacin susceptibility rates in the latter demographic. Draper et al used an antibiogram approach to determine that emergency department-derived *E colii* isolates (regardless of specimen source) demonstrated increased susceptibility rates to ampicillin, levofloxacin, and trimethoprim-sulfamethoxazole when compared with hospital-wide isolates. A similar paradigm was observed with *P. aeruginosa* and aztreonam.

**Profile by Specimen Source**

Differences in susceptibility rates were also compared on basis of specimen source. With respect to each organism, source-specific n values allowed comparisons among 3 specimen sources. Greater

### Profile by Specimen Source

Differences in susceptibility rates were also compared on basis of specimen source. With respect to each organism, source-specific n values allowed comparisons among 3 specimen sources. Greater

#### Table 3. Frequency of Percentage Susceptibility Value Differences for Combinations of Organisms and Antimicrobial Agents Compared by Top 3 Specimen Sources, Wisconsin 2016

<table>
<thead>
<tr>
<th>Organism</th>
<th>Maximum Percentage-Susceptible Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5%</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>38.9</td>
</tr>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>72.2</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>55.6</td>
</tr>
<tr>
<td><em>Streptococcus pneumoniae</em></td>
<td>33.3</td>
</tr>
</tbody>
</table>

* Individual specimen source (skin and soft tissue, invasive, urogenital, lower respiratory, upper respiratory) required 25 isolates to qualify for this analysis.

* Top 3 specimen sources were invasive, skin and soft tissue, and urogenital.

* Top 3 specimen sources were skin and soft tissue, urogenital, and invasive.

* Top 3 specimen sources were skin and soft tissue, invasive, and lower respiratory.

* Top 3 specimen sources were invasive, lower respiratory, and upper respiratory.

#### Table 4. MIC50 and MIC90 Distributions and Categorical Interpretations of *Escherichia coli* Isolate Susceptibility to A: Levofloxacin, and B: Trimethoprim-Sulfamethoxazole by Age, Wisconsin 2016

<table>
<thead>
<tr>
<th>Age, y</th>
<th>n</th>
<th>MIC50</th>
<th>MIC90</th>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>40</td>
<td>≤0.25</td>
<td>0.5</td>
<td></td>
<td>92.5</td>
<td>0.0</td>
</tr>
<tr>
<td>40-59</td>
<td>68</td>
<td>≤0.25</td>
<td>16</td>
<td></td>
<td>80.9</td>
<td>0.0</td>
</tr>
<tr>
<td>60-79</td>
<td>159</td>
<td>≤0.25</td>
<td>32</td>
<td></td>
<td>74.8</td>
<td>0.0</td>
</tr>
<tr>
<td>≥80</td>
<td>90</td>
<td>≤0.25</td>
<td>16</td>
<td></td>
<td>78.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Wisconsin</td>
<td></td>
<td>≤0.25</td>
<td>16</td>
<td></td>
<td>79.9</td>
<td>0.0</td>
</tr>
</tbody>
</table>

* P = .02 for susceptibility rate of 20-39 years versus 60-79 years.

* P = .06 for susceptibility rate of 20-39 years versus ≥80 years.

#### B

<table>
<thead>
<tr>
<th>Age, y</th>
<th>n</th>
<th>MIC50</th>
<th>MIC90</th>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>40</td>
<td>≤1</td>
<td>&gt;16</td>
<td></td>
<td>82.5</td>
<td>17.5</td>
</tr>
<tr>
<td>40-59</td>
<td>68</td>
<td>≤1</td>
<td>&gt;16</td>
<td></td>
<td>85.3</td>
<td>14.7</td>
</tr>
<tr>
<td>60-79</td>
<td>159</td>
<td>≤1</td>
<td>&gt;16</td>
<td></td>
<td>80.5</td>
<td>19.5</td>
</tr>
<tr>
<td>≥80</td>
<td>90</td>
<td>≤1</td>
<td>&gt;16</td>
<td></td>
<td>77.8</td>
<td>22.2</td>
</tr>
<tr>
<td>Wisconsin</td>
<td></td>
<td>≤1</td>
<td>&gt;16</td>
<td></td>
<td>80.7</td>
<td>19.3</td>
</tr>
</tbody>
</table>

Abbreviations: CLSI, Clinical and Laboratory Standards Institute; MIC, minimum inhibitory concentration in µg/mL.
than 86% of individual E coli, P mirabilis, and S pneumoniae antimicrobial combinations exhibited susceptibility rates that varied by <10% between specimen source (Table 3). In contrast, 22.2% of P aeruginosa antimicrobial combinations involved susceptibility variation of >10% between specimen sources. This was characterized by increased meropenem and aztreonam susceptibility rates for invasive P aeruginosa isolates (data not illustrated).

In essence, influence of specimen source on potential empiric regimen choice was less pronounced than that described for location of patient encounter. As one example, urogenital isolates predicted a marginally greater proportion of highly susceptible antimicrobial agents for P mirabilis (50.0%) when compared with skin and soft-tissue isolates (35.7%; data not illustrated). Although participating laboratories were asked to focus collection efforts to derive from skin and soft tissue, invasive, and lower respiratory tract sources, lower-volume laboratories on occasion submitted urinary tract isolates to the SWOTARE program to fulfill an organism quota. The aforementioned analyses (ie, marginal susceptibility differences among specimen sources) suggest that inclusion of this additional specimen source had minimal impact on regional susceptibility rates and contributed to overall representative sampling within the geographic area.

### Profile by Patient Age

Finally, age-related determinants of antimicrobial resistance for each of the 4 surveillance organisms were investigated by focusing on the 2 to 3 antimicrobial agents with the lowest percentage-susceptible values, as elucidated in a previous report. E coli isolates derived from 20- to 39-year-olds demonstrated more susceptibility to levofloxacin than those from 60- to 79-year-olds (P = .02; Table 4A). These isolates also trended toward greater susceptibility when compared with those from patients aged ≥ 80 years (P = .06).

No age-related relationships were noted with trimethoprim-sulfamethoxazole (Table 4B) and ampicillin susceptibility.

With respect to P mirabilis, isolates derived from patients aged 20 to 39 years yielded increased rates of ciprofloxacin susceptibility when compared with isolates from patients aged 60 to 79 years and ≥ 80 years (P = .04 and P = .02, respectively; Table 5A). Similarly, P mirabilis isolates from 20- to 39-year-olds exhibited increased trimethoprim-sulfamethoxazole susceptibility when compared with all other age groups (P ≤ .04; Table 5B). No significant differences were noted when ampicillin susceptibility was stratified by patient age.

P aeruginosa isolates from 40- to 59-year-olds exhibited decreased ciprofloxacin susceptibility when compared with patients over the age of 60 years (P ≤ .03; Table 6A). Similarly, P aeruginosa...
isolates derived from patients aged 60 to 79 years demonstrated less susceptibility to aztreonam than isolates from patients aged ≥ 80 years (P = .05; Table 6B). No significant age delineations were determined with respect to S pneumoniae susceptibility to either penicillin (P ≥ .22; Table 7A) or erythromycin (P ≥ .18; Table 7B).

Swami and Banerjee18 used an antibiogram approach to stratify antimicrobial resistance patterns in E coli and S pneumoniae by patient age (< 18 years; 18-64 years; ≥ 65 years) at a United States institution. The authors noted that their institution-wide antibiogram underestimated resistance profiling in older patients (particularly with respect to ciprofloxacin and E coli) when compared with a specialized antibiogram devised for populations aged ≥ 65 years. In a European study, Grignon et al19 investigated E coli antimicrobial resistance in the emergency department setting in a region of France (with population of 3.6 million) with an area equivalent to the state of Maryland. Of 10 participating emergency departments, 5 were specifically cited as significant risk factors for increased fluoroquinolone resistance in uropathogenic E coli.

In discussing the current status of antimicrobial resistance in the United States, the CDC cited gaps in general knowledge that involved limited national and state capacity for the detection of emerging antimicrobial resistance trends.1 Past state-based efforts20,21 as well as those described within the context of the 2016 SWOTARE collection, several geographic paradigms were noted.3 Grignon et al19 investigated E coli antimicrobial resistance in the emergency department setting in a region of France (with population of 3.6 million) with an area equivalent to the state of Maryland. Of 10 participating emergency departments, 5 were specifically cited as significant risk factors for increased fluoroquinolone resistance in uropathogenic E coli.

In future surveillance collections will improve the validity of antimicrobial-resistant S pneumoniae epidemiologic findings.

### Table 6. MIC₅₀ and MIC₉₀ Distributions and Categorical Interpretations of Pseudomonas aeruginosa Isolate Susceptibility to A: Ciprofloxacin, and B: Aztreonam by Age, Wisconsin 2016

<table>
<thead>
<tr>
<th>Age, y</th>
<th>n</th>
<th>MIC₅₀</th>
<th>MIC₉₀</th>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>17</td>
<td>≤0.25</td>
<td>0.5</td>
<td>94.1</td>
<td>0.0</td>
<td>5.9</td>
</tr>
<tr>
<td>40-59</td>
<td>48</td>
<td>≤0.25</td>
<td>8</td>
<td>77.1</td>
<td>8.3</td>
<td>14.6</td>
</tr>
<tr>
<td>60-79</td>
<td>86</td>
<td>≤0.25</td>
<td>2</td>
<td>90.7</td>
<td>2.3</td>
<td>7.0</td>
</tr>
<tr>
<td>≥80</td>
<td>48</td>
<td>≤0.25</td>
<td>1</td>
<td>93.8</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>17</td>
<td></td>
<td></td>
<td>88.2</td>
<td>3.3</td>
<td>8.5</td>
</tr>
</tbody>
</table>

**A**

<table>
<thead>
<tr>
<th>Age, y</th>
<th>n</th>
<th>MIC₅₀</th>
<th>MIC₉₀</th>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>17</td>
<td>8</td>
<td>8</td>
<td>94.1</td>
<td>5.9</td>
<td>0.0</td>
</tr>
<tr>
<td>40-59</td>
<td>48</td>
<td>4</td>
<td>32</td>
<td>77.1</td>
<td>10.4</td>
<td>12.5</td>
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<tr>
<td>60-79</td>
<td>86</td>
<td>8</td>
<td>16</td>
<td>75.6</td>
<td>17.4</td>
<td>7.0</td>
</tr>
<tr>
<td>≥80</td>
<td>48</td>
<td>4</td>
<td>16</td>
<td>89.6</td>
<td>6.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>8</td>
<td></td>
<td>16</td>
<td>81.0</td>
<td>12.3</td>
<td>6.6</td>
</tr>
</tbody>
</table>

**B**

Abbreviations: CLSI, Clinical and Laboratory Standards Institute; MIC, minimum inhibitory concentration in µg/mL.

P = .03 for susceptibility rate of 40-59 years versus 60-79 years.
P = .02 for susceptibility rate of 40-59 years versus ≥80 years.
research and development efforts have become increasingly necessary. Before such advancements are made, close surveillance of currently available agents is essential. The SWOTARE program currently allows for statewide monitoring of 3 of the 7 aforementioned ESKAPE pathogens in Wisconsin, as well as 1 additional pathogen cited by the World Health Organization as another focus for development of alternative antimicrobial strategies.23

CONCLUSIONS

A number of approaches have been considered in the monitoring of antimicrobial resistance patterns. One advantage of a surveillance paradigm based on isolate collection, such as the SWOTARE program, is its capability of ascribing demographic information to isolates. Testing within the SWOTARE program in 2016 revealed resistance variation with respect to a number of antimicrobial/organism combinations. These differences were more relative to location of patient encounter and patient age when compared with specimen source. Year 1 of this surveillance project also revealed particular niches of potential emerging resistance that will be assessed in future seasons of isolate collection. All told, provision of these data to a broad audience may potentiate revision of local empiric therapy guidelines and contribute to antimicrobial stewardship efforts.

