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Barriers to Birth Control

Why more women aren't using LARC

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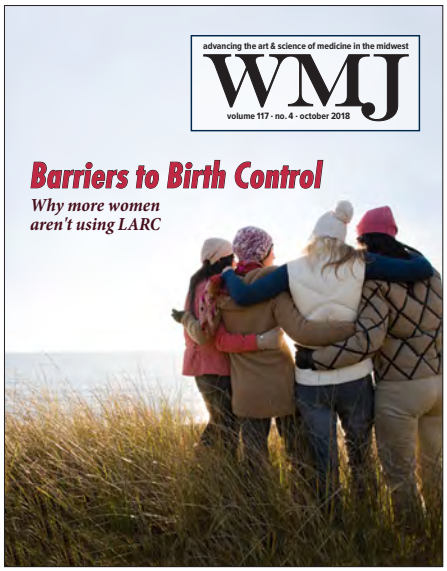

COVER THEME
Barriers to Birth Control: Why more women aren't using LARC

Long-acting reversible contraceptives are a highy effective, but perhaps underutilized, method of birth control. In this issue of *WMJ,* authors of 2 articles explore their history, efficacy and potential barriers to their widespread use.

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Thoughts on 'The Clinical Significance of Relative Bradycardia'

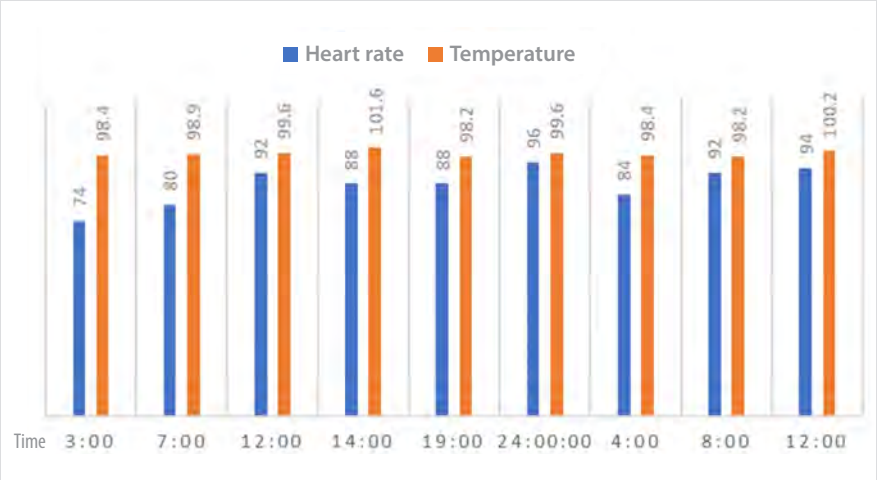
To the Editor:

We read with great pleasure the recent article published in your esteemed journal by Ye et al titled "The Clinical Significance of Relative Bradycardia".[1] We would like to congratulate the authors for the excellent case report and would like to share our similar experience of relative bradycardia in a patient with Coxsackie virus infection, which has not been reported by the authors or before.

A 21-year-old man with no significant past medical history presented to the Emergency Department with complaints of fever and lightheadedness for 2 days. He also had associated fatigue and generalized body aches and joint pains. On examination, he was comfortable and his vitals were normal. Systemic examination was unremarkable. He was found to have leukcopenia (white blood cell count = 3,900) and thrombocytopenia (platelet = 69,000). The biochemical panel was normal except for increased troponin from 0.182 to 0.462 and 0.525. His electrocardiogram showed biphasic T waves in V3 and V4. However, there was no shortening of the PR segment, ST elevation, or conduction block. Echocardiogram demonstrated normal left ventricular function without any valvular pathology. During his hospital stay, a pattern of relative bradycardia was noticed (Figure). He was asymptomatic with respect to his bradycardia. Etiological workup was positive for Coxsackie virus. Other etiological agents for acute febrile illness were negative. Lyme screen was negative. With conservative medical management, his symptoms improved, and he was discharged in a stable condition.

Authors of the article have done an excellent job identifying the different infectious agents that have been reported to cause relative bradycardia. However, we were surprised to find that Coxsackie virus has not been reported to cause the same. Coxsackie virus is a single-stranded RNA virus of the genus Enterovirus. It has protean clinical manifestations including acute hemorrhagic conjunctivitis, hand-foot-and-mouth disease, herpangina, myocarditis, and pleurodynia.[2]

Figure. Depiction of Heart Rate At Time of Fever



Even though the mechanisms proposed are diverse, we agree with the authors regarding the fact that the bedside recognition of pulse-temperature dissociation also known as Faget's sign, Liebermeister's rule, and relative bradycardia can become a significant tool in assisting the clinician with clinical clues into potential etiologies of disease, especially infectious diseases.[1,3]

Ajay Kumar Mishra, MD; Kamal Kant Sahu; Kranis Mark; Saint Vincent Hospital, Worcester, Mass.

Correspondence: Ajay Kumar Mishra, MD, Dept of Internal Medicine, Saint Vincent Hospital, Worcester, MA, 01608; phone 508.762.6692; email Ajay.Mishra@stvincenthospital.com.

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Essential Oils: Initiating a Resident Wellness Program at a Community Hospital

Peter J. Polewski, MD, MA

I had just switched my pager to "not available" after another pretty standard night shift—patient transfers, putting out cross-cover fires, and the occasional MRT/code. Walking home after my sign-out and ritual doughnut, the sugar rush did not lessen the dread of staring down 4 more weeks of this. There was no end in sight and I was exhausted.

It appeared that other residents felt the same way. Whether it was a complicated patient in clinic, the weight of administrative duties, or getting a "buzzer beating" admission, we were feeling chronically stressed and fatigued. Was there anything that would help us catch our breath?

Interest in resilience and physician burnout has increased and, with this added attention, intrinsic and extrinsic factors have been identified as moderators of the daily stresses of being a physician. Whereas extrinsic factors may be largely out of our control, intrinsic factors are more amenable to change.

As a resident, I shared my observations with my program director. I hoped we could develop an outlet for residents to discuss together what was on our minds. He was in full support and a dedicated meeting was scheduled. Outlook asked for a title. I named it "Essential Oils" or Internal Medicine Essential Oils (IMEO). Now I needed engagement from the other residents.

• • •

Author Affiliation: Gundersen Health System, La Crosse, Wis.

Corresponding Author: Peter J. Polewski, MD, MA; Fellow, Department of Hematology and Oncology, Gundersen Health System, La Crosse, WI 54601; phone 608.775.0847; email pjpolews@gundersenhealth.org.

It did not take long for my colleagues to figure out this was my brainchild. I can't say I relished informing them about the addition of yet another item to their agenda. They were thrilled with lunch being provided but glared at requests for openness, interaction, and reflection. Did I worsen stress and now alienate my peers when I was about to need them most? My role rapidly transitioned from friend to nuisance or perhaps even traitor.

At our first meeting, I was uncharacteristically prepared with 3 different presentations in case I had to pivot. The first was my defense: statistics on physician burnout, its common causes and trickle-down effects, and methods actively being employed to combat it. The others were humanities-based wildcards: one on the German physician and father of infographics, Fritz Kahn, and the other a brief (medical) history of Benjamin Rush. Gladly, I did not get to them.

The room was full. People were devouring Chinese food. There was a buzz. As I scanned the room, I was met with apprehensive eyes. Wellness question banks do not exist; no one could prepare. Then, during a lull in the conversation, IMEO began. I gave a brief background of why it is important for physicians to be well and attempted to diffuse any uneasiness. We agreed to make a set of rules for Essential Oils.

I went to the white board and wrote down the following:

- We will not actually be using essential oils.
- This is not intended to be psychotherapy.
- This is not intended to be more work for us.
- We do not have to meet during work hours.
- I do not want you to hate this.
- What happens here, stays here.

This is where it started. Three years later, this is where it remains. Of most importance to the residents was the last declaration. Having "colleague to colleague" confidentiality provided permission to be vulnerable with each other. Tears were shed, hugs were given, jokes were made, and food was eaten.

Personally, I did not hear anything from my fellow residents. But one could feel a sense of renewed support among many who attended. Having heard about this new meeting, staff colleagues asked to attend, and when asked for details, fellow residents said proudly, "What happens in oils, stays in oils." It was our time and it was special to us. Residents who were off would come in for the meeting. If they were unable to attend, they were disappointed. Each meeting naturally took on its own agenda and I never needed those original PowerPoints.

Of course, the complaining associated with being a resident and a physician remained. However, it was attenuated. Although we have not performed objective analyses, we have been successful in strengthening intrinsic factors that in turn have influenced the extrinsic factors and our working environment.

As evidenced by the advent of electronic medical records, work hour restrictions imposed by the Accreditation Council for Graduate Medical Education, and the financial burden of becoming a physician, change is inevitable. With change, we also must change the way we approach our profession from one of perceived endless sacrifice at the expense of the patient, to one of balanced wellness. As illustrated by the success of IMEO, healing the healer with intermittent, resident-led wellness programs can be accomplished at community hospitals. Based on our experience, this type of meeting is a definite win-win for residents and patients.

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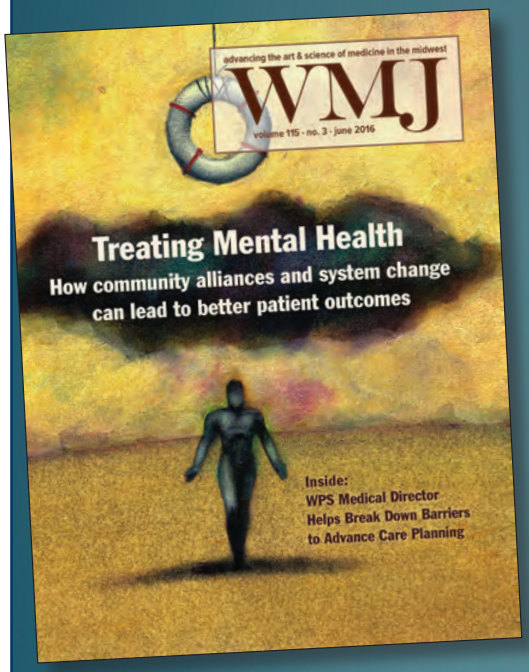

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Sixty Years After the Pill, Medicine Still Needs To Make Progress

John J. Frey III, MD, *WMJ* Medical Editor

Some of us remember the first years of availability for oral contraceptives. When Chang, Pincus, and Rock developed the oral contraceptive in 1959 and marketed it as Enovid in 1960, it changed everything for women, men, and families.[1] Since that time, choice of spacing of children and family size also has changed the world. According to the World Bank, birth rates worldwide are 50% of what they were in 1960, and smaller families have had a profound effect on economies in the developing world and on the educational attainment of women.[2] The story is well known and a remarkable measure of success in the 20th Century.

Intrauterine devices (IUD) were developed in the late 1960s and early 1970s and, along with barrier devices such as vaginal diaphragms and cervical caps, gave more options to women who, for various reasons, would not or could not use oral contraception. I learned to insert IUDs in the mid-1970s. While the first versions had real problems, they represented an advance in choice. With the advent of copper IUDs and progesterone-imbedded devices, both the long-term stability and the lessening of side effects made family planning a possibility for even more women.

When implantable hormonal subdermal agents came along as the next long-acting reversible contraceptives (LARC), there was promise that these agents would decrease unplanned pregnancies even more but, more importantly, would be used by women who had many other objections to what had been available, because LARCs did not require adherence to daily doses of medications.

In this issue of *WMJ*, a review of the biology and use of LARCs with explanations of different methods by Baron, Potter, and Schrager assesses issues of access, possible barriers, and insurance coverage with IUD and hormonal implants in Wisconsin.[3] Their review serves as an excellent primer for clinicians who need to understand the action of LARCs and some of the common misunderstandings about their use–timing and primary and secondary effects.

> ...birth rates worldwide are 50% of what they were in 1960, and smaller families have had a profound effect on economies in the developing world and on the educational attainment of women. The story is well known and a remarkable measure of success in the 20th century.

Olson and colleagues report on a survey they carried out in the state asking obstetrician-gynecologists, family physicians, and pediatricians about their training and comfort using LARCs with their patients.[4] While Ob-gyn clinicians, including midwives, are trained and use LARCs at a high level, pediatricians have low levels of training and use, and approximately 45% of family physicians are trained and use them. The barriers are those of training–family physicians generally do not get training in LARC provision, with the possible exception of IUDs. In all situations, clinicians have more comfort with IUD insertion than the hormonal implants, which might present problems if patients would prefer not using IUDs. While they found no difference between urban and rural clinicians, since family doctors are the primary source of contraceptive care in rural communities, that may create problems for women who would choose LARCs as their contraceptive choice. More training, more information, more skills, and more devices in stock are what is necessary to increase the use of these very effective methods of contraception. However, access to services is confounded by distance and availability of clinicians for rural women as well as insurance coverage and clinicians who will accept Medicaid for low-income women. Training by itself isn't enough.

Once in a while, journal editors come across an article that is not only informative about clinical medicine but also a delight to read. Waclawik writes about the history behind the syndrome of progressive areflexic paralysis, Guillain-Barré syndrome, which he argues might have been called Guillain-Barré-Strohl syndrome, and how its diagnosis has changed since its original description over 100 years ago while retaining the clinical picture that they so clearly described.[5] Ironically, with the Zika virus outbreak and the increase in Guillain-Barré syndrome as a consequence, it has been

in the news a great deal. It may be more clinically correct to not use eponyms for syndromes and diseases, but their persistence in clinical medicine is not only a rationale for dredging up long lost medical school notes but also are fun to use with younger physicians. So when someone inquiries about Guillain-Barré, refer them to Waclawik's article and enjoy.

Three case reports highlight issues to be aware of–as they always do if written well and include a review of the literature as part of the article. Riaz and Dolan describe a man whose diabetes worsened and was increasingly difficult to control and, when his physicians looked at his pancreas, was found to have pancreatic cancer.[6] The lesson is that we should consider other sources for difficult to control diabetes and in that differential, which we all memorized in residency, include pancreatic cancer.

The second case report, by Tak and colleagues, describes a possible familial link to Tako-tsubo cardiomyopathy–the broken heart syndrome.[7] As in so many clinical situations, a good family history can suggest approaches that may not have been thought of from a straight history and physical.

The third case from Marzlin and colleagues is one that describes an unusual clinical presentation in an elderly woman whose dyspnea increased and oxygen saturation decreased when she sat up or stood, with no evidence of increasing heart failure. She was diagnosed with platypnea-orthodeoxia syndrome from an atrial septal defect and recovered post closure. The clinical presentation was the key to the diagnosis—another reason to continue to emphasize physical diagnosis in medical education.[8]

Polewski describes how a resident-led group that, over 3 years, has produced a "colleague to colleague" confidentiality and provided permission to be vulnerable with each other.[9] "Tears were shed, hugs were given, jokes were made, and food was eaten," he writes. This strategy should be institutionalized in his own system and everywhere else. It is an antidote to the professional isolation and loneliness that has become a larger and larger part of professional life.[10]

Finally, Connelly and List describe a pilot program to teach residents about personal finances during and post residency.[11] I remember being asked at my first job what I wanted to do for retirement funds and knowing nothing about the value of various choices. I also have a colleague who loves to regale friends with "triple D stories"–or Dumb Doctor Deals about physicians being duped by shady investments. While one can only go so far in the prevention of stupidity, teaching young doctors how to think about their financial futures through basic education in financial planning seems like a good investment–pun intended.

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Health Care Barriers to Provision of Long-Acting Reversible Contraception in Wisconsin

Emily M. Olson, MD; Renee D. Kramer, MPH; Crystal Gibson, MPH; Cynthia K. Wautlet, MD, MPH; Nicholas B. Schmuhl, PhD; Deborah B. Ehrenthal, MD, MPH

ABSTRACT

Introduction: Long-acting reversible contraceptives (LARC), specifically implants and intrauterine devices (IUDs), are highly effective, low maintenance forms of birth control. Practice guidelines from the American College of Obstetricians and Gynecologists, American Academy of Family Physicians, and American Academy of Pediatrics recommend that LARC be considered first-line birth control for most women; however, uptake remains low. In this study, we sought to understand practices and barriers to provision of LARC in routine and immediate postpartum settings as they differ between specialties.

Methods: We surveyed 3,000 Wisconsin physicians and advanced-practice providers in obstetrics-gynecology/women's health (Ob-gyn), family medicine, pediatrics, and midwifery to assess practices and barriers (56.5% response rate). This analysis is comprised of contraceptive care providers (n=992); statistical significance was tested using chi-square and 2-sample proportions tests.

Results: More providers working Ob-gyn (94.3%) and midwifery (78.7%) were skilled providers of LARC methods than those in family medicine (42.5%) and pediatrics (6.6%) ($P < .0001$). Lack of insertion skill was the most-cited barrier to routine provision among family medicine (31.1%) and pediatric (72.1%) providers. Among prenatal/delivery providers, over 50% across all specialties reported lack of device availability on-site as a barrier to immediate postpartum LARC provision; organizational practices also were commonly reported barriers.

Conclusions: Gaps in routine and immediate postpartum LARC practice were strongly related to specialty, and providers' experience heightened barriers to immediate postpartum compared to routine insertion. Skills training targeting family medicine and pediatric providers would enable broader access to LARC. Organizational barriers to immediate postpartum LARC provision impact many providers.

INTRODUCTION

Reducing unintended pregnancy is a national public health priority. Planned and safely spaced pregnancies result in fewer preterm births,[1] higher educational and professional attainment for women and girls,[2] lower abortion rates,[2] and lower rates of maternal mortality.[3] Similar to national estimates, in 2010, 46% of pregnancies in Wisconsin were unintended at an estimated cost of $313.5 million.[4]

Long-acting reversible contraceptives (LARC), including intrauterine devices (IUD) and hormonal subdermal implants, are the most effective and lowest-maintenance forms of reversible birth control currently available.[5] Both patients and clinicians view these devices as highly acceptable contraceptive options,[6,7] and practice guidelines from leading physician groups[8-10] recommend that LARC be considered first-line birth control for most women; however, uptake remains low. High initial costs may be a barrier for some patients. A statewide initiative in Colorado that provided free contraceptives, including IUDs and implants, led to significant reductions in unintended teen pregnancies and abortions and dramatic cost savings to the health care system and social services.[2,11]

Strategies to increase access to LARC are essential. Prior studies identified knowledge gaps regarding patient eligibility for LARC[12,13] as well as practice differences at the provider level.[13,14] Known barriers to LARC provision include provider training[2,12,15] and inability to perform same-day insertion,[16] which together limit overall use. However, it is unclear how contraceptive care differs across specialties and among midlevel providers. For example, there is some evidence that advanced practice providers (APP) are less likely than physicians to insert LARC devices.[17] Given that APPs comprise a large portion of the women's health workforce, especially in underserved areas, it is important to understand their provision of contraceptives.

