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## Better to Be Lucky Than Good? Errors in Medicine

WILLIAM BINDER, MD

**A**T A RECENT DEPARTMENTAL morbidity and mortality conference, a casual comment from a radiology colleague attending the meeting hushed our group. In response to a delayed diagnosis of an epidural abscess, he remarked that the diagnostic error rate of radiologic interpretation



is believed to be between 3%–5%.<sup>1</sup> Errors are even higher in emergency radiology. In one study out of Massachusetts General Hospital, abdominal/pelvic CTs reviewed by an outside attending radiologist found a 26% discrepancy between readers. In the same study, the CT was re-reviewed by the original radiologist and a 32% discrepancy rate was found.<sup>2</sup> Globally, about 1 billion radiographic examinations are performed worldwide annually. At a 4% error rate, this translates into 40 million errors.<sup>1</sup>

A discrepancy is not always an error – “somewhere between a clear-cut error and the inevitable difference of opinion in interpretation is an arbitrary division defining the limit of professional acceptability.”<sup>3</sup> However, errors do occur. In my own personal experience as an emergency physician, I have occasionally encountered errors which were usually, but not always, minor. Several months ago a 64-year-old teacher and soccer coach presented one evening

with neck pain. His pain had begun about four days earlier without provocation. He could not relate any trauma to the pain, but it did not “feel right.” After examining the patient, and checking basic labs (creatinine), I elected to do a CTA of the neck, which was read as negative. I discharged the

patient home with ibuprofen, but three hours later I received a call regarding an “overread” by an attending radiologist of the patient’s study – he had a subtle right-sided carotid dissection. My remote suspicions had been confirmed and the patient returned, merely inconvenienced as no harm was done, and anticoagulation was initiated.

In this case, information and cognitive overload likely contributed to a diagnostic error. Radiologists have a significant workload on overnight shifts, and with each CT scan composed of scores of images, it is not difficult to imagine that an abnormality might be missed. In emergency departments, radiologists face the daunting task of interpreting thousands of images per evening with little knowledge of the patient’s history (due to the systemic deficiency/efficiency of electronic ordering systems), while managing interruptions, fatigue,

cognitive biases, and inattentive blindness. To underscore this, in a study performed at the Brigham and Women’s Hospital in Boston, a dancing gorilla 48 times larger than an average lung nodule was inserted into the last case of a series of lung nodule cases reviewed by 24 radiologists; 83% of the radiologists did not see the gorilla.<sup>4</sup>

In my specialty (emergency medicine) error comes in many forms and for many reasons. Emergency physicians are interrupted on average 13 times per hour or over 100 times per 8-hour shift.<sup>5</sup> Interruptions signify additional data

**To underscore this, in a study performed at the Brigham and Women’s Hospital in Boston, a dancing gorilla 48 times larger than an average lung nodule was inserted into the last case of a series of lung nodule cases reviewed by 24 radiologists; 83% of the radiologists did not see the gorilla.<sup>4</sup>**

**Link to online article, images:**

[www.ncbi.nlm.nih.gov/pmc/articles/PMC3964612](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3964612)

inputs. This cognitive loading leads to multi-tasking, which, in turn, impacts emotional intelligence, and can result in a decreased attention span and a disregard for important information. Additionally, it causes slower reaction times, and foments burnout, all of which lead to diagnostic errors.<sup>6,7</sup> Yet while workloads increase, our neurons do not.

Other errors are due to atypical presentations of infrequent diseases.

Some studies suggest that 30–40% of all acute aortic syndromes are initially misdiagnosed, and other studies have documented a missed diagnosis on initial evaluation in 27%–55% of patients that is not revealed until a postmortem examination.<sup>8,9,10,11</sup> In some cases, misdiagnosed patients were inappropriately treated and some received antithrombotic therapies.<sup>11</sup> The infrequency of this event contributes to this misdiagnosis rate.<sup>12,13</sup> It is estimated that a busy emergency physician seeing about 3000–4000 patients annually will diagnose only 1 case of acute aortic dissection (AAD) every 3–4 years.

Sometimes it is better to be lucky than good. Recently, a 54-year-old electrical engineer presented with vague symptoms of a tingling sensation in his leg and hand. His strength was normal and his symptoms had mostly abated when he saw my colleague in the triage area of the emergency department. The triage nurse was concerned about a stroke, and the physician acquiesced and ordered a protocolized study of the brain and neck vessels. A CTA revealed an aortic dissection distal to the subclavian with extension into the carotid artery.

So, what is an acceptable level of error? Some authors state diagnostic

error stands at around 10%–15% in both the medical system and emergency department, although less than 10% of errors are reported.<sup>14,15</sup> While this figure seems high, it is hard to imagine that any error is acceptable to a patient. Physicians recognize the inevitability of error but have a similarly low threshold regarding the standard of care. Historically, 2% or more of myocardial infarctions are missed in the emergency department.<sup>16</sup> With higher quality cardiac enzyme studies, in combination with risk prediction scores, we have likely cut this number in half, and emergency physicians now consider a miss rate for MI up to 1% acceptable.<sup>17,18,19,20</sup>

Yet this discussion begs the question, can we do better with every disorder across every field of medicine? A delayed diagnosis (or missed diagnosis) of an AAD or an epidural abscess can have devastating consequences. In emergency medicine, algorithms have increasingly been used to reduce error and risk. Yet systems' failures and information overload continue to impact the specialty and error rates have not budged. Perhaps solutions are close at hand. Machine learning, a subset of artificial intelligence in which computers can parse data through algorithms

without being explicitly programmed, has been demonstrated to improve triage processes, smooth the perturbations in ED operations, and has been used to predict disposition for infants and toddlers with bronchiolitis and to more accurately diagnose retinopathy of prematurity.<sup>21,22,23</sup> Artificial Intelligence has been used in radiology, dermatology, and other fields to improve diagnostic outcomes. Primary care has already been affected and specific protocols and precision medicine can be initiated based on a genomic and social analysis of patient data. Eric Topol and others believe that such machine learning will allow physicians to spend more time with patients, and less time doing data entry, thereby contributing to improved history taking and decreasing error. Indeed, in the current environment, over 50% of a primary care physician's time is spent entering data into the EHR.<sup>24</sup> In the emergency department it is likely that data input and analysis, which currently takes hours and is performed imperfectly, will take seconds to minutes. It is possible that errors will decrease. Until that time comes, however, we will aspire to be both lucky *and* good. ❖

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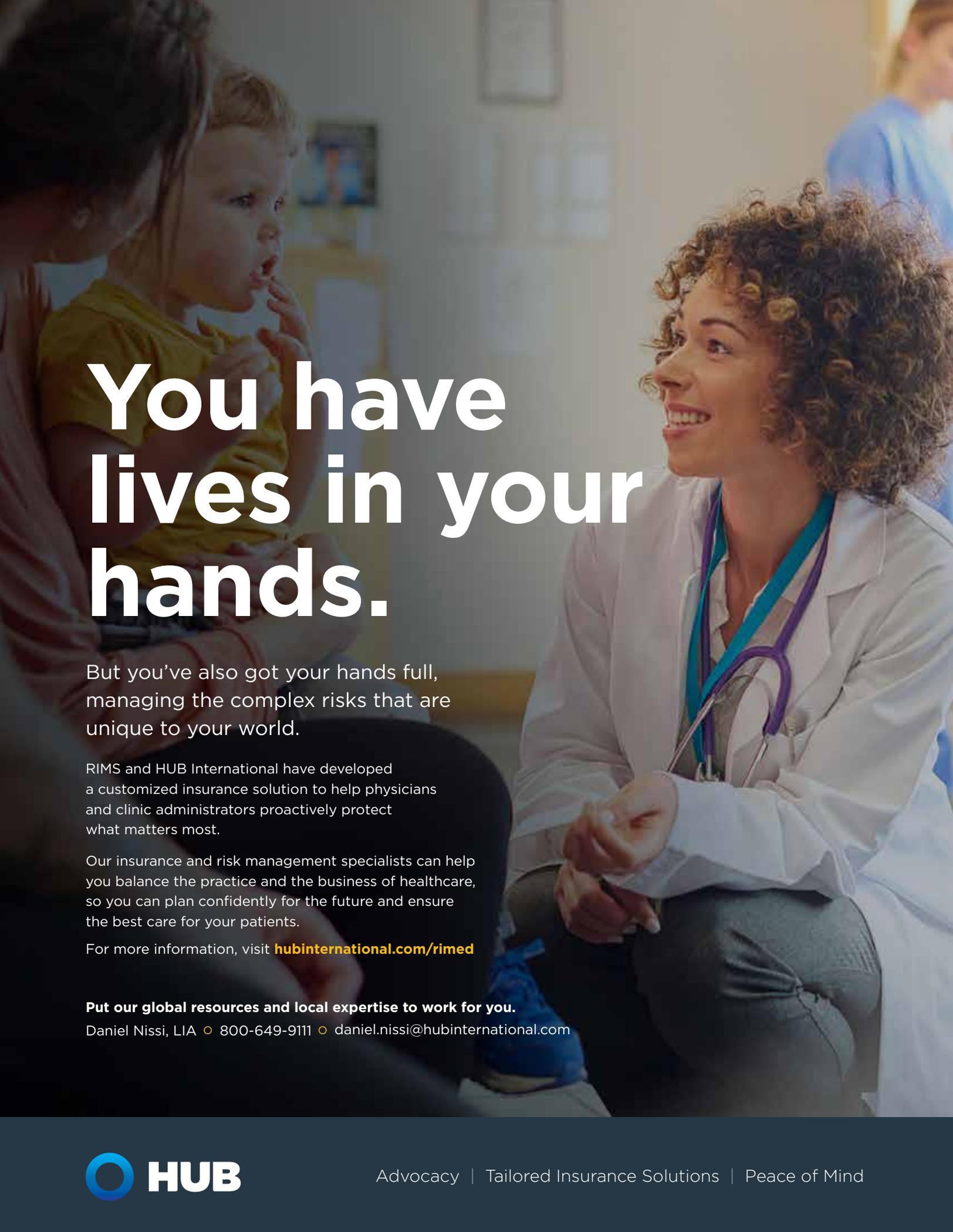
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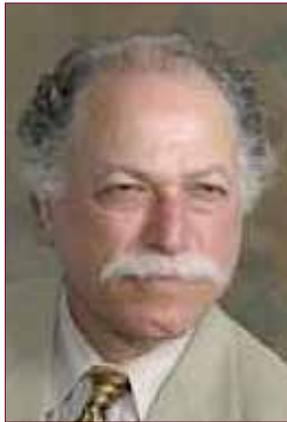
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## Woodstock, a Festival of Peace, Music and Providing Medical Care

KENNETH S. KORR, MD

**T**HIS MONTH MARKS THE 50th anniversary of what was billed as “An Aquarian Exposition: 3 Days of Peace and Music,” commonly known as Woodstock. The “three days that rocked the world,” as it was later described, from August 15–17, 1969, would become the defining event of the Woodstock Generation.



and medical support services accordingly. A local general practitioner was contracted to organize medical care and he hired 18 physicians, 36 nurses and 27 medical assistants to cover 8-hour shifts in a 30-bed hospital tent and several trailers.<sup>1</sup>

Attendance estimates proved woefully inadequate and ultimately more than 400,000 people flocked to the festival site, clogging access roads and overwhelming food and support services. On Thursday, the day before the Festival was set to start, the call went out for additional physicians and nurses from local hospitals and New York City. In addition, two US Army Hueys and Air Force medics

were deployed from the West Point Military Academy about 60 miles from the site. And then there were the numerous volunteers, physicians, nurses, residents and other medical personnel who had come just to hear the music and stepped up to help out.

**In retrospect, it was my first medical “gig” and while I didn’t get paid per se, I did get a free meal of brown rice and veggies after each shift from the Hog Farm kitchen.**

Having just completed my first year at the University of Madrid medical school, I was one of those volunteers. I remember working two 4-hour shifts and it was a heady experience taking care of patients while listening to Richie Havens, Joan Baez, Crosby, Stills, &



Crowd at Woodstock listens to Joe Cocker performing at the Woodstock Festival on Sunday, Aug. 17, 1969. [WIKIPEDIA]

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Magazine advertisement for the "Aquarian Exposition" of the "Woodstock Music & Art Fair," from *Ramparts* magazine, vol. 8, no. 2 (Aug. 1969), pg. 70. [WIKIPEDIA]



Kenneth S. Korr, MD, on motorcycle, in 1969.

Then there were the "Bad Trips" from LSD, mescaline and Psilocybin. The Festival had hired 85 members of a New Mexico commune known as the "Hog Farm" to provide food and shelter and they were also very experienced with "trip tents." Their philosophy was to provide a safe, quiet and reassuring environment and gently talk trippers down without the need for Thorazine. All told, there

over medical care during that trying weekend.<sup>1</sup> Not only the physicians, nurses and medical providers, but also many police and fire personnel and the local townspeople turned out to provide food and water and additional support.

I went back to Bethel 20 years later and what had been a sprawling, chaotic Festival site (the fourth largest city in NY State at the time) had now reverted to pristine rolling hillsides and fields of grain. The contrast was striking.

Though 50 years have passed, the festival experience continues to resonate with me. I still tend to patients, and play the guitar, inspired by my first "medical gig" and the performing artists of my generation. ❖

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Nash, Santana, and Jimi Hendrix, just to name a few. In retrospect, it was my first medical "gig" and while I didn't get paid per se, I did get a free meal of brown rice and veggies after each shift from the Hog Farm kitchen.

Most of what we dealt with were the innumerable foot lacerations (one report estimated over 938 lacerations and 135 puncture wounds treated) from broken glass and sharp rocks and all the bare-foot attendees. And then there was the mud, from torrential downpours on the second day of the Festival, turning the site into a huge mud bath and complicating the wound care. So we cleaned and bandaged and occasionally sutured those wounds and wrapped them in plastic bags to protect them from further contamination. Everyone got a tetanus shot since the site was a working dairy farm with an increased risk for tetanus infection.

were 797 reported bad trips, and only 28 required medication.<sup>2</sup>

In addition, there were 176 cases of asthma requiring treatment, 23 epileptic seizures, 57 cases of heat exhaustion and 250 people that had to be transported to local hospitals, including one woman in labor. There were only two deaths during the Festival weekend – a young man crushed by a tractor in his sleeping bag and a man who suffered a heroin overdose and was Medivac'd out to a local hospital, where he died the next day. By contrast, the city of Buffalo, with a comparable population, had 40 deaths during the same weekend.<sup>3</sup>

Perhaps most of all, it was the incredible spirit of community and "good vibes" that prevented the Festival from becoming a public health nightmare. This success is a tribute to the adept improvisation of medical providers and the vibrant volunteer spirit that took



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### PARADISE ISLAND, BAHAMAS

**Jamie Schaefer, MD**, an oculoplastic surgeon with Lifespan Physician Group Ophthalmology, and Daniel Poling, an information security engineer, downloaded a recent issue of the Journal while attending the 50th Anniversary meeting of the American Society of Ophthalmic Plastic and Reconstructive Surgeons (ASOPRS) at the Atlantis Resort in the Bahamas.

# Introduction of Medical Three-Dimensional Printing in Rhode Island

MICHAEL K. BOYAJIAN, BA, MD'20; JOSEPH W. CROZIER, MA; ALBERT S. WOO, MD

## ABSTRACT

Since the early 2000s, three-dimensional (3D) printing has become a well-rounded, evolving technology which has begun to revolutionize healthcare. 3D printing enables rapid creation and manufacture of individual patient models from original designs or medical imaging data. These models can be used for surgical planning, procedural training for residents and medical students, and the design and manufacture of surgical instruments, implants and prostheses. Current availability of this advanced technology at the Lifespan 3D Printing Lab permits Rhode Island physicians to utilize 3D printing in multiple, diverse settings to help improve their medical practice and optimize healthcare outcomes. This article describes three case-based examples to demonstrate various uses of 3D printing in Medicine.

**KEYWORDS:** 3D printing, surgical planning, patient communication, medical education

## INTRODUCTION

The technique of rapidly prototyping models in three dimensions was first described by Hideo Kodama in 1981.<sup>1</sup> In contrast to subtractive manufacturing whereby 3D objects are created by carving, cutting or drilling, this novel process creates objects by depositing successive layers of material, an example of additive manufacturing.<sup>2</sup> With a unique design for creating three-dimensional (3D) models using digital data from computer-aided design (CAD) and computer-aided manufacturing (CAM), novel uses of 3D printing technology have emerged across many industries, since the early 2000s, 3D printing applications within Medicine have rapidly expanded.<sup>3</sup>

In healthcare, 3D printing has enabled rapid manufacture of complex, individualized patient anatomy models. This technology provides a unique tool for translating information from original designs or scanned radiographic studies into tangible, anatomically distinctive 3D models. These models can be used for patient-specific surgical planning, medical student and resident education, and medical device development.<sup>4-11</sup> (Table 1)

In 2016, this state-of-the-art technology was introduced at Rhode Island Hospital (RIH) with the opening of the Lifespan

**Table 1.** Applications of 3D Printing in Medicine

<b>Patient-specific surgical models</b> <ul style="list-style-type: none"> <li>• Surgical planning</li> <li>• Communication with patients</li> <li>• Resident and medical student education</li> </ul>
<b>Implants and prostheses</b> <ul style="list-style-type: none"> <li>• Limbs</li> <li>• Craniofacial implants</li> </ul>
<b>Surgical simulators</b> <ul style="list-style-type: none"> <li>• Training in a controlled, non-operative setting</li> </ul>
<b>Rapid prototyping</b> <ul style="list-style-type: none"> <li>• Designing and manufacturing medical devices</li> </ul>

**Figure 1.** 3D printed full-color replica of a face. This capability offers numerous potential applications in healthcare, including visual guides for complex soft-tissue reconstruction, production of customized prostheses, and less invasive development of burn masks.



**Figure 2:** This model shows the improvement over time in the patient's facial skeleton after his multistage surgery. The left skull shows the patient's initial severe anatomic deformity. The middle skull demonstrates successful plate fixation (titanium plates in purple), but still reveals unrepaired orbital fractures. The skull on the right shows successful placement of the titanium orbital implants (in blue).



3D Printing Lab. This lab boasts a full-color, multi-material Stratasys J750 Polyjet 3D printer among its additive manufacturing devices. The lab facilitates multiple collaborations both within and outside of RIH and Brown University, with services available for use by physicians across all specialties. In this article, we describe three case-based applications of 3D printing technology.

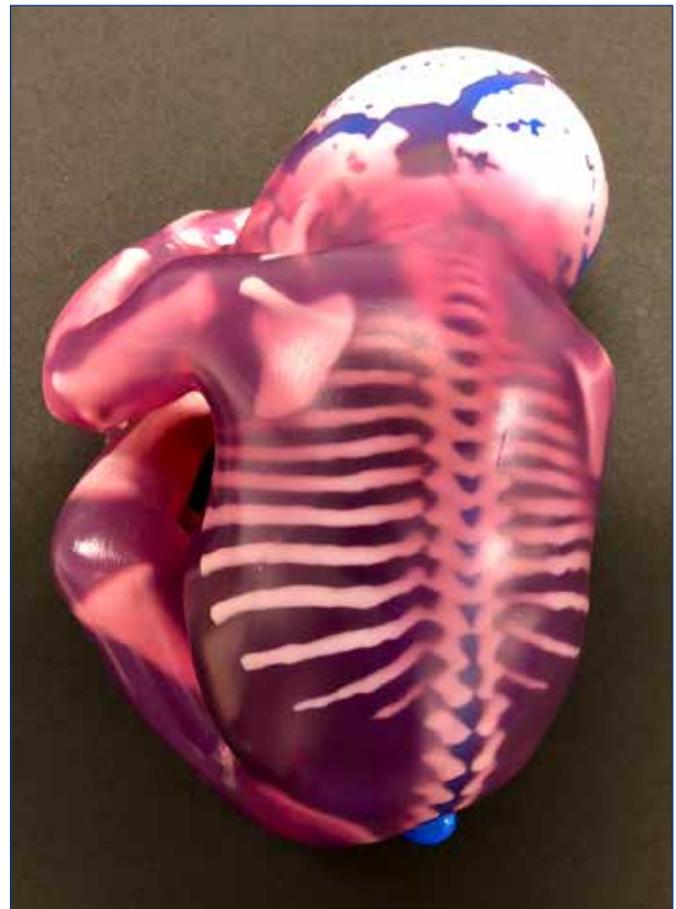
#### Case 1: 3D replica of complex facial anatomy

As a proof of concept, a lifelike replica of a face was produced and printed in full color (Figure 1). First, a stereophotogrammetric image was captured using a Vectra M5 360 imaging system (Canfield, Parsippany, NJ). The data was exported into VRML format and finalized with open source software (Blender Foundation, <https://www.blender.org>). This model demonstrated the powerful capabilities of the Stratasys J750 Polyjet printer, which can produce up to 500,000 colors while encompassing multiple textures, transparencies, and densities with detail down to 14 microns. The ability to replicate complex facial anatomy has numerous potential applications, including visual guides for complex soft-tissue reconstruction, production of customized prostheses, and less invasive development of burn masks<sup>12</sup>.