Table 7. MIC<sub>50</sub> and MIC<sub>90</sub> Distributions and Categorical Interpretations of Streptococcus pneumoniae Isolate Susceptibility to A: Penicillin, and B: Erythromycin by Age, Wisconsin 2016

<table>
<thead>
<tr>
<th>Age, y</th>
<th>n</th>
<th>MIC&lt;sub&gt;50&lt;/sub&gt;</th>
<th>MIC&lt;sub&gt;90&lt;/sub&gt;</th>
<th>Susceptible</th>
<th>Intermediate</th>
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</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>23</td>
<td>≤0.015</td>
<td>0.25</td>
<td>60.9</td>
<td>23.1</td>
<td>39.1</td>
</tr>
<tr>
<td>40-59</td>
<td>37</td>
<td>≤0.015</td>
<td>2</td>
<td>75.7</td>
<td>24.3</td>
<td></td>
</tr>
<tr>
<td>60-79</td>
<td>72</td>
<td>≤0.015</td>
<td>0.5</td>
<td>72.2</td>
<td>27.8</td>
<td></td>
</tr>
<tr>
<td>≥80</td>
<td>44</td>
<td>≤0.015</td>
<td>1</td>
<td>68.2</td>
<td>31.8</td>
<td></td>
</tr>
</tbody>
</table>

Wisconsin: ≤0.06 0.25 0.5 1

**CLSI Breakpoints 0.06/0.12**

**CLSI Breakpoints 0.25/0.5/1**

<table>
<thead>
<tr>
<th>Age, y</th>
<th>n</th>
<th>MIC&lt;sub&gt;50&lt;/sub&gt;</th>
<th>MIC&lt;sub&gt;90&lt;/sub&gt;</th>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>23</td>
<td>≤0.06</td>
<td>&gt;4</td>
<td>52.2</td>
<td>0.0</td>
<td>47.8</td>
</tr>
<tr>
<td>40-59</td>
<td>37</td>
<td>≤0.06</td>
<td>&gt;4</td>
<td>62.2</td>
<td>0.0</td>
<td>37.8</td>
</tr>
<tr>
<td>60-79</td>
<td>72</td>
<td>2</td>
<td>&gt;4</td>
<td>48.6</td>
<td>0.0</td>
<td>51.4</td>
</tr>
<tr>
<td>≥80</td>
<td>44</td>
<td>≤0.06</td>
<td>&gt;4</td>
<td>52.3</td>
<td>0.0</td>
<td>47.7</td>
</tr>
</tbody>
</table>

Abbreviations: CLSI, Clinical and Laboratory Standards Institute; MIC, minimum inhibitory concentration in µg/mL.

*Breakpoints for meningeal S pneumoniae isolates.

ACKNOWLEDGMENTS

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- Cara Tolliver, Sturgeon Bay
- Ellen Wirtz, Fond du Lac
REFERENCES


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Medical Staff Recruitment
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jpnevala@gundersenhealth.org
Chronic Positional Cough: The Presenting Symptom of Left Atrial Myxoma

ABSTRACT

We present the case of a middle-aged woman with chronic positional cough that had worsened over the past year who was ultimately diagnosed with a large left atrial myxoma. The true reason for this patient’s prolonged and distressing symptoms went undiagnosed following multiple rounds of antibiotics, proton pump inhibitor, albuterol inhaler, and even a computed tomography angiogram that captured images of the large cardiac mass. Apart from the history of chronic positional cough, a thorough physical examination and careful cardiac auscultation were paramount in ultimately making the correct diagnosis. Although coughing has been a reported symptom in other published reports of cardiac tumors, it has not been clear that coughing can be so severe and come on so abruptly in relation to changes in body position.

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*Dr Jacobs is now in radiation oncology residency at Duke University, Durham, North Carolina.

Cough is the most common reason patients seek medical attention for illness or injury in the United States and worldwide.1,2 Chronic cough, defined as the presence of cough for at least 8 weeks in adults and 4 weeks in children,3 has a substantial impact on quality of life and healthcare utilization. Some of the most common causes of chronic persistent cough include asthma, postinfectious bronchial hyperreactivity, postnasal drip, gastroesophageal reflux, use of an angiotensin-converting enzyme inhibitor, chronic bronchitis, eosinophilic bronchitis, mediastinal tumors, pleural diseases, early interstitial fibrosis, tracheomalacia, and psychogenesis.4,5 We present the case of a middle-aged woman with a 1-year history of worsening positional cough who was ultimately diagnosed with a large left atrial myxoma.

CASE REPORT

A 47-year-old woman with a history of multiple sclerosis and hypertension came to the pulmonary clinic with the chief complaint of chronic cough. She is a former smoker with a 12 pack-year history who quit 9 years ago. For the previous year she had struggled with a dry, nagging cough and, more recently, dyspnea on exertion. She had not experienced chest pain, fever, chills, or constitutional symptoms, nor had she been exposed to dust or chemicals. Initially she thought she had a prolonged cold and went to urgent care where a chest radiograph was obtained, the results of which were normal. Her pulmonary function testing showed no obstructive or restrictive disease, no bronchodilator response, and normal diffusion capacity. She was prescribed a trial of proton pump inhibitor and an albuterol inhaler.

The prescribed medications did not improve her symptoms, so she returned to urgent care, and a subsequent chest radiograph showed that she had developed some pleural effusions with potential bibasilar pneumonia. She was treated with levofloxacin and then doxycycline, but despite 2 courses of antibiotics her symptoms progressed. Eventually she had to sleep upright in a recliner because lying down would provoke her cough. The patient, and especially her husband, complained that any time she bent over she would have a coughing spell. She then had a computed tomography (CT) angiogram (Figure 1), which identified small bilateral effusions and a slight infiltrate at the right base, but no acute pulmonary embolism.

When this patient came to the pulmonary clinic, the results of her cardiac examination were notable for increased intensity of the pulmonic component (P2), palpable holosystolic murmur (grade II with blowing at apex), early diastolic murmur (grade I with decrescendo at apex), and gallop rhythm with tumor plop. This prompted further review of the recent CT angiogram, which revealed a shadow in the left side of the heart that appeared compatible with an atrial myxoma. A transthoracic echocardiogram (Figure 2; see also videos at URL—gundersenhealth.org/cpc) confirmed the presence of a 5.8 x 3.5 cm highly mobile gelatinous mass in the left atrium that appeared to be attached to the low interatrial septum. The mass would prolapse through the mitral
valve into the left ventricle in diastole, resulting in diastolic inflow obstruction with a mean gradient of 10 to 11 mm Hg at a heart rate of 90 beats per minute. Severe mitral stenosis and a moderately dilated left atrial chamber were also noted. Functional mitral insufficiency due to impaired closure of the mitral leaflets was a likely component, as well, in addition to mitral stenosis. The patient was admitted to the hospital for further management, and cardiothoracic surgery was consulted.

Cardiac magnetic resonance imaging (MRI) scan (Figure 3) obtained the day of admission revealed a large left atrial pedunculated mass measuring approximately 15.3 cm² in diastole (5.9 × 3.2 cm), attached to the distal aspect of the interatrial septum, prolapsing into the left ventricle in diastole causing functional mitral stenosis, with signal characteristics most consistent with an atrial myxoma. Prior to surgical excision of the tumor, the patient underwent left heart catheterization, which showed normal coronary arteries. This was followed by urgent sternotomy and excision of the left atrial mass while on cardiopulmonary bypass. There were no complications with the procedure, and the patient was taken to the intensive care unit in stable condition. Final pathology confirmed atrial myxoma.

The patient’s postoperative course was unremarkable except for acute blood loss anemia, which was treated with ferrous gluconate for 1 month. She was discharged on the second postoperative day and followed up 1 month later in the cardiology clinic. She reported no further cough, shortness of breath, orthopnea, or dyspnea on exertion. Her pulmonary complaints from the previous year resolved following resection of the atrial myxoma.

Figure 1. Computed tomography angiogram (A, axial, and B, coronal). The white asterisk indicates the myxoma.

Figure 2. Transthoracic echocardiogram (A) with mitral valve pressure gradient tracing (B).
**DISCUSSION**

Primary cardiac tumors are extremely rare. Metastatic involvement of the heart is over 20 times more common than primary tumors.6,7 However, although the latter are more common, secondary tumors usually manifest differently because the most common location affected is the pericardium, followed by the epicardium, myocardium, and endocardium.6,8 The majority of primary cardiac tumors are benign, 75% of benign cardiac tumors are myxomas, and 75% of myxomas occur in the left atrium.9,10 Cardiac myxomas are 2 to 3 times more common in women than in men, although they can occur in all age groups, are most frequent between the third and sixth decades of life.11 Our patient was of the typical age and sex for this diagnosis.

Cardiac tumors may be symptomatic or found incidentally. The following mechanisms account for symptomatic presentation: intracardiac blood flow obstruction that mimics heart failure; regurgitation from impaired valve function; embolization of tumor fragments to the systemic or pulmonic circulation; local myocardial invasion causing arrhythmias or pericardial effusion with or without tamponade; or producing constitutional symptoms.9,12 Via these mechanisms, left atrial tumors in particular can result in a variety of positional dyspneas, pulmonary edema, cough, hemoptysis, arrhythmia, fatigue, fever, arthralgia, myalgia, weight loss, malaise, syncope, or stroke.10,11 Symptoms may be worse in certain body positions owing to tumor motion, and on physical examination a characteristic tumor plop may be heard early in diastole, as was true for our patient.13

Our patient came to the pulmonary clinic with the chief complaint of chronic cough. The true reason for this patient’s prolonged and distressing symptoms went undiagnosed following multiple rounds of antibiotics, proton pump inhibitor trial, use of an albuterol inhaler, and chest CT angiogram. Apart from the history of chronic positional cough, a thorough physical examination and careful cardiac auscultation were paramount in ultimately making the correct diagnosis.

In addition to chronic positional cough, our patient complained of positional shortness of breath, which was a more recent and less troublesome symptom. Kamptopnea, which originates from the Greek kamptos meaning bent over, is shortness of breath when bending forward.14 The term was first used in 2014 in response to Thibodeau et al, who published this novel symptom of advanced heart failure, which they originally termed bendopnea.15 This novel term joins a family of other positional dyspneas including orthopnea, paroxysmal nocturnal dyspnea, trepopnea, and platypnea. Several published case reports have documented patients with trepopnea due to both benign and malignant masses.16-18 Our patient was noted to have trepopnea while lying during the echocardiogram, in addition to having cough-induced orthopnea requiring her to sleep upright. Even more distinctly, this patient had cough-induced kamptopnea any time she bent forward. Although coughing has been a reported symptom in other published reports of cardiac tumors, it has not been clear that coughing can be so severe and come on so abruptly in relation to changes in body position.

Surgery is the first-line definitive treatment for primary cardiac tumors with excellent long-term outcomes. A recently published retrospective study of 207 patients with cardiac myxomas showed that only 10 patients (4.8%) had disease recurrence and, after excluding the patients who died within 30 days of surgery, the 10-year survival rate was 92.7%.19 Therefore, patients with cardiac myxomas have survival characteristics that are not significantly different from those of a general population.20
Our patient was noted to have a cough and eventual subsequent shortness of breath from lying flat or lying on a particular side, but the most distinctive feature of her condition was coughing spells resulting from bending forward. We recommend that patients with chronic unexplained cough be evaluated for positional symptoms and have a thorough physical examination.

REFERENCES
A Case of Urinary Outlet Tract Obstruction Caused by Large Nabothian Cysts

ABSTRACT

Nabothian cysts are so ubiquitous and inconsequential that they are the main exception to the rule to biopsy any lesion of the cervix. However, in extremely rare circumstances, when large or numerous enough, they may enlarge the cervix to the extent that symptoms may occur. Since there are few such cases and none showing urinary outlet obstruction without associated malignancy, we report an unusual case involving a 53-year-old woman with massive enlargement of the cervix by multiple large nabothian cysts. After 2 episodes of urinary outlet obstruction, she was successfully treated by hysterectomy with resolution of her voiding difficulties.

CASE PRESENTATION

A 53-year-old nulliparous woman was referred to the gynecology department with a history of being treated in the emergency department for 2 episodes of acute urinary retention of uncertain etiology 1 month apart. The urine analyses results were normal, and the catheterized amounts of urine were 800 ml and 825 ml for the 2 episodes. Consultation had already been performed by the urologist revealing no lesions on cystoscopy; the initial postvoid residual was 402 ml. With a second try at voiding, she was able to reduce this to 139 ml. A magnetic resonance imaging (MRI) scan of the pelvis with and without contrast was performed to investigate for a spinal lesion (Figure 1). This showed a normal spine and lumbosacral plexus region. However, the cervix was noted to contain multiple large nabothian cysts compressing the base of the bladder.