The immediate postpartum (IPP) period is an opportune time to provide these long-acting methods, increasing long-term cost effectiveness[11] and eliminating the need for a follow-up visit.[18] When compared to those using other reversible methods, women receiving

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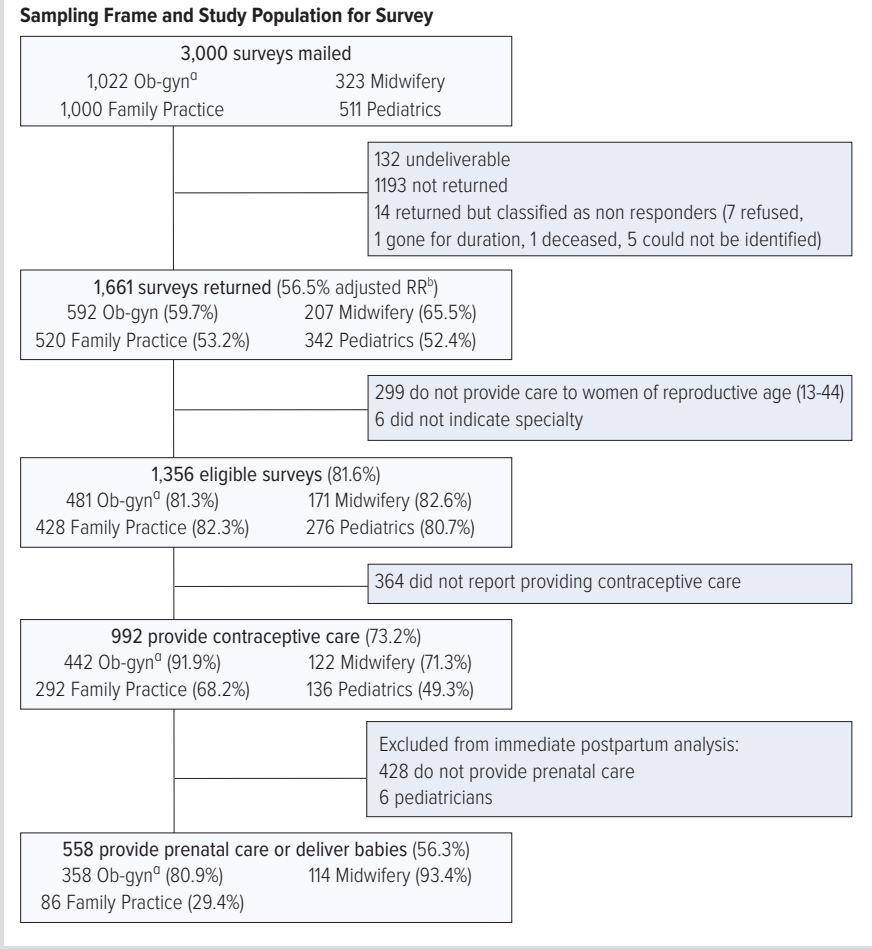
Author Affiliations: University of Wisconsin School of Medicine and Public Health (UWSMPH) (Olson); Department of Population Health, UWSMPH (Kramer); Wisconsin Department of Health Services (Gibson); Department of Obstetrics and Gynecology, UWSMPH (Anderson, Schmuhl, Ehrenthal), Madison, Wis.

Corresponding Author: Deborah Ehrenthal, MD, MPH, WARF Office Building Room 658, 610 Walnut St, Madison, WI 53726; phone 608.265.0559; fax 608.263.2820; email ehrenthal@wisc.edu.

Figure 1. Survey Flow Diagram



Abbreviations: Ob-gyn, obstetrics and gynecology; RR, risk ratio.
[a] Practicing in obstetrics and gynecology.
[b] Adjusted for the proportion of the unknown eligibility who are eligible.

LARC in the immediate postpartum period are more likely to have optimally spaced subsequent pregnancies.[19]

The purpose of this study was to understand contraceptive practices and barriers related to LARC methods in both the routine and immediate postpartum settings among physician and midlevel providers across practice specialties in Wisconsin.

METHODS

Setting and Design

We conducted a mailed survey of physicians, nurse practitioners, and midwives holding active licenses in Wisconsin in 2014. The study was reviewed by the University of Wisconsin-Madison Institutional Review Board and deemed exempt.

We obtained from the state's Department of Safety and Professional Services a list of providers with an active license to practice medicine or surgery who listed their specialty as obstetrics and gynecology (ob-gyn), family medicine, or pediatrics; APPs if they had an active license and listed their specialty as midwifery, ob-gyn/women's health, family medicine, or pediatrics. Physician assistants were not included. We included all providers who had a mailing address in Wisconsin or within 50 miles of the Wisconsin border (n = 7,750). ArcGIS 10.2 was used to geocode mailing addresses, and straight-line buffers were used to identify addresses meeting our 50-mile criteria.

The University of Wisconsin Survey Center (UWSC) mailed the survey to all ob-gyn (n = 1,002) and midwifery (n = 323) providers and sampled 21% in family medicine (n = 1,000) and 47% in pediatrics (n = 675) to achieve a total sample of 3,000. We sampled all ob-gyns and midwives given their high likelihood of providing services to women of reproductive age (13-44 years) and sampled providers in family medicine and pediatrics to ensure sufficient sample size for comparison across specialties. We used SAS 9.4 (SAS Institute Inc., Cary, NC) to select family medicine and pediatric providers via simple random sampling. In consultation with the UWSC, we developed an 8-page, written, self-administered survey. We adapted some questions from prior surveys,[20,21] piloted the survey, and modified questions based on iterative feedback. UWSC employed Dillman's Total Design Method[22] utilizing a 4-contact data collection design between September and October 2015. Initial mailing included a cover letter, survey, self-addressed stamped envelope, and $5 cash incentive. All providers received a postcard reminder 6 days later. Follow-up mailings occurred 4 and 7 weeks from the first mailing.

Our primary variable of interest was skilled insertion of the 3 LARC devices: levonorgestrel IUD (LNG-IUD), copper IUD (Cu-IUD), and hormonal implant. Providers who reported both personally inserting LARC and being "very" or "extremely" confident in insertion of a specific LARC method were classified as "skilled *[device]* inserters." Providers reporting that they "very often" refer patients to other clinicians for LARC insertion and/or "never" prescribe that LARC device were removed from the skilled inserters group for that device. This logic check thus excluded providers who were not inserting LARC regularly. If they were skilled inserters of *any* of the 3 devices, providers were considered skilled inserters of "any LARC."

Our secondary outcomes included provider report of same-day LARC insertion, frequency of LARC counseling, knowledge of medical eligibility guidelines, and provider- and systems-level barriers. Knowledge of guidelines was measured by asking respondents to assess the accuracy of commonly perceived contraindications, includ-

Table 1. Selected Personal and Practice Characteristics of Wisconsin Contraceptive Providers, by Specialty

	ob-gyn[a] (n=442)	Midwifery (n=122)	Family Medicine (n=292)	Pediatrics (n=136)	*P*-value[b]
Provider level					
Physician	343 (77.6%)	0 (0.0%)	187 (64.0%)	117 (86.0%)	<.0001
Advanced practice provider	99 (22.4%)	122 (100.0%)	105 (36.0%)	19 (14.0%)	
Sex					
Female	312 (70.6%)	120 (98.4%)	202 (69.2%)	120 (88.2%)	<.0001
Race/ethnicity					
Hispanic	13 (2.9%)	4 (3.3%)	6 (2.1%)	3 (2.2%)	.11
Non-Hispanic white	375 (84.8%)	110 (90.2%)	261 (89.4%)	112 (82.4%)	
Non-Hispanic black	11 (2.5%)	0 (0.0%)	3 (1.0%)	0 (0.0%)	
Non-Hispanic other[c]	33 (7.4%)	7 (5.7%)	15 (5.1%)	17 (12.5%)	
Earned license					
1994 or earlier	168 (38.0%)	18 (14.8%)	70 (24.0%)	36 (26.5%)	<.0001
1995-2004	126 (28.5%)	41 (33.6%)	81 (27.7%)	44 (32.3%)	
2005 or later	148 (33.5%)	63 (51.6%)	141 (48.3%)	56 (41.2%)	
Practice setting[d]					
Group/solo practice	297 (67.2%)	59 (48.4%)	183 (62.7%)	81 (59.6%)	.002
Hospital	122 (27.6%)	36 (29.5%)	32 (11.0%)	22 (16.2%)	<.0001
Academic	74 (16.7%)	19 (15.6%)	42 (14.4%)	31 (22.8%)	.18
Other[e]	89 (20.1%)	55 (45.1%)	83 (28.4%)	29 (21.3%)	<.0001
% Medicaid patients					
Up to half	245 (55.4%)	34 (27.9%)	185 (63.4%)	73 (53.7%)	<.0001
Half or more	194 (43.9%)	88 (72.1%)	107 (36.6%)	62 (45.6%)	
Urban/rural status[f]					
Large metro	156 (35.3%)	42 (34.4%)	79 (27.1%)	57 (41.9%)	.004
Small metro	203 (45.9%)	57 (46.7%)	122 (41.8%)	55 (40.4%)	
Micropolitan or rural	77 (17.4%)	20 (16.4%)	85 (29.1%)	22 (16.2%)	

Not all columns add up to 100%, due to missing values.

Abbreviations: ob-gyn, obstetrician-gynecologists.; APP, advanced practice providers.

[a]Ob-gyn, obstetrician-gynecologists and advanced practice providers in ob-gyn or women's health.

[b]From chi-square test of homogeneity.

[c]Includes Non-Hispanic Asian, Non-Hispanic American Indian/Alaska Native, Non-Hispanic Hawaiian/Pacific Islander, and Non-Hispanic "other."

[d]Percentages do not add up to 100% because this was a "check all that apply" item.

[e]Includes Planned Parenthood, other family planning clinics, health maintenance organizations/managed care, Federally Qualified Health Centers, and "other."

[f]Only accounts for the first of up to 2 counties listed (n=167 listed a second county of practice).

ing teenage patients (ages 13-19), nulliparous, nonmonogamous, postabortion, immediately postpartum or postplacental, breastfeeding, or history of ectopic pregnancy.[8,11]

Provider-level barriers assessed included lack of skill in insertion, lack of familiarity with insurance policies, cost of the device, challenges with reimbursement, and personal or religious beliefs. Systems-level barriers for both routine and IPP LARC included low patient interest, lack of eligible patients, lack of time available for counseling, and devices not available on site. Barriers unique to IPP LARC included group practice call schedule rotation, coordination of LARC services with delivery facility, delivery facility prohibition, and organizational policies related to IPP LARC.

Statistical Analysis

Most survey items used 5-point Likert-type response scales. Because exploratory analyses showed bimodally distributed data for the majority of items, we created dichotomous variables by collapsing responses ("Not at All/Never/None," "A Little/Rarely/Very Few," and "Somewhat/Sometimes/Some" = -1; "Very/Often/Quite a Bit/Many," and "Extremely/Very Often/A Great Deal/Most" = +1).

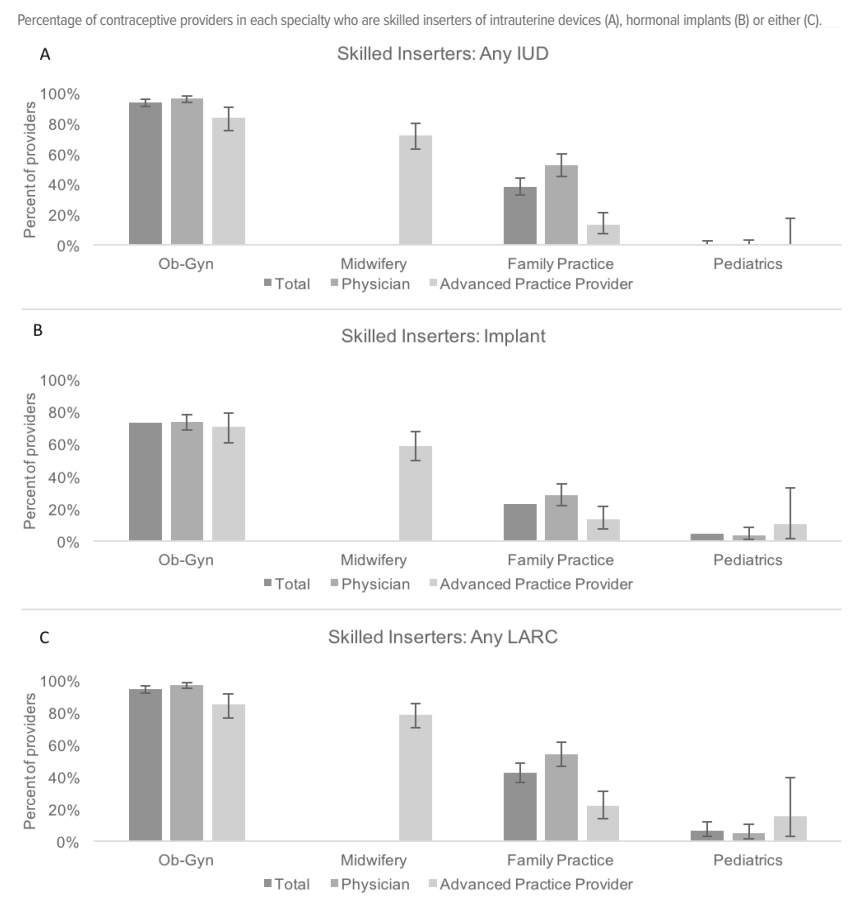
Given the large between-specialty differences in LARC provision, we stratified results by specialty. For relevant analyses, we also stratified within-specialty results by provider type comparing physicians and midwives. We used the National Center for Health Statistics classification system[23] to classify respondents as urban or rural, based on the county in which they indicated seeing the most patients.

We used chi-square tests and 2-sample tests of proportions to compare outcomes by provider specialty and considered *P*-values <.05 to be significant. All analyses were conducted using Stata SE software (version 14.1, StataCorp, College Station, Texas).

RESULTS

Of 3,000 mailed surveys, 1,661 surveys were returned and identifiable for an overall adjusted response rate of 56.5% (Figure 1). In this analysis, we include those who reported that they currently provide contraceptive services and indicated their specialty (n=992, 59.7%). Contraceptive providers included 442 working in ob-gyn, 122 in midwifery, 292 in family medicine, and 136 in pediatrics. For the analyses of practice related to IPP contraception, we include the

Figure 2. Proportion of Contraceptive Providers Surveyed, by and Within Specialty, Who Are Skilled Inserters of 1 or More LARC Methods



Providers who reported both personally inserting LARC and being "very" or "extremely" confident in insertion of a specific LARC method were classified as "skilled *[device]* inserters."
Error bars represent 95% confidence intervals.
Abbreviations: IUD=Intrauterine device. LARC=Long-acting reversible contraceptives.

56.3% (n=558) of contraceptive providers who also reported providing prenatal care and/or delivering babies within the past 12 months. Eighty-one percent (n=358) of those working in ob-gyn, 93.4% (n=114) in midwifery, and 29.4% (n=86) in family medicine met this criterion. The small number working in pediatrics (n=6) were excluded from the IPP analyses. Table 1 provides a description of survey respondents by practice area.

LARC Provision

Figure 2 shows the percentages of contraceptive providers identified as skilled in insertion by device and by provider type. Overall, 94.3% of providers in ob-gyn, 78.7% in midwifery, 42.5% in family medicine, and 6.6% in pediatrics are skilled inserters of at least one device. A greater proportion of physicians than APPs working in ob-gyn and family medicine were skilled at insertion of each ($P<.0001$). There were no significant differences by provider sex ($P=.12$), years since clinical training ($P=.37$), or urban-rural practice location ($P=.12$). Only 30.0% of pediatric providers who have been trained in LARC insertion report currently inserting a device, while the majority of providers in the other specialties do ($P<.001$).

More providers working in ob-gyn are skilled in the insertion of IUDs compared to implants ($P<.0001$); a greater proportion of those working in ob-gyn compared to midwifery are skilled IUD inserters ($P<.0001$). Thirty-eight percent of those working in family medicine and none in pediatrics were skilled IUD inserters and, similarly, were less likely to be skilled implant inserters when compared to those in ob-gyn ($P<.0001$).

There are marked differences by specialty in counseling practice. Ninety-eight percent in ob-gyn, 91.8% in midwifery, 82.5% in family medicine, and 53.7% in pediatrics reported that they discuss the LNG-IUD "often" or "very often" (all pairwise differences <.05). Similarly, more in ob-gyn (83.7%) and midwifery (82.0%) reported that they discuss the implant "often" or "very often," compared to those in family medicine (66.1%) and pediatrics (54.4%, all pairwise differences <.05). A greater proportion of providers in ob-gyn (73.5%) and midwifery (79.5%) reported that they discuss the Cu-IUD "often" or "very often" compared to those in family medicine (57.2%) and pediatrics (13.2%, all pairwise differences <.05).

When asked about providing same-day LARC insertion, responses vary by specialty: 74.7% in ob-gyn, 52.5% in midwifery, 29.1% in family medicine, and 14.0% in pediatrics (all pairwise differences $P<.001$) make same-day insertion available to their patients. Of providers who do not currently insert either IUDs or implants, 85.2% reported that they refer their patients to other clinicians "often" or "very often," with no differences by specialty ($P=.51$).

Eligibility Guideline Knowledge

We assessed knowledge of current patient eligibility guidelines by asking respondents to indicate whether selected patient characteristics were contraindications for LARC devices. As shown in Table 2, across specialties, one of the most common perceived contraindications was the immediate postpartum period, reported by 16.8% of those working in ob-gyn, 28.2% in midwifery, 36.5% in family medicine, and 38.3% in pediatrics. Many working in family medicine (33.7%), pediatrics (39.2%), and midwifery (35.9%) considered a history of ectopic pregnancy to be a contraindication, compared to 11.3% in ob-gyn. More than a quarter of providers in pediatrics (26.7%) saw women in the postabortion period as contraindicated for LARC, and

about a third of providers in family practice (30.5%) saw teens as contraindicated.