#### Case 2: 3D anatomic models facilitate surgical planning

Surgical planning is the most common indication for 3D printing in medical environments. In this case, a trauma victim suffered severe facial injuries in a motor vehicle collision. He required multistage surgery to correct his maxillofacial deformities. The facial skeleton was 3D printed as a sterilizable on-table surgical reference for the complex anatomic deformity as it was being corrected in both procedures (Figure 2).

**Figure 3.** 3D printed model of a fetus with myelomeningocele, which includes bony structures, soft tissue, and the anatomic defect where the infant's spinal canal failed to close. The bulging myelomeningocele is clearly visible (in blue). The model was produced from both MRI and CT data.



### Case 3: 3D printed model can educate patient families and residents

3D printing can play an important role in educating patients, as well as teaching medical students and residents. These benefits are demonstrated in a 23-week fetus diagnosed with a myelomeningocele in utero. To demonstrate this disease, a specific, individualized educational model was created by combining MRI and CT data. This included bony structures, soft tissue, and the anatomic defect where the infant's spinal canal had failed to close (**Figure 3**). The 3D printed model also helped surgical residents gain a 3D understanding of the critical anatomic landmarks for this rare fetal surgery.

### DISCUSSION

Since the early 2000s, the use of 3D printing in medicine and surgery has expanded rapidly<sup>3</sup>. In RI, 3D printing services are available through the Lifespan 3D Printing Lab. This technology has improved surgical planning, communication with patients, and medical education.

With the capability to produce patient-specific models, surgeons, interventional radiologists and others can now see, feel, and even practice on what they will actually encounter in the operating room.<sup>11,13</sup> The 3D model provides an intuitive reference of geometrically complex structures, which adds an extra dimension to viewing X-rays, CT scans, or MRI images on 2-dimensional screens. 3D printed models can be sterilized and brought into the operating room for a real-time surgical reference. The tactile benefits of a physical model give surgeons a clear sense of spatial relations to analyze complex deformities. This enhanced preparation hopefully translates to a decrease in operating room time and improved patient outcomes.

Patient-specific models improve patient-physician communication. The process of explaining diagnoses and treatment plans can be difficult when relying solely on conventional radiology images that may be familiar only to other healthcare professionals. With the benefits of 3D printing, doctors can now provide high-level visual and tactile representations of the patient's problem and anatomy to explain a difficult diagnosis and facilitate discussions of a planned procedure.<sup>10,11,14</sup>

Finally, medical education may benefit from this technology. For medical students, 3D printed models can help teach anatomy and clarify spatial relationships. For residents in training, patient-specific models can demonstrate proposed surgical or interventional radiology approaches and enable practice and rehearsal of certain procedural techniques.<sup>14</sup>

Currently there are some limitations and barriers to 3D printing in Medicine. Namely, production of a patient-specific 3D model relies on the quality of the original medical imaging scans and is time, resource, and labor intensive. There is also a significant learning curve to master the technology. Furthermore, there is a wide range of commercially

available 3D printers without a clear gold standard, and each can typically only print in one type of material. Available printing materials include biomaterials, metal or acrylic, but the ability to combine these materials into a single 3D print remains limited. Finally, because this is such a new technology, there is incomplete data on cost-benefit analysis and objective patient outcomes, although research in this area is expanding.

This article highlights some current and potential uses of 3D printing in Medicine, which will only expand in the future. RI physicians can utilize this advanced technology for multiple applications to innovate and improve their medical practice and patient healthcare outcomes.

### CONCLUSION

The Lifespan 3D Printing Lab introduces the capabilities and contributions of commercial-grade 3D printing in diverse medical environments. This manuscript describes three representative cases to demonstrate how this technology can be used to enhance medical practice and training.

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# Evaluation of Integrated Interventional Radiology Residency Websites

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## ABSTRACT

**RATIONALE AND OBJECTIVES:** In the transition to the integrated interventional radiology residency model, residency websites are important resources of program information for prospective applicants. The objective of this investigation was to evaluate the availability and comprehensiveness of integrated interventional radiology residency websites.

**MATERIALS AND METHODS:** A complete list of programs participating in the 2018 integrated interventional radiology match was collected using the online Fellowship and Residency Electronic Interactive Database and Electronic Residency Application Service. Residency program websites were evaluated for the presence of 19 variables related to resident education and recruitment, and the percent comprehensiveness of each website was calculated based on the number of variables present. The effect of program size and geographic region on website availability and comprehensiveness was assessed.

**RESULTS:** Of the 69 programs participating in the 2018 match, 18 (26%) programs did not have any locatable website. Of the 51 programs with websites, 30 (59%) had stand-alone interventional radiology websites distinct from the associated diagnostic radiology website. Large programs were more likely to have a residency website than small programs (91% versus 54%,  $p=0.001$ ). Across all categories, the mean website comprehensiveness was 33%. Mean website comprehensiveness of programs in the Midwest (43%) and Northeast (37%) was significantly greater than mean website comprehensiveness of programs in the West (19%) ( $p=0.005$ ).

**CONCLUSION:** Overall, 1 in 4 integrated interventional radiology residency programs did not have locatable websites. Many integrated interventional radiology residency websites lack important content variables. Efforts should be made to improve the residency websites and digital training resources for prospective interventional radiology applicants and to help showcase programs in the best light.

**KEYWORDS:** Education; Internet; Interventional Radiology; Residency; Website

## INTRODUCTION

The first full cycle of the new, integrated interventional radiology (IR) residency match in 2017 marked a milestone in IR's evolution as a medical specialty. With this change, the pool of potential IR trainees has increased to include medical students in addition to diagnostic radiology residents. In 2018, integrated IR was tied for the most competitive specialty to match into in terms of number of spots per applicants.<sup>1</sup> Given the immense interest in IR and the evolving application process for integrated IR programs, residency websites are increasingly important online tools. Websites allow the programs to communicate desired information to potential applicants, and also serve as a key source of information for the applicants.

Prior studies have assessed residency websites for their content and accessibility in various specialties, including diagnostic radiology, dermatology, plastic surgery, orthopedic surgery, neurosurgery, and otolaryngology.<sup>2-7</sup> As IR transitions into the new training system, IR residency websites may benefit from a similar assessment. The objective of the present study was to evaluate the availability and content comprehensiveness of IR residency websites utilizing an approach similar to that in many analogous studies previously conducted in other specialties.

## MATERIALS AND METHODS

### Website Localization

A list of all programs that registered to participate in the 2018 integrated interventional radiology residency National Residency Matching Program match was collected from the American Association of Medical Colleges Electronic Residency Application Service and confirmed through the American Medical Association Fellowship and Residency Electronic Interactive Database (FREIDA Online). Program websites were identified from their corresponding FREIDA Online profiles. In situations where no website was listed, the program name and the search identifier "interventional radiology residency" was queried using Google (Google LLC, Mountain View, CA), and the first 10 search results were examined to attempt to identify a program website. When no residency website was identified via Google, the program's home institution's general website and corresponding diagnostic radiology website were manually searched to identify a website for the interventional radiology program.

## Website Review

Websites were evaluated between October 20 and 25, 2017 for the presence or absence of 19 variables related to education (i.e. residency training) and recruitment of applicants. These variables and this categorization scheme were adapted from multiple similar studies in other fields,<sup>3-7</sup> and reflect many pieces of information a prospective applicant may wish to glean from a residency program website irrespective of the specialty. Pertinent modifications specific to IR were made to this variable list in consultation with IR faculty at our institution in order to better reflect additional variables of specific interest to IR trainees (**Table 1**). A variable was only considered to be present if available directly on pages linked by the IR website. For example, if social information about the city was listed on the diagnostic radiology website but not the IR website, it was not counted. However, if a link to social information on the diagnostic radiology website was included on the IR website, it was counted.

**Table 1.** List of residency website content variables.

Educational Content	Recruitment Content
Research Information	Program Director Contact Information
Didactics Schedule	Program Coordinator Contact Information
Rotation Schedule	Social Information
Call Schedule	Alumni (Fellowship) Information
Medical Student Away Rotation Information	Application Requirements
Current Fellows or Residents	Number of Positions
Operative Volume	Early Specialization in IR (ESIR) Information
List of Faculty	Intern Year Preferences
Faculty Profiles	Salary/Benefits
	Affiliated Hospital Information

For each website variable, the percentage of IR residency websites containing that variable was calculated. For each program website evaluated, the total number of variables that website contained was tabulated, and a website comprehensiveness score was calculated as the percentage of total website variables each program's website contained. A total of 19 variables were evaluated, thus a program expressing all 19 variables would be 100% comprehensive.

Additionally, websites were assessed for whether or not they were distinct ("stand-alone") from their associated diagnostic radiology program's website, as this was felt to be important given IR's now distinct application process. A residency website was considered stand-alone if it contained more than one page/link of information related to the interventional radiology program; residency websites that were only a single page on the associated diagnostic radiology

website with no additional links were categorized as not stand-alone websites.

## Program Comparison

To assess potential factors that may be related to the presence or comprehensiveness of IR residency websites, IR programs were categorized based on geographic region and program size. Geographic region (Northeast, Midwest, South, West) was designated as classified by the U.S. Census Bureau. The total number of fellows in 2017, as gathered from the Society for Interventional Radiology (SIR) Training Program Directory, was used as a proxy for program size. The median program size was 3; therefore, programs were considered "small" if they had less than 3 fellows and "large" if they had 3 or more fellows. Number of residency positions was not used as a proxy for program size as even large programs rarely have more than three residency positions, and it was felt that the fellowship, present longer than the residency program, would likely be more related to development of the residency program's website.

## Statistical Analysis

Analysis was conducted to determine whether geographic region or program size was associated with the presence or absence of a program website. Analysis was also conducted to determine whether geographic region or program size was associated with website comprehensiveness.  $\chi^2$  comparisons and Mann-Whitney tests/Kruskal-Wallis tests with post-hoc pairwise analysis were used for categorical and continuous variables, respectively. Threshold for significance was set at  $p < 0.05$ . SPSS version 24 statistical software (IBM Corporation, Armonk, NY) was used for statistical analysis. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. As all the information used for this study is in the public domain, this investigation was exempt from review by the institutional review board at the affiliated university.

## RESULTS

### Presence of Websites

A total of 69 programs were registered to participate in the 2018 integrated IR match. Of these, 74% (51/69) had locatable websites and 26% (18/69) did not. Of the 51 websites, 59% (30/51) were stand-alone interventional radiology websites, whereas 41% (21/51) were not. Information on program size (number of fellows) was available via the SIR Training Directory for 87% (60/69) of programs. These 60 programs were categorized into small ( $n=28$ ) and large ( $n=32$ ) as described under *Program Comparison* above. The remaining 13% (9/69) of programs that did not have information on program size were excluded from program size analysis. When grouping programs by size, there was a significant association between program size and the presence of a website

( $\chi^2$ ,  $p=.001$ ). Specifically, 91% (29/32) of large programs had websites, whereas only 54% (15/28) of small programs had websites. There was no significant association between geographic region and the presence or absence of a website.

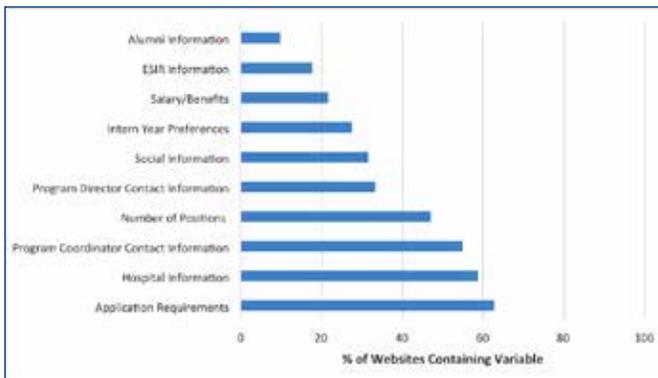
**Website Assessment – Recruitment Content**

The 51 available websites were assessed for the presence of the 10 recruitment variables as outlined in Table 1. The presence of alumni information (percentage of residency websites containing this content variable = 10%) and intern year preference information (27%) were among the lowest, while application requirements (63%) and hospital information (59%) were the highest (Figure 1).

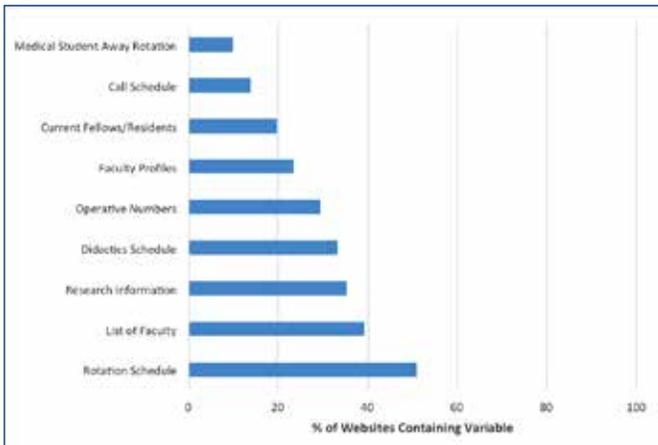
**Website Assessment – Education Content**

The 51 available websites were assessed for the presence of the 9 education variables as outlined in Table 1. Information on medical student away rotations (10%) and call schedules (14%) were particularly low, whereas information on resident rotations (51%) was the highest (Figure 2). Additionally, 39% of websites listed IR faculty distinct from diagnostic radiology faculty, and 24% of websites included specific IR-related information on these faculty members (e.g. training institution, research interests).

**Figure 1.** Recruitment content on IR residency websites.



**Figure 2.** Education content on IR residency websites.



**Website Comprehensiveness**

The mean (SD) comprehensiveness score across all 51 websites was 33% (17%). When organizing programs by geographic region, there was a significant difference in website content (Kruskal-Wallis,  $p=0.005$ ) (Table 2). Post-hoc pairwise analysis demonstrated that the mean comprehensiveness of Midwest program websites (43%) and Northeast program websites (37%) were each significantly greater than the comprehensiveness of West program websites (19%). When organizing programs by size, there was no significant difference in website comprehensiveness between large and small programs (Mann-Whitney,  $p=0.071$ ). Program size information was not available for 14% (7/51) of websites, and therefore these were excluded from this program size analysis.

**Table 2.** Comparison of website comprehensiveness by program characteristics.

	N	Comprehensiveness %, Mean (SD)	P-value
<b>Region</b>			.005
Midwest	12	43 (17)*	
Northeast	18	37 (14)*	
South	12	26 (13)	
West	9	19 (16)*	
<b>Program Size</b>			.071
Small (<3 fellows)	15	38 (13)	
Large (>=3 fellows)	29	29 (18)	

\* post-hoc pairwise comparison demonstrates  $p$ -value < 0.05

**DISCUSSION**

The present study evaluated the online presence of integrated IR residency programs for website availability and comprehensiveness. Only 74% of programs registered to participate in the 2018 integrated IR match had websites, and only 59% of these websites were stand-alone IR websites. Large programs were significantly more likely to have a website than small programs. Overall, IR program websites have room for improvement in terms of the content they provide.

For medical students, residency program websites are a nearly universally accessed source of information, as evidenced in a survey of anesthesia residency applicants that found that 98% of respondents consulted residency websites during the application process.<sup>8</sup> Moreover, with the recent development and launch of integrated IR residency programs, it is expected that greater numbers of prospective applicants are utilizing the internet to learn about various programs, rendering IR residency websites increasingly important. Traditionally, IR has been a fellowship after diagnostic radiology residency. Therefore, residents have likely had multiple rotations in IR, established relationships with

mentors in the specialty, and had more time to learn about different programs before applying. Compared to this system, the new integrated residency model requires medical students to learn about programs with less time and exposure than radiology residents applying to IR fellowship traditionally would have had. Given that data suggests that most students become interested in IR relatively late in their medical school training,<sup>9</sup> the need for publicly available, high quality online information is paramount.

The importance of program websites has been highlighted in radiology as well as other specialties.<sup>10-15</sup> A survey of integrated IR applicants in the 2017 match conducted by DePietro et al. found that applicants ranked program websites as the number one most important resource for learning about programs, even more important than mentoring from attending physicians, away rotations, and residents.<sup>10</sup> In a study of diagnostic radiology residency applicants by Deloney et al., 59% of respondents found residency program websites to be most useful when deciding where to apply and 44% found them useful when preparing for interviews.<sup>13</sup> Additionally, residency websites have also been shown to have a tangible impact on program selection. This was further supported in a study of emergency medicine residency applicants, in which 78% of surveyed applicants reported that information from residency websites influenced their decision to apply to a program and 41% of applicants chose not to apply to a specific program based on the quality of their residency website.<sup>12</sup> A survey of neurosurgery residency applicants found that residency websites influenced 90% of respondents in choosing where to apply and aided more than half of applicants in ranking programs.<sup>15</sup> These studies highlight the importance of program websites and their influence on prospective applicants.

Assessments of residency program websites conducted in other fields,<sup>3-7</sup> including diagnostic radiology,<sup>2</sup> have nearly universally concluded that website content and accessibility were less than desirable and had room to improve. However, in comparing the comprehensiveness of website content between these other fields and the present study's findings for IR, IR websites tended to lag behind in many content variables. For example, the study of diagnostic radiology residency websites found that 63% of websites contained faculty information, 62% contained rotation schedules, and 59% contained research description or requirements,<sup>2</sup> while these values were 24%, 51%, and 35%, respectively, for IR. A similar, and in some instances starker, difference for these variables was noted when comparing IR websites to program websites for otolaryngology, plastic surgery, dermatology, and neurosurgery.<sup>3,4,6,7</sup> These findings are unsurprising given that the integrated IR residency is only in its second full match, but do highlight an area that offers opportunities for improvement as the field matures.

There are several potential limitations of this study. This analysis only evaluated for presence or absence of specific

website content variables. It did not measure quality, level of detail, accuracy, or importance of the content. Moreover, these content variables were adapted from similar studies in other fields. However, it is possible that the relative importance of these variables for IR is different than it is for other fields. That said, the 19 content variables encompass a variety of domains that are of interest to students applying into IR and residency in general, and examining similar content variables assessed in prior studies allows for comparison with the findings of other specialties. Additionally, the review of each website is a subjective process and is inherently susceptible to observer bias. However, each website was reviewed by a single author (C.H.) using a similar approach in order to make the evaluation process as consistent as possible. Future studies may analyze what resources medical students applying into IR find valuable and how programs can best utilize online resources for resident recruitment.

## CONCLUSION

Residency program websites are a valuable source of information and an important opportunity for programs to reach prospective applicants. Our findings suggest that there is room for improvement in IR residency websites. We believe that creating a residency website (for programs without one) and/or improving the content comprehensiveness of program websites would improve the availability of information for prospective applicants. In turn, this could help applicants and programs find the best fit, which is vitally important for the future of the integrated interventional radiology match.