Figure 1. Pelvic magnetic resonance imaging scan showing uterine cervix enlarged by multiple nabothian cysts compressing the base of the bladder.
A CASE OF URINARY OUTLET TRACT OBSTRUCTION CAUSED BY LARGE NABOTHIAN CYSTS

with the dimensions of the cervix being 5.7 cm (transverse), 4.3 cm (anterior/posterior), and 5.8 cm (superior/inferior). There was also evidence of adenomyosis with diffuse abnormal thickening and irregularity of the junctional zone. Tiny cystic spaces were also seen within the junctional zone.

The patient gave a history of regular monthly menses lasting 5 days that had been worsening over the past 6 months. She had some dull, left-sided intermittent discomfort of 1 year’s duration. On examination the uterus was mildly enlarged and the cervix showed no external lesions. For the endometrial biopsy the uterus sounded to 6.5 cm and the pathology was read as quiescent endometrial tissue. Results of the Papanicolaou (Pap) smear were normal. The pelvic ultrasonogram showed a mildly enlarged, globular uterus measuring 10.2 × 6.7 × 8.9 cm with multiple small myometrial echodensities, as well as a nondistinct border between the endometrium and myometrium consistent with adenomyosis. The cervix contained multiple large nabothian cysts, with the largest measuring 2.9 × 2.1 × 2.8 cm (Figure 2).

The patient underwent a vaginal hysterectomy with bilateral salpingectomy without complication. Intraoperative findings were unremarkable, other than the presence of prominent, large nabothian cysts. The pathology report showed a normal cervix, endometrium, and fallopian tubes, but the myometrium had leiomyomata and adenomyosis. By the first postoperative visit, the patient’s urinary retention had resolved, and she has remained without urinary symptoms on annual examinations for over 2 years.

DISCUSSION

Our patient suffered from recurrent urinary outlet obstruction due to a very enlarged cervix from multiple large nabothian cysts. The distinctive aspect of our case is the pathology was completely benign. Urinary tract outlet obstruction from malignant cystic lesions of the cervix, ie, adenoma malignum, has been reported. In addition, a case of endometrial cancer associated with a large nabothian cyst and urinary outlet obstruction has been reported; in this case it was thought that the main cause of obstruction was the large nabothian cyst.

In the current case, hysterectomy was chosen as the curative procedure. However, in women wishing a more conservative approach or desiring to maintain childbearing potential, incision and drainage or cystectomy from the vaginal route has been used with success. Nigam and coauthors report a case of third-degree cervical descent in a 21-year-old nulliparous woman that was successfully treated by cystectomy of a 5 × 4 cm nabothian cyst; the surgery could be performed external to the introitus. Wu and coworkers reported on a 45-year-old woman with pelvic pain thought to be due to 8 × 6.5 cm nabothian cyst who was successfully treated by incision and drainage by a vaginal approach.

Cervical size varies with parity and menopausal status. Transverse cervical width can usually be measured by ultrasonography or MRI scan. In nulliparous patients like ours, mean transverse cervical width has been reported as 2.9 cm (0.6 cm SD). Our patient’s cervix was greatly enlarged to 5.7 cm on transverse diameter. To investigate further for malignancy, we performed a Pap smear and endometrial biopsy because large nabothian cysts can superficially resemble adenoma malignum. In addition, the MRI scan (Figure 1) and ultrasonogram (Figure 2) did not show any solid elements to the cysts. The intraoperative findings appeared benign, and the final pathology report showed benign nabothian cysts.

CONCLUSION

The current case, in addition to being interesting in itself, serves to remind the clinician that even conditions as benign and common as nabothian cysts may rarely present in an extreme form which may be life endangering. Managing such patients requires a mindset not easily amenable to computer algorithms, which tend to include only common to moderately rare options for diagnosis. In such situations, case reports and small case series still remain informative.

REFERENCES

Brugada Syndrome: A Case Report

ABSTRACT

A 33-year-old man came to us with fever and palpitations. The patient reported having experienced palpitations since his early 20s, often in conjunction with illness, and a family history that included his father’s diagnosis of Brugada syndrome and early death due to myocardial infarction. Echocardiography revealed no structural or functional abnormalities of his heart, and results of a chest radiograph were normal. Electrocardiograms showed a type I Brugada sign, but tracings improved when the patient’s fever was controlled with acetaminophen or ibuprofen. Given the potential for sudden cardiac death, Brugada syndrome should be in the differential of any young man with cardiac symptoms, especially if febrile.

CASE HISTORY

A 33-year-old man came to us with fever and palpitations. He reported a history of palpitations since his mid-20s, which were often associated with illness. He had attributed the palpitations to anxiety, but given his family history, he always had concern that they might indicate a heart condition. The patient reported that his father died at age 41 years from myocardial infarction associated with cocaine-induced arrhythmias facilitated by underlying Brugada syndrome. He also reported that his mother has an irregular heartbeat, that his maternal grandfather had a pacemaker implanted in his 60s, and that his twin brother also experiences palpitations.

The previous day, the patient had been at work when he began to feel light headed, panicky, and short of breath. He also experienced palpitations that lasted 3 hours. He drove home, took ibuprofen, relaxed, and went to sleep. The next morning, he woke up with a fever and again had palpitations lasting 2 hours. The patient sought care at a local clinic, where an electrocardiogram (ECG) was obtained showing ST elevation in the right precordial leads. He was admitted to our hospital for further testing.

Serial measures of his cardiac troponin levels were normal. Echocardiography revealed a structurally normal heart, normal size and function of both the left and right ventricles, and no significant valvular abnormalities. The patient’s white blood count was within normal limits. A tick-borne disease antibodies panel was performed, and results were negative for exposure. The results of a chest radiograph were unremarkable. The patient was given scheduled acetaminophen to reduce his fever. Further ECGs were obtained, which showed a type I Brugada sign. The patient was discharged 24 hours after hospitalization in stable, afebrile condition and was scheduled for follow-up with electrophysiology.

After arriving home that evening, the patient took a hot shower. Afterward, he was seated holding his baby when he began to feel febrile and dizzy. His heart began to race and skip beats, and then he became panicked. His wife called emergency services. En route to the hospital, the patient’s ECG showed sinus tachycardia with more pronounced ST elevation in the anterior leads, which was concerning for injury or infarct. ST segment depression was also present now in the inferior leads, and T-wave inversion was now evident in the lateral leads.

On his second admission, our patient had a fever, and his ECG exhibited type I Brugada pattern (Figure 1). The patient was again given acetaminophen for fever management, and ECG tracings improved with decreased fever (Figure 2); however, when the patient was subjected to an increase in body temperature with increased time lapse from previous anti-pyretic therapy, he again became symptomatic with significant ST elevation in the right precordial leads. His Brugada sign then took on a type II pattern.

Upon further evaluation in the hospital, the patient was advised to consider an ischemic contribution to his condition so that more informed decisions could be made about treatment. Cardiac catheterization was therefore recommended, the results of which were unremarkable.

Our Infectious Disease section was consulted to investigate the cause of the patient’s fever, but results of their workup were negative for bacterial infection and suggested a viral illness. The patient was discharged again with strict instructions to take scheduled acetaminophen and ibuprofen to control fever.
The patient followed up with an examination by electrophysiology, where it was concluded that the patient likely had Brugada syndrome, a hereditary condition. They recommended genetic testing and ECGs from the patient’s mother and his children. An ECG from the patient’s twin was also recommended. The patient was advised to carry acetaminophen and ibuprofen to minimize fever whenever he becomes ill again.

It would be interesting to know the results of the patient’s relatives’ ECGs; however, the patient was lost to follow-up, owing to an insurance coverage change.

**DISCUSSION**

Brugada syndrome’s prevalence has been estimated to be .15% in adults, or 1 in every 667 people, and is more common in men than in women.1 A direct relationship between ECG changes in leads V1-V3 and body temperature was observed in our patient, although ECG findings and provoking factors are often transient. Previous reports have demonstrated that febrile states accentuate the ECG pattern of Brugada syndrome.2-8 The ionic mechanisms responsible for Brugada syndrome also have been shown to be temperature dependent.6,9-13

Recognizing the Brugada pattern, clinical signs, and implementing early treatment with anti-pyretics is essential to minimize the risks of arrhythmias and potential sudden cardiac death. Patients with a diagnosis of Brugada syndrome are also advised to avoid excessive use of alcohol. Implantation of a cardioverter defibrillator is recommended for patients who have experienced prior cardiac arrest or who have sustained ventricular tachycardia. Implantation may also be useful in patients with other ventricular arrhythmias.14

Brugada syndrome should be in the differential of any young man with cardiac symptoms, especially if febrile. Other conditions to include in one’s differential causing ST elevation include early repolarization, acute pericarditis, pulmonary embolism, acute myocardial infarction, left ventricular hypertrophy, and male pattern.

The presence of clinical signs and type 1 ST elevation in Brugada are critical for every physician to recognize, given the elevated risk of ventricular arrhythmias and possible sudden cardiac death in patients, especially young men. The autosomal dominant nature of Brugada syndrome renders a thorough family history imperative.

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Myotonic Dystrophy Type 2

ABSTRACT

Myotonic dystrophy type 2 (MD2) is a genetic disorder that manifests through progressive muscle weakness, typically between the ages of 20 and 70 years. We describe the case of a 73-year-old white man in whom an MD2 diagnosis was delayed by the patient’s vitamin B12 deficiency and diabetes mellitus, both of which were believed to have been responsible for his symptoms.

CASE REPORT

A right-handed 77-year-old white man came to our emergency department after sustaining a minor fall at his home earlier that morning. He reported progressive muscle weakness in all extremities over recent years that had worsened over the past week. He previously had sought care for weakness from his primary care provider, at which time he had reported that muscle weakness started in the lower extremities with some tingling and numbness, and gradually ascended to the upper extremities to the point where he was unable to pull and push himself up out of a chair. He said that he was still able to stand and walk, but only slowly and carefully. Thirteen years before, he had been diagnosed with vitamin B12 deficiency confirmed by a methylmalonic acid level of 0.52 nmol/mL (normal = <0.40 nmol/mL), and spinal stenosis by magnetic resonance imaging scan, revealing mild to moderate lumbar foraminal and canal stenosis, which were at that time believed to be the cause of his weakness.

He had not experienced any significant visual symptoms, syncopal episodes, chest pain, nausea, or vomiting, nor had he had any loss of control of bowel or bladder function. He had neither diarrhea nor burning with urination. He reported that his breathing had not been affected, even though the weakness had risen to his shoulders. He had had no upper respiratory tract infections, had seen no ticks or unusual rashes on his body, and had no swollen joints.

His medical history was significant for diabetes mellitus type 2, hyperlipidemia, hypertension, anemia, diabetic neuropathy, anxiety, and end-stage renal disease, and dialysis was done.
through an arteriovenous fistula. Monoclonal gammopathy of undetermined significance (MGUS) was diagnosed by detection of elevated concentration of k light chains in June 2013. He had a 20 pack-year history of smoking, had never used drugs, and consumed very little alcohol. His family history was significant for colon, prostate, and breast cancer, but he had no family members with known MD2.

He has been chronically taking acetaminophen, low-dose aspirin, alprazolam for anxiety, furosemide, omeprazole, and insulin. He had also been taking vitamin B12, which had been prescribed previously for his weakness.

On initial evaluation in the emergency department, the patient’s vital signs were stable. His blood pressure was 112/58 mm HG, his heart rate was within normal limits, and he was saturating well on room air. He appeared fatigued but in no acute distress. Heart sounds were normal without murmurs. Respiratory effort was normal with clear breath sounds bilaterally. His abdomen was not tender to palpation, and his bowel sounds were normal. He had no genitourinary complaints.