Table 2. Perceived Contraindications for Any LARC Among Wisconsin Providers Who Report Providing Contraceptive Care[a]

	Ob-gyn (n = 435)	Midwifery (n = 117)	Family Medicine (n = 282)	Pediatrics (n = 120)	*P*-value[b]
For teens or adolescents ages 13-19	12.0%	9.0%	30.5%	20.8%	< .0001
For nulliparous patients	5.3%	3.4%	12.8%	9.2%	.007
For nonmonogamous patients	13.3%	10.3%	20.2%	10.0%	.016
Following an abortion	3.7%	5.1%	18.4%	26.7%	< .0001
While breastfeeding	3.2%	7.7%	24.8%	17.5%	< .0001
For patients with a history of ectopic pregnancy	11.3%	35.9%	33.7%	39.2%	< .0001
Immediately postpartum/postplacental	16.8%	28.2%	36.5%	38.3%	< .0001

Abbreviations: LARC, Long-acting reversible contraceptive; Ob-gyn, includes obstetrician gynecologists and advanced practice providers working in Ob-gyn or women's health.
[a]Providers who answered zero LARC barriers (n = 38) were excluded from this analysis.
[b]Chi-square test of difference by specialty.

Table 3. Barriers Affecting Routine LARC Provision "Quite a Bit" or "a Great Deal," Among Wisconsin Providers Who Report Providing Contraceptive Care[a]

	Ob-gyn (n = 438)	Midwifery (n = 119)	Family Medicine (n = 277)	Pediatrics (n = 122)	*P*-value[b]
Lack of skill in insertion	1.8%	10.9%	31.1%	72.1%	<.0001
Lack of familiarity with insurance policies	2.5%	7.6%	9.4%	17.2%	<.0001
Cost of device	5.0%	14.3%	10.8%	10.7%	.002
Challenges with reimbursement	4.1%	16.0%	8.7%	10.7%	<.0001
Personal or religious beliefs	0.7%	3.4%	2.5%	3.3%	.08
Low patient interest	5.3%	10.1%	13.4%	27.1%	<.0001
Lack of eligible patients	3.4%	1.7%	7.9%	12.3%	<.0001
Lack of time for counseling	0.9%	0.8%	2.2%	9.0%	<.0001
Lack of time for procedure	0.9%	0.8%	4.3%	13.9%	<.0001
Devices not available on-site	4.8%	17.7%	12.3%	29.5%	<.0001
Separate visit required for insertion	3.0%	10.1%	9.8%	21.3%	<.0001

Abbreviations: LARC, Long-acting reversible contraceptive; Ob-gyn, includes obstetrician-gynecologists and advanced practice providers working in Ob-gyn or women's health.
[a]Providers who answered zero LARC barriers (n = 36) were excluded from this analysis.
[b]Chi-square test of difference by specialty.

Provider and Systems Barriers

As shown in Table 3, barriers differed by specialty and were most commonly reported by those working outside of ob-gyn practice settings. Lack of skill with insertion was cited most frequently by providers in pediatric settings (72.1%), followed by those in family medicine (31.1%) and midwifery (10.9%, all pairwise comparisons $P < .0001$). Challenges with reimbursement were cited by 10.7% in pediatrics; more in midwifery (16.0%) than in family medicine (8.7%) reported this barrier ($P = .03$). Fourteen percent of providers in midwifery, 10.8% in family medicine, and 10.7% in pediatrics reported that cost of devices was a barrier ($P = .002$). Lack of familiarity with insurance policies was cited by 17.2% of providers in pediatrics but by fewer than 10% of providers in other specialties. Personal or religious beliefs was cited by fewer than 5% in all specialties. Five percent or fewer of ob-gyn providers indicated that any provider-level barrier affected their LARC provision.

The lack of availability of devices on-site was reported by more providers in pediatrics (29.5%) than in midwifery (17.7%) or family medicine (12.3%; $P < .05$). Lack of patient interest was cited most frequently by providers in pediatrics (27.1%), followed by those in family medicine (13.4%) and midwifery (10.1%, $P < .001$). Several barriers were reported infrequently by providers in family medicine and midwifery, but commonly by those in pediatrics, including lack of eligible patients (12.3%), lack of time for procedure (13.9%), and requirement of a separate visit for insertion (21.3%). Lack of time for counseling was reported by 10% or fewer of all providers in each specialty area. Again, fewer than 5% of providers in ob-gyn settings indicated that any systems-level barrier affected LARC provision.

More than 80% of respondents indicated resources for patient education, and about half or more indicated provider education on counseling and an algorithm for counseling would help them counsel patients about LARC methods. Sixty-six percent of providers indicated that in-person continuing medical education would help enable their practice, but only 34.9% responded that having a nonphysician educator present in clinic would be helpful. Fewer in ob-gyn (34.0% and 20.7%, respectively) indicated that either of these resources would help them counsel about LARC ($P < .001$).

Unique IPP LARC Issues

A majority (95%) of prenatal/delivery providers reported that they discuss postpartum contraception during pregnancy or at delivery; only 12.4% reported specifically discussing IPP LARC, a proportion that did not differ by specialty ($P = 0.29$). Nine percent of prenatal/delivery providers reported discussing the LNG-IUD as a form of IPP contraception with "many" or "most" patients; 6.1% the Cu-IUD; and 11.1% the implant, with no differences by specialty for any device.

More prenatal/delivery providers in ob-gyn (81.4%) correctly indicated that the IPP period is not a contraindication to using any LARC, compared to those in family medicine (68.6%) and midwifery (68.8%, $P < .01$). A greater proportion of prenatal/

Table 4. Comparison of Barriers Affecting Routine and Immediate Postpartum LARC Provision "Quite a Bit" or "a Great Deal" Among Wisconsin Providers Who Report Providing Both Contraceptive Care and Prenatal Care or Obstetrical Delivery[a]

	Ob-gyn (n=358)			Family Medicine (n=86)			Midwifery (n=111)		
	Routine	IPP	*P*-value[b]	Routine	IPP	*P*-value[b]	Routine	IPP	*P*-value[b]
Barriers impacting both routine and IPP LARC									
Lack of skill in insertion	0.8%	13.8%	<.0001	8.1%	35.9%	<.0001	11.7%	34.2%	<.0001
Lack of familiarity with insurance policies	1.7%	10.6%	<.0001	3.5%	16.7%	<.0001	7.2%	22.5%	.001
Cost of device	3.4%	8.5%	<.0001	5.8%	7.7%	.63	14.4%	20.7%	.13
Challenges with reimbursement	3.1%	16.3%	<.0001	8.1%	9.0%	.85	16.2%	22.5%	.24
Personal or religious beliefs	0.6%	0.9%	.62	2.3%	1.3%	.62	3.6%	6.3%	.35
Low patient interest	3.9%	28.7%	<.0001	11.6%	16.7%	.35	10.8%	36.0%	<.0001
Lack of eligible patients	2.0%	9.4%	<.0001	3.5%	5.1%	.60	1.8%	6.3%	.09
Lack of time for counseling	0.6%	5.9%	<.0001	1.2%	5.1%	.14	.9%	2.7%	.31
Devices not available on-site	3.4%	52.5%	<.0001	7.0%	50.0%	<.0001	18.0%	59.5%	<.0001
Barriers unique to IPP LARC									
Group practice call schedule rotation	N/A	16.4%	N/A	N/A	3.9%	N/A	N/A	13.5%	N/A
Coordination of LARC services with delivery facility	N/A	37.8%	N/A	N/A	34.6%	N/A	N/A	46.0%	N/A
Delivery facility prohibition of LARC	N/A	31.4%	N/A	N/A	35.9%	N/A	N/A	27.0%	N/A
Policies in my organization or practice related to immediate postpartum LARC	N/A	23.8%	N/A	N/A	24.4%	N/A	N/A	30.6%	N/A

Abbreviations: IPP, immediate postpartum; LARC, long-acting reversible contraceptive; N/A, Not applicable.

[a]Providers who answered zero LARC barriers (n=3) were excluded from routine columns; providers who answered zero IPP LARC barriers (n=28) were excluded from IPP columns.

[b]Chi-square test of difference by LARC insertion period.

delivery providers in ob-gyn (96.6%) compared to midwifery (89.0%) and family medicine (81.4%) appropriately stated that these devices are not contraindicated while breastfeeding ($P<.01$).

Table 4 compares barriers reported by prenatal/delivery providers to routine versus IPP provision of LARC. Prenatal/delivery providers generally reported heightened barriers to providing IPP compared to routine LARC. In all 3 specialty groups, a significantly greater proportion reported lack of skill in IPP insertion (all $P<.0001$), devices not available onsite in the IPP period (all $P<.0001$), and lack of familiarity with IPP vs routine insurance policies (all $P<.01$). A significantly greater proportion of those working in ob-gyn reported issues regarding cost of devices, challenges with reimbursement, lack of eligible patients, and lack of time for counseling in the IPP period compared to in-routine practice (all $P<.0001$). Lack of skill with IPP insertion was a commonly cited barrier among those in family medicine (35.9%) and midwifery (34.2%). Over 20% of providers in midwifery reported barriers to IPP LARC related to low patient interest, lack of familiarity with insurance, cost of device, challenges with reimbursement, and policies in the group organization or practice related to LARC.

DISCUSSION

In this statewide survey of contraceptive providers in Wisconsin, we found significant differences between and within provider specialty groups, with providers in ob-gyn and midwifery practices more likely to be skilled at the insertion of IUDs and implants, when compared to providers in family medicine and pediatrics. We identified similar variation by specialty in counseling practices, same-day provision, and knowledge of eligibility guidelines.

In the routine setting, few working in ob-gyn practices indicated barriers to providing these methods. However, those in family medicine and pediatrics frequently reported a lack of skill and absence of devices on-site. These heightened barriers may be a reflection of scope of practice differences, with pediatric and family practice providers seeing a smaller volume of reproductive health issues compared to those in ob-gyn or midwifery.

More providers in our sample were skilled in placement of IUDs than implants, consistent with results from a study of rural family medicine and internal medicine physicians.[14] Similar to results from another study, family medicine and pediatric providers were less likely to recommend, provide, and feel comfortable inserting IUDs than those working in ob-gyn practices.[13] A greater proportion of physicians than APPs are skilled at inserting any LARC, similar to findings in a 2008 survey of family planning providers.[17] With the growing reliance on APPs for women's preventive care including contraceptive counseling, LARC training specific for APPs is needed.

We found that providers face important systems-level barriers to routine LARC provision, including devices not being available onsite. Tyler et al (2012) showed that providers without IUDs onsite had increased odds of misconceptions about IUD safety, suggesting that knowledge deficits may accompany systems barriers, both of which have tangible consequences for LARC provision.[12] In the present study, few in ob-gyn indicated substantial barriers, implying that LARC provision is strongly influenced by the clinical context. For example, the frequency with which providers insert LARC may influence barriers such as reimbursement or navigating insurance; however, this is an area for further research.

Despite indicating knowledge about immediate postpartum insertion, providers discuss IPP LARC fairly infrequently. This is

important because contraceptive discussions with a prenatal provider increase the likelihood of postpartum LARC use.[24] Known challenges associated with IPP LARC use, such as high IUD expulsion rates, could limit the enthusiasm of some providers.[11] Providers reported more barriers to the insertion in the postpartum period, including unique barriers such as facility policies. These findings support the importance of strategies developed by the "Learning Community" of the Association of State and Territorial Health Officials, which implemented policies in birthing facilities that sought to address several of the barriers identified in our study, including training, reimbursement, stocking, and supply.[25]

This study is limited in that it measures self-reported practices and not actual practice. Some questions (ie, insertion, same-day insertion) assessed LARC provision as a whole rather than by device, but in fact these practices may differ between IUDs and implants. Similarly, the survey does not specifically ask providers about their IPP LARC insertion practices, instead asking only if providers discuss IPP LARC as a contraceptive option. While we have a strong response rate, practices among nonrespondents may differ from those who did respond to the survey. Further, without knowing the reach of each specialty in their provision of contraception across the state, we cannot fully estimate the impact of these differences in practice on access at the population level.

Our findings suggest that strategies to support contraceptive recommendations from American College of Obstetricians and Gynecologists, American Academy of Family Physicians, and American Academy of Pediatrics should address both provider skill gaps as well as systems-related barriers in both the routine and obstetrical settings. In light of the myriad complex barriers to contraceptive access, addressing providers' challenges at the healthcare system level may be a feasible strategy for intervention. Education through continuing medical education could improve provider understanding of contraindications and guide discussions about LARC. Our study suggests that increasing training, especially among APPs and pediatric and family medicine providers, as well as revising health systems policies, are critical steps to improving women's broad access to these essential health services.

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A Review of Long-Acting Reversible Contraception Methods and Barriers to Their Use

Melyssa Baron; Beth Potter, MD; Sarina Schrager, MD, MS

ABSTRACT

Unplanned pregnancies are a serious health concern in Wisconsin. Increasing access to contraception is a proven method to reduce unplanned pregnancies while giving patients greater agency. Long-acting reversible contraception (LARC) methods, such as subdermal implants and intrauterine devices (IUD), are among the most effective contraception methods available and have high patient satisfaction. However, relatively few Wisconsin patients use these methods. Lack of provider skill in inserting and counseling about LARCs, inability to perform same-day LARC insertion, and absent hospital protocols for immediate postpartum insertion represent barriers to LARC access. Centralized efforts are required to remove these barriers so that all patients in Wisconsin can access highly effective contraception.

BACKGROUND

In 2011, 37% of all Wisconsin pregnancies were unplanned.[1] Patients with unplanned pregnancies are more likely to delay prenatal care, experience maternal depression, and face violence during pregnancy.[2] These pregnancies are more likely to end in abortion, while infants born are more likely to face health problems.[2] An unplanned pregnancy can reduce parents' educational attainment and earning potential.[2] Unplanned pregnancies also carry financial implications for families, hospital systems, and state entitlement programs.

Increasing access to all family planning methods is an effective and cost-efficient strategy to decrease unplanned pregnancies in Wisconsin. Long-acting reversible contraception (LARC) methods are among the most effective contraception methods. They prevent pregnancy for 3 to 10 years, independent of user action. In studies where women are provided no-cost contraception, 20% to 42% of women choose LARCs.[3,4] (Note that no studies have thus far investigated LARC use among transgender men or nonbinary patients.) Despite the data, only 4.4% to 5.7% of Wisconsin women enrolled in Medicaid currently use a LARC.[1] This low uptake is linked to several barriers preventing patients from receiving their contraception of choice.

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Author Affiliations: University of Wisconsin School of Medicine and Public Heath, Madison, Wis (Baron, Potter, Schrager).

Corresponding Author: Sarina Schrager, MD, MS, 1100 Delaplaine Court, Madison, WI 53715; phone 608.241.9020; email sbschrag@wisc.edu.

CME available. See page 159 for more information.

What Are LARCs?

LARC is a term used to describe contraceptive methods that are reversible but do not require any action by the user to be effective. There are 2 types of LARC available in the United States: etonogestrel single rod subdermal implants and intrauterine devices (IUD). There are 5 different IUDs available in the United States, 4 with progestin and 1 copper IUD.[5] (See Table) Both the implant and the IUDs require a visit with a trained clinician. Clinicians are trained to insert IUDs during residency training but have to complete an FDA-approved, industry-sponsored program in order to be certified to insert the contraceptive implant. Nurse practitioners and physician assistants also may be trained by their colleagues to insert LARC.

How Do LARCs Work?

The etonogestrel contraceptive implant (marketed as Nexplanon) releases a low level of progestin during the 3 years it is in place. This low level of progestin leads to thickened cervical mucus and suppression of ovulation.[5] The typical failure rate is 0.05%, which makes it one of the most effective contraceptive methods available. The implant is inserted in the upper, inner aspect of the nondominant arm with a procedure that takes less than 5 minutes. After insertion, the main side effect is changes in menstrual bleeding patterns. Patients may experience a variety of different bleeding patterns ranging from frequent spotting to amenorrhea. This low-dose progestin method does not confer many of the traditional side effects seen with other progestin-only methods such as weight gain and headache.[5]

There are 5 different IUDs available in the United States (Table). The Copper T-380 IUD is a nonhormonal method of contraception. The copper IUD's main mechanism of action is to prevent fertilization by impacting sperm migration and viability. It does not interfere with existing pregnancies.[5] It has a failure rate of 0.08%, which is comparable to the annual failure rate of a tubal ligation. The most common side effect of the copper IUD is increased menstrual bleeding and pelvic pain. There are no hormonal side effects. It can also be used as emergency contraception (preventing pregnancy) if inserted up to 5 days after unprotected intercourse.

There are 4 different hormonal IUDs, each with levonorgestrel (LNG). These IUDs prevent pregnancy by causing thickened cervical mucus (a progestin effect).[5] A secondary effect of the LNG-IUDs is that the progestin induces endometrial thinning and atrophy, which then causes decreased menstrual bleeding in many patients, usually after a period of irregular bleeding.[5] The LNG-IUDs do not interrupt an existing pregnancy.

New guidelines for IUD insertion provide broader recommendations. IUDs are appropriate for teenagers, patients who have not had children, and patients who have had a pelvic infection in the past.[5,6] Same day IUD insertions are acceptable if a reasonable exclusion of pregnancy is performed.[5,6]

Table. Types of Intrauterine Devices (IUD) Available in the United States[5]

IUD Name	Type of IUD	Brand Name	Comments
Copper T380A	Nonhormonal	Paraguard	FDA-approved for up to 10 years Effective emergency contraception
LNG-20 IUD	Hormonal	Mirena	Contains a total of 52mg of LNG Releases 20 mcg/day of LNG FDA-approved for up to 5 years
LNG-18.6	Hormonal	Liletta	Contains a total of 52mg of LNG Releases 18.6mcg/day of LNG FDA-approved for up to 4 years
LNG-19.5	Hormonal	Kyleena	Contains a total of 19.5 mg of LNG Releases 17.5 mcg/day of LNG FDA-approved for up to 5 years
LNG-13.5	Hormonal	Skyla	Contains a total of 13.5mg of LNG Releases 14 mcg/day of LNG FDA-approved for up to 3 years Smaller insertion device than other LNG-IUDs

Abbreviation: LNG, levonorgestrel.

DISCUSSION

Clinical Use of LARC

Both IUDs and the contraceptive implant should be routinely offered as contraceptive options to adolescent and nulliparous women. There is no evidence showing an increased risk of complications when using IUDs in this population.[5] No studies have demonstrated an increased risk of pelvic inflammatory disease or infertility in women using an IUD. Women who are at high risk for sexually transmitted infections can be tested for infection at the time of placement of the IUD and treated if the results are positive. As long as pregnancy can be reasonably excluded, an IUD or implant can be placed at any time during the menstrual cycle.[5] Women should be counseled to use backup contraception for the first 7 days after placement of implant or LNG-IUD. A copper IUD is effective immediately and no backup contraception is required.[6]

Barriers

Provider Education—Provider knowledge gaps about LARCs directly affect provision. Specialty matters, as 88% of providers working in obstetrics and gynecology nationwide report providing LARCs, compared with only 24% of those working in internal medicine or pediatrics.[7] Furthermore, 44.2% of family medicine practices report safety misperceptions surrounding LARCs, compared to only 14.7% of gynecology and obstetrics providers.[7] Providers who receive continuing education about LARCs have fewer safety misperceptions and are more likely to include LARCs in their practices.[7]

Some providers may believe that there are limitations in appropriateness of LARC usage. However, most expert panels agree that LARCs are suitable for nulliparous patients, teenagers, and patients with a history of ectopic pregnancy, sexually transmitted infections, abortion, depression, or obesity.[2]

Same-Day Insertion—Attending a health appointment requires patients to access transportation, find childcare, leave work, and pay a copayment. Allowing same-day LARC insertion eliminates the need for patients to make another costly appointment. However, several barriers prohibit same-day LARC insertion.