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# Impact of State Regulations on Initial Opioid Prescribing Behavior in Rhode Island

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## ABSTRACT

The opioid epidemic presents an urgent public health problem. Rhode Island has enacted comprehensive rules to address primary prevention of opioid overdose. This study evaluates the efficacy of those regulations in altering prescribing behavior, specifically regarding the initial prescription. Using data extracted from the Rhode Island Prescription Drug Monitoring Program (PDMP), before and after the publication of updated acute pain management regulations, we studied the rate of opioid prescribing using statistical process control (SPC) charts and found that the rate of prescribing unsafe doses of opioids, more than 30 morphine milligram equivalents (MMEs) per day or more than 20 doses to opioid naïve patients, decreased significantly.

**KEYWORDS:** Opioids; Primary Prevention; Regulations; Acute Pain Management; Prescription Drug Monitoring Program

## BACKGROUND AND PURPOSE

Since 2000, the opioid overdose death rate for the US has increased from 1.4 per 100,000 to 10.2 per 100,000 in 2016.<sup>1</sup> Similarly, over the same time period, Rhode Island's rate has increased from 5.4 per 100,000 to 26.7 per 100,000.<sup>2</sup> It has also adversely affected the lives of 1 in 10 people who have chronic pain who suffer from opioid addiction<sup>3</sup>. Efforts to combat the public health impact of opioid overdose deaths have ranged from tertiary prevention (i.e., increasing the availability of naloxone to first responders); secondary prevention (i.e., increasing the prescribing of Medication Assisted Treatment (MAT) to at-risk opioid users), and primary prevention (i.e., reducing the use of opioids in opioid naïve patients).

In an effort to reduce overdose deaths, State regulatory bodies, pharmacies, and insurers have largely focused on the duration of the initial prescription, based on evidence that this may be a dominant factor in eventual dependence. However, this focus on duration of the initial prescription neglects that prescriptions with higher MMEs or more doses can be spread over longer durations than intended, and that these factors are also independent predictors of dependence.<sup>4-7</sup> Additionally, few studies have evaluated the

efficacy of such prescribing policies promulgated as regulations, and no prior studies have evaluated an all-inclusive set of policies promulgated as regulations such as those in Rhode Island.

This study aims to evaluate the rates of unsafe opioid prescribing before and after the publication of Rhode Island's updated acute pain management regulations, along with the implementation strategies that followed.

## SETTING

Rhode Island promulgated regulations regarding controlled substance prescribing in March 2015.<sup>8</sup> Regulations differ from guidelines as they have the force of law and represent a minimum standard for prescribers. The acute pain management regulations, updated in March 2017, reflected a statutory change that required that initial prescriptions for a patient new to the prescription of opioids (no prior opioid in the preceding 30 days) not exceed 20 doses and 30 MME/day. These regulations were based on research showing that regardless of the indication, initial opioid prescription dose and duration increased the risk for patients to experience long-term dependence and overdose.<sup>4-7</sup>

Patients who are new to the prescription of opioids, (i.e., have not taken an opioid in the most recent 30 days) are referred to as "initiates." These patients represent a vulnerable group relevant to persistent opioid use and overdose since they do not have prior exposure or tolerance to opioids. The 2017 updated pain management regulations align with RIDOH's public health priorities which aim to decrease the number of opioid-naïve individuals exposed to an opioid, decrease the number of persistent opioid users, and decrease the number of individuals who have experienced an opioid overdose.

## INTERVENTIONS

RIDOH developed two primary interventions to enforce these updated acute pain management regulations. Intervention 1 was a strategic communications plan of the acute pain regulations to prescribers of controlled substances in April of 2017.

Intervention 2 launched in July 2017 as a cooperative effort by RIDOH and the largest third-party payers in the State of Rhode Island by activating a pharmacy system alert

(prior authorization) for any opioid prescription to a patient that was new to the prescription of opioids and exceeded 20 doses and 30 MME/day. This prior authorization occurred prior to dispensing and allowed the pharmacists to contact the prescriber for a change in the prescribed amount, or alternatively, override the prior authorization, if there was an appropriate exception to the regulation (e.g., a diagnosis of chronic pain).

## IMPLEMENTATION

This communications plan consisted of letters to prescribers from relevant State regulators of controlled substances prescribing and dispensing. The content of the letter informed prescribers of the regulation and emphasized the importance of complying with this regulation, as well as announcing an eight-hour Continuing Medical Education (CME) opportunity being offered by a local university relevant to the interdisciplinary treatment of pain. This messaging was delivered from five separate regulatory leaders to their respective members, including letters from the Director of Health, Chief Administrative Officer of the Board of Medical Licensure and Discipline, Chief Administrative Officer of the Board of Dental Examiners, State Director of Nursing, and Chief Administrative Officer of the Board of Pharmacy. In addition, Rhode Island's top 2,000 opioid prescribers were identified by gathering data from the Rhode Island PDMP. These top prescribers received letters via the US Postal Service that were written and signed by RIDOH Director of Health. RIDOH also leveraged partnerships with the State's third-party payers and medical associations to promote this regulatory messaging.

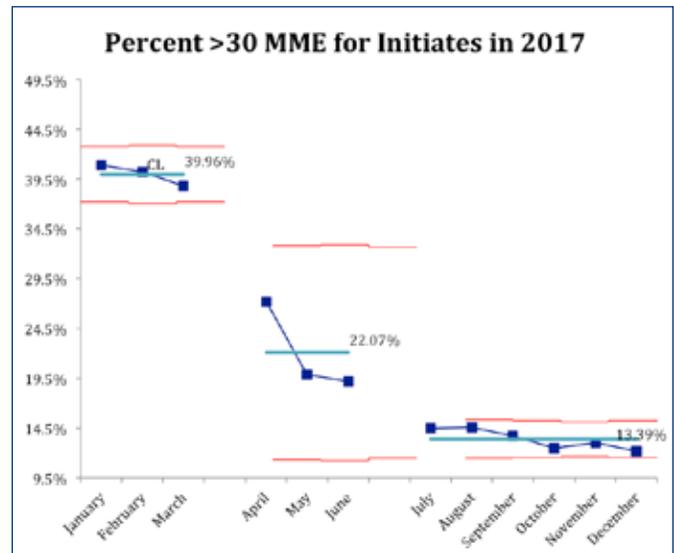
## EVALUATION

Opioid prescription data were abstracted from the Rhode Island PDMP from 2017, and were categorized according to duration (<3, 3-30, 30-90, and >90 days); number of doses (<5, 5-21, 21-90, and >90 doses); and, daily MME (<30, 30-90, and >90 MME) prescribed. The categories chosen were informed by the regulations in order to determine the proportion of prescriptions by month above safe prescribing limits as defined by the updated acute pain management regulations.

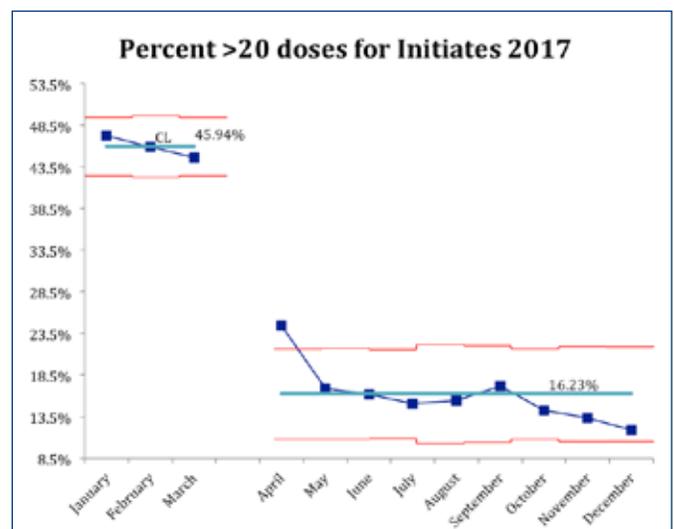
For initiates, we evaluated the proportion of unsafe prescriptions (i.e., not adhering to the updated acute pain regulations: >30 MME/day or >20 doses) out of the total monthly initiate prescriptions using statistical process control charts. Using  $P'$  charts, with Laney's approach<sup>9,10</sup> we identified special cause variation when points fell outside of the control limits (i.e., at three standard deviations).

**Figure 1** shows the percent of prescriptions greater than 30 MME, and demonstrates non-random and sustained decreases from 40% to 22%, in April 2017, and from 22% to 13% in July 2017. Chi squared test of proportions found these

**Figure 1.** p-chart with monthly initiate prescriptions >30 MME out of total initiate prescriptions. Significant downward shifts are noted in April and July. The center line has been segmented at those points to show the mean over those periods. Control limits are shown in red, and define 3 standard deviations above and below the mean.



**Figure 2.** p-chart with monthly initiate prescriptions >20 doses out of total initiate prescriptions. A significant downward shift is noted in April. The center line has been segmented to show the mean over those periods. Control limits are shown in red, and define 3 standard deviations above and below the mean.



decreases to statistical significance with  $p$  values <0.0001 for these changes in April and July. A related increase was seen in the number of patients receiving less than 30MME.

**Figure 2** shows the percent of prescriptions greater than 20 doses, and demonstrates a non-random and sustained decrease in April 2017. Chi squared test of proportions showed a decrease from 46% to 16% ( $p < 0.0001$ ).

## SUSTAINABILITY

The decrease demonstrated in the process control charts appear to be sustained over the months observed, though 2 more months of data are required to establish a process in statistical control. The updated acute pain management regulations are sustained by state law and are enforced by the RIDOH. The additional prior authorizations are sustained by the cooperative agreement between the RIDOH and third-party payers. Although our current analysis is limited to the end of 2017, other RIDOH published data<sup>11</sup> demonstrate a 29% decrease in the number of people who are receiving a new opioid prescription since January of 2017. Additionally, there is a 13% decreased in average MME per prescription since January of 2017. This suggests a long-term adoption of this regulation by prescribers and pharmacists and an effective, sustainable public health intervention.

## PUBLIC HEALTH SIGNIFICANCE

State regulation as a means of enforcing safe opioid prescribing represents an important step towards primary prevention of opioid dependence and overdose. Rhode Island's updated acute pain management regulations successfully decreased the number of unsafe prescriptions to opioid naïve patients. Our results suggest that this regulation, which limits dose and potency of the initial prescription, has been successful in changing prescribing behavior towards known safe standards.

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# High Rates of Indeterminate TB Tests Among Hospitalized Patients: Can We Optimize Use of Interferon Gamma Release Assays in Tuberculosis?

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## ABSTRACT

In the United States, high concern for iatrogenic reactivation to tuberculosis (TB) disease secondary to prescribed immunosuppression has resulted in increased use of the QuantiFERON-TB Gold In-Tube test (QFT-GIT) to screen for *Mycobacterium tuberculosis* (Mtb) infection. The aim of our study was to determine indications for QFT-GIT testing and risk factors for indeterminate QFT-GIT results. We retrospectively identified patients with QFT-GIT testing over a six-month period in a tertiary care academic health care system and performed a record review. Inpatients were 11 times more likely to have an indeterminate QFT-GIT result than outpatients (95% CI 7.6-16.2). 61.5% inpatient QFT-GITs were ordered during workup of active TB. Providers treating exogenously or endogenously immunosuppressed patients ordered the most QFT-GITs. We highlight the significant limitations of TB screening tests in the inpatient setting and the need to test earlier in those requiring immunosuppressive therapy to avoid indeterminate results.

**KEYWORDS:** IGRA, Tuberculosis Infection, LTBI, Tuberculosis Screening, Tuberculosis Diagnostics

## INTRODUCTION

While case rates of tuberculosis disease (TB) in the United States have decreased to 2.8 per 100,000 population in 2017,<sup>1</sup> there are still an estimated 12.4 million people in the United States living with *Mycobacterium tuberculosis* (Mtb) infection.<sup>2</sup> Evidenced by a positive tuberculin skin test (TST) or interferon gamma release assays (e.g. QuantiFERON-TB Gold In-Tube test, Quiagen; QFT-GIT), 5-10% of untreated Mtb infections may develop into active TB disease.<sup>3</sup> Screening for Mtb infection is now arguably easier with laboratory-based blood tests like the QFT-GIT, which also offer increased specificity for testing Bacille Calmette-Guerin (BCG) vaccinated patients.<sup>3</sup> However, determining who and when to screen still can be confusing.

In 2016, the US Preventive Services Task Force recommended routine Mtb infection screening in people with increased risk, especially former residents of TB-endemic countries and high-risk congregate settings.<sup>3</sup> However, with

increasing use of immunosuppressive agents, such as TNF inhibitors, some healthcare systems have chosen to screen all patients for TB before initiating certain medications, regardless of exposure risk.<sup>4</sup> In immunosuppressed patients, poor immune response can result in indeterminate QFT-GIT results due to low mitogen response.<sup>5</sup> To facilitate interpretation of indeterminate qualitative results, the CDC guidelines recommend reporting both the QFT-GIT's qualitative and quantitative results.<sup>6</sup>

QFT-GIT can be difficult to interpret in clinical care, especially when the results are "indeterminate." This is more common among critically ill patients, inpatients<sup>7</sup> and patients receiving immunosuppressive medications.<sup>8</sup> Additionally, some inpatient providers still use Interferon Gamma Release Assay (IGRA) as an adjunctive test for active TB diagnosis, yet 1 in 4 patients with active TB are estimated to be IGRA negative.<sup>9</sup> The goal of our study was to explore the indications for QFT-GIT testing in our academic medical system and risk factors for indeterminate QFT-GIT results.

## METHODS

Following Lifespan's Institutional Review Board approval, we performed a retrospective review of all patients with QFT-GIT tests ordered from June to August 2015 and from November 2015 to January 2016. These dates were originally chosen for a parent quality improvement project monitoring the transition of the QFT-GIT to in-house laboratory testing, focused on potential interlaboratory and seasonal variability. The Lifespan lab serves three Brown University-affiliated hospitals, onsite outpatient clinics and Lifespan-affiliated practices in Rhode Island. Tests ordered at all sites, including those serving pediatric patients, were included in the study. QFT-GIT was performed by technicians according to the manufacturer's recommendations.<sup>5</sup> For patients with QFT-GIT testing during the study period, demographics and the ordering location were identified using the Lifespan laboratory database.

A subset analysis was then performed on adult inpatients over the age of 18 years. Clinical information of the laboratory-identified adult inpatients was abstracted from the electronic medical record (including inpatient prescription of immunomodulatory medications 14 days after or before the QFT-GIT, diagnoses associated with the hospital stay, TST

during the hospitalization, and HIV status) from Lifespan's Epic data warehouses into an Excel database. Detailed individual chart reviews were not completed for this study and outpatient prescription and pharmacy data was unavailable. ICD-9 diagnosis codes for the hospitalization were reviewed by a physician to determine if the QFT-GIT was ordered for screening or diagnosis. The determination as to whether QFT-GIT was ordered during work-up of active TB disease was made based on indicative diagnosis codes (e.g. Pneumonia, fever, cavitary disease, pericardial effusion). QFT-GIT in patients with ICD-9 diagnostic codes less suggestive of active TB disease (e.g. chest pain/shortness of breath) were not classified as being ordered for diagnosis. If the diagnosis codes for the hospitalization suggested the patient was

a transplant recipient, had a malignancy or an immune-mediated inflammatory disorder, then they were classified as having a diagnosis managed with immunosuppression.

Statistical analyses were performed using JMP Pro software (version 13.2; SAS Institute Inc). Pearson chi-squared and student t test were used to compare baseline characteristics where appropriate (Table 1) and a kappa coefficient was calculated for test concordance.

## RESULTS

A total of 1,817 QFT-GIT tests were performed during the study period. Of these, 221 (12.2%) were inpatient QFT-GIT tests and 1596 (87.8%) were performed outpatient. Among the 182 adult inpatients, 61.5% of tests ordered were on patients with ICD-9 diagnostic codes indicating they were undergoing work up for active TB disease, and 37.4% of QFT-GIT tests were on patients prescribed immunosuppressive drugs at the time of their testing (Table 1).

Comparing indeterminate to determinate test results amongst inpatients (Table 1), a greater proportion with a diagnosis managed with immunosuppression (32% vs 25%,  $p=0.34$ ) or already on immunosuppression at the time of the QFT-GIT (44% vs 34.8%,  $p=0.25$ ) had an indeterminate result, though neither reached statistical significance.

### Agreement Among Repeat Tests

We identified 30 patients with adult inpatient QFT-GITs who also had TST ordered. Of this group, 53.3% (16/30) performed prior to the requesting order for QFT-GIT. Despite concern for potential boosting phenomenon by the TST,<sup>10</sup> there was no discordance between positive QFT-GIT and TST results. However, of inpatients with negative TSTs, 63.2% (12/19) had indeterminate QFT-GIT results.

Additionally, 11 adult patients had one repeat QFT-GIT during their inpatient stay, one patient had 3 QFT-GIT tests, and another had a repeat QFT-GIT while outpatient. Of the 12 patients with duplicate QFT-GIT tests while inpatient, only 3 had disparate results from the original test (75% concordance, kappa 0.56, SE=0.23). Two patients with negative QFT-GITs had indeterminate results on repeat testing, while one patient initially had an indeterminate result that then resulted as negative on repeat testing. For the one patient with a repeat outpatient QFT-GIT, both tests resulted as negative.

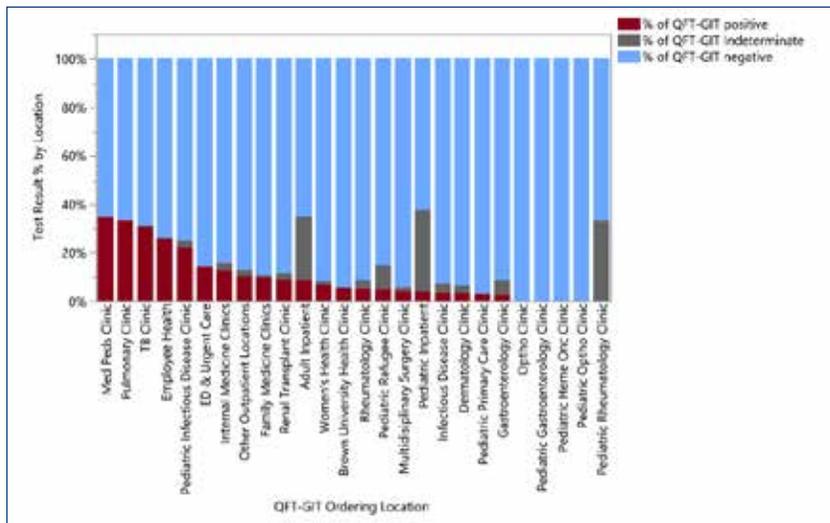
**Table 1.** A comparison of characteristics of adult inpatients who had indeterminate vs determinate QFT-GIT results (n=182).

Characteristics:	Total Inpatient n (%)	Indeterminate n (%)	Determinate n (%)	P value
Total	182	50/182 (27.5)	132/182 (72.5)	
<b>Age</b>				0.20
Over 65 years	45 (24.7)	9 (18.0)	36 (27.3)	
Under 65 years	137 (75.3)	41 (82.0)	96 (72.7)	
<b>Sex</b>				0.24
Male	93 (51.1)	22 (44.0)	71 (53.8)	
Female	89 (48.9)	28 (56.0)	61 (46.2)	
<b>HIV Positive</b>	<b>16 (8.8)</b>	<b>5 (10.0)</b>	<b>11 (8.3)</b>	<b>0.72</b>
QFT-GIT Processing Time (mean days)	3.18	3.04	3.23	0.35
<b>Active TB work up:</b>				<b>0.20</b>
Yes	112 (61.5)	27 (54.0)	85 (64.4)	
No	70 (38.5)	23 (46.0)	47 (35.6)	
<b>Dx managed with immunosuppression:</b>				<b>0.34</b>
Yes	49 (26.9)	16 (32.0)	33 (25.0)	
No	133 (73.1)	34 (68.0)	99 (75.0)	
<b>On immunosuppression prior to QFT-GIT:*</b>				<b>0.25</b>
Yes	68 (37.4)	22 (44.0)	46 (34.8)	
No	114 (62.6)	28 (56.0)	86 (65.2)	
<b>Started on immunosuppression after QFT-GIT:**</b>				<b>0.02</b>
Yes	18 (9.9)	9 (18.0)	9 (6.8)	
No	164 (90.1)	41 (82.0)	123 (93.2)	

\*The inpatient pharmacy record documented administration of immunosuppressive chemotherapy within the 2 weeks prior to QFT-GIT testing.