Results of the patient’s neurologic evaluation were remarkable for weakness that had progressed significantly from his earlier visit to his primary care provider. His deltoid muscle strength decreased from 5/5 (normal strength) to 3/5 (movement possible against gravity, but not against resistance by the examiner), and his tricep and bicep muscle strengths were 4/5 (movement possible against some resistance by the examiner). Strength of his distal upper extremities was 4/5 to 4+/5, and of his proximal lower extremities was 3/5 to 4+/5. His hamstring and quadriceps muscles were 4/5. Ankle dorsiflexor and plantarflexor muscle strength was 4+/5. He required assistance standing from a seated position, and he was unsteady on his feet. Reflexes were approximately 1+5 (muscle flicker, but no movement) but present. Babinski reflexes were absent bilaterally. No further significant findings were made on the physical examination.

Results of laboratory tests completed on admission revealed a white blood cell count of 7.34×10^9/L, platelet count of 152×10^9/L, and hemoglobin concentration of 111 g/L. His creatine phosphokinase concentration was within normal limits (3.2 µkat/L), and blood tests were negative for hepatitis B and C antigens and antibodies. An electromyogram (EMG) showed severe length-dependent axonal sensorimotor polyneuropathy and extensive myotonic disorder involving the proximal and distal muscles of the upper and lower extremities. Magnetic resonance imaging showed no significant spinal cord lesions.

Muscle biopsy revealed a myopathy with old, moderately severe denervation atrophy consistent with the diagnosis of MD. Due to his age and comorbid disease, genetic testing was not pursued.

**DISCUSSION**

Initial findings of muscular weakness did not fully correlate to myotonic dystrophy, so it probably was not at the top of the differentials due to comorbidities that could have contributed to the weakness. His B12 deficiency had to be fully treated before other causes could be ruled out. Furthermore, the progression pattern of this disease is not one that is familiar to many clinicians because MD2 is rare.

In retrospect, our patient’s most recent visit provided clinical clues to his condition. His inability to rise from a seated position using both arms and legs supported the presentation of MD2, which is also described as PROMM (proximal myotonic myopathy). Early in this condition, patients usually have weakness in the hip girdle, thigh, and hip flexor and extensor muscles, impairing the ability to arise from a seated position or climb stairs. Notable weakness of elbow extensors and triceps is also often present, which—although it correlates well with this patient’s presentation—is also noted in some myopathies and neuropathic disorders. Myotonia is often a key finding in progressive MD but was not readily evident in this patient on physical examination. Myotonia is often prominent in the early stages of the illness and can be aggravated by cold and stress, features not noted by this patient. However, myotonia is often more pronounced in MD1 than in MD2.

Endocrine abnormalities are often present in patients with MD2, but it was unclear whether our patient’s endocrine abnormalities were related to his disease. He had been diagnosed with diabetes in 2014, which was quite rapid in onset. Only 3 months prior to that diagnosis, while on insulin his hemoglobin A1C concentration was 5% to 5.5%, within the normal range. Insulin resistance is quite common among MD1 patients, but frank diabetes is more prevalent in MD2.

Another abnormality seen in patients with myotonic dystrophy is primary hypogonadism, which begins with elevated follicle-stimulating hormone (FSH) and luteinizing hormone, leading to infertility. Our patient and his wife had had no children during their 48 years of marriage.

Autoimmune causes are also reported in MD2. Although this patient had no reports of the more common disorders seen, such as rheumatoid arthritis, Sjogren syndrome, or autoimmune hepatitis, he did have documented vitamin B12 deficiency, which is one of the more common disorders in MD2.

The predominant clue to an underlying disorder in our patient was the presence of neuropathy. Because he had been diagnosed with diabetes, his neuropathy initially was confused with diabetic neuropathy. In retrospect, he had experienced neuropathy prior to the diagnosis of diabetes, and it is probable that his neuropathy was due to his MD2.

This patient’s presentation was complicated by several factors that, when viewed separately, could have been attributed to multiple common disorders acting separately; however, after EMG and muscle biopsy, it became clear that he had MD2.

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Multiple Synchronous Primary Lung Cancer Diagnosed by Low-Dose Computed Tomography Screening and Treated with Stereotactic Body Radiation Therapy

ABSTRACT

The incidence of multiple primary lung cancer is increasing, and with the implementation of lung cancer screening an increasing number of early-stage lesions is expected. We report a rare case of a patient diagnosed with 3 early-stage primary synchronous lung tumors by routine low-dose chest computed tomography who was treated with stereotactic body radiation therapy (SBRT) to all 3 tumors simultaneously. Surgery has traditionally been the standard of care in this population, but a growing body of evidence suggests a potential equivalence between surgery and SBRT in terms of survival. Although our patient’s cancer was medically inoperable, SBRT may be a promising treatment for medically operable cancers, as well.

CASE REPORT

A 63-year-old currently smoking woman with an 84 pack-year tobacco history had a low-dose chest CT scan for lung cancer screening in May 2015. The chest CT demonstrated 3 separate nodules: a 2.2-cm spiculated nodule with internal cavitation in the right upper lobe (RUL) abutting the pleural surface; an 8-mm spiculated nodule in the RUL located 3.5 cm medial and 1 cm inferior to the first nodule; and a 1.6-cm spiculated nodule in the left upper lobe (LUL) abutting the left major fissure anteriorly (Figure 1). Whole-body positron emission tomography (PET)/CT scan with expected postradiation changes (right column). Radiographic measurements confirm an interval decrease in size of all 3 tumors after stereotactic body radiation therapy (SBRT).

Figure 1. The 3 lung tumors are shown in separate rows of images from the diagnostic low-dose computed tomography (CT) scan (left column), pretreatment positron emission tomography (PET)/CT scan (middle column), and 6-month post-treatment CT scan with expected postradiation changes (right column). Radiographic measurements confirm an interval decrease in size of all 3 tumors after stereotactic body radiation therapy (SBRT).
scan was obtained, the results of which demonstrated that all 3 nodules were 18F-fluoro-2-deoxy-D-glucose (FDG) avid (Figure 1). A borderline enlarged precarinal lymph node was FDG negative.

The patient underwent bronchoscopy with biopsy of the LUL and the larger RUL nodule. The RUL pathology revealed adenocarcinoma (Figure 2), but the LUL pathology was nondiagnostic. Subsequent CT-guided core needle biopsy of the LUL lesion revealed poorly differentiated adenocarcinoma (Figure 3). The biopsied nodules had identical immunohistochemistry and mutation analysis: TTF1/NAPSIN A positive, P40/CK 56 negative, wild-type epidermal growth factor receptor (EGFR), and ALK gene rearrangement not detected (Figures 4 and 5). As noted, the smaller 8-mm nodule in the RUL had radiographic features different from those of the larger nodule and was located 3.5 cm away without any other surrounding satellite lesions or regional adenopathy. Thus, this was likely a separate primary tumor, but this smaller RUL nodule did not undergo pathologic examination because a specimen would have been technically difficult to obtain and because even if the pathology result had returned negative for malignancy, the planned local therapy would have remained the same.

To complete her lung cancer staging, our patient underwent mediastinal bronchoscopy with endobronchial ultrasound-guided biopsy. The pathology was negative for malignancy on all 4 nodal specimens (4R, 7, 11L, 11R). A brain magnetic resonance imaging (MRI) scan was also negative for metastatic disease. Therefore, this
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patient was diagnosed with 3 separate T1N0M0 primary lung cancers that were all stage IA.

To guide treatment decisions, the patient underwent pulmonary function testing (PFT) and was seen by cardiothoracic surgery, medical oncology, and radiation oncology. The patient’s PFT results revealed an obstructive ventilatory defect with forced expiratory volume in the first second of expiration (FEV₁)/forced vital capacity (FVC) ratio of 65% predicted, severely decreased FEV₁ at 2.02 L (27% predicted), and FVC of 2.63 L (42% predicted). These results rendered the patient a poor surgical candidate. She chose to proceed with SBRT to all 3 tumors. No adjuvant chemotherapy was warranted.

In July 2015 the 2 RUL lesions were treated in a single SBRT treatment plan, and the LUL lesion was treated concurrently in a second SBRT treatment plan. Each area received 55 Gy in 5 fractions (10 total treatments) over a period of 9 days. Both the right and left lung adenocarcinomas were treated by volumetric modulated arc therapy using 6-MV photons and daily image-guided radiation therapy by cone beam CT. One hour prior to each SBRT treatment, the patient took 4 mg dexamethasone and had no acute side effects from radiation. Of note, the patient quit smoking several weeks prior to SBRT. Three surveillance chest CT scans have all shown that the LUL mass and both RUL masses have decreased in size with no mediastinal adenopathy or evidence of disease (Figure 1).

DISCUSSION

Lung cancer is the leading cause of cancer death worldwide.6 In the United States, the death rate from lung cancer is greater than that of the next 3 most common cancers combined (colon, breast, and prostate), with a 5-year survival rate of only 17% to 18%.7 Notwithstanding these dismal statistics for a single case of lung cancer, some patients develop MPLC. The concept of MPLC was introduced in 1924,8 and the incidence is increasing owing to improved diagnostic, treatment, and surveillance mechanisms, as well as to aging of the population.9 Several studies have reported survival advantages for metachronous lung tumors compared with synchronous ones.5,10,11 Okada et al,12 on the other hand, found no significant differences in survival between synchronous and metachronous MPLC and suggested no pathophysiological differences between the two, since the classification is based entirely on the timing of diagnosis and not the actual development process.

Effective February 2015, the Centers for Medicare and Medicaid Services approved coverage of lung cancer screening by low-dose CT for asymptomatic patients aged 55 to 77 years with a tobacco smoking history of at least 30 pack-years who currently smoke or quit smoking within the last 15 years.13 Our patient met all of these criteria as an asymptomatic 63-year-old current smoker with an 84 pack-year history. Had lung cancer screening not been implemented when it was, it is possible that this patient’s delayed malignant diagnoses would have resulted in a dramatically worse prognosis. This patient is fortunate to have met the United States Preventive Services Task Force (USPSTF) screening criteria, unlike the upwards of two-thirds of newly diagnosed lung cancer patients who do not.14

It can be argued that our patient did not definitively have 3 distinct lung primaries because only 2 of the tumors were biopsy proven and 2 of the lesions occurred in the same lobe. However, it is not unusual for multiple primary cancers to occur near the same site as the initial primary tumor due to exposure, risk factors, and genetic predisposition, which is explained by the hypothesis of field cancerization.15 Furthermore, another case of 3 synchronous primary lung cancers in a patient very similar to ours, including 2 separate primaries in the same lobe, has been reported.16 Nevertheless, if the 2 nodules in the RUL were from the same adenocarcinoma, the stage would have been changed to T3N0M0 (stage IIB), but ultimately this patient would still have MPLC and would receive the same local therapy.

Our patient lacked clinical, radiographic, and pathologic evidence of hilar, mediastinal, or distant metastases, which is consistent with multiple primary synchronous lesions even though our patient had histologically similar cancers. Roughly two-thirds of patients with synchronous double primary lung cancers evaluated by Ferguson et al17 had identical histologic subtypes, as did our patient. Sometimes standard pathologic examination is unable to discriminate between a primary and a metastasis, but comparative mutational profiling has been shown to reliably assess the relatedness of multiple cancer lesions.17 Interestingly, genomic profiling was found to contradict the clinicopathological diagnosis in 18% of tumor comparisons of primary versus metastasis.18 Our patient was treated with concurrent SBRT to all 3 tumors. SBRT is superior to conventional lung radiation therapy for early-stage NSCLC because it results in less toxicity, increased patient compliance, and shorter total treatment duration with similar outcomes.19 SBRT for early-stage NSCLC is usually reserved for medically inoperable patients since the current standard of care is anatomic surgical resection. Although no randomized controlled clinical trials have compared SBRT with surgery, a growing body of evidence suggests a potential equivalence between surgery and SBRT in terms of survival in this patient population.20 Total SBRT doses ranging from 45 Gy to 66 Gy delivered in 3 to 4 fractions have resulted in excellent 2- to 3-year local tumor control rates ranging between 84% and 98%.20 SBRT is an attractive alternative to surgery because it is noninvasive, is performed on an outpatient basis with 20- to 30-minute treatments over 1 to 2 weeks, and does not require sedation or anesthesia because it is painless. Furthermore, patients can immediately return to activities.