Stocking LARC devices is an oft-cited issue. When purchased from a wholesaler, LARCs cost $700 to $850 each.[2] Due to the costs, clinics may wait for patients to request a device before buying one from a pharmacy, ensuring reimbursement. This means the clinic will not have the device onsite when requested.

Lack of provider skill and education may also be a barrier. Providers who lack training in LARC insertion must refer patients to other providers, requiring their patients to schedule an additional appointment.

Lastly, some providers find that same-day insertion is not possible due to the time needed to conduct a pregnancy test. According to "Quick Start" insertion guidelines, there are many instances where a pregnancy test is not necessary, such as when a patient's last menstrual period was less than 7 days ago. In addition, a progestin IUD or implant can be quick-started if a patient has not had unprotected sex since their last menstrual period.[8]

Utilizing Existing Insurance Options—LARCs inserted immediately postpartum (IPP) can be safe and well-tolerated. Research shows that IPP LARC insertion has a high continuation rate,[9] improves optimal interpregnancy intervals,[10] and is cost-efficient.[11,12] However, due to previous "bundling" of Medicaid coverage for IPP LARCs with birth costs, hospitals were disincentivized to provide this service. Beginning January 2017, provision of LARCs IPP has been "unbundled" in

Wisconsin, allowing hospitals to bill Medicaid separately for the procedure and receive reimbursement for the costly devices.

Despite these changes, obstacles to IPP LARC insertion remain. For an IUD to be inserted immediately after placental delivery, the device must be readily available where the patient is giving birth. However, many Wisconsin hospitals have yet to adapt their stocking procedures, order sets, and pharmacy formularies to allow for IPP insertion. Lack of provider training in performing IUD insertion postpartum is an additional barrier nationwide.[13]

An underutilized insurance option that Wisconsin offers is the Family Planning Only Services Program. This program provides low-income patients who are at least 14 years old with no cost family planning-related services (such as LARC insertion). These services and their notices are confidential, minors can apply for them on their own, and patients can access them even if they already have health insurance.[14]

Ideological Concerns

Remembering past reproductive injustices is the first step to avoiding them in the future. Providers must know about the historical legacy of sterilization and forced contraceptive use against patients living in poverty, communities of color, and those with disabilities or mental illnesses.[15] Researchers and advocates encourage thoughtfulness when promoting LARC use. LARC promotion may lead to coercion and targeting of certain patients if a social justice framework is not in place.[15]

Some people may have personal reservations towards LARC use. The 2016 "Future of the Family Commission" of the Wisconsin Department of Children and Families acknowledges that LARC use may "carry moral considerations that are unacceptable to segments of the population".[16] While LARCs do not interfere with an implanted embryo, some patients and providers may oppose their use due to religious or personal beliefs.

Special Issues in Rural Patients—Patients living in rural Wisconsin may have different challenges than patients living in urban areas. Some research suggests that women of reproductive age who live in rural areas have less access to contraceptive care.[17] This access is likely related to shortages of women's health providers in rural areas as well as clinic-based barriers. One survey of 558 family planning clinics in 16 Midwestern and Great Plains states found that clinics in rural areas had less access (shorter hours, no evening or weekend hours), fewer providers trained in IUDs, and less administration of hormonal contraception.[18]

Potential Benefits

Removing barriers to LARC use gives patients and providers increased freedom when making decisions about family planning. In fact, when clinicians receive training in LARC insertion, billing policies, and counseling, patients report greater autonomy in choosing contraception.[19] Women also report high satisfaction with LARCs in comparison to short-acting methods.[4]

Programs in St. Louis and Colorado show that when barriers to LARC provision are removed, the unplanned pregnancy rate falls.[3,4] The Colorado Family Planning Initiative began with a private donor's investment in the state health department's family planning program. Health providers received training in LARCs, family planning clinics received financial support, and low-income patients were able to receive their choice of contraception for little to no cost. Since the initiative began, births to women without a high school education fell 38%.[3] For young patients, fewer unplanned pregnancies means greater education and career stability before childbirth.[3] Rapid repeat births declined by 12% among all women in the state. Fewer unplanned pregnancies increase the health of patients and their children, allowing for healthy birth spacing while decreasing low birth weight and high-risk births.[3] Lastly, abortion rates were reduced by 49.7% among women in Colorado aged 15 to 24 between 2009 and 2014.[3]

In St. Louis, the Contraceptive CHOICE project enrolled over 10,000 women to participate in a study where they would receive the contraception method of their choice. When counseled, over 75% of women chose a LARC method.[4] LARC-using patients in St. Louis were 20 times less likely to get pregnant than those using short-acting methods.[4]

Finally, increasing LARC access is cost-effective for patients, hospital systems, and entitlement programs. Once used for 2.1 years, LARCs are cost-saving for patients in comparison to short-acting methods.[20] Models have shown that providing LARCs IPP is cost-saving for health care systems, saving $1,263 per patient in one estimate.[8,9] The Colorado Family Planning Initiative avoided millions of dollars in costs to state entitlement programs such as Medicaid, Temporary Assistance for Needy Families, Supplemental Nutrition Assistance Program, and the Special Supplemental Nutrition Program for Women, Infants, and Children between 2010 and 2014.[3]

Current Efforts in Wisconsin and Beyond

A handful of programs in Wisconsin increase patient access to LARCs. The Ryan Residency Training Program at Meriter Hospital in Madison provides free IPP LARCs to low-income women. The Collaborative Improvement and Innovative Network (CoIIN) to Reduce Infant Mortality has partners throughout Wisconsin working to improve the reproductive health content of postpartum visits and adolescent well checks. Wisconsin Contraceptive Access Network (CAN) is a fledgling initiative seeking to eliminate barriers to contraception via health care quality improvement, stakeholder engagement, and policy advocacy.

These efforts are important, but they are not sufficient to eliminate barriers to LARC access in Wisconsin. Other states have seen success with more centralized programs, such as the Colorado Family Planning Initiative described above. One new example of such a program is Delaware, where the state has reallocated funding from its public health budget (alongside significant private funding) to partner with a nonprofit called Upstream USA. The program will train health care providers and billing staff so that all patients in major health care centers will be asked about their pregnancy plans and provided no- to

low-cost birth control if desired.[21] If the initiative leads to a decrease in Medicaid spending and unplanned pregnancy rates, it may prove viable for application in other states such as Wisconsin.

There are also nationwide efforts to improve LARC access, such as the ASTHO Increasing Access to Contraception Learning Community. This initiative teaches strategies and best practices so states can implement policies and programs that increase access to all contraceptive methods. Twenty-seven states, including Iowa and Illinois, are partnered with ASTHO; Wisconsin currently is not one of them.[22]

CONCLUSION

Improving access to LARCs is a cost-effective way to increase patient satisfaction and agency while reducing unplanned pregnancies. With the new low-cost IUD recently on the market (brand name Liletta), clinics may be able to keep more IUDs in stock in the future, making same-day insertion more feasible. Increasing provider education so that providers know which patients can be provided with LARCs, how to insert LARCs, and when contraception can be given via "Quick Start" will decrease the need for patients to schedule additional appointments. Adapting stocking procedures, order sets, and pharmacy formularies to match current Medicaid policies surrounding IPP LARC insurance will allow more patients to receive LARCs immediately postpartum. Improving health care staff awareness of the Family Planning Only Services Program can increase the program's utilization so that more Wisconsin patients have access to insurance providing no-cost LARCs. Lastly, health care providers can advocate for Wisconsin's participation in more centralized efforts to improve LARC access, looking to programs such as the Colorado Family Planning Initiative, Delaware CAN, and the ASTHO Increasing Access to Contraception Learning Community as examples. Through knowledge, awareness, and advocacy, more Wisconsin patients will be able to access their contraception of choice.

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The Legacy of the Seminal Publication by Guillain, Barré, and Strohl: The History Behind the Eponym

Andrew J. Waclawik, MD

ABSTRACT

The report, "On a syndrome of radiculoneuritis with hyperalbuminosis of the cerebrospinal fluid without a cellular reaction. Remarks on the clinical characteristics and tracings of the tendon reflexes," published in 1916, included superb longitudinal clinical observations of progressive areflexic paralysis in 2 French soldiers, unique laboratory findings from the still new at that time technique of lumbar puncture, and electrophysiological studies. The classic observation of the albumino-cytologic dissociation in the spinal fluid, even over 100 years later, is still one of the most important laboratory findings used by clinicians to confirm the suspected diagnosis of the Acute Inflammatory Demyelinating Polyneuropathy, typically eponymously referred to as Guillain Barré Syndrome (GBS). The contribution of André Strohl, who reported the electrophysiological abnormalities observed in their patients with novel myographic studies of tendon reflexes, led to eventual widespread use of electrodiagnostic techniques in bedside diagnosis of neuromuscular conditions. Since 1916, the clinicopathological spectrum of GBS has expanded continuously, with better understanding of the etiology, pathology, and electrodiagnostic findings. However, most of the seminal observations and conclusions presented by Guillain, Barré, and Strohl have withstood the test of time. Their landmark publication has become a standard of excellence in the history of clinical neurology. Deservedly, "GBS" is one of the most recognized medical eponyms around the world.

INTRODUCTION

In 2016 we observed the 100th anniversary of the seminal publication by Georges Guillain, Jean-Alexandre Barré, and André Strohl, which led to a definition of one of the most recognized clinical syndromes in the history of neurology.[1,2] Their report included superb longitudinal clinical observations of progressive areflexic paralysis in 2 patients, unique laboratory findings from lumbar puncture, and electrophysiological observations with a novel myographic study of tendon reflexes.

Of the 3 authors, two were neurologists (Guillain and Barré).[3,4] During World War I, Guillain was director of the Neurological Services for the Sixth French Army. After the war, he was appointed Professor of Diseases of the Nervous System and held the position of the Charcot Chair at the Salpêtrière Hospital in Paris between 1923 and 1948. He was a prolific writer and lecturer, and made many contributions to clinical neurology; however, despite his significant body of work, with multiple publications on various neurological topics, his legacy has been defined by the work on a syndrome described in the 1916 publication.

Barré did part of his neurological training with Joseph Babinski. During World War I, he worked with Guillain in the Sixth French Army neurological unit. He authored and coauthored several hundred papers and was a professor of neurology in Strassbourg.[3]

Strohl (Figure 1) was the youngest of the 3 authors. During World War I, among other medical duties, he performed radiological exams. He typically is credited for performing the myographic studies of tendon reflexes, one of the hallmarks of the 1916 paper. Unfortunately, he was later not given the appropriate credit for his work, and the classic eponym does not include his name. Nevertheless, after World War I he had a very successful medical career. He was interested in physiology and was professor of physiological medicine in Algiers and later in Paris. At the very young age of 35, he was elected to the Académie de Médecine.[5,6]

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Author Affiliations: Department of Neurology, University of Wisconsin School of Medicine and Public Health, Madison, Wis (Waclawik).

Corresponding Author: Andrew J. Waclawik, MD, Department of Neurology, University of Wisconsin School of Medicine and Public Health, 7136, 7th Floor, MFCB, 1685 Highland Ave, Madison, WI 53705; phone 608.263.7539; fax 608.263.0412; email waclawik@neurology.wisc.edu.

REVIEW AND DISCUSSION

The 1916 article was not the first report of progressive areflexic paralysis in the medical literature. Spreading paralyses had been observed and reported for many years prior.[7,8] The most frequently quoted is the classic report of ascending paralysis by Landry in 1859.[9,10] The case of a 43-year-old patient, from the first part of Landry's report, was very well documented by detailed longitudinal observations and examinations. Any physician practicing today would have no difficulty recognizing many of the characteristic features of what we now refer to as a Guillain-Barré syndrome (GBS). Guillain had difficulty accepting Landry's index case—and other similar cases—as representing the same syndrome he and his colleagues reported in 1916. He made several arguments in speeches and subsequent publications on the differences between his classic observations and case reports by other authors.[11,12] One of the major differences Guillain pointed out was that the prognosis in the syndrome he described was typically good, whereas Landry's index patient had died. However, Landry's case report was very valuable because it also provided autopsy findings showing, most importantly, that the spinal cord was not affected. One can only speculate that the prestige of having an eponym linked exclusively to his own publication is what drove Guillain to dismiss not only Landry's report, but also many other similar cases reported prior to 1916, as belonging to the same syndrome he described. Nevertheless, to this day some neurologists refer to cases of areflexic paralysis caused by polyradiculoneuritis as a Landry-Guillain-Barré-Strohl syndrome.[7]

Why was the 1916 publication so important, and why has it had such a widespread impact on the practice of clinical neurology? There are 3 major elements that make that publication such a classic. First, it is an excellent demonstration of diligent clinical neurological examination, performed in a longitudinal fashion, allowing neuroanatomical localization of the neurological deficit within the peripheral nervous system. Second, the clinical investigations incorporated the still new at that time technique of lumbar puncture (introduced by Quincke in 1891)[13] into the diagnostic process, which led to the discovery of the characteristic cerebrospinal fluid (CSF) abnormalities. Third, the authors introduced a novel study of tendon reflexes with a myographic method, which improved the understanding of the underlying neuropathophysiology of the paralysis and complemented the clinical exam. That work eventually led to recognition of the clinical utility of electrodiagnositc techniques in evaluation of patients with neuromuscular diseases.

The authors' clinical excellence is evident from reading the diligent, thorough description of findings from longitudinal neurological examinations of their patients. By 1916, the bedside techniques of comprehensive neurological examination were well established.[14] Trained neurologists had a good understanding of neuroanatomy, and usually, with a high degree of confidence, were able to recognize upper motor versus lower motor neuron causes of weakness. The two cases described in the 1916 publication were French soldiers, infantry men, age 25 and 35. The clinical presentation was strikingly similar in both patients and can be summarized by the following: (1) progressive weakness of all limbs, initially starting with difficulty marching, affecting the distal muscle more than proximal; (2) loss of tendon reflexes; (3) preservation of cutaneous reflexes; (4) paresthesia; (5) some mild objective sensory loss; (6) severe muscle tenderness on palpation; (7) no sphincter incontinence; and 8) good recovery.

Figure 1. Dr. André Strohl

Portrait of Professor André Strohl by L. De Fleurac. Published in 1928 in Chanteclair. Collection of the Bibliothèque interuniversitaire de Santé. From reference 5. Public domain.

It is not clear why the authors decided to perform the lumbar puncture on their 2 patients. It is probable that they wanted to rule out any possible infectious process, including polio. Or perhaps they were merely tempted to utilize a novel, exciting diagnostic tool that could possibly provide some additional information about the etiology of the neurological syndrome they observed. Whatever their rationale, their observation of the albumino-cytologic dissociation (ACD) has been one of the all-time most important findings in the diagnosis of GBS. The authors wrote in their paper that the same spinal fluid abnormality had been previously observed in cases of cord compression, Pott's disease, and neurosyphilis. However, they accurately claimed that it had previously never been reported in cases of pure radiculitis or polyneuritis. A century later, the ACD is still one of the most important laboratory findings in evaluation of patients with suspected GBS. Of course, in clinically typical cases today, an expert clinician would never rule out the GBS diagnosis based on the normal CSF protein content, which may vary over the

Figure 2. The Myographic Curve

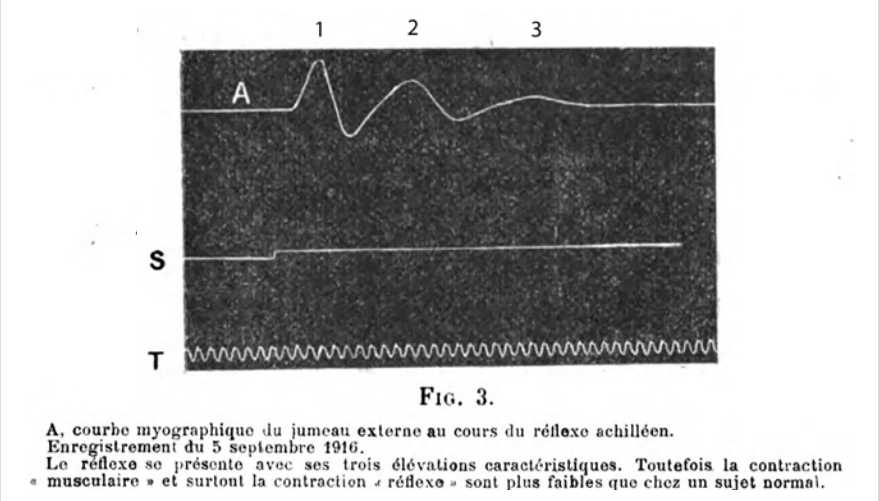

FIG. 3.

A, courbe myographique du jumeau externe au cours du réflexe achilléen. Enregistrement du 5 septembre 1916. Le réflexe se présente avec ses trois élévations caractéristiques. Toutefois la contraction « musculaire » et surtout la contraction « réflexe » sont plus faibles que chez un sujet normal.