\*\*The inpatient pharmacy record documented administration of immunosuppressive chemotherapy in the 2 weeks following QFT-GIT testing.

Abbreviations: HIV, human immunodeficiency virus; QFT-GIT, QuantiFERON-TB Gold In-Tube test; TB, tuberculosis; Dx, diagnosis.

**Figure 1.** QuantiFERON-TB Gold in-Tube test results by ordering location

Abbreviations: QFT-GIT, QuantiFERON-TB Gold in-Tube test; Med Peds, medicine-pediatrics; TB, tuberculosis; ED, emergency department; Ophtho, ophthalmology; Heme Onc, hematology-oncology.

### Across the Academic Healthcare System

Pediatric and adult inpatients tested were more likely than outpatients to have indeterminate results (27.1% (60/221) vs 2.4% (39/1596),  $p < 0.01$ ), resulting in a relative risk of 11.11 (95% CI 7.6-16.2). Comparison of QFT-GIT tested inpatients and outpatients on the basis of age (average 48.2 vs 40.8 years old,  $p = 0.28$ ), sex (49.3% vs 44.8% male,  $p = 0.20$ ), ethnicity (18.6% vs 17.4% Hispanic or Latino,  $p = 0.65$ ), and HIV positivity (6.8% vs 6.8%,  $p = 0.98$ ) found no statistically significant differences. Examination of the locations ordering the QFT-GIT revealed that clinics caring for patients with autoimmune diseases were among those with the most frequent orders. Among the ten highest inpatient/outpatient ordering locations, rheumatology clinic accounted for 22.1% of the orders, followed by adult inpatient (15%), the TB clinic (10.7%), internal medicine (10.2%), infectious disease (9.4%), renal transplant (8.6%), family medicine (7.9%), gastroenterology (6.2%), surgery multidisciplinary (5.3%) and women's health (4.6%) clinics. The med-peds, pulmonary, TB, and employee health clinics had the highest percentage of positive QFT-GIT results, while the inpatient locations and clinics caring for immunosuppressed patients, such as infectious disease and rheumatology clinics, had a greater proportion of indeterminate results (Figure 1). All indeterminate results regardless of ordering location were due to poor mitogen response.

### DISCUSSION

In keeping with other studies,<sup>7,11</sup> inpatients were 11 times more likely to have an indeterminate QFT-GIT result than outpatients in our cohort. However, we also showed a high proportion of adult inpatient QFT-GITs were ordered for

evaluation of active TB (61.5%). Though limited by our reliance on ICD-9 codes, to our knowledge, this is the first study to explore the indications for QFT-GIT testing in a tertiary care academic medical system in the United States. The second pattern we observed was high provider concern for iatrogenic TB reactivation. In our cohort, this resulted in high utilization of the QFT-GIT amongst providers treating diseases managed with immunosuppression, such as rheumatology and subsequently a higher proportion of indeterminate results from locations caring for immunosuppressed patients (Figure 1).

Despite that one in four patients with culture-confirmed pulmonary TB will have negative IGRAs,<sup>9</sup> we observed that a majority of adult inpatient QFT-GITs in our cohort were associated with workup for active TB disease. Education regarding testing

practices for evaluation of TB disease remains necessary, even at a tertiary academic referral center. A negative TST or IGRA result cannot remove active TB from consideration and, as we have shown, almost 30% of inpatient QFT-GITs will result as indeterminate, prompting further workup and may prolong patient airborne-isolation.

Our findings suggest we are entering an era where, risk of progression from *Mtb* infection to TB disease due to immunosuppression rather than epidemiologic risk for *Mtb* infection (formerly known as targeted testing) is driving TB screening patterns. In our hospital system, pharmacy protocols, suggesting TB screening prior to initial TNF alpha antagonist therapy, contributed to 37% of inpatient QFT-GITs drawn on patients already on immunosuppressive therapy. Although differences were not statistically significant, our analysis suggests that such persons may be predisposed to having indeterminate QFT-GIT results. Similarly, a recent study reported 76% of patients receiving the equivalent of 20 mg of prednisone or greater had indeterminate QFT-GIT results, as compared to only 6% in patients receiving less than this amount of steroid ( $P < 0.001$ ).<sup>12</sup> In our study, all indeterminate results, hospital system-wide, were due to insufficient immune response. In addition, we demonstrated moderate strength agreement amongst repeat tests, suggesting that reordering the same test will likely lead to the same result in circumstance where immunosuppression continues. Our work highlights the potential opportunity to avoid indeterminate results by screening for *Mtb* infection in those at risk prior to initiation of any immunosuppression.

Due to our study's retrospective nature and the limited use of our hospital-based EMR by affiliated outpatient providers, our ability to capture all diagnoses and outpatient immunosuppressive medications was restricted. Prior studies show

low albumin,<sup>7,8,11</sup> and lymphopenia<sup>7,8</sup> to be associated with indeterminate QFT-GIT results; however, we were unable to investigate these factors and did not replicate prior associations with older age<sup>13</sup> and female sex.<sup>7,13</sup> Analytical factors contributing to QFT-GIT variability<sup>10</sup> and indeterminate results<sup>7</sup> were similarly not addressed here. As discussed above, if pharmacy protocols contributed to inpatient QFT-GIT ordering, this may reduce generalizability of our results; however, practices within our healthcare system are informed by subspecialty society recommendations<sup>4</sup> and therefore are likely in keeping with national trends.

Though inpatient contacts with healthcare may be a convenient time for Mtb infection screening, providers should be aware of high rates of indeterminate results in this setting. Screening for Mtb infection should be considered at the time of a diagnosis that might require immunosuppression rather than waiting until escalation of immunosuppressive therapy. TB disease is best investigated with tests looking for the organism, such as acid-fast smears, nucleic acid amplification tests and culture, rather than IGRAs like the QFT-GIT. With these lessons around testing, we can optimize testing practices and provide patients and providers with the information needed.

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# Corporal Punishment: Rhode Island Physicians' Perceptions, Experience and Education

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## ABSTRACT

Corporal punishment (CP) is defined as inflicting pain to redirect an undesired behavior. The objective of the current study is to assess Rhode Island physicians' perceptions, experiences and education regarding CP. Our data may be used to inform future research and education/training for health care providers on how to provide guidance and have conversations surrounding CP. We developed an anonymous survey that assessed the perceptions, experiences and training of Hasbro Children Hospital physicians regarding CP in the medical setting. A total of 58 physicians responded; participants responded that CP was never effective for improving behavior (67.2%) and never recommended CP (98.2%) to patient families. However, most participants reported never received education on CP (67.9%). Our findings highlight that pediatric providers do not find CP an appropriate method of discipline and underscore the need for standardized training and education surrounding this issue.

**KEYWORDS:** corporal punishment; pediatric physicians; education; patient families; survey

## INTRODUCTION

Corporal punishment (CP) is defined as inflicting pain to redirect an undesired behavior, and is still a widely practiced method of discipline in American households.<sup>1,2</sup> CP is defined as punishment in which physical force is used and intended to cause some degree of pain or discomfort. This can include hitting (i.e. smacking, slapping, spanking) children with the hand or with an implement (i.e. a whip, stick, belt, shoe, wooden spoon).<sup>1</sup> CP may also involve kicking, shaking, or throwing children; scratching, pinching, biting, pulling hair, or boxing ears; forcing children to stay in uncomfortable positions; and burning, scalding, or forced ingestion.<sup>1</sup>

Brookings found that 81% of parents believe that spanking is sometimes appropriate and two-thirds of parents have spanked their child.<sup>3</sup> Prior research has identified that CP is associated with negative sequela for children and adolescents<sup>4</sup>; this includes increased aggressiveness<sup>5</sup>, heightened risk for physical abuse<sup>5-7</sup>, reinforcement that violence or hitting

is an appropriate solution to problems<sup>5,6</sup>, and decreased learning capacity.<sup>8</sup> While CP that involves hitting, slapping, or pushing may change behavior in the short-term, CP has consequentially been correlated with a myriad of mental health issues for children in the long-term, such as mood disorders, anxiety, personality disorders, and substance use disorders.<sup>6,8-10</sup> In 2018, Rhode Island Kid's Count identified 9 cases of child abuse allegations related to CP, which decreased from 13 cases in 2016.<sup>11</sup>

The American Academy of Pediatrics (AAP) and the American Academy of Child and Adolescent Psychiatry (AACAP) identify that CP should not be used with children as it is less effective and associated with negative outcomes in both childhood and adulthood.<sup>1,2</sup> A recent 2018 AAP policy statement acknowledges that pediatricians are in the position of providing guidance to parents on effective discipline, and discussing the harmful consequences of CP.<sup>1</sup> In addition, pediatricians should be cognizant of local resources to provide families, including parenting classes/groups and mental health professionals.

Caregivers rely on pediatricians for advice on a variety of parenting matters; a 2012 study involving 500 parents in Louisiana demonstrated that parents were more likely to follow the advice of pediatricians compared with other professionals, and nearly half (48%) indicated that they were most likely to consult their pediatricians for advice on corporal punishment.<sup>12</sup> Pediatricians and other health providers have the opportunity to be a source of advice for caregivers regarding appropriate discipline.<sup>1</sup> However, there is limited literature regarding physicians' education and training on speaking with families about discipline, and how to intervene when these behaviors are seen. Therefore, the objective of the current study is to assess Rhode Island pediatric physicians' perceptions, experiences and education regarding CP. Our data may be used to inform future research and education/training for health care providers on how to provide guidance and have conversations surrounding CP in our community's hospital settings.

## METHODS

The Rhode Island Hospital Institutional Review Board approved all procedures. We developed an anonymous survey that assessed the perceptions, experiences and training

of Hasbro Children Hospital pediatric physicians regarding CP in the medical setting. Experienced child abuse pediatricians reviewed the survey for content.

Participation in the study was voluntary and anonymous. The survey was distributed in November 2017 via e-mail to the pediatric department, including chief residents, who were asked to send the survey to their staff members. Staff listed in the Hasbro Children's Hospital staff services and/or the department of pediatrics at Hasbro Children's Hospital were invited to participate. Several reminder e-mails were subsequently distributed at two-week intervals of time.

The survey captured demographic information (e.g. gender, level of training), personal histories (e.g. use of CP with their own children) and professional experiences (e.g. if they have witnessed CP in the hospital) with CP. Moreover, agreeability and likelihood scales were designed to evaluate participants' views on the importance of providing intervention and education regarding CP. Education and training of participants regarding CP was also assessed.

Research Electronic Data Capture (REDCap) software, a free, secure, Web-based application, was used to create and distribute the survey, and collect de-identified and aggregated data.

## RESULTS

A total 58 pediatric physicians at Hasbro Children's Hospital completed the survey; their responses are reported in **Table 1**.

### Demographics

The mean age was 42.7 years old, and the majority of participants were female (67.2%). Of the 58 physicians who completed the survey, 63.8% were attendings, 25.9% were residents and 10.3% were fellows. Of participant reported specialty, slightly less than half were general pediatrics (42.9%), followed by pediatric psychiatry (19.0%).

### Personal Opinions of and Experiences with CP

When asked if CP is effective for improving behavior, the majority reported 'never' (67.2%) or 'rarely' (25.9%). Forty-one participants reported having children; the vast majority reported never or rarely using CP with their children (92.7%). Approximately one-third of participants (33.4%) reported 'sometimes' or 'often' experiencing CP as a child.

### Professional Experiences with CP

Most participants (98.2%) never recommended CP to patient families for unruly children.

Using an agreeability scale (strongly disagree → strong agree), the majority reported agreeing/strongly agreeing that one should intervene when an adult is yelling/threatening a child (84.4%), or when an adult hits a child (98.3%). Moreover, participants mostly agreed/strongly agreed that it is

**Table 1.** RI Physician Responses to Corporal Punishment Survey

Demographics	Total n=58
Gender	
Male, n (%)	19 (32.8)
Female	39 (67.2)
Profession	
Physician	37 (63.8)
Resident	15 (25.9)
Fellow	6 (10.3)
Is CP effective?	
Never	39 (67.2)
Rarely	15 (25.9)
I don't know	2 (3.4)
Sometimes	2 (3.4)
Often	0
Did your parents use CP with you?	
Never	11 (19.3)
Rarely	27 (47.4)
I don't know	0
Sometimes	16 (28.1)
Often	3 (5.3)
Have you used CP with your kids?	
Never	26 (63.4)
Rarely	12 (29.3)
I don't know	0
Sometimes	3 (7.3)
Often	0
Should we educate parents about no CP?	
Strongly Agree	30 (51.7)
Agree	22 (37.9)
Neutral	5 (8.6)
Disagree	0
Strongly Disagree	1 (1.7)
Should we educate parents about other methods of discipline?	
Strongly Agree	40 (69)
Agree	14 (24.1)
Neutral	3 (5.2)
Disagree	0
Strongly Disagree	1 (1.7)

important to educate adults about not using CP (89.6%), and educate about other methods of discipline (93.1%).

Using a likelihood scale (not at all → definitely), participants reported somewhat (43.1%) or definitely (41.4%) likely to intervene when an adult threatens a child, and definitely likely to intervene when an adult hits a child (84.5%). Furthermore, a little over half of participants (53.4%) reported being 'definitely' likely to educate parents about CP, and providing education about other methods of discipline (58.6%).

In the last 6 months, 22.4% of participants witnessed an adult hit/slap/spank a child while in the hospital or clinic setting; of these participants, slightly less than half reported never intervening (38.5%).

### Education on CP

When asked if they have ever received education on intervening when an adult hits a child, most participants reported

never (67.9%). Moreover, the majority (73.7%) reported never receiving formal education (e.g. lectures, grand rounds) about how to talk to patient families about discipline or specifically CP (68.4%). More participants reported receiving informal education (e.g. bedside teaching) on how to talk to patient families about discipline (63.2%) and CP (42.1%).

## DISCUSSION

Research has identified that corporal punishment is both ineffective and harmful to children and adolescents long-term.<sup>5</sup> Although CP use among U.S. parents has been declining during the 21st century, these behaviors still occur not only in the home, but also in hospital or clinic settings. Our study examined Rhode Island pediatric physicians of varying levels of training on their opinions, experiences and education regarding CP. The majority of participants do not agree CP is effective, and believe they should intervene and provide education to families when CP is identified. However, our findings revealed that many RI physicians have not received formal and/or informal education/training on how to intervene when disruptive behaviors are observed, and how to have discussions with families about CP.

Data from a recent 2016 survey found that US pediatricians do not endorse CP; only 6% of 787 pediatricians held positive attitudes toward spanking, and only 2.5% expected positive outcomes from spanking. Respondents did not believe that spanking was the “only way to get the child to behave” (78% disagreed) or that “spanking is a normal part of parenting” (75% disagreed).<sup>13</sup> Similarly, RI pediatric physicians responded that CP was never effective for improving behavior (67.2%) and do not personally use CP in their home environments (92.7%). Research suggests that African Americans, less formally educated parents, Southerners and born-again Christians are more likely to use or find CP acceptable.<sup>14,15</sup> To our knowledge, statistics specifically on gender differences do not exist, but it is possible that the majority of our respondents being female may have influenced perceptions of and experiences with CP.

The AAP recently released a policy statement (2018) firmly against the use of CP, and the call for pediatricians to provide guidance and resources to families.<sup>1</sup> Consistent with AAP guidelines, the overwhelming majority of our participants (98.2%) never recommended CP to patient families for unruly children. Participants also reported feeling that discussions surrounding CP and discipline were important, and that they were likely to have these conversations with

patient families. Duncan et al. reviewed periodic surveys of members of the AAP and noted that between 2003 and 2012, pediatricians had increased their discussions of discipline with parents.<sup>16</sup> By 2012, more than half (51%) of the pediatricians surveyed responded that they discussed discipline in 75% to 100% of health supervision visits with parents of children ages 0 through 10 years.<sup>16</sup> Pediatricians and other health care providers have the opportunity to assess safe and appropriate discipline with families.

The new AAP policy statement now addresses the harm of verbal punishment (e.g. shaming, humiliation). Interestingly, our participants reported decreased likelihood and agreeability to intervene when an adult threatens a child in comparison to hitting a child. The UN Children’s Fund defined “yelling and other harsh verbal discipline as psychologically aggressive towards children.”<sup>17</sup> Research supports that verbal abuse is associated with increased adolescent depression and conduct problems.<sup>18,19</sup> Pediatricians should be aware of this policy update, and provide intervention and education for families regarding yelling and threatening behaviors.

Despite the majority of RI pediatric physicians reporting that intervening and educating families about CP is important, and are likely to do so, many have not received either formal or informal training on what to do when hitting behaviors are witnessed or how to talk about discipline/CP. Therefore, education regarding these issues should be integrated into formalized settings, such as grand rounds, lectures and training for all pediatric physicians and other healthcare providers. Moreover, informal education such as bedside teaching should also be utilized to practice and observe appropriate ways to have these important conversations with families. Education and training for pediatricians can include a variety of techniques, such as motivational interviewing. Moreover, Barkin et al demonstrated that it was possible to teach parents to use time-outs within the constraints of an office visit.<sup>20</sup> It is also important that pediatricians are aware of community resources for more intensive or targeted help to families (Table 2). Considering the close link between CP and physical abuse, physician training should also include education on physical abuse to provide prevention to patient families.

**Table 2.** Rhode Island Resources for Families Regarding Corporal Punishment

Rhode Island Parent Information Network (RIPIN)	(401) 270-0101, <a href="https://ripin.org/">https://ripin.org/</a>
Family Care and Community Partnership (FCCP)	(401) 519-2280, <a href="https://www.familysericri.org/fccp">https://www.familysericri.org/fccp</a>
Early Intervention	(401) 462-5274, <a href="http://www.eohhs.ri.gov/Consumer/FamilieswithChildren/EarlyIntervention.aspx">http://www.eohhs.ri.gov/Consumer/FamilieswithChildren/EarlyIntervention.aspx</a>
Nurse Family Partnership	<a href="https://www.nursefamilypartnership.org/">https://www.nursefamilypartnership.org/</a>
Incredible Years	(206) 285-7565, <a href="http://www.incredibleyears.com/">http://www.incredibleyears.com/</a>
The Parent Support Network (PSN)	(401)-467-6855, <a href="http://www.psnri.org">http://www.psnri.org</a>

## LIMITATIONS

The current study had several limitations. Pediatric physicians who practice at Hasbro Children's Hospital in Rhode Island completed the survey, and thus, our results may not generalize to all pediatric physicians in our state or medical providers outside our institution and state. In addition, respondents were asked to identify if they have received education concerning CP, but we did not ask about the specifics of their training. As with any survey, an element of recall bias might have resulted from certain survey questions. Furthermore, to our knowledge there are no statistics about gender differences of parents who inflict CP, and therefore we could not examine whether this may have influenced the responses of our participants. Future studies should explore innovative ways of providing education and training to physicians on CP and discipline. Moreover, integrating more formalized policies and guidance around CP in RI hospital settings may decrease these disruptive and harmful behaviors, and provide pediatricians a platform to initiate these important conversations with families.

## CONCLUSION

Our findings, in conjunction with prior studies, highlight that pediatric physicians do not find CP an appropriate method of discipline and underscore the need for standardized training and education surrounding this issue. Caregivers often seek information and hold their pediatricians in a position of trust, and pediatricians may even witness hitting/threatening in the hospital setting; however, discussions of discipline may prove challenging. The presented survey should be utilized to inform an education curriculum specifically for medical providers to subsequently aid in improving victim identification efforts, medical assessments and referrals, informing collaboration with a multidisciplinary team, and developing prevention strategies.