CONCLUSION

To our knowledge, this is the first reported case of a patient diagnosed with 3 early-stage primary synchronous lung tumors by routine low-dose chest CT scan who was treated with SBRT to all 3 masses simultaneously. At this writing, the patient has had no evidence of disease recurrence or progression. Our patient’s cancer was medically inoperable, but SBRT may be a promising treatment for medically operable candidates, as well.
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Lemierre syndrome in an adolescent hockey player: case report and current approaches

ABSTRACT

A 19-year-old otherwise healthy male hockey player came to urgent care with dyspnea and pleuritic chest pain with marked leukocytosis and thrombocytopenia. A contrast-enhanced computed tomography scan of the chest performed the next day showed diffuse septic pulmonary emboli with empyema. The patient required broad-spectrum antibiotics, thoracentesis, and chest tube placement. Blood culture grew gram-negative rods later identified as Fusobacterium necrophorum, which suggested Lemierre syndrome. An upper extremity ultrasonogram obtained after identification of the bacteria revealed a remnant clot in the left internal jugular vein, confirming a Lemierre syndrome diagnosis. The patient’s empyema continued to grow, and he ultimately required video-assisted thoracoscopic surgery and right lung decortication to remove the pleuritic fluid. His respiratory status improved quickly afterwards, and he was discharged on a multi-week course of antibiotics and anticoagulation.

BACKGROUND

Diagnosis of Lemierre syndrome is often delayed owing to its non-specific presentation—typically a low-grade fever and accompanying pharyngitis in an otherwise healthy young man. The pharyngitis tends to resolve on its own, but an internal jugular thrombosis forms shortly thereafter, delivering septic emboli into the pulmonary vasculature. If left untreated, the mortality rate of patients with Lemierre syndrome can exceed 90%. We describe the case of a young man whose seemingly unconnected hockey injury perhaps resulted in illness ultimately diagnosed as Lemierre syndrome.

CASE PRESENTATION

Our patient was a 19-year-old otherwise healthy man who played for a local junior hockey team. He came to urgent care with a 4-day history of shortness of breath and pleuritic chest pain. One week before this visit, he had experienced an intermittent episode of sore throat, malaise, and fever of 103°F. At that time, he had seen his primary care provider, who performed a rapid antigen test for group A streptococcal pharyngitis and a rapid heterophile antibody test for infectious mononucleosis, the results of which were both negative. The patient was prescribed rest, symptomatic management, and increased fluid intake. By the time he came to urgent care, his fever and sore throat had resolved, but he continued to experience chest pain with deep and shallow breathing. Laboratory test results showed that he had an elevated white blood cell count with left shift (18 000/µL; to convert to ×10⁹/L, multiply by 0.001) and thrombocytopenia (platelet count of 56 x 10³/µL; to convert to ×10⁹/L, multiply by 1.0). His chest radiograph was clear and did not show any interstitial or alveolar disease. At that point, the patient’s physical examination and the results of his laboratory tests and imaging study suggested a viral or atypical pneumonia, and he was subsequently prescribed azithromycin and urged to continue to rest and keep up his fluid intake.

The next morning, the patient came to the emergency department with significant worsening shortness of breath and pleuritic chest pain. His D-dimer concentration was elevated, and computed tomography angiography (CTA) of the chest was performed to rule out pulmonary embolism. The CTA showed a small right-sided pneumothorax, bilateral pleural effusions, and multiple pulmonary nodules with cavitation consistent with septic emboli (Figure 1).

The patient was placed on empiric vancomycin and piperacillin/tazobactam. An emergent thoracentesis was then performed with aspiration of approximately 1400 mL and 650 mL of cloudy yellow fluid on his left and right pleural spaces, respectively. Bilateral chest tubes were then placed to drain the remaining fluid. Pleural fluid analysis suggested exudative process with a glucose concentration of <2 mg/dL (to convert to mmol/L, multiply by 0.0555), lactate dehydrogenase concentration of >2500 U/L (to convert to μkat/L, multiply by 0.0167), protein concentration of 4.1 g/dL (to convert to g/L, multiply by 10), a pH of <6.7, and large numbers of white blood cells.

Preliminary results from the blood cultures revealed gram-negative rods and gram-positive rods. Transthoracic echocardiography (TTE) was performed to look for endocarditis, but no evidence of vegetation was detected on valvular structures.
Contrast computed tomography (CT) of his chest/abdomen/pelvis and esophogram also did not reveal any source of infection. On further questioning, the patient revealed that 4 weeks prior, he had suffered a chipped tooth from an inadvertent hockey stick swing of an opposing player. The tooth required only minimal repair from a dentist, and he had not experienced any issues from that tooth since then. At the time of his admission, no visible trauma or maxillofacial abscess was identified on his physical examination or imaging scans.

By hospital day 2, the patient was feeling less short of breath, likely from the thoracentesis and resolution of the pneumothorax. His chest radiograph, however, showed persistent pleural effusion. Pleural fluid culture and blood cultures grew both *Arcanobacterium haemolyticum* and *Fusobacterium necrophorum* on hospital day 4. Identification of *F necrophorum* led to consideration of Lemierre syndrome as a diagnosis. Intravenous piperacillin/tazobactam was continued for broad aerobic and anaerobic bacterial coverage. Owing to the association of Lemierre syndrome with internal jugular thrombus, Doppler ultrasonography of the patient’s upper extremity and neck veins was performed. The scan revealed a stable thrombus in his left internal jugular vein (Figure 2).

Chest tubes continued to demonstrate minimal drainage, even after the addition of tissue plasminogen activator (tPA) for

![Figure 1](image1.png) **Figure 1.** Computed tomography angiogram (CTA) of a 19-year-old patient who came to the emergency department with shortness of breath, leukocytosis, and thrombocytopenia. The CT scan revealed bilateral pleural effusions and multiple pulmonary nodules.

![Figure 2](image2.png) **Figure 2.** Color Doppler ultrasonogram of the left internal jugular vein showing a remnant non-occluding thrombus. The thrombus (yellow arrow) is identified by the filling defect around the flow signal (top). Doppler waveforms of the internal jugular have sinusoidal peaks that coincide with the cardiac cycle (bottom).

![Figure 3](image3.png) **Figure 3.** Patient’s chest radiograph with bilateral chest tube placement. Bilateral chest tubes with tissue plasminogen activator (tPA) were placed in an attempted lysis of the empyema. The empyema continued to grow despite 3 days of tPA treatment via bilateral chest tubes.
attempted lysis of the empyema (Figure 3). The patient’s breathing remained labored, improving only minimally since the first day of admission. He required 3 to 5 L of oxygen to maintain oxygen saturation greater than 88%, and his respiratory rate remained greater than 20 breaths per minute. With the decreasing drainage of his chest tubes and increasing pleural effusions seen on chest radiograph, he underwent video-assisted thoracoscopic surgery (VATS) and right-lung decortication (Figure 4). The procedure removed an additional 2.6 L of fluid from his right pleural space. Chest tubes were replaced, at which point his pulmonary function improved daily until full recovery 3 days later.

The patient’s intravenous (IV) piperacillin/tazobactam was transitioned to oral amoxicillin/clavulanic acid and metronidazole when he was discharged to complete a total of 6 weeks of antibiotics. He was also sent home with a 7-week course of apixaban due to the persistent clot in his left internal jugular vein.

Within 2 weeks of hospital discharge, the patient resumed physical activity, such as jogging and skating on ice. Because of his anticoagulation regimen, he did not play the rest of his hockey season.

**DISCUSSION**

Lemierre syndrome was first described by French bacteriologist André-Alfred Lemierre in 1936, where he characterized 20 cases of anaerobic postanginal sepsis from a single anaerobe and concurrent thrombus formation in the internal jugular vein. Although Lemierre was neither the first to isolate the anaerobic organism nor the first to clinically describe postanginal sepsis (also reported as “human necrobacillosis” in prior literature), he was the first to correlate the single bacterial source, path of infection, and collection of symptoms to the disease that now bears his name.

The unique combination and timing of symptoms usually begins with rapid-onset fever and pharyngeal infection, typically in a young, healthy individual. Over a period of 1 week, the anaerobic bacteria *F. necrophorum* seeds from the oropharyngeal cavity into the internal jugular vein or nearby vessels, forming a thrombus. The thrombus then releases septic emboli into the bloodstream and into the pulmonary vasculature. At the time of discovery, at which time antibiotics were not yet available, the rate of mortality was as high as 90% within 2 weeks of diagnosis without treatment. Since that time, rapid administration of broad-spectrum antibiotics has led to a dramatic decrease in comorbidities and mortalities. As a result, Lemierre syndrome has become known as “the forgotten disease.”

**Presentation**

The classic presentation of Lemierre syndrome is that of an otherwise young, healthy patient under the age of 30 years with pharyngitis, tender and palpable neck veins, and fever. These symptoms are often accompanied by acute respiratory distress, resulting in tachycardia, tachypnea, and poor oxygen saturation on room air. Laboratory findings are consistent with sepsis from bacteremia, with leukocytosis, and evidence of end-organ failure. A defining sequela of Lemierre syndrome is the seeding of *F. necrophorum* into the internal jugular vein leading to thrombophlebitis and subsequent septic embolization from infected pieces of thrombus into the pulmonary vasculature. That sentinel event can often lead to neck stiffness and sometimes swelling, both of which may be the first clinical sign that the etiology is not a viral pharyngitis.

**Diagnosis**

The criteria required to firmly diagnose Lemierre syndrome are debatable, but essentially 3 characteristics must be met: (1) recent history of upper respiratory tract infection, (2) radiologic or pathologic evidence of metastatic septic thrombosis, and (3) growth of *F. necrophorum* in the blood or in some otherwise sterile site. The flexibility of diagnosis with or without culture-positive *F. necrophorum* is particularly useful because it takes several days to grow anaerobic microorganisms. Relying entirely on blood culture results may delay appropriate treatment. The most common location of septic embolization is the pulmonary vasculature, which is present in up to 90% of cases, although dissemination into the joints, spleen, kidney, and liver has been reported.

If the initial suspicion for Lemierre syndrome is sufficiently high, Doppler ultrasonographic imaging of the neck and upper extremity should be performed to look for thrombotic source. Moreover than 80% of the thrombi occur in the internal jugular vein, but cases of facial vein thromboembolism have been reported. A chest CTA is the most sensitive imaging modality in detecting pulmonary septic emboli. Ultrasonography is radiation-free and can be performed bedside, but scan quality may be limited in deeper vessels or obese patients. Furthermore, whether the internal jugular vein thrombus or the septic emboli confers a higher positive
predictive value for the diagnoses of Lemierre syndrome remains a matter of debate at this writing.\textsuperscript{19} As a result, the optimal initial imaging modality for diagnosis remains unresolved.

**Treatment**

Time to administration of IV antibiotics plays a significant role in the management of Lemierre syndrome. \textit{F} necrophorum is generally susceptible to penicillin, clindamycin, and metronidazole.\textsuperscript{7} Empiric treatment choices should be active against anaerobic organisms, as well as streptococci and staphylococci, typically starting with a beta-lactam and beta-lactamase inhibitor. Piperacillin/tazobactam and carbapenems have traditionally been used successfully either as monotherapy or in combination with metronidazole. In a recent review, 98% of cases were successfully treated with the aforementioned antibiotics, with a mean treatment duration of 4 weeks.\textsuperscript{3} Patients can be transitioned to oral therapy after 1 to 2 weeks of IV antibiotics.