One of the 3 figures from the 1916 paper. The myographic curve was recorded from the lateral gastrocnemius muscle after percussion of the Achilles tendon. The figure shows 3 characteristic elevations which, according to the authors, represented: (1) mechanical jerk caused by impact of the percussion hammer, (2) "muscular" (idiomuscular) contraction, and (3) the "reflex" muscle contraction with the longest latency. The authors commented that the registered "muscular" and especially the "reflex" contractions were very weak compared to a normal subject. From reference 1 (numbers indicating specific elevations of the myographic curve were added by the author).

course of the disease and, even in classic cases, the ACD may not be observed.[15] On the other hand, the finding of the characteristic CSF abnormalities is very reassuring for a clinician evaluating a patient with suspected GBS. Guillain himself insisted that the very high CSF protein is almost a sine qua non diagnostic finding in GBS and had reservations in recognizing many of the reported cases where the CSF protein was not markedly elevated.[11]

There has been some misunderstanding about the type of electrophysiologic studies that were conducted and described in the 1916 paper. The authors reported that the excitability of different muscles and nerves to galvanic and faradic stimulations was mostly preserved, although some responses were attenuated and some muscles and nerve trunks were slightly hyperexcitable. Those techniques were not novel and already had been in use by physicians in the second half of the 19th century, even without good understanding of the underlying neurophysiological phenomena.[16] However, the novelty of the 1916 report was the original report on the myographic method to study the abnormalities of tendon reflexes in the course of the disease in the first of the 2 described patients. The authors mention that the timing of the muscle tendon excitation was registered with the help of the apparatus referred to as a "signal de Desprez".[17] They recorded the latencies from the moment of tendon percussion to the onset of muscle contraction. They indicated that typically (in normal subjects) 3 different elevations were observed in the myographic curves, corresponding to: (1) mechanical jerk, (2) "muscle" (likely idiomuscular) contraction, and (3) "reflex" contraction (Figure 2). They observed that the latencies of the "reflex" muscle contraction waves were markedly delayed or nonrecordable at different stages of the disease and later the responses reoccurred, correlating with clinical improvement. The registered "muscle" (idiomuscular) contractions also were attenuated and delayed but were better preserved than the "reflex" muscle contractions. The findings from the myographic study of the tendon reflexes led the authors to conclude that the likely pathophysiology was related to the disruption of the central part of the reflex arc. The role of myelin in nerve physiology, and its importance for saltatory nerve conduction, was still unknown in 1916.[18] Electrophysiological studies over the next decades clearly demonstrated that the primary pathology in most cases of GBS is nerve demyelination, frequently associated with early loss of tendon reflexes. The pioneering myographic study reported in 1916 heralded future incorporation of modern electrophysiological tests to evaluations of patients with suspected GBS and other neuromuscular conditions. The authors rightly recognized the importance of the myographic technique as complementing the clinical exam.

Despite Strohl's major contributions to the 1916 report, his name eventually was dropped from the eponym. Draganesco and Claudian usually have been credited for introducing the eponym of the Guillain-Barré syndrome, dropping Strohl's name in 1927.[19] There are several possible explanations for the omission of Strohl's name from the eponym. Strohl was not a neurologist and was very young at the time of the 1916 publication, thus likely not respected by the contemporary neurologists. Also, it seems that Guillain himself, in his multiple public speeches and subsequent articles, did not consistently mention Strohl's name when referring to their work.[4,7] There was also speculation that there might have been some political reason for not giving Strohl the credit he deserved. Strohl not only had a German last name, but was born in Alsace, a heavily German province in France, suggesting that he may have been a victim of anti-German sentiments after World War I.[20] One might also presume that the eponyms with 3 names are not "user friendly" because they are simply too long.

Our understanding and definition of the GBS has evolved since the initial description in 1916, representing its expanding clinicopathological spectrum.[21] There is an ongoing dispute over how broadly the spectrum of the GBS can be expanded before the eponym could lose its meaning and nosological specificity. Should it be reserved to cases with predominantly demyelinating pathology? Should terms such as "pure sensory" or "autonomic" variants of GBS be used? There will always be splitters and lumpers, and the controversy will continue.

The seminal observations and most of the conclusions presented by Guillain, Barré, and Strohl have withstood the test of time. Their publication has become a landmark and standard of excellence in the history of clinical neurology. Deservedly, "GBS" is one of the most recognized medical eponyms around the world.

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The Effect of Understanding Issues of Personal Finance on the Well-being of Physicians in Training

Peter Connelly, MD; Cassandra List, MD

ABSTRACT

Background: This study assessed trends in personal financial issues among physical medicine and rehabilitation resident physicians and their impact on resident well-being.

Methods: A 25-question cross-sectional survey was sent to 18 physical medicine and rehabilitation residents.

Results: A total of 17 residents completed the survey (94% response rate), with 82% (14 of 17) endorsing personal finances as a contributor to their personal health. Residents also endorsed minimal previous financial education and an interest in more formal education on related topics.

Discussion: This study revealed personal financial issues are a factor in resident well-being and garner high levels of interest. Despite this, residents have received little financial education. These results have motivated us to address this deficit in our education program.

BACKGROUND

Completing medical education in the current socioeconomic climate is both intellectually and financially challenging. Medical students invest significant time and money in their education.[1] Though potentially rewarding long-term, this investment is often met with financial insecurity during the years of graduate medical education and early independent practice.[2]

Indeed, many studies reveal the average educational debt burden among medical school graduates has grown significantly in the last 2 decades.[3] Recent studies indicate that 83% of medical school graduates have greater than $100,000 in educational debt, with 48% possessing greater than $200,000 in educational debt.[1] This, among other factors, commonly causes resident physicians' personal finances to be characterized by negative net worth, low home equity, and minimal retirement savings.[4] These financial factors are potentially compounded by poor personal financial literacy among resident physicians.[5] Consequently, many young physicians are vulnerable to financial mismanagement in the early stages of their careers, which can have devastating effects on their short- and long-term financial and psychosocial health.[5,6]

This pilot study of trainees in a Physical Medicine and Rehabilitation program sought to identify trends in personal financial issues, the impact of personal financial literacy on trainee health and well-being, and to what degree trainees are interested in acquiring formal financial education.

METHODS

A cross-sectional survey using a 5-point Likert rating scale was distributed to 18 physical medicine and rehabilitation residents at a single institution. Prior to distribution, the survey was reviewed by an independent biostatistician and nonteam member physicians to ensure clarity of questions and statistical integrity. The majority of questions rated their agreement/disagreement with a variety of statements that probed the effects of personal financial issues on psychosocial health, confidence in basic financial literacy, and the level of interest in formal education on personal financial topics. Residents were asked their level of post graduate year (PGY) training (PGY II, III, IV) and sex.

Our primary outcomes of interest were to determine the percentage of respondents who considered personal financial issues to be an influence on their psychosocial health, confidence in topics of personal finance, previous financial education, and the degree to which they were interested in formal financial education.

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Author Affiliations: Medical College of Wisconsin (Connelly); Zablocki VA Medical Center, (Connelly); Medical College of Wisconsin Affiliated Hospitals (List); Milwaukee, Wis.

Corresponding Author: Peter Connelly, MD, Assistant Professor of Physical Medicine and Rehabilitation, Medical College of Wisconsin, 9200 W Wisconsin Ave, Milwaukee, WI 53226; phone 630.215.7346; fax 414.955.0104; email pconnelly@mcw.edu.

We also explored secondary topics including burdens of educational debt and personal financial planning habits.

Respondents were contacted via email and electronic educational portal Desire 2 Learn (D2L) hosted by the authors and an educational coordinator blind to the study objectives. A follow-up email was sent 3 weeks later to encourage completion of the survey. Responses were collected in September 2017. There were no exclusion criteria. The participants were assured that all survey responses were anonymous.

The Institutional Review Board at the Medical College of Wisconsin approved the study as low-risk, exempt. Statistical analyses were performed using Microsoft Excel 2016.

Figure 1. Impact of Personal Finances on Personal Health

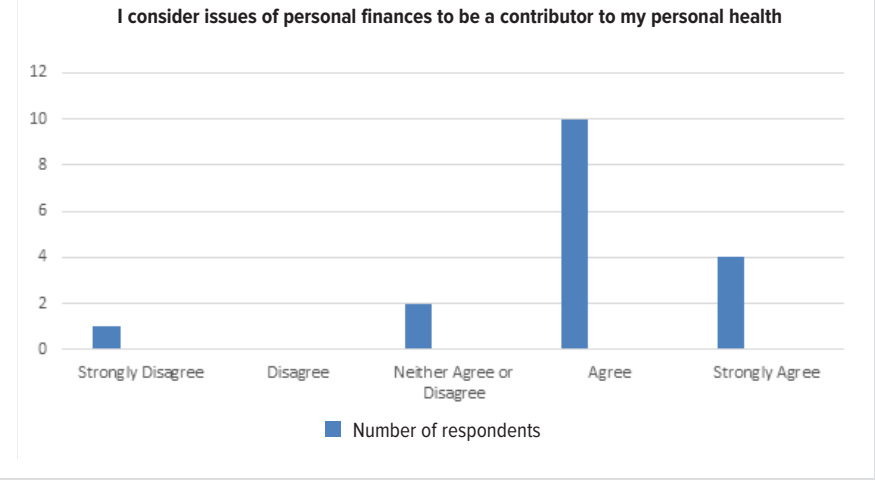
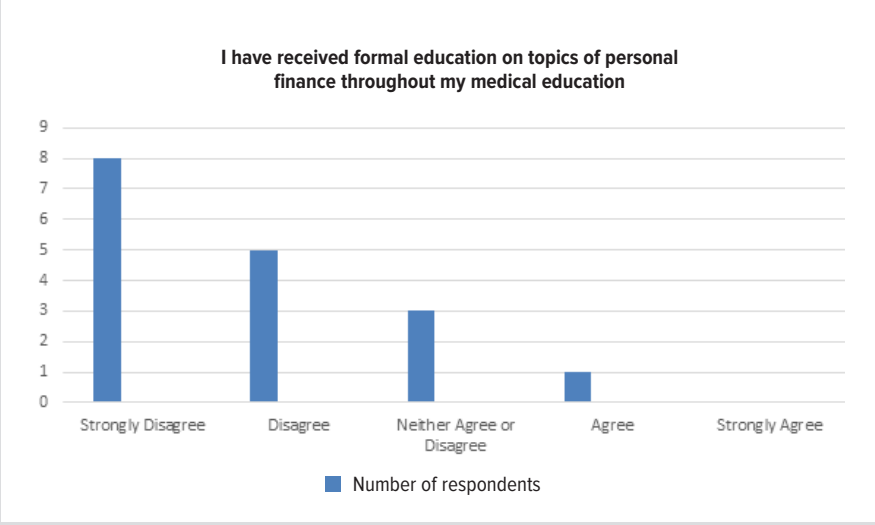


Figure 2. Background in Financial Education



RESULTS

The response rate was 94%, with 17 residents submitting a completed survey. The respondents by PGY year were 29% PGYII, 35% PGYIII, and 35% PGYIV. Additional respondent characteristics, survey questions, and responses are available in the Appendix (available at https://www.wisconsinmedicalsociety.org/_WMS/publications/wmj/pdf/117/4/Appendix%20-%20Survey%20Questions%20and%20Respondent%20Characteristics_Connelly.pdf).

An overwhelming majority of respondents (n = 14, 82%) considered personal finance issues to be a contributor to their personal health (Figure 1). Of those residents, 76% reported low levels of previous formal financial education (n = 13/17) (Figure 2), 92% stated they possessed low levels of confidence in financial management abilities (n = 13/14), 86% preferred more formal education on topics of personal finances (n = 12/14), 93% stated they were poorly prepared for independent financial management (n = 13/14), and 78% indicated high levels of educational debt burden, defined as greater than $100,000 (n = 11/14).

The survey also revealed the following: 59% (n = 10) of respondents identified themselves as primarily responsible for their household finances, 76% (n = 13) considered participating in a resident financial literacy course a reasonable activity, 29% (n = 5) used the services of a professional financial planner, 0% (n = 0) identified financial industry professionals as their primary source of financial information, 71% (n = 12) identified peers as their primary source of financial information, 35% (n = 6) identified having clearly defined financial goals, and 59% (n = 10) reported directing 10% or less of their monthly income toward any type of savings.

DISCUSSION

This pilot study reveals that an overwhelming majority of the residents surveyed endorse issues in personal finances as contributors to their personal health and well-being. This is concerning considering recently published data documenting low levels of financial literacy among medical trainees.[7] The negative influence of inadequately managed personal finances among medical trainees is likely exacerbated by the paucity of financial education among medical education programs.

At present, academic medical institutions appear not to per-

ceive financial literacy as a core educational mission.[8] Based on our findings, we conclude that the financial competency of medical trainees is of critical importance to the personal health of future physicians, the profession at large, and ultimately the patients receiving care from these physicians. This is particularly true given the ongoing changes in physician practice arrangements, including the decline of self-employed physicians and falling reimbursement rates. In the current environment, it is incumbent upon medical education institutions to improve the financial literacy of their graduates.

These findings are impacted by some key limitations. Specifically, the small cohort and the single-site, single-program nature of the survey limits its generalizability. While the survey response rate was high (94%), indicating enthusiasm for the topic, the voluntary nature of the survey raises the possibility of selection bias. Finally, the self-reporting aspect creates possible recall bias.

Over the last 30 years, the medical education community has made significant strides in increasing awareness of medical trainee well-being. Most efforts to address these issues have focused on work-hour limitations and sleep deprivation. Our study indicates that issues in personal finances is a potentially neglected contributor to poor medical trainee well-being, particularly considering low levels of financial literacy. Future efforts should include the implementation of formal personal financial literacy education programs within medical education curriculum. These programs should be followed on a longitudinal basis to evaluate their efficacy in improving financial literacy and resident well-being. Finally, follow-up studies with larger sample sizes and improved generalizability should be undertaken to better clarify the impact of financial issues on resident physician well-being, burnout, and ultimately patient care.

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Diabetes Mellitus—Not Just Type 1 or Type 2 Anymore

Aiman Riaz, MD; Michael J. Dolan, MD, FACP

ABSTRACT

Introduction: Diabetes mellitus traditionally has been categorized as type 1 (insulin deficiency due to autoimmune destruction of islet cells) or type 2 (insulin resistance with the development of relative insulin deficiency). However, other pathophysiologic etiologies for diabetes must be considered in the evaluation of patients with new-onset diabetes.

Case Presentation: We report the case of a 50-year-old man with a diagnosis of type 2 diabetes mellitus who—despite appropriate pharmacotherapy—developed worsening hyperglycemia. Further investigation revealed the presence of metastatic pancreatic cancer.

Discussion: Although an association between pancreatic cancer and diabetes has been noted widely in the gastroenterology, oncology, and endocrine literature, a paucity of primary care literature on the topic exists. Features of predominant insulin deficiency and new onset of diabetes in a patient without family history of type 2 diabetes should raise suspicion for undetected/early-stage pancreatic cancer.

Conclusions: This case highlights the importance of considering all possible pathophysiologic etiologies when a patient has a new diagnosis of diabetes. Clinicians should consider the possibility of pancreatic cancer in patients with new-onset diabetes mellitus, especially when features not characteristic of type 2 diabetes are present. Understanding the relationship between diabetes and pancreatic cancer has the potential to improve early detection of pancreatic cancer and can provide an opportunity for early treatment and improved survival.

CASE PRESENTATION

A 50-year-old man came to our acute care clinic with a 5-day history of polyuria. He also was experiencing polydipsia and dry mouth. He recently had started antihypertensive therapy with losartan-hydrochlorothiazide, but with the onset of these symptoms, he had called his primary care clinician and the hydrochlorothiazide was discontinued. Despite this change in medications, his symptoms had worsened.

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Author Affiliations: Department of Medical Education (Riaz), Department of Internal Medicine (Dolan); Gundersen Health System, La Crosse, Wis.

Corresponding Author: Aiman Riaz, MD, Department of Medical Education, Gundersen Medical Foundation, Mail Stop: C03-006A, 1836 South Ave, La Crosse, WI 54601; phone 608.775.2923; fax 608.775.1548; email ariaz@gundersenhealth.org.

The patient had no family history of diabetes and no known comorbidities other than hypertension. His body mass index (BMI) was 29 kg/m², his serum glucose was 435 mg/dL, and his hemoglobin A1c (HbA1c) was 8.6%. A urinalysis showed 3+ glucose and 2+ ketones. He was diagnosed with type 2 diabetes mellitus and started on metformin 500 mg twice daily. He was scheduled to see his primary care clinician 2 days later.

At the initial follow-up appointment, the patient reported that he had minimal improvement in the dry mouth and polydipsia, and that he still had substantial polyuria. He had also lost 10 pounds. He was referred to a diabetes educator but declined. No changes were made in his medication, and he was advised to return to his primary care clinician's office in 3 months with a repeat HbA1c test.

Twelve days later, the patient again came to the acute care clinic reporting that he continued to have significant polyuria. Additional laboratory studies were repeated and he was again noted to have hyperglycemia. Glipizide was added to his regimen. He was prescribed a glucometer and advised to start monitoring his blood sugar concentrations at home.

Four days later, the patient saw his primary care clinician, who believed that a dental infection could be contributing to his uncontrolled diabetes, so he was started on antibiotics. No other changes were made in his therapy. He agreed to see a diabetes educator.