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# Prescription Opioid Use among Pregnant Women Enrolled in Rhode Island Medicaid

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## ABSTRACT

**OBJECTIVE:** Our objective was to identify patterns of opioid use among pregnant women enrolled in RI Medicaid.

**METHODS:** This study used linked RI Medicaid and RI Birth Certificate data from 01/01/2006 to 12/31/2016. We examined temporal trends of prescription opioid dispensings and identified risk factors associated with opioids use during pregnancy.

**RESULTS:** Among 25,500 RI Medicaid enrolled pregnant women who delivered a live baby from 2008 to 2016, 1,914 (7.5%) received at least one prescription for an opioid medication during pregnancy, 810 (3.2%) were during the first trimester, 633 (2.5%) during the second trimester, and 866 (3.4%) during the third trimester. Of these, 213 (0.8%) women received 3 or more opioids during pregnancy. The prevalence of prescription opioids dispensed in pregnant women increased from 4.9% in 2008 to 9.6% in 2015 ( $\beta \pm SD$ : 0.66 $\pm$ 0.28,  $P=0.05$ ).

**CONCLUSIONS:** Prescription opioid use during pregnancy has increased among women enrolled in RI Medicaid.

**KEYWORDS:** opioid analgesics, pregnant women, RI Medicaid

## INTRODUCTION

While gestational opioid use may be associated with increased risk of maternal, fetal, and neonatal complications,<sup>1,2</sup> few studies regarding the opioid use in pregnant women exist. It is important to investigate the extent of opioid use during pregnancy to gain insight into the potential risk of maternal opioid exposure on mother and infant health. Therefore, we assessed the use of prescription opioids in a cohort of Medicaid-enrolled pregnant women in Rhode Island. This population is highly relevant as Rhode Island has been disproportionately affected by opioid overuse and addiction; it is among the top 10 states with the highest rate of opioid overdose deaths.<sup>3</sup> In RI the number of substance-affected newborns and babies diagnosed with neonatal abstinence syndrome (NAS) has more than doubled from 44/10,000 in 2005 to 94/10,000 in 2016.<sup>4</sup> Further, national research has shown that patients with opioid abuse or dependence are

more likely to be insured through Medicaid than a private insurance company (76.1% vs. 42.8%).<sup>5</sup> Covering 30% of the population, 25% of women of childbearing age, RI Medicaid is an important data source to investigate the impact of the opioid epidemic on pregnant women.

The goal of the study was to determine the prevalence of prescription opioid use among pregnant women enrolled in the Rhode Island (RI) Medicaid program with characterization of use over time, by types of, and intensity of opioid medication prescribed.

## METHOD

### Data Source

This retrospective cohort study evaluated linked RI Medicaid and RI Birth Certificate data from January 1, 2006 to December 31, 2016. Deidentified Medicaid medical information was provided by the RI Executive Office of Health & Human Service (EOHHS). Data were comprised of eligibility, medical, and prescription drug records for healthcare services from inpatient hospitals, outpatient clinics, emergency rooms, and pharmacies. Demographic information for enrolled members include age, gender, race, and location of residency. We validated the pregnancy (exposure) period, and ascertained pregnancy outcomes using birth certificate data provided by the RI Department of Health (RIDOH), which collects the data within 24 to 48 hours after delivery. Data were linked by RI EOHHS and RIDOH, then subsequently deidentified for third-party research purposes. This study was approved by the Institutional Review Board at the RIDOH and the University of Rhode Island.

### Study Cohort

We included mothers enrolled in RI Medicaid who had a live birth occurring between July 01, 2006 and December 31, 2016. Mothers who had a diagnosis of cancer pre- or post-delivery or were dispensed opioids (methadone or buprenorphine) for Opioid Use Disorder (OUD) during pregnancy were excluded from the study.

### Exposure Window

Gestational age was derived through ultrasound examination of mothers and included in RIDOH birth certificate data. The conception date was estimated by subtracting the

infant's gestational age, derived through ultrasound examination of mothers. The first 6 months prior to the conception date was evaluated for baseline opioid utilization. The pregnancy window included the period from conception date through delivery date. Prescription opioid exposure was evaluated 14 days prior to the conception date through delivery date to encompass the possible residual effects of opioid use during the preconception period. Opioid use was assessed between January 01, 2008 and December 31, 2015 to compare the full year utilization rate.

### Prescription Opioid Exposure

Prescription opioid exposure during pregnancy was obtained through pharmacy records using Therapeutic Class Code for filled prescription opioids, and using the number of days for which the medication was supplied to determine if exposure occurred during the pregnancy window. Prescription opioids considered in this study included hydrocodone, oxycodone, codeine, morphine, and tramadol, which were the most commonly prescribed opioids for RI Medicaid-covered pregnant women.

Opioid exposure was defined as any one receipt of a prescription opioid dispensed during the pregnancy exposure window; including opioids dispensed before the exposure window with days supply extending to cover at least 1 day within the exposure window. Average days of supply and daily doses were calculated. The daily doses for each opioid prescription were converted to Morphine Milligram Equilibrium (MME) using the Centers for Disease Control (CDC) conversion Table (2016 version). Further investigation was conducted to determine the pattern of prescription opioids filled in three pregnancy trimesters.

### Comparison Group

To identify the risk factors associated with opioid use during pregnancy, we selected a comparison group that included women without any opioid dispensings during pregnancy.

### Baseline Characteristics

Maternal characteristics at baseline included: age, race, substance use and abuse, tobacco use, alcohol use, preexisting conditions, pain conditions, psychiatric medications use, and opioid use at baseline. The operational definitions for the medical covariates, including substance use and abuse, tobacco use, and alcohol use, are described in **Appendix Table 1**.

### Statistical Analyses

Descriptive analyses of prescription opioid dispensings, temporal trends, and corresponding demographic and clinical characteristics were conducted. Continuous variables were presented as mean  $\pm$  standard deviation (SD) and compared using a student t test. Categorical variables were presented as frequency (%) and compared using a chi-square test or Fisher exact test depending upon the sample size in each

**Appendix Table 1.** Data Sources and Operational Definitions for Covariates.

Variables	Data Sources	Operational Definitions
Maternal Age	RI DOH Birth Certificates	Age at delivery
Race	RI DOH Birth Certificates	White, Black, and Others
Marijuana	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Cocaine	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Tobacco use	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Alcohol use	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Multiple gestation	RI DOH Birth Certificates	
HIV infection	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Depression	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Anxiety	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Fibromyalgia	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Migraine	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Back pain	RI Medicaid Inpatient/ Outpatient Claims	ICD-9 Diagnosis Code
Anxiolytics Use	RI Medicaid Pharmacy Claims	Therapeutic Class Code
Antidepressants Use	RI Medicaid Pharmacy Claims	Therapeutic Class Code
Antipsychotics Use	RI Medicaid Pharmacy Claims	Therapeutic Class Code
Stimulants Use	RI Medicaid Pharmacy Claims	Therapeutic Class Code
Opioid use at baseline	RI Medicaid Pharmacy Claims	Therapeutic Class Code

level. A multivariate logistic regression model was developed to identify significant risk factors associated with opioid use during pregnancy. Statistical significance was set up at  $p \leq 0.05$ . All statistical analyses were conducted using SAS 9.4 (Cary, NC).

### RESULTS

Of the total included 25,500 pregnancies, 1,914 (7.5%) received a total of 4,046 opioid prescriptions at any time during their pregnancy; 810 (3.2%) received a prescription for an opioid medication during their first trimester; 633 (2.5%) during their second trimester; 866 (3.4%) during their third trimester; 315 (1.2%) received prescriptions in two

trimesters, and 80 (0.3%) in all three trimesters. Only 213 (0.8%) pregnancies were identified with dispensings of more than 3 prescriptions for opioid medication.

Among those with opioid use during the 6-month period preceding pregnancy, the leading documented pain-related indications included: abdominal pain (27%), back pain (30%), or headache (18%). Among those with opioid use during the pregnancy period the leading documented pain-related indications included: antepartum conditions or complications (66%), abdominal pain (38%), back pain (36%), or headache (24%).

**Figure 1** shows the temporal trend of prescription opioid use during pregnancy from January 01, 2008 to December 31, 2015. The percentage of pregnancies with a dispensed opioid increased significantly from 4.9% in 2008 to 11.1% in 2015 (Slope  $\beta \pm SE$ :  $0.9 \pm 0.2$ ,  $p = 0.01$ ), with sharp increases occurring in 2011 (145% from the previous year) and 2012 (43% from the previous year).

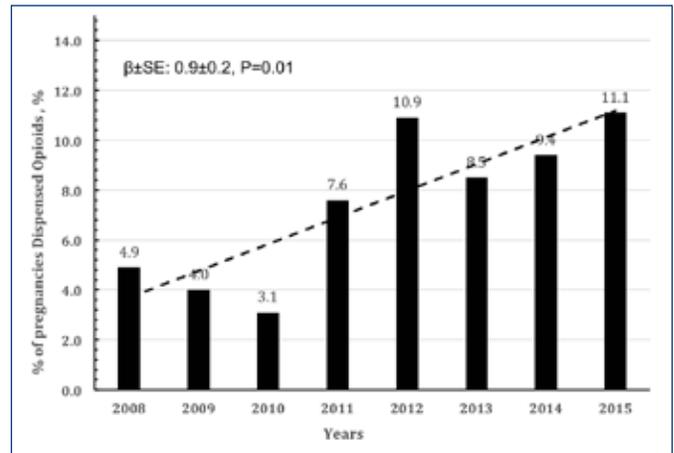
The most commonly dispensed opioids were hydrocodone, oxycodone, codeine, and tramadol, respectively (**Figures 2a,b**). Hydrocodone was the most frequently dispensed opioid for all years (35-61% of prescription opioids) except 2008, for which oxycodone use was more prevalent (50%). Four types of opioids (hydrocodone, oxycodone, codeine and tramadol) accounted for nearly all prescription opioid use between 2011–2015, while use of other opioid types including morphine and hydromorphone dissipated after 2010.

The average days of supply for prescription opioids dispensed was 9.3 days  $\pm$  9.4 (mean $\pm$ SD). A statistically significant trend in change in days supply from 2008 to 2015 was not observed. The average days of supply and MME for four commonly dispensed opioids are listed in **Table 1**.

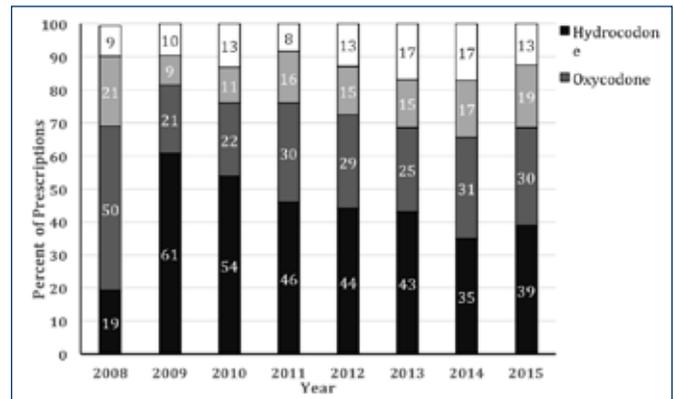
Demographic and clinical characteristics were assessed during the 6-month baseline window and compared between women with and without opioid dispensing during pregnancy (**Table 2**). Women with opioid dispensings during pregnancy were observed to be younger (<18: 41% vs 34%,  $p < .0001$ ), of white race (64% vs 52%,  $p < .0001$ ), had higher rates of tobacco (6.2% vs 2.2%,  $p < .0001$ ), alcohol (7% vs 1%,  $p < .001$ ), or cocaine use (0.4% vs 0.07%,  $p < .0001$ ), a higher rate of chronic pain diagnoses (e.g., fibromyalgia, migraines and back pain), have more comorbid psychiatric conditions (e.g., depression or anxiety), and increased use of psychiatric medications, including benzodiazepines, antidepressants, and antipsychotics.

**Table 3** presents the results of multivariable logistic regression analysis. The significant risk factors that were associated with maternal opioid exposure during pregnancy included: mother's age at the delivery (18–24 or 25–34 years old), white race, cocaine use, tobacco use, alcohol use, migraine, low back pain, opioid use prior to pregnancy, and the year of delivery after 2011. The model fits well (Hosmer and Lemeshow Goodness-of-Fit Test:  $P=0.95$ ) with C Statistics at 0.72.

**Figure 1.** Percentage of Pregnancies Dispensed Prescription Opioids for Pain. Rhode Island Medicaid: 2008-2015



**Figure 2a.** Percent of Prescriptions Per Year for Opioid Types Prescribed for Pregnant Women in RI Medicaid.



**Figure 2b.** Frequencies and Percentages of Opioid Types by Years

Drug Name	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015
Hydrocodone	62 (19)	102 (61)	82 (54)	197 (46)	237 (44)	154 (43)	170 (35)	177 (39)
Oxycodone	159 (50)	35 (21)	34 (22)	129 (30)	158 (29)	91 (25)	150 (31)	135 (30)
Codeine	69 (22)	15 (9)	17 (11)	67 (16)	81 (15)	52 (15)	84 (17)	86 (19)
Tramadol	29 (9)	16 (10)	20 (13)	36 (8)	68 (13)	60 (17)	83 (17)	57 (13)

**Table 1.** Morphine Milligram Equivalents (MME) and Supply Days for Opioids Prescribed in RI Women.

Drug Name	Average Supply Days Median (25th percentile, 75th percentile)	Average MME Median (25th percentile, 75th percentile)
Hydrocodone	5 (3, 10)	25 (20, 38)
Oxycodone	5 (3, 13)	45 (30, 71)
Codeine	3 (2, 5)	27 (18, 45)
Tramadol	10 (6, 22)	20 (15, 32)

**Table 2.** Comparison of baseline characteristics of pregnant women in RI Medicaid. N=25,500.

Characteristics	Exposed to Opioids during pregnancy N = 1,914	Unexposed to Opioids during pregnancy N = 23,586	P Value
<b>Maternal Age at delivery</b>			
Mean ± SD	25.6 ± 8.3	25.9 ± 6.3	0.06
<18	794 (41)	8,007 (34)	<0.0001
18-24	387 (20)	6,914 (29)	
25-34	626 (32)	7,206 (30.5)	
≥35	107 (5.6)	1,459 (6)	
<b>Race, N(%)</b>			
White	1,228 (64)	12,277 (52)	<0.0001
Black	121 (6)	9,095 (38.6)	
Other	565 (29.5)	2,214 (9.4)	
<b>Substance use and abuse</b>			
Marijuana	2 (0.1)	36 (0.15)	0.60
Cocaine	8 (0.4)	16 (0.07)	<0.0001
<b>Tobacco use, N(%)</b>	118 (6.2)	518 (2.2)	<0.0001
<b>Alcohol use, N(%)</b>	135 (7)	331 (1.4)	<0.001
<b>Maternal preexisting condition, N(%)</b>			
Multiple gestation	29 (3.2)	214 (2.3)	0.31
HIV infection	3 (0.16)	17 (0.07)	0.19
Depression	145 (7.6)	1,091 (4.6)	<0.0001
Anxiety	50 (2.6)	296 (1.3)	<0.0001
<b>Pain conditions</b>			
Fibromyalgia	39 (2)	117 (0.5)	<0.0001
Migraine	175 (9)	1,047 (4.4)	<0.0001
Back pain	231 (12)	955 (4)	<0.0001
<b>Psychiatric medications</b>			
Anxiolytics	106 (5.5)	355 (1.5)	<0.0001
Antidepressants	175 (9)	995 (4.2)	<0.0001
Antipsychotics	34 (1.8)	163 (0.69)	<0.0001
Stimulants	4 (0.2)	57 (0.24)	0.78
<b>Opioid use at baseline</b>	311 (16)	773 (3)	<0.0001

## DISCUSSION

From 2008 to 2015, approximately 7.5% of RI Medicaid covered women received at least one opioid prescription during their pregnancy, with 1 in 6 receiving opioid medication for two trimesters, which raises concern given the risks of longer-term opioid use in pregnancy. The increased risk for neonatal abstinence syndrome or specific cardiovascular and central nervous system defects has been reported in previous studies.<sup>1,2</sup>

Although recent studies showed that opioid use in pregnant women decreased from 14.9% in 2005 to 12.9% in 2011 within the US,<sup>5,6</sup> we observed an increased dispensing of opioids to pregnant women in RI Medicaid that more than doubled from 5% in 2008 to 11% in 2015, with a sharp rise in 2010 and 2011. The overall increase in the dispensing of

**Table 3.** Significant Risk Factors for Maternal Opioid Use during Pregnancy. Results of Multivariable Logistic Regression Analysis

Characteristics	Odds Ratio	95% CI		P Value
		Lower Bound	Upper Bound	
Mother Race White vs Black	1.65	1.32	2.06	<0.0001
Cocaine use	3.10	1.15	8.36	0.025
Tobacco use	1.44	1.12	1.86	0.005
Alcohol Use	6.38	5.02	8.10	<0.0001
Migraines	1.51	1.22	1.88	0.0002
Low back pain	1.86	1.52	2.29	<0.0001
Benzodiazepine Use	1.60	1.19	2.14	0.0019
Opioid use prior to pregnancy	4.40	3.64	5.32	<0.0001
Mother Age < 18 vs 18-24	0.26	0.13	0.54	0.0002
Mother Age 25-34 vs 18-24	1.45	1.25	1.69	<0.0001
Mother Age ≥ 35 vs 18-24	1.22	0.94	1.59	0.14
<i>Delivery Year</i>				
2015 vs 2008	15.89	7.63	33.10	<0.0001
2014 vs 2008	14.24	6.81	29.76	<0.0001
2013 vs 2008	1.93	1.52	2.46	<0.0001
2012 vs 2008	2.64	2.10	3.31	<0.0001
2011 vs 2008	1.93	1.52	2.46	<0.0001
2010 vs 2008	0.86	0.64	1.15	0.3
2009 vs 2008	1.03	0.77	1.37	0.8

prescription opioids directly led to an increase in dispensing of combination products with hydrocodone, which was dispensed more than all other prescription opioids. Based on CDC reports in 2010, approximately 16,651 opioid overdose deaths involved oxycodone, hydrocodone, or methadone.<sup>3</sup> To control for the dramatic increase in opioid abuse and overdose deaths, the Drug Enforcement Administration (DEA) designated hydrocodone combination products from Schedule III to a more stringently controlled Schedule II category of drug in 2014.<sup>7</sup> However, our results showed that hydrocodone was still the most widely dispensed opioid in pregnant women on Medicaid in RI in 2014 and 2015.

Opioids most commonly dispensed to RI pregnant women were hydrocodone, oxycodone, codeine, and tramadol, respectively. In other studies using national claims data, codeine was a more commonly dispensed opioid in pregnant women than oxycodone.<sup>6,8</sup> However, oxycodone was more widely dispensed to pregnant women in RI than codeine. The dispensed prescriptions of hydrocodone and oxycodone almost tripled from 2010 to 2011 (from 82 to 197 for hydrocodone and 34 to 129 for oxycodone), and increased more than four-fold for codeine (from 17 to 67). Prescriptions for hydrocodone also increased throughout 2011 and 2012, while oxycodone and codeine saw only a relatively small increases during this period. After 2012, the dispensing rates for all four commonly used opioids appeared to level off.

Previous studies have demonstrated the risk of teratogenesis for some opioids, especially when used in the first trimester of pregnancy.<sup>1,9</sup> Codeine and hydrocodone used early in pregnancy have been associated with greater risk of cardiac septal defects, hypoplastic left heart syndrome, spina bifida, and gastroschisis.<sup>1</sup> Oxycodone has the potential to cause more dependence and overdose. Surprisingly, tramadol, classified pregnancy category C by the FDA because of its potential teratogenic effects suggested by animal studies and schedule IV by the DEA resulting from its abuse potential, was also prescribed to pregnant women in RI during the study period.