The role of anticoagulation in the treatment of Lemierre syndrome is currently evaluated on a case-by-case basis. Thrombus that continues to extend in the acute phase of the disease process will likely require anticoagulation. Likewise, if the thrombus is stable, then no anticoagulation will be required. A recent retrospective single-institution review of previous patients with Lemierre syndrome revealed no difference in thrombus growth or recurrence in patients who had or had not received anticoagulation, ranging from a period of 2 weeks to 6 months.\textsuperscript{15}

Other treatment modalities can be required, particularly if the abscesses or empyema persists in anatomical spaces despite antibiotic treatment. Image-guided percutaneous drainage or surgical drainage have been commonly utilized for symptomatic management. Ligation of noncritical vessels containing persistent thrombus has also been performed in the past to prevent further dissemination of further septic emboli.\textsuperscript{16,17}

Lemierre syndrome is a rare disease that, if left untreated, can have devastating consequences.\textsuperscript{19} As the initial symptoms of fever and sore throat are fairly nonspecific, the radiological findings of cavitating septic emboli found on CT scan examination is often the first concrete evidence of Lemierre syndrome.\textsuperscript{4}

The incidence of Lemierre syndrome has been rising in the last decade, likely due to the decrease in empiric antibiotic use in patients who come in with pharyngitis.\textsuperscript{19} Inappropriate antibiotic use has been correlated with antibiotic resistance. Guidelines sponsored by the American College of Physicians and Centers for Disease Control and Prevention recommend risk-stratifying patients before performing a rapid antigen test for group A streptococcal pharyngitis.\textsuperscript{15} These guidelines identify only the most severe cases of pharyngitis to warrant empiric antibiotic treatment. Because \textit{F} necrophorum is susceptible to many first-line antibiotics, it is possible that prior practices of empiric antibiotic administration treated patients with early-stage Lemierre syndrome before encountering respiratory distress.

In the patient described in this case report, the initial findings of pharyngitis, normal chest radiograph, and negative strep test were distractors because his symptoms were dismissed as a simple viral or atypical bacterial infection. In his initial visit to urgent care, the only red flags were a white blood cell count of 18 000/\mu\text{L} and a platelet count of 56×10\(^3\)/\mu\text{L}. An immediate follow-up chest CT scan with contrast, as opposed to chest radiograph, likely would have revealed the early formation of septic emboli in the lungs. There was also an anchoring bias when gram-positive and gram-negative bacteria were growing in the early blood cultures. Extensive imaging with CT and echocardiography was utilized in an ultimately fruitless search for an abscess, bowel perforation, or endocarditis. It was not until several days later, when the blood culture grew \textit{F} necrophorum, that the suspicion of Lemierre syndrome was raised and confirmed. At that point, the patient had already been on broad-spectrum IV antibiotics since admission and required no further change in antimicrobial management.

\textit{F} necrophorum is a pleomorphic, gram-negative obligate anaerobic bacillus that has been notoriously difficult to culture, requiring more than 3 to 5 days to incubate.\textsuperscript{20} While it has been sometimes reported to be part of normal flora in the human oropharynx, gastrointestinal tract and female genitalia, it is now considered standard practice to treat its presence as a pathogen.\textsuperscript{21} Delaying treatment until culture results are available may lead to further comorbidities. The other bacteria grown in our patient was \textit{A} hemolyticum, a catalase-negative, beta-hemolytic, gram-positive aerobic bacillus that is part of normal oral flora. When it enters the bloodstream, either through infection or trauma, it can cause head and neck infections that manifest as pharyngitis. The clinical features of pharyngitis caused by \textit{A} hemolyticum are indistinguishable from those caused by \textit{Streptococcus pyogenes} and can be successfully treated with beta-lactams or macrolides. This organism rarely causes systemic or deep-seated infections in young, healthy individuals, but it has been associated with Lemierre syndrome, especially in the presence of \textit{F} necrophorum.\textsuperscript{22}

The patient’s extensive ice hockey schedule brings to question whether contact sports and injuries, particularly in the maxillofacial region, played a role in the pathogenesis of his disease. Ice hockey players can skate up to 30 miles per hour (48 kilometers per hour) and hit pucks up to 100 miles per hour (161 kilometers per hour) with regular collisions with other players, the puck, or the rigid wall.\textsuperscript{23} Participants are required to wear full-body protective gear to reduce the risk of potential injuries; however, this gear is not always worn in a recreational or practice setting. One study found that the most common injuries for which hockey players were seen in an emergency department were facial lacerations (16.4%) and head concussions (7.0%).\textsuperscript{24} Our patient had suffered a chipped tooth in preceding weeks that required dental repair, but no visible trauma was identified on either physical examination or CT scan. It is difficult to definitively link a chipped tooth to the onset of Lemierre syndrome. However, given the absence of any other reported dental/oral trauma, the chipped tooth cannot be completely ruled out as the nidus of \textit{F} necrophorum infection in the oropharynx.

Arriving at the correct diagnosis of Lemierre syndrome with blood culture was critical to the patient’s management because it pointed to the internal jugular vein as the first place to look via Doppler ultrasonography to localize the source of the septic emboli. Confirmation of the thrombus led to the hematologist team’s decision to offer anticoagulation treatment for 7 weeks. Furthermore, the diagnosis of Lemierre syndrome provided prognostic information regarding duration of antibiotic treatment and future outcome to the patient and family.
# REFERENCES

A Cross-Cultural Study of the Oath of Hippocrates: Living a Dedicated Life — Has It Any Meaning?

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The Oath of Hippocrates has been an accepted ethical guide for the practice of medicine from antiquity to the present; however, it is only poorly understood by the average reader. This cross-cultural study will familiarize the reader with this otherwise formidably difficult extant Ionic text.

Ethical problems in the practice of medicine were clearly recognized in antiquity. The Oath of Hippocrates addressed these problems with such an inspired dedication to a life of helping the sick that it has endured over the centuries as the hallmark of medical ethics. However, it is often quoted in a fragmentary way, poorly understood as a unified whole.

I have undertaken a cross-cultural study of this Oath from the ancient Ionic text, the language on the Greek island of Kos at the time of Hippocrates. I was given the Ionic text by the International Hippocratic Foundation of Kos when I visited Kos in November of 1985 as a participant in the International Medical Symposium, "A Return to Hippocrates."

The goal of a cross-cultural study is to gain a proper understanding of the meaning contained within the language symbols of the culture under study. Word for word translation cannot achieve this, for the meanings of so many words are culturally specific. Also, many language symbol groupings are idiomatic, and their proper meanings do not carry over in translation. A proper cross-cultural study requires searching for the language symbols of our own personal culture that are living equivalents in meaning for those language symbols of the foreign culture we are attempting to understand.

Approaching this ancient text with the scholarly insights of many knowledgeable philologists of the Ionic Greek language helps to open up the structure and meaning of this lost language. Coupling this knowledge with the modern discipline of cross-cultural study based on anthropological concepts, the Hippocratic Oath is found to be a rare, carefully structured literary gem containing a treasure trove of ethical thought.

Hippocrates established the proper role for a physician in fulfilling this Oath of medical ethics in the second sentence of his first Aphorism: "Life is short, and art long, the crisis fleeting, experience perilous, and decision difficult. Further, (the doctor) must alone of himself make what is proper come to pass, and also (make) the sick person, those attending him, and those external (cooperate)."

Figure 1 presents the Ionic text of the Oath of Hippocrates in a plaque presented by the International Hippocratic Foundation of Kos. Table 1 presents the Ionic alphabet of this text, as the interested reader will find this a most useful key in opening up the meanings to be discussed as we examine this most remarkable writing.

There are several acceptable translations of the Ionic text of this Oath. I will present the translation repeated by the participants of "A Return to Hippocrates" in the solemn ceremony at the altar of Apollo on the second level of the partially restored ruins of the Asclepeia on the Aegean island of Kos in the late morning sun of November 13, 1985.

The Oath of Hippocrates†

I swear by Apollo physician, by Asclepius, by Hygeia and Panacea, and by all the gods and goddesses, making them my witnesses, that I will carry out, according to my ability and judgment, this Oath and this indenture. To hold my teacher in this art equal to my own parents; to make him partner in my livelihood; when he is in need of money to share mine with him; to consider his family as my own brothers, and to teach them this art, if they want to learn it, without fee or indenture. To impart instruction written, oral, and practical, to my own sons, the sons of my teacher, and to indentured pupils who have taken the physician’s oath, but to nobody else. I will use treatment to help the sick according to my ability and judgment, but never with a view to injury and wrongdoing. Neither will I administer a poison to anybody when asked to do so, nor will I suggest such a course. Similarly, I will not give to a woman a pessary to cause abortion.

*Cosponsored by the Society of Teachers of Family Medicine of the United States and the Universities of Athens and Crete of Greece

†Approved translation, International Hippocratic Foundation of Kos
Ο ΟΡΚΟΣ ΤΟΥ ΙΠΠΟΚΡΑΤΟΥΣ

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ΤΑΣ ΤΕ ΚΑΙ ΠΑΝΑΣ ΙΣΤΟΡΙΑΣ ΠΟΛΕΥΜΕΝΟΣ, ΕΠΙ
ΤΕΛΕΑ ΠΟΙΗΣΕΙΝ ΚΑΤΑ ΔΥΝΑΜΙΝ ΚΑΙ ΚΡΙΣΙΝ ΕΜHN
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ΓΕΝΟΣ ΤΟ ΕΗ ΛΑΤΕΩΥ ΑΔΕΛΦΟΙ (ΣΟΝ ΕΠΙΚΡΙΝΕΙ
ΕΙΝ ΑΡΡΕΙΟ), ΚΑΙ ΔΙΔΑΕΙΝ ΤΗΝ ΤΕΧΝΗΝ ΤΑΥΤΗΝ,
ΗΝ ΧΡΗΣΙΩΝ ΜΑΝΘΑΝΕΙΝ, ΑΝΕΥ ΜΙΣΘΟΥ ΚΑΙ ΕΥ
ΠΡΑΦΗΝ, ΠΑΡΑΓΩΓΕΙΝ ΤΕ ΚΑΙ ΑΚΡΟΘΙΟΙ ΚΑΙ ΤΗΣ
ΛΟΙΠΗΣ ΑΠΑΣΗΣ ΜΑΘΗΣΙΟΤΟΙ ΜΕΤΑΔΟΣΙΝ ΠΟΙΗΣΑΣ
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ΔΙΑΘΗ ΜΑΣΙ ΤΕ ΧΡΗΣΟΜΑΙ ΕΠ’ ΦΕΛΕΙΝ, ΚΑΜΝΟ
ΝΤΑΝ ΚΑΤΑ ΔΥΝΑΜΙΝ ΚΑΙ ΚΡΙΣΙΝ ΕΜΗΝ, ΕΠΙ ΔΑΗ
ΣΕΙ ΔΕ ΚΑΙ ΑΔΙΚΗΝ, ΕΙΡΕΕΙΝ. ΟΥ ΔΥΣΟΧ ΣΕ ΟΥΔΕ
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Η ΙΔΗΝ, Η ΑΚΟΥΣΑΝ, Η ΚΑΙ ΑΝΕΥ ΘΕΡΑΠΗΠΗΣ ΚΑΤΑ ΒΙΟΝ ΑΝΘΡΩΠΩΝ, Α ΜΗ ΧΡΗ ΠΟΤΕ ΕΚΛΑΛΕΩΣΟΙΛ
ΕΙΝ, ΣΙΓΝΟΜΑΙ, ΑΡΡΗΤΑ ΝΕΥΜΕΝΟΣ ΕΙΝΑΙ ΤΑ ΤΟ
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Α ΠΟΙΕΟΝΤΙ ΚΑΙ ΜΗ ΕΥΓΧΕΟΝΤΙ, ΕΙΝ ΕΠΑΥΡΑΙ
ΑΙ ΚΑΙ ΒΙΟΥ ΚΑΙ ΤΕΧΝΗΣ ΔΟΕΙ ΑΖΟΜΕΝΟΣ, ΠΑΡΑ Π
ΑΣΙΝ ΑΝΘΡΩΠΟΙΣ ΕΣ ΤΟΝ ΑΙΕΙ ΧΡΟΝΟΝ ΠΑΡΑΒΑΙ
ΝΟΝΤΙ ΚΕΙ ΕΠΙ ΟΡΚΟΥΝΤΙ, ΤΑΝΑΝΤΙΑ ΤΟΥΤΕΝ.
But I will keep pure and holy my life and my art. I will not use the knife, not even, verily, on sufferers from stone, but I will give place to such as are craftsmen therein. Into whatsoever house I enter, I will enter to help the sick, and I will abstain from all intentional wrongdoing and harm, especially from abusing the bodies of man or woman, bond or free. And whatsoever I shall see or hear in the course of my profession, as well as outside my profession in my intercourse with men, if it be what should not be published abroad, I will never divulge, holding such things to be holy secrets. Now if I carry out this oath, and break it not, may I gain forever reputation among all men for my life and for my art; but if I transgress it and forswear myself, may the opposite befall me.