One month later, he called his primary care clinician's office to report that his condition was deteriorating. He had experienced epigastric abdominal pain for several weeks and reported that he had lost 35 pounds since his original diagnosis of type 2 diabetes. He was referred to the Emergency Department for further evaluation. Urinalysis again showed 3+ glucose and 2+ ketones, and his alkaline phosphatase concentration was mildly elevated at 168 U/dL (normal

Figure. Computed Tomography Image of Abdomen Showing Pancreatic Mass Involving the Body and Tail of the Pancreas (tip of arrow)

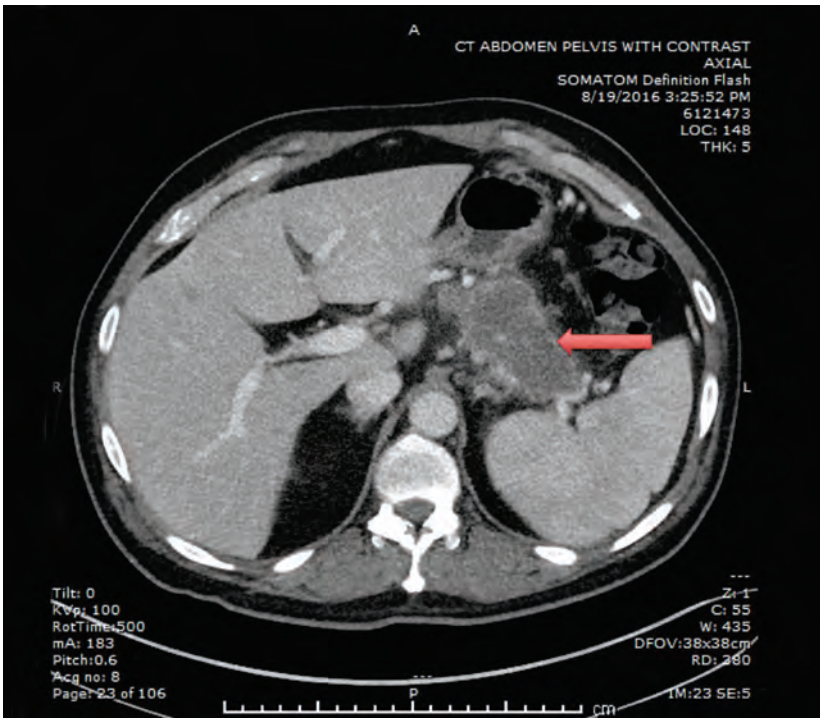

Table 1. Laboratory Study Results of a Patient with Pancreatic Cancer-Associated Diabetes on Admission and at Discharge

Analyte	Reference Range	On Admission	At Discharge
Glucose	70-99 mg/dL	621 mg/dL	194 mg/dL
Creatinine	0.7-1.3 mg/dL	1.2 mg/dL	0.54 mg/dL
Urea nitrogen	8-26 mg/dL	39 mg/dL	N/A
Sodium	135-146 mEq/L	139 mEq/L	146 mEq/L
Potassium	3.4-5.0 mEq/L	5.0 mEq/L	3.1 mEq/L
Carbon dioxide	22-29 mEq/L	4 mEq/L	32 mEq/L
Chloride	96-108 mEq/L	100 mEq/L	104 mEq/L
Anion gap $Na^+ - (Cl^- + HCO_3^-)$	6-16 mEq/L	35 mEq/L	10 mEq/L
Magnesium	1.7-2.5 mEq/L	2.7 mEq/L	2.3 mEq/L
Phosphorous	2.7-4.5 mg/dL	4.9 mg/dL	N/A
Lactate	4.5-19.8 mg/dL	35.1 mg/dL	N/A
β-hydroxybutyric acid	<0.4 mmol/L	9.7 mmol/L	N/A
pH	7.35-7.45	7.06	N/A
White blood cell count	3,700-10, 400/μL	29, 430/μL	N/A
Hemoglobin	13.6-16.7 g/dL	15.7 g/dL	N/A
Platelet count (thrombocytes)	140-385×10^3/μL	285×10^3/μL	N/A
Hemoglobin A_{1c}	4.5%-6.0%	12.0%	N/A

SI conversion factors: To convert glucose to mmol/L, multiply values by 0.0555; creatinine to μmol/L, multiply by 88.4; urea nitrogen to mmol/L, multiply by 0.357; sodium to mmol/L, multiply by 1.0; potassium to mmol/L, multiply by 1.0; carbon dioxide to mmol/L, multiply by 1.0; chloride to mmol/L, multiply by 1.0; anion gap $Na^+ - (Cl^- + HCO_3^-)$ to mmol/L, multiply by 1.0; magnesium to mmol/L, multiply by 0.50; phosphorus to mmol/L, multiply by 0.323; lactate to mmol/L, multiply by 0.111; β-hydroxybutyric acid to μmol/L, multiply by 96.06; white blood cell count to ×10^9/L, multiply by 0.001; hemoglobin to g/L, multiply by 10.0; platelet count (thrombocytes) to ×10^9/L, multiply by 1.0.

range 30-140 U/dL). A computed tomography scan of the abdomen was obtained and showed a 7.8-cm mass in the body and tail of the pancreas, as well as hepatic and peritoneal metastases (Figure).

One week later the patient underwent a percutaneous biopsy of his pancreas, which revealed adenocarcinoma. Biopsy of an omental mass showed metastatic adenocarcinoma. He was referred to oncology, and treatment options were reviewed. He elected to start chemotherapy with folfirinox. He underwent placement of a port catheter and infusion of his first cycle of chemotherapy.

Three days later the patient went to an outside hospital with complaints of weakness, palpitations, and chest pain. An electrocardiogram revealed atrial fibrillation with a rate of 135 beats per minute. A diltiazem infusion was started, which improved his heart rate. Additional laboratory studies were obtained (Table 1), and a diagnosis of diabetic ketoacidosis (DKA) was considered. He was transferred to our center and underwent standard treatment for DKA. His metabolic abnormalities improved rapidly with intravenous fluid resuscitation and insulin therapy. He was maintained on a standard insulin regimen at discharge.

DISCUSSION

An association between diabetes mellitus and pancreatic adenocarcinoma was recognized as early as 1934.[1] Since that time, multiple studies have been conducted to determine the relationship between these entities. Using the American Diabetes Association (ADA) criterion of fasting blood glucose concentration of > 126 mg/dL, Pannala et al[2] reported that 47% of patients with pancreatic cancer have diabetes mellitus, closely mirroring a 2001 report by Chari et al[3] (46%). However, the primary care literature rarely identifies the association of pancreatic cancer and new-onset diabetes mellitus.

A temporal association also has been described. In a large population-based study, Chari and colleagues[4] found that in the 3 years after a new-onset diabetes diagnosis, patients have an 8-fold higher

risk of being diagnosed with pancreatic cancer compared with the general population. Diabetes associated with pancreatic cancer is typically new-onset, less than 24 months.[5] In a meta-analysis of cohort studies, Ben et al[6] reported a relative risk of 5.4 with diabetes of less than 1 year duration, with the relative risk decreasing to 1.5 for diabetes of greater than 5 years duration. Hence, new-onset diabetes should raise suspicion for undetected/early-stage pancreatic cancer. Gangi et al[7] reported that diabetes occurs before radiological evidence of malignancy. Evidence of early derangements in glucose metabolism can provide a useful clinical tool for the early detection of pancreatic cancer before radiological diagnosis.

Table 2. Comparison of Clinical and Laboratory Characteristics of Type 2 Diabetes Mellitus With Those of Pancreatic Cancer-Associated Diabetes (Type 3c)

Characteristic	Diabetes Mellitus Type 2	Pancreatic Cancer-Associated Diabetes (Type 3c)
Family history of diabetes	Yes	No
Weight change at diagnosis	Weight gain	Weight loss
Circulating insulin levels	Increased	Increased
Beta cell dysfunction	Present	Present
Insulin resistance	Present	Present
Cytokines	Mediators for decreased adiponectin concentration, increased leptin concentration	Mediators for increased adrenomedullin concentration
Resolution of diabetes with surgery	N/A	Yes
Other manifestations of metabolic syndrome	Yes	No
Impact of weight loss on glycemic control	Improves	Worsens
Diabetic ketoacidosis	Rare	Yes

Diabetes caused by pancreatic cancer behaves differently than type 1 or type 2 diabetes mellitus. The underlying mechanism appears to be that pancreatic cancer itself induces diabetes in part by paraneoplastic phenomenon and in part by other less clear mechanisms. One of the obvious features related to diabetes with pancreatic cancer is weight loss at the time of diagnosis, as opposed to weight gain associated with type 2 diabetes mellitus.[8] Furthermore, in pancreatic cancer-associated diabetes, fasting blood glucose levels become progressively higher as weight loss progresses, whereas in type 2 diabetes mellitus, weight loss leads to improved glycemic control.[9] Pancreatic cancer causes beta cell dysfunction and insulin resistance similar to that seen in type 2 diabetes mellitus; however, the underlying molecular mechanisms have been postulated to be different.[10] Higher levels of adrenomedullin are observed in pancreatic cancer patients than in patients with type 2 diabetes mellitus,[11] where decreased adiponectin and increased lectin levels play an important role in insulin resistance. Insulin resistance at the postreceptor level is observed with both types of diabetes, but differences have been reported in glycogen metabolism.[12] Islet amyloid polypeptide has been reported to be partially responsible for the insulin resistance seen in pancreatic cancer, but that suggestion is controversial.[13] Studies also have suggested relationships between pancreatic cancer and adipose inflammation and lipolysis, similar to those observed in type 2 diabetes mellitus. A comparison of the clinical and laboratory similarities and differences between type 2 diabetes mellitus and pancreatic cancer-associated diabetes mellitus (type 3c) is provided in Table 2.

Higher levels of circulating insulin and C-peptide levels observed in patients with pancreatic cancer support the fact that the cancer causes insulin resistance.[2,14] One of the earlier postulated mechanisms was similar to the pathogenesis of diabetes in chronic pancreatitis,[2,15] where the progressive destruction of healthy tissue and consequent beta cell loss led to worsening hyperglycemia, which can come into play at later stages of the disease.[10] Tumor resection in pancreatic cancer results in resolution of diabetes in up to 60% of cases, further evidence that the tumor itself causes the diabetes mellitus.[2,9]

Islet cell dysfunction also is believed to play a causative role in diabetes associated with pancreatic cancer. Cersosimo and colleagues[16] demonstrated reduced insulin secretion in response to normal stimuli in patients with pancreatic cancer. Current evidence supports a paraneoplastic etiology, rather than a loss of a critical mass of islet cells, for the reduction of insulin release.

New-onset diabetes was significantly related to larger tumors and elevated levels of cancer antigen 19-9 (CA 19-9) but not to tumor location[9,17] and presence of biliary obstruction.[17]

The ADA recognizes diabetes associated with exocrine pancreas as type 3c diabetes based on an etiological classification, an entity separate from type 1 and type 2, wherein type 3c is associated with neoplasia of exocrine pancreas.[18]

The biggest utility of understanding diabetes related to pancreatic cancer is the potential for early detection of pancreatic cancer before symptomatic or radiological diagnosis is possible. This, in turn, can provide opportunity for early resection of tumor and the possibility of improved survival. According to a 2015 American Cancer Society report,[19] pancreatic cancer is the fourth-leading cause of cancer death in the United States. Five-year survival of pancreatic cancer (5%-8%) has been unchanged since 1975, primarily due to the lack of a better marker for early tumor detection.[19]

CONCLUSIONS

The prevalence of diabetes is far higher than that of pancreatic cancer, so there is a need to develop a protocol to select and stratify patients with new-onset diabetes mellitus who should undergo screening for pancreatic cancer. One potential group should be patients with new-onset (<24 months) diabetes mellitus who have no family history

of diabetes, who have unexplained weight loss, and whose glycemic concentrations are poorly responsive to oral antidiabetic medications, as was the case for our patient. Although our focus has been on new-onset diabetes mellitus, another potential group should be patients with already diagnosed diabetes mellitus whose disease abruptly becomes more difficult to control.

Clinical management of type 3c diabetes mellitus poses noteworthy challenges, and conventional strategies used for managing type 2 diabetes might not be effective in patients with pancreatic cancer. However, appropriate therapy of patients with type 3c diabetes mellitus can prevent the development of potentially life-threatening conditions like diabetic ketoacidosis and decrease potential morbidity. Although 1-year survival is less than 30%, understanding the relationship between diabetes and pancreatic cancer has the potential to improve early detection of pancreatic cancer and can provide an opportunity for early treatment and improved survival.

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Familial Tako-tsubo Cardiomyopathy: Clinical and Echocardiographic Features Including Magnetic Resonance Imaging Findings

Tahir Tak, MD, PhD; Umesh Sharma, MD, MBA; Swetha Karturi, MD; S. Michael Gharacholou, MD

ABSTRACT

Introduction: Tako-tsubo cardiomyopathy (TCM) is being recognized more frequently; and a familial form of this diagnosis has been suspected but is less well-established.

Case: A 75-year-old patient with a family history of TCM was admitted with suspected ST-segment elevation myocardial infarction. Transthoracic echocardiography showed apical dyskinesis with hyperdynamic basal walls and a left ventricular ejection fraction (LVEF) of 25%. Repeat echocardiography showed normal LVEF of 60% ejection fraction. Cardiac catheterization showed no significant stenosis.

Discussion: TCM is characterized by transient systolic left ventricular dysfunction. A few cases of familial TCM have been reported in the literature and a genetic component is suspected.

Conclusions: Although there has been a paucity of data, familial cases of TCM have been reported. This case study addresses TCM and the familial occurrence of the syndrome, which may have a genetic basis.

CASE REPORT

A 75-year-old white woman presented to the Emergency Department with acute onset of chest pain. There were no precipitating events prior to her presentation. She had a family history of Tako-tsubo cardiomyopathy (TCM) in her older sister, who had experienced emotional stress prior to her admission. The patient's 12-lead electrocardiogram (ECG) demonstrated transmural myocardial ischemia with 2 mm ST elevations in the anterior leads V2-V6 (Figure 1). Transthoracic echocardiography (TTE) revealed apical dyskinesis "apical ballooning," with hyperdynamic basal walls and an estimated left ventricular ejection fraction (LVEF) of 25%. Emergent cardiac catheterization was performed and revealed nonsignificant lesions in the coronary vasculature that did not require any intervention. There was mild "myocardial bridging" of 1 vessel. Of note, the ECG abnormalities were extensive and could not be explained by her angiogram. Soon after cardiac catheterization, the patient developed cardiogenic shock and an intra-aortic balloon pump (IABP) was needed to stabilize her hemodynamics. Biochemistries showed a troponin T peak of 0.86 ng/ml and a brain natriuretic peptide of 144pg/ml (N < 125 pg/ml).

On magnetic resonance imaging (MRI) scan using gadolinium, there was delayed enhancement in the anterior wall (Figure 2). In the ensuing hospital days, her clinical condition improved dramatically. Repeat TTE done 4 days later showed that the LVEF had improved to 43%, while another study repeated 6 months post discharge showed an election fraction to 63% with complete resolution of the apical wall motion abnormalities.

The initial clinical presentation suggested an acute coronary syndrome; however, diagnostic workup showing transient ECG abnormalities, echocardiographic findings of apical dyskinesis, cardiogenic shock, and no significant lesions in coronary arteries raised a suspicion for possible TCM. Additionally, the improvement of the ECG and echocardiographic findings led us to believe that this was most likely a case of TCM.

BACKGROUND AND DISCUSSION

TCM is being recognized more frequently, and while there has been speculation about a familial form of this disease, it is less well-established. Echocardiographic findings typically show apical dyskinesis "ballooning" of the left ventricle in systole. The shape resembles that of a fisherman's pot used

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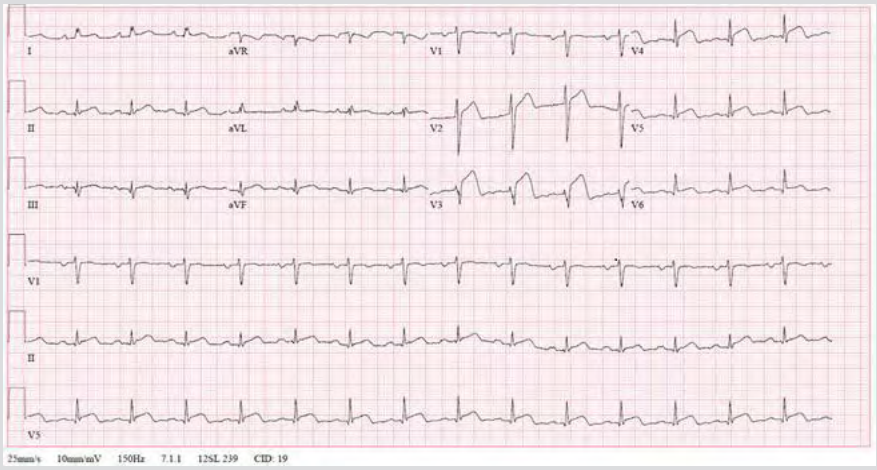
Author Affiliations: Departments of Cardiovascular Diseases (Tak) and Hospital Medicine (Sharma, Karturi), Mayo Clinic Health System - Franciscan Healthcare, La Crosse, Wis; Mayo Clinic, Rochester, Minn (Tak); Department of Cardiovascular Diseases, Mayo Clinic, Jacksonville, Fla (Gharacholou).

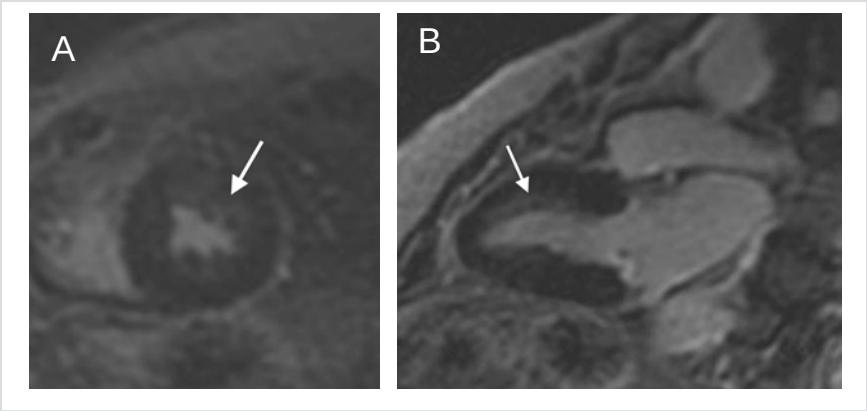
Corresponding Author: Tahir Tak, MD, PhD, FACC, Cardiovascular Diseases, Mayo Clinic, 200 First St SW, Rochester, MN 55905; phone 507.284.2941; fax 507.266.7929; email tak.tahir@mayo.edu.

Figure 1. 12-lead ECG on Admission Showing ST Elevations in Leads V2-V6 Consistent With Transmural Myocardial Ischemia



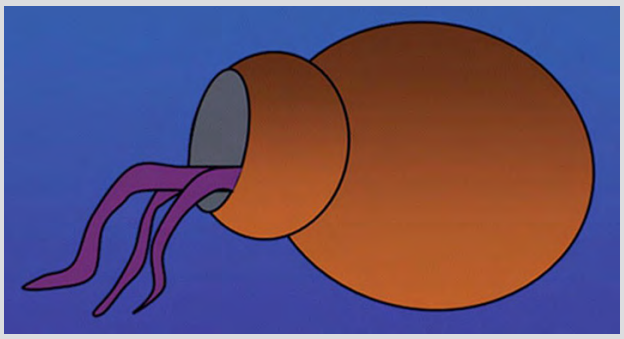
Abberviation: ECG, electrocardiogram.

Figure 2. Cardiac MRI Scans Using Gadolinium Enhancement



A. Short axis view of magnetic resonance imaging showing area of delayed gadolinium enhancement in anterior wall (see arrow). **B.** Long axis view showing area of delayed enhancement in left ventricle anterior wall (see arrow).

Figure 3. Fishing Pot used to Catch Octopi in Japan



Pot has narrow neck and wide base to prevent octopus from escaping once it enters the pot.

in Japan to catch octopi. The pot, referred to as "takotsubo", has a round base and a narrow neck (Figure 3). The echocardiographic wall motion abnormalities are reversible and usually resolve within 4 to 8 weeks of the acute event. The MRI findings in this condition may be helpful if echocardiographic images are suboptimal or if ischemic heart disease is present at the same time.[1-4]

This report illustrates a case of TCM and the echocardiographic and MRI findings in a patient whose sister was diagnosed 3 years earlier with the same condition.