### Implications for Practice and/or Policy

Pregnant women can experience a variety of pain syndromes (e.g., back pain, abdominal pain, and migraines) during pregnancy.<sup>10</sup> Prevalence of low back or pelvic pain was 71.7% in pregnancies,<sup>11</sup> while migraines were present in 35% of pregnancies.<sup>12</sup> Providers often face difficult choices when prescribing safe and effective pain control medications during pregnancy. Non-steroidal anti-inflammatory drugs are a poor alternative, as they also pose potential harm to both mother and fetus.<sup>13</sup> Careful consideration of the potential benefits and harms of perinatal opioid use is of particular importance. While opioids are often prescribed, they can have adverse effects on the fetus.<sup>1,2</sup>

According to the CDC data, RI has a disproportionately high rate of opioid overdose deaths, (N=320, 31.0% in 2017), which is ninth in the nation.<sup>3</sup> Rhode Island dispensed the highest total Morphine Milligram Equivalents (MME) in 2016 (2,623.7 mg/person), more than two-fold higher than the average total MME in the US.<sup>14</sup> Medicaid enrollees were also noted to have higher rates of prescription opioid use (22%) compared to commercially insured patients in the general population (9%).<sup>15</sup> Our findings that the rates of opioid use significantly increased from 2008 to 2015 confirmed that RI Medicaid-covered pregnant women are at a high risk of opioid use. In March 2017 and July 2018, RI updated the regulations for Pain Management, Opioid Use, and the Registration of Distributors of Controlled Substances.<sup>16</sup> The new version of regulations placed stricter controls on prescribing opioids, including dose limits for initial prescriptions. We expect to see decreased rates of opioid use in RI in the future.

In some instances the use of opioids for the treatment of pain occurring during pregnancy is clinically justifiable. For an opioid prescription to be written and given to a patient, a prescriber-patient relationship and 'medical need' for the medication is required. In a statement on Opioid Use During Pregnancy, the American College of Obstetricians and Gynecologists (ACOG) recommended that, "Opioids should only be used for treatment of pain when alternatives are not appropriate or effective..."<sup>17</sup> Yet the available literature regarding the safety of opioid use during pregnancy is mixed and would be better informed by additional and larger

cohort studies. A review of the evidence regarding the short-term and long-term risks of opioid use during pregnancy reported inconsistent results for studies of fetal development, preterm birth, and birth defects overall.<sup>18</sup> Many of the studies included in the review involved the use of codeine, which was less frequently utilized in our population. The FDA labels for oxycodone and hydrocodone note that no well-controlled studies in pregnant women are available, highlighting an important gap in evidence.<sup>19</sup> The new CDC guideline for prescribing opioids for chronic pain issued in 2016 suggested that physicians prescribe non-opioid analgesics or opioids with the lowest dose.<sup>20</sup> With the new CDC guideline and RI regulation for opioid prescribing,<sup>16,20</sup> we expect to see the lower prescribing rate of opioids in RI pregnant women.

### Limitations

Our study has several limitations. First, the use of illicit drugs, including illicit prescription opioids, was not captured since the prevalence of illicit drug use is not available in the Medicaid claims data. Second, our data source only collects prescriptions filled by patients in pharmacies located in RI. Any illicit drug use or opioids filled in pharmacies outside of RI are not accounted for. Third, expected opioid use was estimated based on pharmacy claims. Actual patient utilization may deviate from the pharmacy dispensing. Fourth, the study is based on the RI Medicaid data. Rates of opioid use have substantial geographical variations and are significantly different between Medicaid enrollees and commercially insured patients.<sup>14,15</sup> Therefore, the study findings can only be generalizable to RI Medicaid enrollees. Lastly, the study only included women with pregnancies resulting in a live birth. If opioids are associated with therapeutic or spontaneous terminations of pregnancies, total opioid use may be underestimated. Nevertheless, Medicaid pharmacy claims data is seen as the gold standard of drug exposure compared to outpatient medical records or self-reported drug use information.

In conclusion, our findings of increasing rates of prescription opioids, filled by pregnant women enrolled in RI Medicaid, calls for a comprehensive safety assessment of opioids and their long-term effects on the developing fetus to help inform clinical practice.

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## Disclaimer

The views expressed herein are those of the authors and do not necessarily reflect the views of the RI Department of Health.

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## A Case of Acute Esophageal Necrosis

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### ABSTRACT

Acute esophageal necrosis (AEN) is a rare condition that impacts the distal esophagus after a vascular insult. In this case report, we describe a patient with multiple comorbid conditions presenting with shock from gastroenteritis who subsequently developed AEN complicated by refractory strictures.

**KEYWORDS:** acute esophageal necrosis; black esophagus; esophageal ischemia; gastroenteritis; upper gastrointestinal bleeding

### INTRODUCTION

Acute esophageal necrosis (AEN), also known as black esophagus or necrotizing esophagitis, is a rare but serious condition found in approximately 0.2% of upper gastrointestinal (UGI) endoscopy cases.<sup>1-3</sup> Patients typically present with dysphagia, chest pain, abdominal discomfort or signs of upper gastrointestinal bleeding.<sup>4</sup> The etiology for AEN is unknown but is theorized to result from microvascular thrombosis to the esophagus due to ischemic, infectious or chemical mucosal injury from vomiting, severe reflux, acid buildup or gastric outlet obstruction caused by gastric volvulus or peripyloric ulcer.<sup>3,5</sup> While AEN can resolve with supportive care, the mortality rate can be as high as 35%, largely due to impaired esophageal function in combination with underlying medical co-morbidities.<sup>4,6</sup> Potential complications include bacterial superinfections, esophageal perforation and esophageal stricture formation.<sup>6</sup> In this case report, we present a patient diagnosed with AEN in the setting of gastroenteritis complicated by refractory esophageal stricture.

### CASE PRESENTATION

A 78-year-old female presented to the emergency department with several weeks of watery diarrhea, abdominal pain and intermittent chest pain provoked by eating, as well as decreased oral intake due to dysphagia. She had a history of ulcerative colitis, Schatzki's ring, atrial fibrillation, hypertension, hyperlipidemia, and cerebrovascular accidents with residual left-sided weakness. At admission, medications included allopurinol, amlodipine, aspirin, atorvastatin, clopidogrel,

diazepam, doxazosin, labetalol, and mesalamine. Upon presentation, she was hypotensive with a blood pressure of 70/40 mmHg, pulse of 100 beats/min, and a temperature of 95.8 F. Physical examination was notable for diffuse abdominal tenderness without signs of peritoneal irritation. Pertinent laboratory studies included a white blood cell count of 26,000 leukocytes/mL, hemoglobin of 7.7 g/dL, and platelet count of 234,000. She had several metabolic abnormalities including a sodium 133 meq/L, chloride 97 meq/L, bicarbonate of 13 meq/L, blood urea nitrogen of 168 mg/dL, and serum creatinine of 8.96 mg/dL. After hemodynamic stabilization, a computer tomography (CT) scan of the abdomen and pelvis revealed multiple fluid-filled, nondilated loops of small and large bowel as well as circumferential thickening at the gastroesophageal (GE) junction. The patient was diagnosed with gastroenteritis. She continued to have episodes of hypotension and had an acute drop in hemoglobin to 6.4 g/dL, but was responsive to intravenous fluids, packed red blood cells, and broad-spectrum antibiotics.

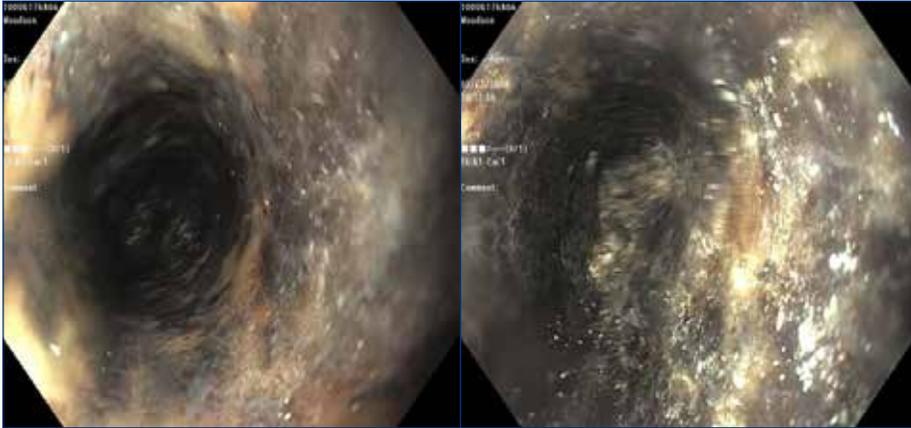
Several days following presentation, the patient clinically improved but continued to complain of intermittent odynophagia with vague substernal chest pain. A barium swallow study revealed partial obstruction at the gastroesophageal junction concerning for a thickened gastric fold or polypoid mass. An UGI endoscopy showed black, necrotic mucosa circumferentially throughout the mid and lower third of the esophagus (**Figure 1**). Biopsies revealed necrotic tissue fragments colonized by coccoid organisms. Although cultures failed to grow any organisms, she was managed empirically with Fluconazole and Amoxicillin/Clavulanate.

Repeat endoscopic evaluation six weeks later revealed a significant stenosis with stricture formation in the area overlying the initial insult (**Figure 2**). Multiple endoscopic sessions with balloon dilatation and stenting were attempted, but the patient continued to suffer from dysphagia and refractory strictures. A percutaneous endoscopic gastrostomy (PEG) tube was ultimately placed.

### DISCUSSION

Acute esophageal necrosis is a rare phenomenon characterized by diffuse, circumferential, black-appearing, distal esophageal mucosa that stops abruptly at the gastroesophageal junction (GEJ).<sup>8</sup> Exceptionally rare cases of proximal

**Figure 1.** Initial endoscopic appearance revealing diffuse, circumferential esophageal necrosis involving the mid and distal esophagus.



**Figure 2.** Severe esophageal stricture persisting after healing and requiring serial dilatation



“black esophagus” have been reported.<sup>9</sup> While the exact mechanism resulting in AEN is unknown, it is suspected to be multifactorial. Current hypothesis include tissue hypoperfusion, massive esophageal influx of gastric content, and impaired local defense barriers overwhelming the esophageal mucosa, resulting in profound ischemic changes.<sup>10</sup> Comorbid conditions, including diabetes, atherosclerotic disease, immunosuppressive states, chronic kidney disease, alcohol or cocaine abuse and advanced age, may act as predisposing factors in susceptible individuals.<sup>7,11</sup> Low flow states, as seen in sepsis, shock, congestive heart failure, cardiac arrhythmia, pancreatitis, acute blood loss, and hyperthermia, may also compromise the esophagus. Critical illness, poor nutritional status, and general deconditioning may further compromise local protective barriers, impair defense mechanisms and potentiate ischemic and chemical injury.

Clinically, the majority of patients present with hematemesis or melena after an UGI bleed.<sup>1-9</sup> Other associated symptoms can include dysphagia, epigastric pain, atypical chest pain, and low-grade fever. Symptoms may also be related to the underlying process including signs of sepsis, tachycardia, hypotension or altered mental status, usually presenting within 24 hours after an inciting event. Anemia and leukocytosis are often present; if CT is performed, it may reveal distal esophagus thickening.

The definitive diagnosis for AEN is made with endoscopy, which, in this patient, revealed a grossly necrotic, friable and ulcerated esophagus in the mid to distal portions with an abrupt transition point into a normal appearing stomach. The distal third of the esophagus is commonly affected due to its hypovascular anatomy, rendering it more vulnerable to ischemic insult. Histologically, necrotic debris extends into the submucosa with local inflammatory response, which, as demonstrated in this case, should always be sent for culture to exclude an underlying bacterial or fungal infection.<sup>10</sup> Rarely, necrosis is mild or healing at endoscopy, increasing the risk of delayed or missed diagnosis.

AEN carries a very poor prognosis. As a result, the initial management requires hemodynamic stabilization with intravenous fluids, aggressive acid suppressive medications with a PPI, and NPO status.<sup>12</sup> Nasogastric tubes are usually contraindicated as they may increase the risk of perforation.

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# Disulfiram and Hypotension in a 53-year-old Woman

ERICA LASH, MD; JASON B. HACK, MD, FACEP, FACMT

## ABSTRACT

We describe a case of disulfiram-ethanol reaction in a patient presenting with altered mental status. The patient was found to be profoundly hypotensive, requiring multiple vasopressor agents. As the symptoms associated with disulfiram reaction are non-specific, it is important to maintain a high level of suspicion for drug reaction when caring for the undifferentiated altered and hypotensive patient.

**KEYWORDS:** disulfiram-reaction, alcohol-dependence, altered mental status, hypotension

## CASE REPORT

A 53-year-old woman with a history of alcohol dependence and bipolar disorder, currently prescribed diazepam, lithium, trazodone, zolpidem, disulfiram, and propranolol, was found by her family on the floor of her home, surrounded by pills and beer cans. She presented to the hospital with altered mental status.

On arrival to the hospital, the patient was obtunded and hypotensive. Her vital signs demonstrated blood pressure of 75/40 mmHg, heart rate of 87 beats per minute, respiratory rate of 16 breaths per minute, SpO<sub>2</sub> of 95% on room air, and a temperature of 98.1°F. Her pupils measured 4 mm and were reactive. She had moist mucous membranes. Her neck was non-tender and without signs of meningismus. The patient had clear lung fields and had an unremarkable cardiac examination. Her abdomen was soft, non-tender, and non-distended. Neurologic exam revealed an obtunded patient with spontaneous eye opening and incomprehensible speech. There was no clonus. The patient was somnolent, unable to follow commands but responded appropriately to noxious stimuli and was able to move all four extremities equally. Her skin examination was significant for diffuse erythema across her face, chest, and upper back.

An ECG revealed a sinus rhythm at a rate of 90, with normal intervals and without significant ST elevations or depressions. Her laboratory evaluation revealed an elevated blood alcohol level of 148 mg/DL and a lactate level of 2.7 mEQ/L. A lithium level was non-detected. A urine screen for drugs of abuse tested positive only for benzodiazepines.

She remained persistently hypotensive after fluid resuscitation, and required vasopressor support with norepinephrine and vasopressin. The patient's presentation and physical examination did not clearly fit a single toxidrome such as serotonin syndrome, nor an overdose of a beta-blocker or an opiate. Based on her medication list, blood alcohol level, flushing, and hypotension, she was admitted to the Medical Intensive Care Unit with a presumptive diagnosis of a disulfiram-ethanol reaction.

## DISCUSSION

### History

The history of disulfiram and its introduction to medical therapy resulted from the accidental intersection of industry and medicine. Disulfiram, or Antabuse (tetra-ethylthiuram disulfide), is a drug approved [in the US] for the treatment of alcohol addiction. Disulfiram has been used since the 1800s in the rubber manufacturing industry, in a rubber stabilization process known as vulcanization.<sup>1</sup> In the 1930s, an American physician, E.E. Williams, noted that a group of workers exposed to disulfiram at a chemical plant became symptomatic after drinking alcohol.

*After a glass of beer (6 ounces) the blood pressure falls about 10 points, the pulse is slightly accelerated, and skin becomes flushed in the face and wrists. In fifteen minutes the blood pressure falls another 10 points, the heart is more rapid, and the patient complains of fullness in the head. There doesn't seem to be any other effect of the chemical; men have worked here for years without any complaint other than their inability to drink. They have become involuntary total abstainers...If the chemical compound is not harmful to man, one wonders whether one has discovered the cure for alcoholism.<sup>2</sup>*

Dr. Williams postulated that disulfiram could be used to treat alcoholism. About a decade later, in late 1940s, two Danish researchers, Hald and Jacobsen, arrived at the same conclusion while researching disulfiram as an anti-helminthic after Jacobsen, a physician with a penchant for self-experimentation, sampled the medication and experienced the same adverse reaction after drinking alcohol.<sup>1</sup> They teamed up with a physician, Martensen-Larsen, to perform clinical trials and found disulfiram to be an effective

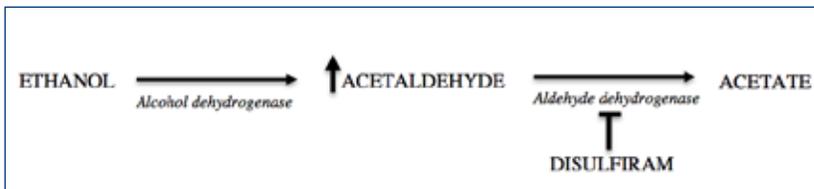
deterrent from alcohol consumption. The FDA ultimately approved the drug as a treatment for alcoholism in 1951.<sup>3,4</sup>

### Mechanism of Aversion

Disulfiram does not have any central nervous system effects to decrease alcohol cravings.<sup>3</sup> Instead, its administration is intended to deter alcohol consumption by causing the patient to fear the unpleasant and serious reaction that follows alcohol intake while on the drug. In reality, rather than not drinking, many patients struggle with compliance and do not take disulfiram on a regular basis. In fact, adherence rates have been found to be as low as 20%.<sup>3</sup>

### Mechanism of Action and Symptoms

The adverse disulfiram-ethanol reaction is due to acetaldehyde. The first step of ethanol metabolism is the conversion of ethanol to the intermediate, acetaldehyde, by alcohol dehydrogenase. Acetaldehyde is subsequently broken down to acetate by aldehyde dehydrogenase. Disulfiram and its metabolites prevent this pathway from running to completion by irreversibly inhibiting aldehyde dehydrogenase, leading to a 5 to 10-fold increase in acetaldehyde concentration.<sup>4</sup>



Within minutes, the increased acetaldehyde concentration results in adverse symptoms. Many of these symptoms are due to the acetaldehyde-mediated release of histamine. The symptoms of this response ranged from mild reactions including facial flushing, sweating, and a headache to moderate reactions including nausea and vomiting. More severe reactions are characterized by significant hypotension and tachycardia. In the most severe reactions, arrhythmias, cardiovascular collapse, seizures, and death can also occur.<sup>4</sup>

The profound hypotension seen in the disulfiram-ethanol reaction is not only due to histamine release, but is also mediated by direct inhibition of dopamine-beta hydroxylase (DBH) by disulfiram and its metabolites. As DBH synthesizes norepinephrine from dopamine, inhibition by disulfiram results in depletion of endogenous norepinephrine. In addition, acetaldehyde has been observed to have a direct vasodilatory effect in the setting of norepinephrine depletion.<sup>5</sup>

### Causes of Disulfiram Reaction

The disulfiram-ethanol reaction can occur with exposure to alcohol from any route. While consumption of alcohol (often intentional) is the most common cause of the reaction, many common – and some unexpected – items contain

alcohol. Household products such as adhesive, detergents, foods (liquor-containing desserts, fermented vegetables, vinegars, and sauces), various medications, toiletries such as after-shave, cologne, deodorants, contact lens solution, as well as many cleaning supplies and industrial products may all contain alcohols in various forms.<sup>4</sup> From beer-containing shampoos to kitchen cleaning products, libations are among many possible routes to alcohol exposure.<sup>6-9</sup>

In addition to alcohol, many medications can interact with alcohol to cause disulfiram-like reactions. While the mechanisms of these reactions have not been fully elucidated in some cases, common examples include metronidazole, cephalosporins, sulfamethoxazole/trimethoprim, sulfonyleureas, certain HIV/HAART therapy drugs such as abacavir, and various fungicides.<sup>4</sup>

Another substance that causes a disulfiram-like reaction is the inky cap or shaggy mane mushroom (*Coprinopsis atramentaria*). The mushroom gets its name from its release of inky liquid once picked, caused by release of a peptidase which auto-digests the gills. The mushroom contains the toxin coprine. The metabolites of coprine, similar to disulfiram, inhibit aldehyde dehydrogenase and cause an increased concentration of acetaldehyde and subsequent disulfiram-like reaction upon concurrent exposure to alcohol.<sup>4,10</sup>

### Treatment

In the case of a disulfiram-ethanol reaction or a disulfiram-like reaction, the treatment is the same and consists of supportive care. GI decontamination is not recommended.<sup>4</sup> In the setting of vomiting, diaphoresis, and hypotension, IV fluid resuscitation is recommended. Anti-emetics and histamine-antagonists can treat many of the histamine-mediated symptoms. In severe reactions with profound hypotension, norepinephrine is the vasopressor of choice given the blockade of endogenous production of the catecholamine.