In this study I present first the thought phrases of the Oath’s Ionic text, with the English translation in bold beneath. I follow this with a short cross-cultural discussion of each of these phrases. Before this text can be properly entered, however, we must first understand that this Oath is a promissory oath (a confirmation oath). To break a confirmatory oath would be to call down upon oneself the wrath of the gods everywhere to be witnesses to and guarantors of the swearer’s promises. This makes this Oath essentially inviolable, student before entering his medical career. While the first word of this phrase, ΕΙΛΕΙΤΕΑΘΑ, implies perfection in all things to be undertaken in fulfilling the Oath, it is tied in meaning to the infinitive form, indicating that this Oath was to be taken by a medical student before entering his medical career.

Part 1: Invocation

ΟΜΝΥΜΙ ΑΠΟΛΑΩΝΑ ΗΗΤΡΩΝ

I swear by Apollo physician,

Apollo is invoked first as the god of health and life. He healed all diseases, stopped epidemics, and kept evil away. His divine influence extended to the cure of moral as well as physical disease. He was also able to foresee the future (divination), which Hippocrates called prognostics. Hippocrates regarded medicine and divination as two closely related arts that had one father, Apollo.

ΚΑΙ ΑΣΚΛΗΠΙΟΝ

by Asclepius,

Asclepius is invoked second as the deified mortal son of Apollo who became the first great healer in ancient Greece. He was worshipped throughout Greece where over 300 Asclepieia* were founded. He was the Greek inventor of therapeutics, being the first to use specific decoctions in the treatment of disease. He was the ancestor of Hippocrates.

ΚΑΙ ΥΓΕΙΑΝ ΚΑΙ ΠΑΝΑΚΕΙΑΝ

by Hygeia and Panacea

Hygeia and Panacea, goddess daughters of Asclepius, are next invoked. Hygeia was the goddess of physical and mental health. Panacea was the goddess able to cure anything. The Oath has now invoked all the gods and goddesses of Hippocrates’ day who were specifically involved in healing the sick.

ΚΑΙ ΘΕΟΥΣ ΠΑΝΤΑΣ ΤΕ ΚΑΙ ΠΑΣΑΣ ΣΤΟΡΑΣ ΠΟΙΕΥΜΕΝΟΣ

and by all the gods and goddesses, making them my witnesses,

This grand and all-inclusive conclusion to the call of the Invocation makes this an ecumenical! Oath as it calls upon all gods everywhere to be witnesses to and guarantors of the swearer’s promises. This makes this Oath essentially inviolable, for to forswear it would be to call down upon oneself the wrath of all the gods.

ΕΠΙΤΕΛΕΑ ΠΟΙΗΣΕΙΝ ΚΑΤΑ ΔΥΝΑΜΙΝ ΚΑΙ ΚΡΙΣΙΝ ΕΜΗΝ

that I will carry out, according to my ability and judgment,

The second word of this phrase, ΠΟΙΗΣΕΙΝ, is in the future infinitive form, indicating that this Oath was to be taken by a medical student before entering his medical career. While the first word of this phrase, ΕΠΙΤΕΛΕΑ, implies perfection in all things to be undertaken in fulfilling the Oath, it is tied in meaning to the modifying phrase, ΚΑΤΑ ΔΥΝΑΜΙΝ ΚΑΙ ΚΡΙΣΙΝ ΕΜΗΝ, which

*temples of healing

The original Greek meaning of the word ecumenical, ΟΙΚΟΥΜΕΝΙΚΟΣ, was "whole inhabited world."
Table 1  Phonetic Ionic Greek Alphabet.

<table>
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<th>Ionic symbol</th>
<th>Greek letter</th>
<th>English sound</th>
<th>Ionic symbol</th>
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<td>man</td>
<td>Ω</td>
<td>omega</td>
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acknowledges an awareness of both human limitations and of the imperfections that exist in all known science. The student thus swears within the known realities of this world's imperfections to make perfection his goal.

OPKON TΩΝΔΕ ΚΑΙ ΖΥΤΡΑΦΗΝ ΤΗΝΔΕ

this oath and this indenture.

The word ΖΥΤΡΑΦΗΝ indicates that a written, binding contract, in addition to this spoken Oath, was required of the Hippocratic student of medicine. The contract and Oath added to the weight of the commitment being made by the future Doctor of Medicine. This brings Part 1 to its end on a most solemn note.

Part 2: Duties to the Profession

ΗΓΗΣΑΣΘΑΙ ΜΕΝ ΤΟΝ ΔΙΔΑΣΚΑΛΟΝ ΜΕ ΤΗΝ ΤΕΧΝΗΝ ΤΑΥΤΗΝ ΙΣΑ ΓΕΝΕΤΗΣΙΝ ΕΜΟΙΣΙ

To hold my teacher in this art equal to my own parents;

The first duty promised to the profession is that of the student to his teacher. The student is to become as an adopted son to the man who initiates him into the knowledge of the art of medicine.

ΚΑΙ ΒΙΟΥ ΚΟΙΝΩΝΙΑΣΘΑΙ ΚΑΙ ΧΡΩΝ ΧΡΗΙΖΟΝΤΙ MΕΤΑΔΟΣΙΝ ΠΟΙΗΣΑΣΘΑΙ

to make him partner in my livelihood; when he is in need of money to share mine with him;

These two phrases enlarge the duties of the student to his teacher to include helping him provide for the personal, professional and financial needs of life.

ΚΑΙ ΓΕΝΟΣ ΤΟ ΕΞ ΩΥΤΕΟΥ ΑΔΕΛΦΟΙ ΙΣΟΝ ΕΠΙΚΡΙΝΕΙΝ ΑΡΡΕΡΙ

to consider his family as my own brothers,

This phrase extends the bond between student and teacher to the next generation.6

ΚΑΙ ΔΙΔΑΣΚΑΛΟΝ ΤΗΝ ΤΕΧΝΗΝ ΤΑΥΤΗΝ ΙΣΑ ΓΕΝΕΤΗΣΙΝ ΕΜΟΙΣΙ

and to teach them this art, if they want to learn it, without fee or indenture.

This phrase completes the natural cycle of perpetuation in human events. The student swearing the Oath becomes the future teacher of the art of medicine for the next generation. All doctors become teachers of their art, either directly or indirectly, by the examples they set in the performance of their profession. The root meaning of the word “doctor” is “teacher.”

ΠΑΡΑΓΓΕΛΙΗΣ ΤΕ ΚΑΙ ΑΚΡΟΘΗΣΙΟΣ ΚΑΙ ΤΗΣ ΛΟΙΠΗΣ ΑΠΑΣΗΣ ΜΑΘΗΣΙΟΣ ΜΕΤΑΔΟΣΙΝ ΠΟΙΗΣΑΣΘΑΙ

To impart instruction written, oral, and practical,

The ancient Greek words ΠΑΡΑΓΓΕΛΙΗΣ, ΑΚΡΟΘΗΣΙΟΣ and ΜΑΘΗΣΙΟΣ, taken in the ascending order in which they are written, indicate “written instructions for beginners,” “esoteric lectures for advanced students,” and “clinical bedside training” for the practical application of learned knowledge in the total teaching of the art of medicine. This phrase tells us an advanced and well organized level of medical teaching existed in that ancient time.

ΥΙΟΙΣΙ ΤΕ ΕΜΟΙΣΙ ΚΑΙ ΤΟΙΣ ΤΟΥ ΕΜΕ ΔΙΔΑΣΚΑΛΟΣ ΚΑΙ ΜΑΘΗΤΑΙΣ ΣΥΓΓΡΑΜΜΕΝΟΙΣ ΤΕ ΚΑΙ ΩΡΚΙΣΜΕΝΟΙΣ ΝΟΜΩΝ ΙΗΤΡΙΚΩΝ ΑΛΛΩΝ ΔΕ ΟΥΔΕΝΙ

6 It is to be noted that at the time of Hippocrates women were strictly confined within the limits of the home and housekeeping; and therefore only males are considered in this oath.
to my own sons, the sons of my teacher, and to indented pupils who have taken the physician's oath, but to nobody else.

Until the time of Hippocrates, knowledge of the art of medicine was passed down within the Asclepian clan as a clan secret. No one outside this clan was to be taught this art.

Hippocrates broke with this sacred tradition, teaching "worthy" pupils (those who were indentured and had taken the physician's oath), along with members of the Asclepian clan. No one else, however, was to be taught this art of medicine. *

The ending phrase, ΑΛΛΑ ΔΕ ΟΥΔΕΝΙ, "but to nobody else," of Part 2 is perhaps best understood as the needed "quality assurance" requirement that successfully preserved this newly emerging profession that we now recognize as modern medicine. Such restrictions guided the new science through the warring chaos of antiquity and the intellectual night of the Dark Ages into the renascent dawn of our enlightened era.

All religions of that day taught that disease was a punishment from the gods caused by disobeying the will of the gods (sinning); healing required expiation for these sins. Hippocrates had clearly broken from this belief in his treatise "On the Sacred Disease" and Galen strongly supported Hippocrates' stand, stating all diseases had "natural" causes and were healed by "natural" means. 1

Modern scientific knowledge bears out the truth of Hippocrates' ancient teachings, establishing Hippocrates as the "Father of Medicine" and the founder of modern medical science.

Part 3: Duties to the Patient

ΔΙΑΙΤΗΜΑΣΙ ΤΕ ΧΡΗΣΩΜΑΙ ΕΙΠ ΩΘΕΛΕΙΗ ΚΑΜΝΟΝΤΩΝ ΚΑΤΑ ΔΥΝΑΜΙΝ ΚΑΙ ΚΡΙΣΙΝ ΕΜΗΝ

I will use treatment to help the sick according to my ability and judgment.

The controlling third word, ΧΡΗΣΩΜΑΙ, of this phrase is in the future indicative form, making "Duties to the Patient" a future declarative statement by the swearer. This Oath thereby becomes a powerful declarative of purpose that is to control the future actions of the swearer.

The first word, ΔΙΑΙΤΗΜΑΣΙ (ΔΙΑΙΤΑ—food, diet, way of living), clearly supports Hippocrates' basic medical tenet, "Nature is the healer of diseases." Modern medical science bears out the truth of this ancient tenet, establishing proper nutrition and exercise as essential in restoring and supporting the body's defenses against disease, and in maintaining good health. Having a minimal pharmacopoeia with which to work, Hippocrates used few drugs in the treatment of disease.

The fourth, fifth, and sixth words, ΕΙΠ ΩΘΕΛΕΙΗ ΚΑΜΝΟΝΤΩΝ, "to help the sick," state the central promise made by the swearer of this Oath. This promise at once becomes and remains the total purpose of the Oath of Hippocrates.

The modifying phrase ΚΑΤΑ ΔΥΝΑΜΙΝ ΚΑΙ ΚΡΙΣΙΝ ΕΜΗΝ is used again, as it was in the Invocation, to humanize the meaning of this powerful declarative statement of purpose, but with a very different dynamic effect in its clarification of the underlying meaning of this portion of the Oath.

Here we must turn to the ionic words themselves, ΔΥΝΑΜΙΝ and ΚΡΙΣΙΝ, to realize the marked difficulty scholars have in presenting a proper translation while trying also to bring across the original author's true meaning. While ΔΥΝΑΜΙΝ translates as "ability," and ΚΡΙΣΙΝ translates as "judgment," it is obvious in this opening statement that "ability" and "judgment" are shallow words that leave behind the heart of the author's true meaning.

"Ability" is a dead word, implying a detached degree of skill; but ΔΥΝΑΜΙΝ (ΔΥΝΑΜΙΝ — dynamo) bristles with life and energy. A dynamo is a source of power, and this, I submit, is the author's true meaning here. Similarly, "judgment" is a dead word, implying a remote degree of knowledge; but ΚΡΙΣΙΝ (ΚΡΙΣΙΝ — crisis) bristles with applied action, for in the ionic it means "a separating, putting asunder."