A PUBMED and Google Scholar search was performed using specific keywords to identify cases of familial TCM. It is sometimes also called "apical ballooning syndrome" or "stress cardiomyopathy" and represents a reversible form of cardiomyopathy that commonly presents in association with acute emotional or physiologic stressful conditions.[5] The clinical presentation is similar to an acute coronary syndrome in the absence of obstructive coronary artery disease and does not explain the distribution of associated transient wall motion abnormalities.[6] Postmenopausal women seem particularly prone for unclear reasons. The protective role of estrogen hypothesis has been raised in the past.[7] However, the mechanism by which a lack of estrogen predisposes to the condition is not well understood. The pathophysiology of the syndrome is unknown but may involve pathologic sympathetic myocardial stimulation caused by a surge in plasma catecholamines.[8] In addition, metabolic disturbances and dysfunction of microcirculation also are suspected to be the underlying mechanisms.[9]

Typically, patients present with chest pain and shortness of breath, transient electrocardiographic changes, moderate troponin elevation (median initial troponin 7 to 8 times upper limits of normal). Echocardiography initially shows regional wall motion abnormalities. These regional abnormalities are mostly confined to the apical and midventricular walls (with preserved basal segment systolic function) and usually resolve within 4 to 8 weeks of the acute event. Coronary angiography typically shows normal coronary arteries or nonsignificant lesions. The prognosis is, perhaps, not as benign as was previously thought. Data from the United States Medicare database (2007-2012) shows that 30-day and 1-year mortality rates vary from 2.5% to 6.9% and 4.7% to 11.7%, respectively.[10]

According to a review by Gianni et al,[11] the true prevalence of TCM remains uncertain, but a reasonable estimate of its incidence is approximately 2% of all patients presenting with an acute coronary syndrome. Their data also showed an inhospital mortality of 1.1%; only 3.5% of patients experience a recurrence.[12]

A familial form of TCM has been suspected and is reported in the literature.[13-19] PUBMED and Google Scholar searches revealed a few familial cases of TCM in the last 15 years (Table). These reports confirm that TCM can be seen in family members, suggesting a possible genetic etiology of this condition. Our case report also provides evidence that this condition can be encountered in family members. The patient's older sister suffered similar complaints and was diagnosed elsewhere with TCM; her clinical presentation was identical to our patient and her cardiac catheterization demonstrated normal coronary arteries. Additionally, echocardiography showed complete resolution of her LVEF and normalization of apical wall motion abnormalities at 4 weeks after the acute event.

Table. Cases of Familial Tako-tsubo Cardiomyopathy and Precipitating Factors Triggering Clinical Events

Author	Familial Relationship	Precipitating Factors
Pison[17] (2004)	Sisters	Argument with husband, physical exercise
Kumar[13] (2010)	Mother-daughter	Severe emotional stress
Subban[14] (2012)	Mother-daughter	Emotional stress after sudden death of a family member
Sharkey[12] (2013)	Mother-daughter	Stressful event
Masumeci[19] (2013)	Sisters	Emotional stress after sudden death of a family member
Ikutomi[10] (2014)	Sisters	Stress
Caretta[18] (2015)	Sisters	Skin prick test for asthma, emotional stress after a dispute

A 2014 study of 28 TCM patients performed a whole-exome sequencing of genes related to catecholamine and adrenergic signaling, revealing that 93% of the patients had at least a malignant variant of 55 candidate genes.[20]

A 2017 genome-wide association study of 95 patients with TCM revealed 68 loci of potential nucleotide polymorphism. Eighteen out of 65 loci contained single nucleotide polymorphism (SNP) supported by SNPs in high linkage disequilibrium.[21]

The genetics of TCM still remain unclear. Hence, high-quality phenotyping and identification of candidate genes is necessary to further explore and understand the pathogenesis of TCM.

In regard to MRI in TCM, there are isolated publications describing small diffuse areas of late enhancement in the anterior and apical segments.[1-4] The edema on T2 weighted images is typically located in the apical mid ventricular planes, sparing the base plane. However, myocardial edema also is seen in acute myocardial infarction and myocarditis. Late gadolinium enhancement (LGE) in MRI is generally absent in TCM as opposed to myocardial infarction, where it is very intense (more than 5 SD above the mean signal intensity of the remote myocardium). However, it can be seen occasionally in TCM. LGE may help differentiate TCM from myocarditis, where a "patchy" distribution of myocardial edema is seen.[22]

CONCLUSIONS

Multiple familial cases of TCM have been reported, although there has been a paucity of data regarding case series. The search for a genetic basis of the disease is ongoing, and genetic testing is not currently available commercially. In TCM, characteristic transient wall motion abnormalities are seen by echocardiography. The ECG changes are generally overwhelming, resembling an acute coronary syndrome, and angiographic findings are essentially normal. Coronary angiography is mandatory in the diagnosis of TCM. MRI findings are generally nonspecific but may be useful in differentiating from ischemic heart disease and myocarditis. At this time, MRI is not performed routinely in patients with suspected TCM. The recurrence rate of TCM is thought to be around 3.5%.[12] Awareness of the condition is key to explaining the clinical presentation, although treatment is similar to patients presenting with acute coronary syndromes.

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Platypnea-Orthodeoxia: A Case of Unexplained Hypoxia

Nathan Marzlin, MD; Sara Dunbar, DO; Michael Cinquegrani, MD, FACC, FSCAI

ABSTRACT

Introduction: Platypnea-orthodeoxia syndrome is a rare clinical syndrome defined by worsening deoxygenation and dyspnea when changing to an upright sitting or standing position. It is seen in 3 different clinical scenarios: intracardiac shunts, pulmonary arteriovenous shunts, and ventilation/perfusion mismatch in the lungs.

Case: An 82-year-old woman with a history of nonischemic cardiomyopathy with reduced ejection fraction was admitted with dyspnea and hypoxemia. She was found to have atrial septal defect with right to left shunting in the setting of normal right atrial pressures.

Discussion: Platypnea-orthodeoxia syndrome is a clinical syndrome where, in the setting of an interatrial communication, a right to left shunt can occur without elevated pulmonary or right atrial pressure, resulting in significant hypoxia.

Conclusion: Platypnea-orthodeoxia syndrome is a clinical condition that is being recognized more frequently due to more accurate diagnosis, and its treatment can alleviate symptomatic hypoxemia.

INTRODUCTION

Platypnea-orthodeoxia is an uncommon clinical phenomenon that usually manifests in older patients and is defined by worsening hypoxemia and dyspnea with the change to an upright sitting or standing position. Patients with platypnea-orthodeoxia syndrome (POS) experience hypoxia from a right to left cardiac shunt without the need for elevated right heart pressure.[1]

The condition was first reported in 1949 in a patient with an intrathoracic arterial venous shunt. Since then it has been described in a small subset of patients and can be seen in 3 different clinical scenarios: intracardiac shunts, pulmonary arteriovenous shunts, and ventilation/perfusion mismatch in the lungs.[1] In POS cases involving intracardiac shunts, 3 different defects have been described: patent foramen ovale (PFO), atrial septal defect (ASD), and a fenestrated atrial septal aneurysm (Box 1). PFO is the most common among these three, but in cases of POS caused by an ASD, the ostium secundum type is most common.[1]

CASE PRESENTATION

An 82-year-old woman with a history of nonischemic cardiomyopathy with reduced ejection fraction was transferred from a referring hospital for new onset of hypoxemia and dyspnea requiring high levels of oxygen. She recently had been hospitalized for a heart failure exacerbation with improvement after standard medical management. She had returned to the referring hospital several days after discharge with new hypoxia and dyspnea without any clinical signs of heart failure. She required 10L/min of oxygen via face mask to maintain oxygen saturation in the low 90s. A transthoracic echocardiography with bubble study led to the diagnosis of an interatrial shunt. Transesophageal echocardiography revealed a secundum ASD measuring up to 8 mm in diameter. The atrial septum demonstrated increased mobility consistent with an atrial septal aneurysm. A right heart catheterization performed while the patient was supine demonstrated hypoxia, which improved with 100% FiO_2 during the procedure, and normal right atrial, right ventricle, and pulmonary capillary wedge pressures.

A pulmonary work-up was performed following the right heart catheterization. Computed tomography scan of the chest showed no evidence of any pulmonary arterial venous malformations (AVM). Ventilation-perfusion scan demonstrated very low probability for acute pulmonary embolism, and pulmonary function testing showed normal spirometry with no significant improvement after bronchodilators.

The patient continued to have high oxygen needs ranging from 4L to 10L on high flow nasal cannula. On further evaluation, she was found to have worsening oxygen needs when changing from a lying to seated position and standing up from a recumbent position. The clinical picture was consistent with platypnea-orthodeoxia

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Author Affiliations: Medical College of Wisconsin, Milwaukee, Wis (Marzlin, Dunbar, Cinquegrani).

Corresponding Author: Nathan Marzlin, MD; 9200 W. Wisconsin Ave, Milwaukee, WI 53226; phone 414.805.6850; email nmarzlin@mcw.edu.

Box 1. Most Common Types of Intracardiac Shunting in Platypnea-Orthodeoxia Syndrome

1. Patent Foramen Ovale
2. Atrial Septal Defect (Ostium Secundum)
3. Fenestrated Atrial Septal Aneurysm

Box 2. Common Findings in Platypnea-Orthodeoxia Syndrome

Interatrial communication or pulmonary arteriovenous malformation
Right to left shunt without elevated pressure
Worsening oxygenation when sitting/standing
Dyspnea that resolves when lying flat
Resolution with closure of defect

syndrome. Based on this diagnosis, the patient underwent an atrial septum defect closure using a 30 mm Gore Septal Occluder. Her POS promptly resolved, and she was discharged without requiring supplemental oxygen. Follow-up 2 months later showed that she was still oxygenating well on room air and was free of dyspnea.

DISCUSSION

Platypnea-orthodeoxia syndrome is an uncommon clinical syndrome. Since it was first reported in 1949 under 200 cases have been reported in the literature.[1] Common findings are listed in Box 2. With prompt recognition of clinical signs—mostly through a thorough history and physical exam—POS can be accurately diagnosed, leading to appropriate intervention and a reduction in patient morbidity. Most intracardiac cases of POS respond to intervention.

In the case of our patient, POS concern was crucial in deciding that intracardiac shunting was the likely cause of hypoxemia. After closure of the ASD she was weaned from supplemental oxygen and returned home to her baseline functional status.

While the exact mechanism of POS is still not known, there have been several theories on its pathophysiology. One possibility is that right to left shunting at the atrial level is caused by transient fluctuations in right atrial pressure, coupled with diminished right atrial compliance when the patient transitions to a sitting or standing position. Decreased right atrial compliance may be related to comorbid conditions, such as right-sided myocardial infarction, right atrial myxoma, or eosinophilic myocardial disease, predisposing some patients to develop right to left shunts.[1] Another potential mechanism is the presence of some distortion in the normal thoracic anatomy leading to more directed flow from the vena cava through the patient's preexisting PFO or ASD.

The most common thoracic abnormality described is dilation or elongation of the aorta. This may affect the architecture of the right atrium, causing horizontalization of the atrial septum.[1] Another possibility is that a persistent eustachian valve or stretching of the ASD with changing body positions may allow blood flow to stream from the inferior vena cava through the anatomical defect and into the left atrium.[2] Other anatomic defects associated with POS include Chiari's network, kyphosis of the spine, previous pneumonectomy, and hemiparalysis of the right diaphragm.[1]

POS also can been seen in noncardiac etiologies, most commonly pulmonary AVM where the upright position increases blood flow to the lung bases, accentuating shunt through the AVM and causing increased hypoxemia.[3] Similar physiology is seen in hepatopulmonary syndrome, where dilated pulmonary capillary vessels can cause V/Q mismatch in an upright position, decreased alveolar-arterial diffusion, and arteriovenous shunting.[3] Even though our knowledge of the pathophysiology of POS has improved in recent years, the exact mechanism that leads to symptomatic shunting in an individual patient may not be clear. In the case of our patient, there was significant kyphosis noted on radiologic imaging.

Proper diagnosis of POS is crucial for appropriate treatment, which can greatly improve the patient's clinical status. In a recent review, the median age at the time of diagnosis was in the seventh decade of life.[1] A retrospective analysis of 78 patients with POS demonstrated that percutaneous closure of the atrial level shunt resulted in significant improvement in New York Heart Association Functional Classification. Successful closure of an atrial defect was shown to produce symptomatic improvement in more than 95% of patients. Given the relative ease of application, percutaneous septal defect closure is the preferred method of treatment of ASD or PFO.[4]

CONCLUSIONS

While POS remains rare, it is being recognized more frequently as a cause of hypoxemia in older patients. Timely diagnosis and treatment are key to reducing morbidity. It is important to report cases of POS to improve understanding about clinical scenarios in which the syndrome may occur. POS appears to be largely a condition of the elderly where chronic structural changes of aging result in misdirection of blood flow, but the condition of right to left shunting via an ASD or PFO occasionally may occur in younger patients as well. While this disease drastically decreases functional status or quality of life, percutaneous closure has been shown to be a reliable and effective treatment.

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

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A message from Wisconsin Department of Justice, Brad Schimel, Attorney General, and the Wisconsin Department of Health Services

Wisconsin Department of Health Services

Mark E. Burkard, MD, PhD

Robert N. Golden, MD

Shared Knowledge in Precision Cancer Care

Mark E. Burkard, MD, PhD; Robert N. Golden, MD

John told his oncologist, Dustin Deming, MD, he had no interest in chemotherapy. At age 79, John had survived cancer and chemotherapy a decade earlier, and he now had colon cancer metastatic to the liver. Chemotherapy-related toxicities would have dramatically altered his quality of life, and that just didn't make sense to John. In helping consider alternatives, Dr Deming—the co-leader of the Precision Medicine Molecular Tumor Board (PMMTB) at the University of Wisconsin School of Medicine and Public Health (SMPH)—performed DNA testing of 87 genes from John's tumor biopsy. Surprisingly, his type of colon cancer was driven by a gene called *HER2*—an extracellular receptor that typically drives growth of breast cancer. Dr Deming presented the finding to the PMMTB, which confirmed that this was a good drug target and recommended trastuzumab (Herceptin)—a monoclonal antibody approved for breast cancer that targets and turns off the *HER2* protein. With this information, John decided to undergo the trastuzumab treatment instead of chemotherapy. Over the next 3 months, his tumors shrank dramatically, and he had minimal side effects. His carcinoembryonic antigen (CEA) level plummeted from more than 7,500 ng/ml to 50 ng/ml.

Breathtaking progress in cancer therapy provides hope, and it also challenges oncologists to keep abreast of the latest innovations. Today, integrating genomic information into patient care is one preeminent challenge, as it strikes at the very root of traditional cancer classifications. For example, guidelines exist for colon cancer and breast cancer, but not for colon cancer that is genetically similar to breast cancer. To address the challenge and optimize the impact on cancer patients across Wisconsin, the SMPH and the UW Carbone Cancer Center launched the PMMTB as a collaborative endeavor that links oncologists across the state with the diverse expertise of UW-Madison faculty and staff members, at no cost to physicians or patients.

> Advances in technology over the past decade have catalyzed the clinical application of DNA sequencing, allowing it to be routinely and inexpensively performed on hundreds of genes in each patient's cancer. However, using this information can be daunting, given the number of possible genes that may be involved.

Cancer is a genetic disease in which DNA mutations in specific oncogenes drive the growth and aggressive behavior of tumors. Knowledge of particular mutations can profoundly help some patients, because select drugs can turn off specific oncogenes, leading to tumor regression. Advances in technology over the past decade have catalyzed the clinical application of DNA sequencing,

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Mark Burkard, MD, PhD, is an associate professor in the Department of Medicine, Division of Hematology and Medical Oncology and co-leader of the Precision Medicine Molecular Tumor Board, University of Wisconsin School of Medicine and Public Health; Robert N. Golden, MD, is the dean of the School of Medicine and Public Health and vice chancellor for medical affairs, University of Wisconsin-Madison.

allowing it to be routinely and inexpensively performed on hundreds of genes in each patient's cancer. However, using this information can be daunting, given the number of possible genes that may be involved. Even within a given gene, it is possible to have dozens of distinct mutations, only some of which impart functional alterations to the encoded protein. Moreover, the findings of DNA sequencing routinely challenge the very classifications of cancer entrenched through a century of practice and education.

Traditionally, cancers have been classified by their site of origin—breast cancer starts in the breast, and lung cancer starts in the lung. However, DNA sequencing reveals a startling diversity in the genes that drive cancers from a given organ. It also commonly finds unexpected similarities between cancers that originate in different organs. While current cancer treatment guidelines do not encompass recommendations for testing for rare mutations, regulatory bodies—including the US Food and Drug Administration (FDA)—recognize the progress and are in the vanguard of pushing forward clinical applications made possible by this emerging science. In 2017, the FDA, for the first time, approved a drug based on mutations regardless of tumor type. This first-ever *pan-cancer* approval was for the use of pembrolizumab to treat any solid tumor that harbors mutations in genes involved in DNA mismatch repair. A second pan-cancer drug, which targets extremely rare *NTRK* fusions, is being reviewed by the FDA. Others are expected to follow.

Since 2015, the PMMTB has led a bimonthly, web-conferenced statewide tumor board through which physicians can discuss cancer patients, including their tumor DNA testing results. The PMMTB calls upon UW-Madison experts in pathology, genomics, genetic counseling, medical oncology and pharmacy, as well as collaborators, usually medical oncologists, from health systems throughout Wisconsin. The board focuses on helping patients for whom there are no standard treatments known to cure the cancer—typically those whose cancer is metastatic. To date, the PMMTB has reviewed DNA testing and provided specific recommendations for more than 500 patients. Along the way, there have been many unexpected findings. For example, individual breast cancer patients were found to have mutations of *EGFR*, *MET*, *ROS1* and *RET*—mutations found in 10%, 2%, 2% and 1% of non-small-cell lung cancer, but all of which are found mutated in far fewer than 1% of breast cancers. This allowed the respective lung-cancer-targeted drugs to be repurposed for these Wisconsin patients.

There are many opportunities for missteps in selecting treatments. It is important to be aware of clinical trials, basic research and failed drugs related to specific mutations within a gene. Oncologists must recognize that DNA tests can produce false findings. Not all mutations reported in a gene confer functional changes in the resulting protein. Moreover, some mutations can be inherited in families and are not limited to the tumor—a critical consideration that can have profound impacts on the patient's family members.

The implementation of DNA testing in patients also presents practical challenges. For instance, it can be difficult to update standard pathology processes so that advanced DNA testing becomes routine. Payers often do not cover the cost of testing, and some require laborious authorization processes. Current guidelines are silent on when to perform DNA testing in most patients, so physicians often are left to decide with each patient. One common practice is to perform DNA testing only after multiple standard therapies have been exhausted, but this may be too late if the patient becomes too ill to tolerate even targeted therapies. Further, oncologists operating independently might make missteps in selecting drugs, and it may be difficult to share failures or successes with colleagues. Thus, other oncologists may repeat similar, unsuccessful trials due to the missed opportunity to learn from the prior experience of others. By sharing best practices and knowledge, the PMMTB is helping oncologists across Wisconsin avoid such pitfalls, with the goal of making sure patients in the Badger State receive the most advanced and broadest access to precision oncology.