### Advanced Therapy

Case reports describe the use of fomepizole in refractory cases.<sup>11</sup> The antidote for volatile alcohol poisoning, fomepizole, is a competitive inhibitor of alcohol dehydrogenase, which prevents the production of acetaldehyde and has been anecdotally shown to rapidly improve symptoms in severe reactions. In life-threatening circumstances, hemodialysis to remove the alcohol substrate has also been suggested as a possible treatment.

## SUMMARY AND CASE RESOLUTION

The symptoms associated with a disulfiram-ethanol reaction are non-specific. Taken out of context, or in scenarios where minimal history is available, it is easy to overlook disulfiram as the culprit. Case reports describe encounters

in which disulfiram-ethanol reactions were misdiagnosed as ACS, cardiogenic, anaphylactic, and septic shock.<sup>12-14</sup> In the case initially described, the patient's presentation was highly suggestive of a poly-ingestion, with suspicion for a disulfiram-ethanol reaction based upon her medication list, blood alcohol level, vital signs, and physical examination. She was treated with IV fluids and ultimately required multiple vasopressors for blood pressure support. She gradually improved over hours and was transferred to inpatient psychiatry once medically stable. Her disulfiram was discontinued.

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# Bilateral Serous Retinal Detachment from Neonatal-Onset Multisystemic Inflammatory Disorder

BRITTNEY STATLER, MD; TINEKE CHAN, MD; WENDY CHEN MD, PhD; LORY SNADY-MCCOY, MD; ROBERT H. JANIGIAN, MD

## ABSTRACT

**PURPOSE:** Neonatal-onset Multisystem Inflammatory Disorder (NOMID) is a systemic syndrome characterized by rash, large joint osteoarthropathies and chronic meningitis. Ocular manifestations include optic disc edema, corneal opacities and uveitis. We report the novel finding of serous retinal detachments (RD) in NOMID.

**METHODS:** Case report.

**RESULTS:** An eight-month-old girl was referred to the ED for work-up of optic disc edema. Physical exam revealed flat fontanelles; macrocephaly and frontal bossing; diffuse urticarial rash; and swollen joints; WBC count and inflammatory markers were elevated. Ophthalmology exam revealed decreased visual acuity, optic disc edema and bilateral serous RD. MRI revealed bilateral enhancement of the ocular choroid and enlargement of the third and fourth ventricles secondary to aqueductal webbing. After infectious testing returned negative, the patient was treated with anakinra, an interleukin-1 receptor antagonist. Three months later, the serous RDs resolved.

**CONCLUSION:** Physicians should consider NOMID in infants presenting with diffuse rash, bilateral disc edema and serous retinal detachments.

**KEYWORDS:** inflammatory disease; neonatal-onset multi-inflammatory disorder; ophthalmic manifestations; pediatric uveitis; serous retinal detachment

## INTRODUCTION

We present a novel finding of bilateral serous retinal detachment in an 8-month-old girl with Neonatal-onset Multisystem Inflammatory Disorder (NOMID). NOMID is a newly recognized autoimmune disorder, characterized by diffuse rash, large joint osteoarthropathies and chronic meningitis. Previously reported ophthalmic manifestations include optic disc edema, optic disc atrophy and uveitis. Knowledge of this syndrome is crucial because systemic and ocular inflammation respond well to treatment with anakinra, a systemic interleukin-1 antagonist.

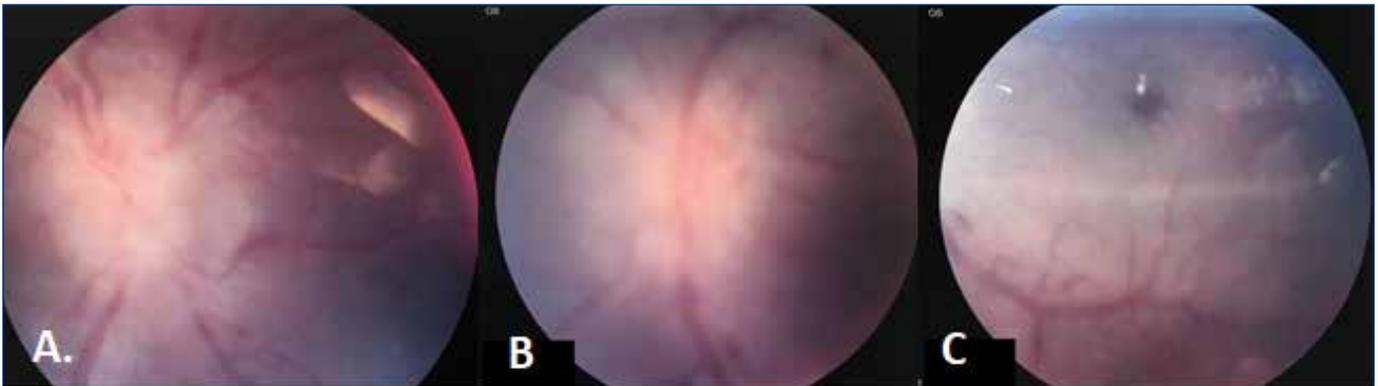
## CASE REPORT

An 8-month-old Hispanic girl presented to the emergency department (ED) after her pediatric ophthalmologist noted bilateral optic disc edema. The patient was born at 32 weeks gestation via vaginal delivery to a gravida 4 para 4 obese mother with gestational diabetes. At birth she had abnormal facies, diffuse rash, bilateral hearing loss and a placental appearance concerning for candidal infection. She was treated with systemic antifungal medication and admitted to the neonatal intensive care unit. A dilated retina examination performed by ophthalmology was normal at that time.

**Figure 1.** External photos depicting urticarial-like rash present over trunk and extremities (top) and facial rash with saddle nose deformity and frontal bossing (bottom).



**Figure 2.** Ocular fundus photos showing optic disc edema in the right (A) and left (B) eyes as well as the gray-colored retina (C).

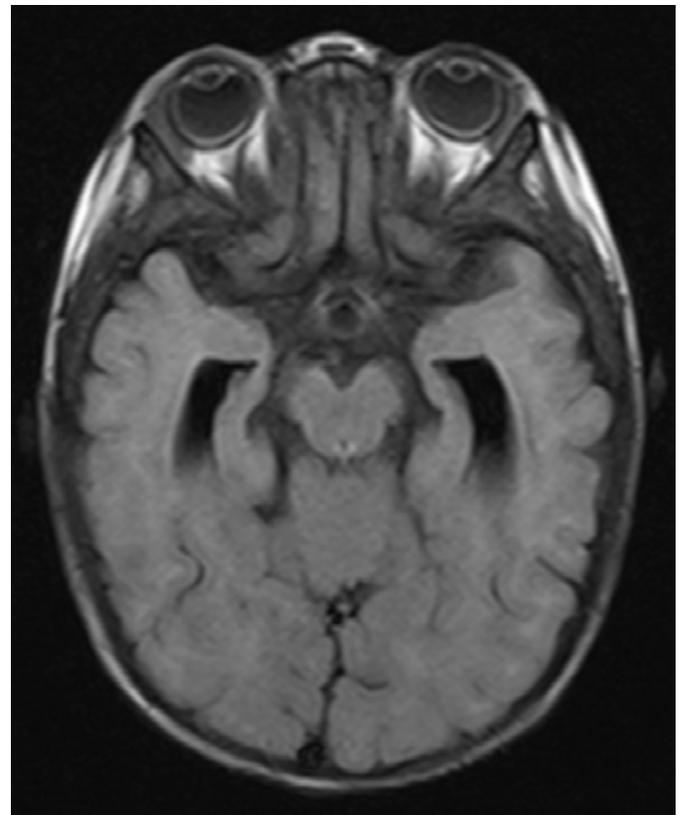


Her medical history included small vessel calcific thrombus of the left kidney and autoamputation of the left toe after peripheral IV infiltration with thrombus. Infectious, hypercoagulability and genetic microarray studies were negative.

Physical exam in the emergency room revealed flat fontanelles, macrocephaly with frontal bossing and saddle back nose deformity, urticarial rash on the face, trunk and extremities, and swollen joints (**Figure 1**). There was no fever. Her labs included CRP 140 mg/L (N=0.00-10 mg/L), ESR >140 mm/h (N=0.00-20 mm/h), WBC 27,000 cells/mcL (N=5,000-15,000 cells/mcL) and hemoglobin 9.3 g/dL (N=10.5-13.5 g/dL). Eye examination showed intermittent blinking to light and poor fixation and follow, which is lower visual acuity than expected for her age. Anterior segment examination with a portable slit-lamp was normal. A red reflex was blunted but visible. Dilated retinal examination revealed optic disc edema, tortuous vessels, and a gray colored retina bilaterally (**Figure 2**). Ocular ultrasonography showed a shallow inferior serous retinal detachment in both eyes. Magnetic resonance imaging with venography revealed increased enhancement of the ocular choroid bilaterally (**Figure 3**) and enlargement of the third and fourth ventricles secondary to aqueductal webbing. These findings were consistent with chronic hydrocephalus without increased intracranial pressure. Neurosurgery consultation recommended refraining from lumbar puncture or other surgical intervention. Tuberculosis and toxoplasmosis screening were negative. Anakinra, an interleukin-1 receptor antagonist, was initiated for presumed NOMID.

At four weeks after discharge, her ability to fixate had improved. Retinal examination revealed unchanged optic disc edema, resolution of the serous retinal detachments, and residual choroidal thickening on ocular ultrasound. At 10 weeks, ophthalmic examination revealed anterior vitreous cells with a portable slit-lamp. In consultation with rheumatology, her anakinra dose was increased with interval normalization of CRP level as well as complete resolution of fevers and rash. Her last visual acuity, three months after initial presentation, was central, steady and maintained with good fixation and follow in both eyes.

**Figure 3.** Bilateral ocular choroidal enhancement on axial FLAIR views of MRI. Lateral ventricular dilation is also noted.



## DISCUSSION

Neonatal-onset multisystem inflammatory disease (NOMID) is a syndrome characterized by persistent urticarial-like rash, large joint osteoarthropathies and chronic meningitis.<sup>1,2</sup> Since its recognition as a syndrome, apart from juvenile idiopathic arthritis, additional sequelae have been identified in other systems including the eyes. The most common ocular manifestation is optic disc edema eventually resulting in atrophy likely secondary to either neutrophilic infiltration<sup>3</sup> or chronic papillitis.<sup>4</sup> Additional ocular findings include perilimbal injection, corneal opacities, uveitis and vascular

sheathing.<sup>3,5</sup> Systemic inflammation is secondary to a mutation of the NLRP3/CIAS1 gene resulting in an upregulation of IL-1 production,<sup>6</sup> which responds to treatment with anakinra, a systemic IL-1 receptor antagonist.<sup>7</sup> We postulate that the etiology of this patient's serous retinal detachments is multifactorial. It is well documented that optic disc edema due to anterior ischemic optic neuropathy,<sup>8</sup> papilledema<sup>9</sup> and diabetic papillitis<sup>10</sup> disrupts glial tissue at the disc resulting in retinal separation and accumulation of subretinal fluid. However, this patient's serous retinal detachments resolved with immunosuppression despite persistent optic disc edema suggesting that breakdown of the blood-retina barrier in the setting of chronic inflammation also may have been a contributing factor.

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## Maternal Obesity and Birth Defects in Rhode Island

KRISTEN ST. JOHN, MPH; SAMARA VINER-BROWN, MS

Obesity is a growing problem in Rhode Island. From 2011 to 2017, the prevalence of adult obesity in Rhode Island increased from 25% to 30%.<sup>1</sup> Obese individuals are at an increased risk for many conditions, including heart disease, stroke, and diabetes.<sup>2</sup> According to the Rhode Island Pregnancy Risk Assessment Monitoring System (PRAMS), the prevalence of pre-pregnancy obesity was 21% from 2012-2015, an increase over previous time periods.<sup>3</sup> In pregnant women, obesity has been shown to cause poor maternal and fetal outcomes, including macrosomia, stillbirth, and delivery complications,<sup>4,5</sup> and has been associated with birth defects such as neural tube and congenital heart defects.<sup>5,6,7</sup> The Rhode Island Birth Defects Program's (RIBDP) previous study on the effect of pre-pregnancy obesity on birth defects suggested an association between obesity and certain types of birth defects.<sup>8</sup> As a follow-up to its previous study, the RIBDP has re-examined the relationship between pre-pregnancy obesity and birth defects in newborns to determine if the same associations are seen as obesity becomes more prevalent.

### METHODS

In Rhode Island, all healthcare providers and hospitals are required to report children up to the age of five diagnosed with a birth defect to the RIDBP. The RIBDP used this surveillance data to conduct a case control study for Rhode Island resident births from 2015 to 2017. Cases were defined as a newborn diagnosed with a birth defect ICD-10 'Q' code at discharge from the birth hospital and having a Rhode Island maternal residence. Controls were Rhode Island resident births without a reported birth defect diagnosis and were crossmatched with cases to ensure no cases were included.

Starting in 2015, pre-pregnancy height and weight were reported on the birth certificate by the mother at the time of birth. Body mass index (BMI) was calculated using pre-pregnancy height (inches) and weight (pounds) from the Rhode Island Department of Health's Vital Records birth file ( $BMI = \text{weight}/\text{height}^2 \times 703$ ). Both cases and controls with missing height and/or weight were excluded from analysis. Obesity was defined as having a BMI greater than or equal to 30 kg/cm<sup>2</sup>.

Other maternal demographic information was also self-reported by the mother on the birth certificate, including city/

town of residence, education, insurance, and race/ethnicity. City/town of residence was defined by core city status (core or non-core). A core city (Central Falls, Pawtucket, Providence, and Woonsocket) has a poverty level higher than 25%.

Medical information related to the pregnancy, including birth weight, gestational age, and diabetes status, were reported to the birth registration system by a physician. Low birth weight was defined as a birth weight less than 2500 grams. Preterm gestational age was defined as a gestational age of less than 37 weeks at birth. For diabetes status, only pre-pregnancy diabetes was included in this analysis.

Demographics for cases and controls were examined to determine if any variables should be controlled for in analysis. Adjusted odds ratios (aOR) were calculated using logistic regression to control for confounding by diabetes status, since diabetes has been associated with both obesity<sup>2</sup> and birth defects.<sup>7</sup> Other demographic variables that were examined and had a significant association were known to be generally associated with birth defects in Rhode Island from previous analyses.<sup>9</sup> P-values less than 0.05 were considered statistically significant. SAS Version 9.4 software was used for analyses (SAS Institute, Cary, NC).

### RESULTS

There were 1,036 birth defects cases reported from 2015 to 2017, with 959 (93%) eligible for inclusion in the study. During this time frame, there were 31,255 Rhode Island resident births without birth defects, with 29,206 (93%) eligible for inclusion. **Table 1** shows the demographic characteristics of cases and controls. In cases, 28% of mothers were obese prior to pregnancy, which is slightly higher than controls, where 24% of mothers were obese prior to pregnancy ( $p < 0.05$ ). Rates of maternal diabetes (2.0%), low birth weight (16.6%), and preterm gestational age (16.8%) in cases were approximately twice the rate in controls (0.8%, 7.2%, and 8.3%, respectively). Cases were also more likely to be male (61.8%) than controls (50.6%).

**Table 2** shows the association between pre-pregnancy obesity and birth defects by body system. After controlling for diabetes, there was a significant association between pre-pregnancy obesity and all birth defects (aOR=1.22,  $p < 0.01$ ). Using the National Birth Defects Prevention Network (NBDPN) conditions (47 major anomalies that are

**Table 1.** Comparison of Demographic Information for Cases and Controls

Variable	Cases (n=959) (%)	Controls (n=29,206) (%)
<b>Obese (BMI &gt;30)*</b>		
Yes	268 (28.0%)	6,965 (23.9%)
No	691 (72.0%)	22,241 (76.2%)
<b>Diabetes (Pre-gestational)*</b>		
Yes	19 (2.0%)	228 (0.8%)
No	939 (97.9%)	28,926 (99.0%)
<b>Birth Weight*</b>		
Low (<2500g)	159 (16.6%)	2,096 (7.2%)
Normal	798 (83.2%)	27,025 (92.5%)
<b>Gestational Age*</b>		
Preterm (<37 weeks)	161 (16.8%)	2,415 (8.3%)
Term	794 (83.1%)	26,695 (91.4%)
<b>Sex*</b>		
Male	593 (61.8%)	14,765 (50.6%)
Female	366 (38.2%)	14,440 (49.4%)
<b>Maternal Age</b>		
<20	48 (5.0%)	1,234 (4.2%)
20-34	722 (75.3%)	22,336 (76.5%)
>34	189(19.7%)	5,636 (19.3%)
<b>City/Town*</b>		
Core**	463 (48.3%)	11,578 (39.6%)
Non-Core	495 (51.6%)	17,628 (60.4%)
<b>Race/Ethnicity*</b>		
Non-Hispanic White	516 (53.8%)	17,346 (59.4%)
Non-Hispanic Black	96 (10.0%)	2,320 (7.9%)
Hispanic	275 (28.7%)	7,119 (24.4%)
Asian	37 (3.4%)	1,502 (5.1%)
Other/Unknown	35 (3.6%)	919 (3.1%)
<b>Insurance*</b>		
Public	625 (65.2%)	16,809 (57.6%)
Private	319 (33.3%)	11,242 (38.5%)
None	7 (0.7%)	191 (0.6%)
<b>Education*</b>		
<12th grade	135 (14.0%)	3,207 (11.0%)
12th grade	204 (22.0%)	5,698 (19.5%)
>12th grade	520 (54.2%)	18,000 (61.6%)

\* The p-value was less than 0.05.

\*\*A core city (Central Falls, Pawtucket, Providence, and Woonsocket) has a poverty level higher than 25%.

**Table 2.** Association between Pre-pregnancy Obesity and Birth Defects, Before and After Controlling for Diabetes, Rhode Island, 2015–2017

Body System	Cases (n)	Unadjusted Odds Ratio (Confidence Interval)	Adjusted Odds Ratio* (Confidence Interval)	p-value for aOR
<b>Overall birth defects</b>	959	1.24 (1.07–1.43)	1.22 (1.06–1.41)	<0.01
<b>NBDPN birth defects</b>	486	1.29 (1.06–1.57)	1.25 (1.03–1.53)	0.03
<b>Cardiovascular defects</b>	296	1.25 (0.98–1.62)	1.23 (0.95–1.59)	0.12
Septal heart defects	183	1.26 (0.91–1.74)	1.25 (0.91–1.73)	0.17
Conotruncal heart defects	20	2.11 (0.86–5.12)	1.87 (0.74–4.75)	0.19
Obstruction heart defects	20	2.11 (0.64–4.68)	1.77 (0.70–4.54)	0.23
<b>Orofacial defects</b>	47	1.49 (0.80–2.75)	1.45 (0.77–2.72)	0.25
<b>Genitourinary defects</b>	239	1.09 (0.82–1.46)	1.07 (0.79–1.43)	0.68
<b>Musculoskeletal defects</b>	309	1.09 (0.84–1.41)	1.04 (0.80–1.35)	0.79
<b>Central Nervous System</b>	52	1.33 (0.72–2.41)	1.29 (0.69–2.41)	0.42
<b>Respiratory</b>	25	2.93 (1.34–6.42)	2.96 (1.35–6.48)	<0.01
<b>Eye/Ear/Face/Neck</b>	32	1.90 (0.93–3.90)	1.92 (0.94–3.93)	0.08
<b>Digestive</b>	62	1.19 (0.69–2.09)	1.19 (0.68–2.08)	0.54

\*The adjusted odds ratio (aOR) was obtained by performing logistic regression, controlling for diabetes status and compares those with birth defects to those without a birth defect.

considered important for national surveillance) as a proxy for more serious birth defects, there was also a significant association seen after adjusting for diabetes (aOR=1.25, p=0.03). The respiratory system was the only body system to show a significant association with obesity (aOR=2.96, p< 0.01).