Both these ionic words stress active and decisive involvement in every situation that the swearer will encounter in helping the sick. This intent of the author's real meaning is supported by the second sentence of Hippocrates' First Aphorism, presented in the introductory portion of this treatise — "Further, the doctor must alone of himself make what is proper come to pass, and also make the sick person, those attending him, and those external cooperate."

The physician of today is, therefore, to be a person of action in the middle of the storms of life, taking on all challenges in living a life dedicated to helping the sick, not the remote and detached scientific automaton implied by the words "ability and judgment." When we say those words in this Oath, we must remember that Hippocrates, in his own active involvement with life, was a high profile, aggressive assenter of the truths he so clearly taught.

ΕΠΙ ΔΗΛΗΣΕΙ ΔΕ ΚΑΙ ΑΔΙΚΗΙΕ ΕΙΡΞΕΙΝ

but never with a view to injury and wrongdoing.

The two words, ΔΗΛΗΣΕΙ, "injury," and ΑΔΙΚΗΙ, "wrongdoing," in this phrase are synonyms. The author used paired synonyms within this Oath to emphasize and impress upon the swearer the importance of the statements being made, and also to make these statements unyielding and impossible to compromise without transgressing and thereby forsaking this Oath.

The remainder of all the statements made in Part 3 are but
Neither will I administer a poison to anybody when asked to do so, nor will I suggest such a course. Similarly, I will not give to a woman a pessary to cause abortion. Hippocrates broke with these accepted ancient traditions and mores with these two opening statements, establishing the sanctity of human life as the fundamental ethic in Hippocratic medicine.

**ΑΓΝΩΣΔ ΚΑΙ ΩΣΩΣ ΔΙΑΤΗΡΗΣΩΣ ΒΙΟΝ ΤΟΝ ΕΜΟΝ ΚΑΙ ΤΕΧΝΗΝ ΤΗΝ ΕΜΗΝ**

But I will keep pure and holy both my life and my art.

This one positive statement amongst the rest of the negative “Thou shalt not” statements shines out as a beacon light to guide the doctor’s path through all the evils of this life.

**ΟΥ ΤΕΜΕΩ ΔΕ ΟΥΔΕ ΜΗΝ ΛΙΘΩΝΤΑΣ ΕΚΧΩΡΗΣΩ ΔΕ ΕΡΓΑΤΗΣΙΝ ΑΝΔΡΑΣΙ ΠΡΗΣΙΟς ΤΗΣΔΕ**

I will not use the knife, not even, verily, on sufferers from stone, but I will give place to such as are craftsmen therein.

Perhaps no word in this Oath has intrigued scholars more, in their quest to find the author’s true meaning, than has the word *ΛΙΘΩΝΤΑΣ*, “stone-sufferers.” It is obvious, on study, that this word is contained within an idiomatic phrase whose actual meaning has been lost. Whether *ΛΙΘΩΝΤΑΣ* refers to “bladder stone,” “kidney stone,” “gallstone,” or to “castration” is of no real consequence in finding the author’s intended meaning for this statement as a whole. It is to be remembered that this Oath was to be taken by a medical student.

Hippocrates was not opposed to surgery, as some have misinterpreted this statement to mean, for Hippocrates wrote many detailed surgical treatises covering a wide variety of surgical topics. Understanding the literary construction of this statement unlocks its otherwise hidden meaning. Like the literary construction of Hippocrates’ First Aphorism, the first half of this statement gains the reader’s attention while the second half states the author’s real meaning and reason for making the total statement. The referral of patients requiring highly technical procedures to those specialized in doing those procedures has always been the proper course of action in providing medical care. This, I submit, is the author’s intended meaning here.

**ΕΣ ΟΙΚΙΑΣ ΔΕ ΟΚΟΣΑΣ ΑΝ ΕΣΩ ΕΣΕΛΕΥΣΟΜΑΙ ΕΙΠ ΩΦΕΛΕΙΝ ΚΑΜΝΟΝΤΩΝ ΕΚΤΟΣ ΕΣΩΝ ΠΑΣΗΣ ΛΙΘΩΝΤΑΣ ΕΚΟΥΣΗΣ ΚΑΙ ΦΟΡΗΣ ΤΗΣ ΑΛΛΗΣ ΚΑΙ ΑΦΡΟΔΙΣΩΝ ΕΡΤΩΝ ΕΙΠ ΤΕ ΓΥΝΑΙΚΕΩΝ ΣΩΜΑΤΩΝ ΚΑΙ ΑΝΔΡΩΝ ΕΛΕΥΘΕΡΩΝ ΤΕ ΚΑΙ ΔΟΥΛΩΝ**

Into whatsoever house I enter, I will enter to help the sick, and I will abstain from all intentional wrongdoing and harm, especially from abusing the bodies of man or woman, bond or free.

This next clarifying and expanding statement of Part 3 restates the central promise and total purpose of this Oath, *ΕΙΠ ΩΦΕΛΕΙΝ ΚΑΜΝΟΝΤΩΝ*, “to help the sick” and links it to the interpersonal environment required for the proper practice of medicine.

To gain the proper interpersonal environment necessary for accurate diagnosis and correct treatment, the patient must expose all areas of concern to the scrutinizing examination of the doctor. This required exposure included not only the patient’s affected body parts but also the patient’s lifestyle and possessions.

Hippocrates recognized the potential moral and ethical dangers that exist within this relationship, and he therefore places rigid controls and restrictions upon the actions of the doctor.

The words *ΑΛΙΚΗΣ*, “wrongdoing” (injustice), and *ΦΟΡΗΣ*, “harm” (corruption), in this statement are generic, thereby forbidding the doctor from engaging in any form of cheating or stealing or taking advantage of the patient.

The author of this Oath clearly recognizes the need to single out and specifically forbid any sexual activity within this doctor-patient relationship. The word *ΑΦΡΟΔΙΣΩΝ* (venery, sexual indulgence) is derived from *ΑΦΡΟΛΙΤΗ* (Aphrodite, the goddess of love). The word *ΕΡΤΩΝ* (abstain from, drive off, shut out), coupled with this word *ΑΦΡΟΔΙΣΩΝ* and the phrase *ΓΥΝΑΙΚΕΩΝ*...

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*We gain insight in, and sensitivity to, the necessity of such “inhumane” population control measures by ancient societies when we recognize that the self-sufficient Inuit (Eskimo) societies practiced these same methods right up into the present century, to enable them to survive in the harsh arctic environment. When times were difficult, the Inuit used death by exposure (mainly of newborns, old people, and others who were no longer able to contribute to the survival of the group) as a method of population control.*

†There are learned arguments that support each of these interpretations.
ΣΩΜΑΤΩΝ ΚΑΙ ΑΝ∆ΡΩΝ ΕΛΕΥΘΕΡΩΝ ΤΕ ΚΑΙ ΔΟΥΛΩΝ, “the bodies of man or woman, bond or free,” specifically forbids sexual activity of any kind within the doctor–patient relationship.

This statement carries the meaning of the words ΔΗΛΩΣΕΙ, “injury,” and ΛΙΚΗ, “wrongdoing,” of the concluding phrase of the first sentence of Part 3 beyond the medical actions of the doctor to include all of the actions of the doctor in the interpersonal environment of the doctor-patient relationship.

Α Δ’ ΑΝ ΘΕΡΑΠΕΙΗ Η ΙΔΩ Η ΑΚΟΥΣΗ Η ΚΑΙ ΑΝΕΥ ΘΕΡΑΠΙΨΗΝ ΚΑΤΑ ΒΙΟΝ ΑΝΘΡΩΠΩΝ Α ΜΗ ΧΡΗ ΠΟΤΕ ΕΚΑΛΑΣΩΣΘΑΙ ΕΞΩ ΣΙΓΣΟΜΑΙ ΑΡΡΗΤΑ ΗΓΕΥΜΕΝΟΣ ΕΙΝΑΙ ΤΑ ΤΟΙΑΥΤΑ
And whatsoever I shall see or hear in the course of my profession, as well as outside my profession in my intercourse with men, if it be what should not be published abroad, I will never divulge, holding such things to be holy secrets.

This last clarifying and expanding statement of Part 3 carries the meaning of the words ΔΗΛΩΣΕΙ, “injury,” and ΛΙΚΗ, “wrongdoing,” beyond the doctor’s actions to include the doctor’s words and thoughts. The author’s phrase ΚΑΤΑ ΒΙΟΝ ΑΝΘΡΩΠΩΝ, which translates literally to say “in the course of life belonging to man,” is unbounded and all-inclusive.

By this sentence the swearer is to judge all that he sees and hears, and to keep silence (ΗΓΕΥΜΕΝΟΣ “to hold, consider”) secret (ΑΡΡΗΤΑ “not to be said, unspoken, mysterious, forbidden, unutterable, shameful to be spoken, and, therefore, holy secrets”).

Because the required doctor-patient relationship exposes the patient totally to the scrutiny of the doctor in both body and thought, the author requires the swearer to become the guardian-protector of the patient in this sacred interpersonal relationship. The Oath of Hippocrates hereby establishes the inviolate right of professional secrecy, making this the foundation upon which the doctor–patient relationship can be built. Only within this inviolate environment can the doctor practice the art of medicine properly in helping the sick; and “to help the sick” remains the central promise and total purpose of this Oath of Hippocrates.

Part 4: Epilogue

ΟΡΚΩΝ ΜΕΝ ΟΥΝ ΜΟΙ ΤΟΝΔΕ ΕΠΙΤΕΛΕΑ ΠΟΙΕΩΝΤΙ ΚΑΙ ΜΗ ΞΥΤΕΩΝΤΙ ΕΙΗ ΕΠΙΑΥΡΑΣΘΑΙ ΚΑΙ ΒΙΟΥ ΚΑΙ ΤΕΧΝΗΣ ΔΟΣΑΖΟΜΕΝΩ ΠΑΡΑ ΠΑΣΙΝ ΑΝΘΡΩΠΟΙΣ ΕΣ ΤΟΝ ΑΙΕΙ ΧΡΟΝΟΝ ΠΑΡΑΒΑΙΝΟΝΤΛ ΒΕ ΚΑΙ ΕΠΙΟΡΚΟΥΝΤΙ ΤΑΝΑΝΤΙΑ ΤΟΥΤΕΩΝ

Now if I carry out this oath, and break it not, may I gain forever reputation among all men for my life and for my art; but if I transgress it and forswear myself, may the opposite befall me.

The conclusion of this Oath is in the classical tradition of Hippocrates’ day, naming the desired and expected reward for keeping the Oath and acknowledging the understood and accepted consequences for breaking it.

This reward, ΔΟΣΑΖΟΜΕΝΩ ΠΑΡΑ ΠΑΣΙΝ ΑΝΘΡΩΠΟΙΣ “esteem among all men,” is to be for both the swearer’s personal life and his professional life, ΚΑΙ ΒΙΟΥ ΚΑΙ ΤΕΧΝΗΣ “for my life and for my art.” No mention is made of wealth or of possessions in this altruistic request for the esteem of a good name. It is understood that the proper necessities and comforts of life accompany the gaining of a good name.

Stating this desired and expected reward the Oath ends with a thunderclap as the swearer declares, “but if I transgress it and forswear myself, ΤΑΝΑΝΤΙΑ ΤΟΥΤΕΩΝ” (ΤΑΝΑΝΤΙΑ “the opposite” ΤΟΥΤΕΩΝ “in the same way, just the same”). No specific consequence is named. The loss of a good name will impoverish indeed.

Comment

Now that I have lived the life of a doctor long enough to understand, I value those haunting learning experiences all doctors must endure in attaining professional equanimity in the face of the bitter intellectual and technical defeats that belong to our human condition. I realize, finally, how little security there is in momentarily correct scientific knowledge, and how dependent we are upon the bedrock on which our profession stands — our dedication to a life of helping the sick.

It was Hippocrates’ lofty dedication to this life of helping the sick, so eloquently stated in this Oath, that lifted the practice of medicine from a trade hawked in the marketplaces of antiquity or ceremony incanted in the temples of healing of that day to a scientific profession of nobility in servitude. Let us cherish and preserve it as such.

Acknowledgement

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