To further these efforts, in 2017 the Wisconsin state government provided support for the PMMTB, which has enhanced its infrastructure. The board now is providing access to more patients, and by creating a database that carefully catalogs outcomes, it is continuously improving the strength of its predictive power.

Not every cancer patient will benefit from precision oncology. Those with potentially curable cancer are best served by stepwise advances in clinical trials or standard treatments. Many patients with incurable cancer have common DNA mutations in genes such as TP53 and KRAS, which are poor drug targets, and mutations in these genes do not help identify the best treatments. However, a significant fraction of those with incurable cancer—people like John—benefit profoundly.

A well-known adage in medicine regarding "hoofbeats" and "horses versus zebras" reminds us that common things are common. However, the experience with the PMMTB's first 500 patients has partially challenged this view. Given the large number of possible genes and mutations involved in cancer, there are thousands of ways that DNA testing can reveal a very uncommon feature of cancer. As shown by the *HER2* in John's colon cancer—and *ROS1*, *RET and MET* in breast cancer—collectively, the uncommon becomes common. Through the PMMTB's ongoing work, every cancer patient in Wisconsin can have access to the most sophisticated, state-of-the-art approach to personalized oncology care.

Wisconsin Health Care Making Progress Toward CMS Quality Strategy Goals, Part II

Kristin Westphal, MS; Jody Rothe, RN

Alcohol Use and Depression Screening, Diabetes Education, and Quality Payment Program Assistance Demonstrate Notable Improvements for the Health of Wisconsinites

MetaStar, which represents Wisconsin in the Lake Superior Quality Innovation Network (QIN), has been working alongside Wisconsin health care professionals in many settings to advance the 6 CMS Quality Strategy goals.[1] MetaStar served as Wisconsin's Quality Improvement Organization for 40 years. Following a change in the structure of the program by Centers for Medicare and Medicaid Services (CMS) in 2014, this work became part of a regional partnership, Lake Superior QIN, which serves Michigan, Minnesota, and Wisconsin.

Lake Superior QIN works with partners and stakeholders, including the Wisconsin Medical Society, to impact the 1.05 million Medicare beneficiaries in the state. Current initiatives include antibiotic stewardship, behavioral health, cardiac health, coordination of care, diabetes care, medication safety, nursing home quality, the Quality Payment Program, and quality reporting.

Three goals are featured in this article. For more information about the remaining goals, refer to MetaStar Matters in the previous issue of *WMJ*.

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Kristin Westphal, MS, is the Vice President of Marketing, Communication, and Education at MetaStar. Jody Rothe, RN, DON-CLTC, is Program Manager at MetaStar and also serves as the State Director for Wisconsin for the Quality Innovation Network-Quality Improvement Program work. This material was prepared by the Lake Superior Quality Innovation Network, under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the US Department of Health and Human Services. The materials do not necessarily reflect CMS policy. 11SOW-WI-A1-18-20 060718

Goal 4: Promote effective prevention and treatment of chronic disease

While there are several chronic diseases that affect patients and care in Wisconsin, 1 chronic disease being addressed in primary care clinics across the state involves mental health and substance use conditions. While some of these conditions can be acute and treated successfully with brief interventions, others are known to be chronic issues that require ongoing treatment and medical management.

Depression has been identified by the World Health Organization as the leading cause of disability worldwide.[2] According to the National Alliance on Mental Illness, 1 in 5 adults in America experience a mental illness, 1 in 25 adults in America live with a serious mental illness, and 60% of adults with a mental illness did not receive mental health services in the previous year.[3]

MetaStar has been working with approximately 200 primary care clinics in Wisconsin to screen for depression and alcohol use. The intention is to identify, treat, and/or refer patients who score positive during screening so they can obtain the care they need. To date, these clinics have increased their average screening rates from below 25% in 2015 to more than 50% by the end of 2017. In addition, some organizations report they are screening anywhere from 75% to 90% of their patients. As a result, many more patients in Wisconsin are now receiving treatment for mental health and substance use conditions.

Goal 5: Work with communities to promote best practices of healthy living

Diabetes continues to be a disparity in Wisconsin and according to American's Health Rankings, in 2017 diabetes increased 17% in Wisconsin.[4] Diabetes self-management education and support (DSMES) is a strategy that can support patients to better understand the disease and take actions that can improve their overall health. DSMES are available in the form of a billable Medicare service and/or a free peer-led workshop. Both opportunities are underutilized by clinicians as a referable service for their patients.

In order to increase utilization of DSMES, MetaStar has been working with a number of Wisconsin clinical practices to develop a process to offer DSMES or refer to DSMES in the surrounding area. In addition, MetaStar has partnered with the Wisconsin Institute for Healthy Aging (WIHA), which has been a strong supporter of individuals with diabetes

for a number of years and is recognized as an innovator in providing programs and services to meet the changing needs of older people. WIHA offers a Stanford-based DSMES curriculum called Healthy Living with Diabetes in both English and Spanish throughout Wisconsin. MetaStar has also partnered with the Midwest Latino Health Research Training and Policy Center to offer a second curriculum using the Diabetes Empowerment Education Program (DEEP). Survey results from workshop participants indicate marked improvement in knowledge, empowerment, and changes in behaviors following completion of a standard 6-week program.

Since 2014, approximately 2600 people with diabetes have completed DSMES through the programs mentioned above.

Goal 6: Make care affordable

Prior to the Quality Payment Program (QPP), payment increases for Medicare services were set by the Sustainable Growth Rate (SGR) law. This capped spending increases according to the Medicare population, and included a modest allowance for inflation.[5] Due to clinician's increased utilization for services, the reimbursements for each unit of service were adjusted downward to hold costs constant. The SGR would have resulted in large decreases in the Physician Fee Schedule. These large decreases were not sustainable and required Congress to pass a new law every year authorizing the current fee schedule and a small increase for inflation.

The Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) replaced the SGR and provided an avenue for Medicare to reward high value, high quality clinicians with payment increases. As a result, the QPP began in 2017. MetaStar works with eligible clinicians and provider group to provide support and education on this new program.

Through extensive outreach, MetaStar engaged more than 90% of the eligible clinicians in Wisconsin to assist with successfully reporting in the QPP. This also helped eligible clinicians avoid a payment penalty in payment year 2019.

CMS Quality Strategy Goals

1. Make care safer by reducing harm caused in the delivery of care.
2. Strengthen person and family engagement as partners in their care.
3. Promote effective communication and coordination of care.
4. Promote effective prevention and treatment of chronic disease.
5. Work with communities to promote best practices of healthy living.
6. Make care affordable.

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W. Stancil Starnes, JD

The Safety of Consistency in a Changing World

W. Stancil Starnes, JD

Think for a minute about the profound changes you have seen in your years of practice. Whether you are just a few years out of your residency or nearing retirement, you have seen the delivery of health care evolve at an unprecedented pace.

No matter how medicine changes to address the demanding financial challenges and daunting technological advances, the one constant continues to be the compassionate, effective delivery of care that is the hallmark of a sound physician/patient relationship. There is great comfort in knowing that, at its heart, medicine is still about your one-on-one relationship with your patient.

We all know that in rare instances that relationship can break down for unexplained reasons or an unexpected outcome can cause that bond to fray. When that occurs and litigation ensues, the other constant you can count on is the advocacy of ProAssurance as you face a legal system that may seem stacked against you. We do what it takes: choosing the best attorneys and defense experts and expending extraordinary effort to level the playing field for our insureds.

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W. Stancil Starnes, JD, is chairman and chief executive officer of ProAssurance Corporation, the parent company of ProAssurance Casualty Company (formerly PIC Wisconsin) and the endorsed medical professional liability carrier of the Wisconsin Medical Society.

Last year not one ProAssurance-insured Wisconsin physician whose case went to court was found guilty of malpractice. The overwhelming majority of claims that did not reach the courtroom were closed without any indemnity payment. I believe in large part that is because of the excellent practice of medicine prevalent in Wisconsin and the leadership of organized medicine through the Wisconsin Medical Society (Society). But it is also due to our willingness to provide the finest defense possible, which can lead to success even when it appears the odds are against our defendant physician—as they often are in some Wisconsin courtrooms.

No matter how medicine evolves to address the demanding financial challenges and daunting technological advances, the one constant continues to be the compassionate, effective delivery of care that is the hallmark of a sound physician/patient relationship.

Our advocacy is not limited to the trial court level. When the plaintiff bar successfully attacked Wisconsin's crucial $750,000 cap on noneconomic damages in the Court of Appeals, ProAssurance supported the Society's challenge of that decision. The strong arguments made by the Society, with ProAssurance's support via an amicus brief, restored the cap on noneconomic damages. That has played a key role in maintaining an affordable and fair medical liability climate in Wisconsin.

Sadly, Wisconsin's largely favorable medical liability climate, however challenging it may seem when viewed from within the state, is becoming the exception rather than the rule. As we survey the loss trends across the United States, we see a return of large verdicts that go beyond the scope of fairly compensating the plaintiff for their injuries. TransRe, a leading reinsurer, reports that in 2017 the number of verdicts nationally that were at or above $25 million reached levels not seen since the last malpractice crisis a decade ago. Just as troubling was their report that the number of verdicts at or above $10 million was the second highest since the year 2000, and increased 38% over 2016.

It's a truism in the legal profession that the plaintiff bar follows the money. If that holds true, this increase in severity is likely to lead to an increase in frequency of claims. No state or jurisdiction will be immune to this trend. This is why ProAssurance maintains the legal

expertise Wisconsin physicians know to be of the highest quality and backs that with a stated, sustained commitment to deploy our resources on your behalf.

However, it's not just our legal expertise and advocacy that sets us apart. ProAssurance maintains a superior balance sheet that allows us to expend such extraordinary effort on claims defense. This ensures we have the ability to keep our promise of insurance on those rare occasions when adverse judgments are rendered.

In fact, ProAssurance's outstanding financial performance and policyholder security were recognized again this year by the Ward Group, which named ProAssurance one of the 50 top performing insurance companies in the country out of nearly 3,000 companies considered—the 12th year in a row we have been named to the prestigious Ward's 50.

For Wisconsin physicians, these are all key factors you should consider when you benchmark ProAssurance against competitors. But there is much more you should think about as you evaluate long-term commitments. Remember, the most expensive piece of paper can be a cheap malpractice insurance policy if it leaves you holding the bag.

Consider also the commitment ProAssurance has made in support of the Wisconsin Medical Society, whose leadership in health and medicine has been so effective. Through the Member Benefit Plan, Society members can receive premium credits of up to 15% if all criteria are met. The Member Benefit Plan also provides coverage enhancements such as CyberAssurance® Plus to help address ever-present cyber risks—and an additional $1 million of coverage per year should Wisconsin's compensation fund deny coverage for damages above your policy limits. There are additional benefits as well. We encourage you to contact Wisconsin Medical Society Insurance & Financial Services to learn more.

In addition to member benefits developed in collaboration with the Society, 16 physician leaders, including Society CEO Clyde "Bud" Chumbley, MD, MBA, participate on our Wisconsin Claims and Underwriting Committee. An additional 31 physicians serve on our Wisconsin Regional Advisory Boards. These leaders help shape our approach to the unique needs of Wisconsin physicians, and they can be an additional voice for you in our organization.

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To learn more about the Member Benefit Plan, contact your Wisconsin Medical Society Insurance and Financial Services Agent at 866.442.3810 or visit www.wisconsinmedicalsociety.org/insurance.

Editor's Note: *The Wisconsin Medical Society helped form PIC Wisconsin in 1985 to ensure the availability of medical professional liability insurance for Wisconsin physicians. Today the Society continues to endorse ProAssurance (formerly PIC Wisconsin) to provide professional liability insurance coverage for physicians.*

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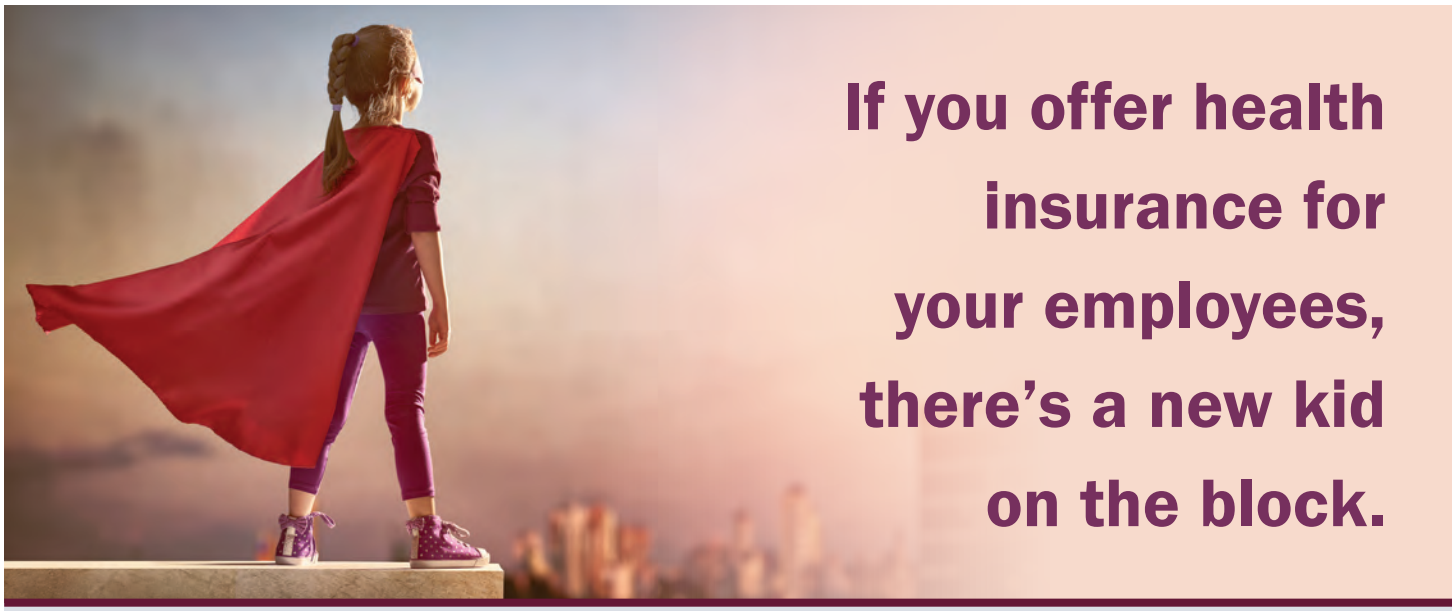

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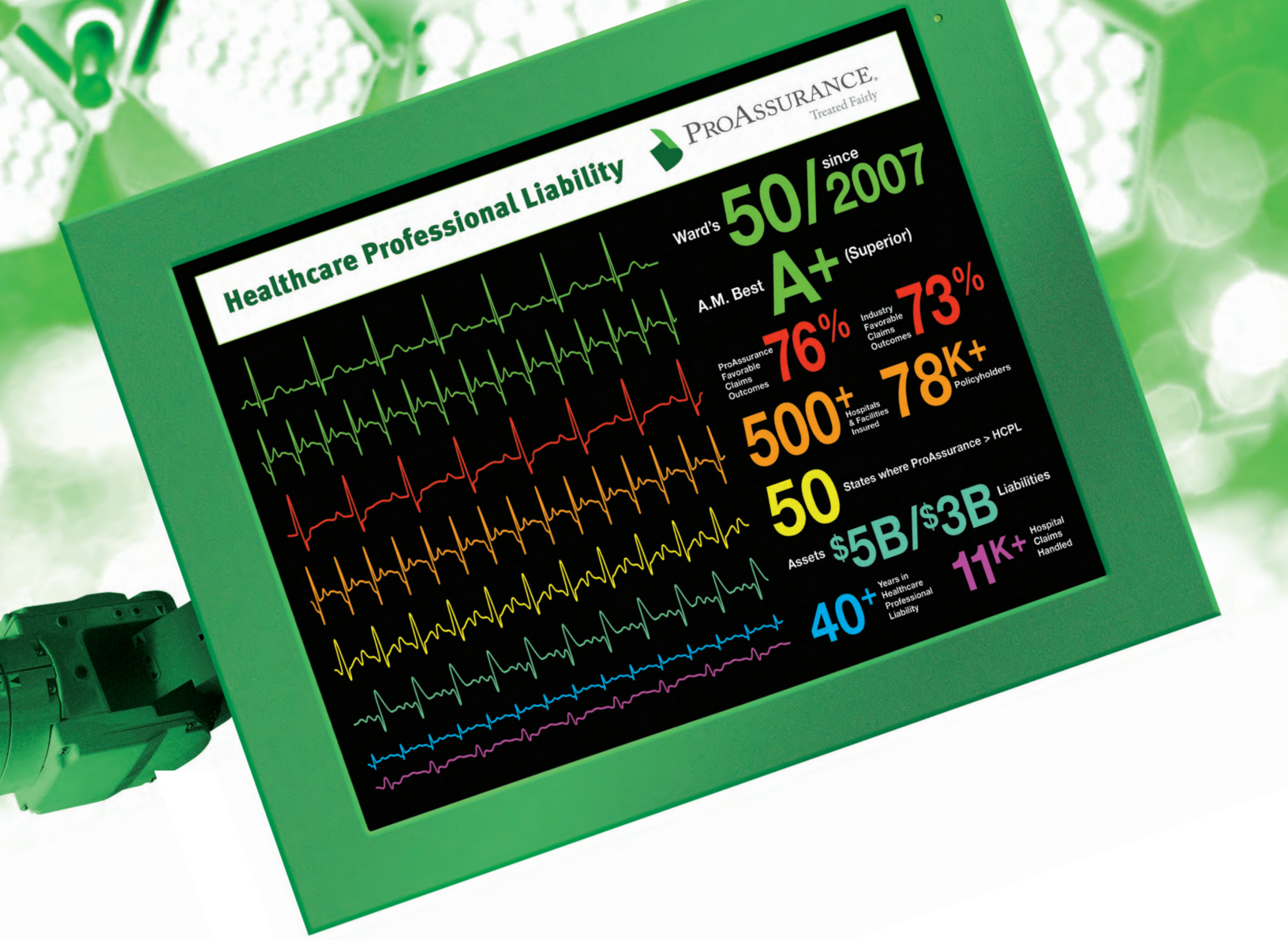

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