## DISCUSSION

Rhode Island women who were obese prior to pregnancy had an increased risk of having a baby with a birth defect, especially a more serious birth defect tracked by the NBDPN or a respiratory system birth defect. A strong relationship between NBDPN anomalies and pre-pregnancy obesity was also seen in 2007 to 2009 data.<sup>8</sup>

The association between obesity and respiratory system birth defects, such as choanal atresia and pulmonary hypoplasia, was not observed previously. This body system had a small number of cases during this time frame, which limits

any conclusions that may be drawn about its relationship with obesity and should be studied in the future.

Conotruncal heart defects previously showed a strong association with pre-pregnancy obesity (aOR=1.88, p=0.02).<sup>8</sup> An association of a similar magnitude was seen in this study but was not statistically significant. Obstruction heart defects and the eye/ear/face/neck body system also had aORs that suggested an association but were not significant. The small case numbers for these body systems may have limited the ability of this study to detect a significant association. These relationships should be examined in future studies to see if an association is seen with a larger number of cases.

Case numbers were too small to further classify BMI to see if there was a varying effect of BMI class on birth defect outcomes and may have been too small to show a relationship between some body systems and obesity. Information to calculate BMI was first available in the 2015 vital records birth file in Rhode Island, which currently limits the years of recent data available for analysis. Additionally, there may be bias present in height and weight reporting of pre-pregnancy obesity if mothers who self-reported this data used to calculate BMI over- or underestimated these measurements.

Considering the association between birth defects and maternal obesity, if obesity rates continue to increase as has been the trend locally,<sup>1,3</sup> the birth defects rate is likely to increase, which has emotional and financial implications for families of children with birth defects and the health-care system. Birth defects can cause serious illness or even death, with about one in five infant deaths in Rhode Island attributed to a birth defect.<sup>9</sup> Newborns with a birth defect have an average hospitalization cost approximately 10 times the cost of a newborn without a birth defect and stay in the hospital four times longer on average.<sup>9</sup> As children with a birth defect age, those who were hospitalized have an average length of stay twice that of children without a birth defect.<sup>9</sup> Children with birth defects may also require developmental, educational, and specialty healthcare services.

Not all birth defects can be prevented but focusing on reducing modifiable risk factors, such as obesity, can help reduce the prevalence of birth defects and lead to better outcomes for newborns. Recent PRAMS data estimate that 45% of Rhode Island mothers who were obese prior to pregnancy reported the pregnancy was unintended.<sup>3</sup> With almost half of births to obese women resulting from unintended pregnancies, it is important to incorporate pre-conception messaging into preventive care and public health communications. The RIBDP will increase its messaging focusing on healthy weight as part of its birth defects prevention strategy and work with providers to further disseminate this information to their patients.

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# Rhode Island Monthly Vital Statistics Report

## Provisional Occurrence Data from the Division of Vital Records

VITAL EVENTS	REPORTING PERIOD		
	FEBRUARY 2019	12 MONTHS ENDING WITH FEBRUARY 2019	
	Number	Number	Rates
Live Births	820	11,417	10.8*
Deaths	833	10,450	9.9*
Infant Deaths	4	57	5.0#
Neonatal Deaths	3	48	4.2#
Marriages	206	6,689	6.3*
Divorces	261	3,036	2.9*

\* Rates per 1,000 estimated population

# Rates per 1,000 live births

Underlying Cause of Death Category	REPORTING PERIOD			
	AUGUST 2018	12 MONTHS ENDING WITH AUGUST 2018		
	Number (a)	Number (a)	Rates (b)	YPLL (c)
Diseases of the Heart	181	2,447	231.4	3,117.0
Malignant Neoplasms	205	2,219	209.9	4,960.0
Cerebrovascular Disease	30	469	44.4	506.0
Injuries (Accident/Suicide/Homicide)	67	914	86.4	12,492.5
COPD	30	508	48.0	432.5

(a) Cause of death statistics were derived from the underlying cause of death reported by physicians on death certificates.

(b) Rates per 100,000 estimated population of 1,056,298 (www.census.gov)

(c) Years of Potential Life Lost (YPLL).

NOTE: Totals represent vital events, which occurred in Rhode Island for the reporting periods listed above.

Monthly provisional totals should be analyzed with caution because the numbers may be small and subject to seasonal variation.

### ADDITIONAL VITAL STATISTICS REPORTS

[January 2019/July 2018](#)

[December 2018/June 2018](#)

[November 2018/May 2018](#)

[October 2018/April 2018](#)

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**RIMS NOTES: NEWS YOU CAN USE**

This issue sponsored by

Welcome to the current issue of *RIMS Notes*, your concise, bi-weekly bulletin to keep RIMS members up to date on RIMS, the legislature, and highlights of our advocacy efforts.

**Volume 1 - Number 21**

For more information about our Sponsors, please visit [here](#).

**What's New**

**On October 14 CMS published its Final Rule for implementing MACRA.** All physicians must take careful note of the momentous changes in how Medicare will pay starting in little more than 2 months. On October 20, AMA released two new documents to help physicians understand the Final Rule and what it means for their practices. AMA's new [chart](#) provides an outline, while AMA's new [summary document](#) provides detail of MACRA. The Final Rule incorporates a number of improvements that AMA fought for to ease the transition for doctors.

**Membership Activities**

**The Medical Society's new website** debuted September 22, 2016. The URL is unchanged: [www.rimed.org](#), but everything else has been rebuilt from the ground up in fulfillment of strategic planning and consulting done last winter. You will like what you see.

**December 1** Back by popular demand! [Paint and Wine](#) at the Muse Paint Bar, 117 North Main Street, Providence. Register through the [Member Portal](#) on RIMS' website. Unleash your inner artist.

**Keeping You Posted: Opioids**

**New Prescription Limits are in Effect!** By state law effective June 28, 2016, initial opioid prescriptions for outpatient adults shall entail no more than 30 morphine milligram equivalents (MMEs) or 20 total dosages. Review the impact of these important new laws [here](#).

**Co-prescribing** FDA now requires strong warnings for combined use of opioid analgesics, prescription opioid cough products, and benzodiazepines. The action is part of a national effort led by Rhode Island Director of Health, Nicole Alexander-Scott, MD, MPH, to highlight the dangers of co-prescribing.

**Surgeon General to physicians: Take the pledge!** Vivek H. Murthy, MD, MBA, calls on America's doctors to [Turn the Tide](#) on the opioid crisis. Read his [letter](#). Take the pledge.

**This Date In History - 23 Years Ago**

October 21 is National Mammography Day, and October is Breast Cancer Awareness Month. President Bill Clinton designated the third Friday of October as Mammography Day in 1993.

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Contact Sarah if you've missed an issue, [sstevens@rimed.org](mailto:sstevens@rimed.org).



## Working for You: RIMS advocacy activities

### July 2, Tuesday

RIMS Physician Health Committee:  
Herbert Rakatansky, MD, Chair

### July 4–5, Thursday–Friday

RIMS closed in observance  
of Independence Day

### July 8, Monday

RIMS Board of Directors Meeting:  
Peter A. Hollmann, MD, President

### July 10, Wednesday

Board of Medical Licensure  
and Discipline

Governor’s Overdose Prevention  
and Intervention Task Force

Meeting with Coverys regarding  
trends in medical professional liability  
in Rhode Island and New England

### July 11, Thursday

State Innovation Model (SIM)  
Grant Steering Committee:  
Peter A. Hollmann, MD, President

### July 12, Friday

*RIMS Notes* issue production

### July 15, Monday

Governor’s Overdose Prevention and  
Intervention Task Force Work Group  
on Harm Reduction

Rhode Island Action Coalition:  
Robert Wood Johnson Foundation  
grant “Building a Culture of Whole  
Person Health”

### July 16, Tuesday

OHIC Aligned Measure Sets Review

### July 17, Wednesday

Primary Care Physician Advisory  
Council

Attorney General Neronha fundraiser

### July 26, Friday

*RIMS Notes* issue production

### July 30–August 1, Tuesday–Thursday

AMA State Advocacy Roundtable

# CONVIVIUM

FRIDAY, SEPTEMBER 20, 2019

## RIMS Membership Convivium and Awards Dinner

Good food, good music, and good company in a relaxed and  
beautiful setting at the Roger Williams Park Casino in Providence

**INVITATIONS WILL BE MAILED IN EARLY AUGUST, WATCH FOR YOURS!**





## RIMS CORPORATE AFFILIATES

The Rhode Island Medical Society continues to drive forward into the future with the implementation of various new programs. As such, RIMS is expanding its Affinity Program to allow for more of our colleagues in health-care and related business to work with our membership. RIMS thanks these participants for their support of our membership.

Contact Marc Bialek for more information: 401-331-3207 or [mbialek@rimed.org](mailto:mbialek@rimed.org)



[www.nhpri.org](http://www.nhpri.org)

Neighborhood Health Plan of Rhode Island is a non-profit HMO founded in 1993 in partnership with Rhode Island's Community Health Centers. Serving over 185,000 members, Neighborhood has doubled in membership, revenue and staff since November 2013. In January 2014, Neighborhood extended its service, benefits and value through the HealthSource RI health insurance exchange, serving 49% the RI exchange market. Neighborhood has been rated by National Committee for Quality Assurance (NCQA) as one of the Top 10 Medicaid health plans in America, every year since ratings began twelve years ago.

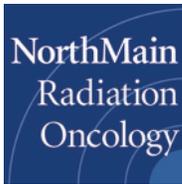


[www.ripccpc.com](http://www.ripccpc.com)

RIPCPC is an independent practice association (IPA) of primary care physicians located throughout the state of Rhode Island. The IPA, originally formed in 1994, represent 150 physicians from Family Practice, Internal Medicine and Pediatrics. RIPCPC also has an affiliation with over 200 specialty-care member physicians. Our PCP's act as primary care providers for over 340,000 patients throughout the state of Rhode Island. The IPA was formed to provide a venue for the smaller independent practices to work together with the ultimate goal of improving quality of care for our patients.



RIMS gratefully acknowledges the practices who participate in our discounted Group Membership Program



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## Mavis Nimoh named to lead The Center for Prisoner Health and Human Rights at The Miriam Hospital

PROVIDENCE – The Center for Prisoner Health and Human Rights at The Miriam Hospital has established itself nationally as being on the forefront of a myriad of social justice issues and it now is under the leadership of **MAVIS NIMOH**, a graduate of Shea High School and the University of Rhode Island, and a Pawtucket native with extensive experience in public health and the criminal justice system. She returned to her hometown after many years out of state working in top-level positions for government agencies and non-profits.

“After a nationwide search process, Mavis was by far our top choice and we are delighted to have her join the center. Throughout her career, Mavis has been a change agent and led transformative initiatives that shifted culture and practice in behavioral health and criminal justice to better serve families and communities,” said **JOSIAH RICH, MD**, the center’s co-founder and director.

The center was established in 2005 to act as a hub for the innovative correctional health research and programming occurring at The Miriam Hospital and other research hospitals in Rhode Island and around the country. The center’s mission is to advance health equity and human rights for individuals and populations impacted by the criminal justice system. The center’s work involves raising awareness at the national and state levels about the health and re-entry challenges of incarcerated and other justice-involved populations; utilizing a public health model to shift policy and practice to improve outcomes; informing and facilitating innovative approaches at the program, community, and system levels; providing education and training opportunities for college, graduate, and medical students; and supporting student engagement and leadership in criminal justice issues.

The organization is involved with the Center of Biomedical Research Excellence (COBRE), funded with a five-year, \$11 million grant to Rhode Island Hospital from the National Institutes of Health. The center is also focused on statewide criminal justice planning with community and state agency stakeholders and partners – with the Lifespan Community Health Institute, the Rhode Island Hospital Center for Primary Care, and the R.I. Department of Corrections – on the Transitions Clinic, which supports justice-involved populations with chronic illnesses. Additionally, the center spearheads a criminal justice policy collaborative with local and national leaders.



Pawtucket native **Mavis Nimoh** graduated from URI with a bachelor’s degree in political science and received a master’s degree in public administration from Penn State University. She is a White-Riley-Peterson Public Policy Fellow at Furman University. [PHOTO: LIFESPAN]

“I am thrilled to join the Center for Prisoner Health and Human Rights as its executive director and work alongside partners and experts sourcing and implementing systems-level change and solutions at the intersection of health equity and criminal justice and its correlating impacts on individuals, families, and communities throughout Rhode Island and the nation. Equally as important for me was to return home and serve the communities that raised me and set me on the path for success. Representation matters, and I am proud to work for an organization that values and champions diversity, equity, and opportunity.” Nimoh said.

Nimoh served as state director of victim services for MADD Pennsylvania and executive director of a county agency focused on access to quality care for uninsured and under-insured individuals with substance use disorders. Her work also included spearheading the first ever diversionary program within the county’s booking center as well as overseeing treatment and recovery services for the county’s drug court and school-based treatment initiatives. She was also appointed secretary of the Pennsylvania Board of Pardons under the direction of the state’s lieutenant governor. In this capacity, she helped to dramatically change the clemency process and lead criminal justice reform policy efforts.

In Rhode Island, Nimoh led expanded learning initiatives as a member of the Special Legislative Commission on Out of School Time Learning and managed the Rhode Island Afterschool Network. She is on the board of directors for the Providence Afterschool Alliance (PASA), Rhode Island School for Progressive Education (RISPE), and mentors emerging leaders with the New Leaders Council of RI. ❖

## Study identifies new drug to weaken membranes of “superbugs” that can cause severe illnesses

*Rhode Island Hospital leads team of researchers from Brown, Emory and Northwestern Universities, Massachusetts Eye & Ear Infirmary and Massachusetts General Hospital*

PROVIDENCE – A team of researchers, led by a lab at Rhode Island Hospital, has identified a drug that can target and weaken the cell membranes of these dormant “persister” cells, making them more vulnerable to treatment with antibiotics.

The findings, just published by the *Proceedings of the National Academy of Sciences* (PNAS), are the result of ongoing research into treating MRSA (methicillin-resistant *Staphylococcus aureus*) that is being undertaken by Rhode Island Hospital in collaboration with Brown, Emory, Harvard and Northwestern universities, along with institutions in China and Brazil.

**ELEFTHERIOS MYLONAKIS, MD, PhD**, chief of infectious diseases at Rhode Island Hospital and The Miriam Hospital in Providence, and Charles C.J. Carpenter Professor of Infectious Disease at the Warren Alpert Medical School of Brown University, is leading a multidisciplinary team in search of drugs to target bacteria that have developed a resistance to conventional antibiotics and entered into a dormant state for which there is no known effective treatment.

The researchers discovered that the clinically approved compound bithionol, an anti-parasitic agent, demonstrated the ability to selectively embed into and weaken bacteria membranes while leaving mammalian cells unharmed. The research also found that bithionol, when combined with gentamicin, effectively kills persisters and reduces overall levels of MRSA bacteria in mice.

The development of new drugs is not keeping pace with the rise in drug-resistant bacteria.

“This is an emergency,” Mylonakis said, citing a World Health Organization (WHO) projection that “by 2050, superbugs will surpass cancer as the global No. 1 killer. This is a frightening situation. It affects more than individuals in the hospital or the very ill or the very old. It effects everybody.”

Mylonakis said drug-resistant staphylococci pose a major health risk because it’s commonly found on our skin and in the environment, is highly virulent, and can cause serious blood, bone and organ infections. Trying to find new drugs to combat the problem requires experts in a variety of fields, including chemistry and engineering.

“Our study demonstrated the potential for an old drug, bithionol to be repurposed to treat deadly MRSA,” said the lead author **WOOSEONG KIM, PhD**, a postdoctoral researcher at Rhode Island Hospital and the Warren Alpert Medical School of Brown University.

**GUIJIN ZOU, PhD**, and **HUAJIAN GAO, PhD**, researchers at Brown University’s School of Engineering, said, “Our computer simulations revealed the molecular mechanism of interactions between screened compounds and different cell membranes. In particular, the high degree of selectivity of bithionol has been attributed to their preferential penetration of bacterial rather than mammalian membrane. This work further demonstrated the great potential of in silico modelling in aiding the discovery and development of new antibiotics.”

**PETIA VLAHOVASKA, PhD**, associate professor of engineering science and applied mathematics at Northwestern University, said, “The research is an amazing fusion of medical research with basic science coming from numerical simulation and biomimetic systems.”

“As a chemist I was surprised by the molecular simplicity of the lead molecules and how effective they were against these hard to treat infections thereby making them attractive targets for future development,” said **WILLIAM WUEST, PhD**, member of the Emory Antibiotic Resistance Center, an associate professor of chemistry and a Georgia Research Alliance Distinguished Investigator.

The research team had previously identified two compounds, both synthetic retinoids, that also had the ability to impair bacterial membranes and, when combined with gentamicin, kill persister cells. That study was published in *Nature* in March 2018. The discoveries have resulted from the team’s development of novel ways to screen large numbers of compounds for those that could be effective antibiotics without being toxic to humans. Ultimately, 185 compounds were identified.

The research has been supported by National Institutes of Health grant P01 AI083214, National Science Foundation grant CMMI-156290 and National Institute of General Medical Sciences grant 1R35GM119426. ❖

## Statement on Care New England's withdrawal from discussions with Lifespan, Brown

From **CHARLES R. REPPUCCI**, chair, CNE Board of Directors and **JAMES E. FANALE, MD**, president and CEO, Care New England [7/16/2019]:

Yesterday, after careful deliberation, the CNE Board voted to formally withdraw from tri-party discussions with Lifespan and Brown University. CNE was an active and willing participant, meeting in good faith, as requested by Governor Raimondo. The discussions have been collaborative, mutually respectful, and held honestly and transparently. We would like to thank the Governor's Office, The Rhode Island Foundation, and The Partnership for Rhode Island for their leadership throughout this important process.

As those responsible for the fiduciary oversight of CNE, the Board has concluded that it is in the best interest of CNE and the community it serves to end the tri-party discussions. In making this decision, the Board took into account many considerations, including but not limited to, capital requirements and financial stability of the combined system, community need, anti-trust considerations, organizational stability, and implementation risks.

CNE has implemented a remarkable turnaround with significant improvements. With this in mind, it is the respectful position of CNE to step back and continue on the dedicated path of improving quality, service, and access to health care for our patients.

The Board, leadership, and dedicated staff of CNE are fully prepared for and look forward to the opportunities ahead for our system. We have exciting growth plans, clinical development opportunities, and plans for capital improvements. We also look forward to expanding our collaboration with Lifespan and Brown University on new clinical and academic opportunities. We are confident and optimistic about the future and our place as a leading health care institution in Rhode Island. As we move forward in our mission, we will continue to serve our patients with honesty, integrity, and clinical excellence. ❖

## Care New England announces Q3 financial report

*System achieved \$7.4 million in income from operations*

Care New England Health System announced on July 29th that for Fiscal Year 2019, third quarter (April–June), the System achieved income from operations of \$7.4 million, a \$13.2 million improvement from the second quarter.

"The third quarter results are a tremendous success for CNE," said **JAMES E. FANALE, MD**, president and CEO. "It represents incredibly hard work by our dedicated staff, focused management, detail to action planning, and strong operational execution. While this is a significant accomplishment, it must be emphasized that in order to continue this positive momentum, our perseverance and dedication must be sustained. CNE is moving forward for a stronger, healthier future for our staff, community, and our patients. Today's announcement is further proof of that effort."

To date, CNE, inclusive of Memorial Hospital, has recorded income from operations of \$2.3 million, \$1.6 million better than budget. Without Memorial, the System recorded income from operations for the past nine months of \$4.9 million, \$147,134 better than budget and in comparison to \$1.8 million income from operations through the third quarter in FY 2018.

The greatest financial challenges facing the system this year include patient volumes, specifically, NICU, medical/surgical, obstetrics, and deliveries. However, action plans are stabilizing these patient trends, as well as the careful management of appropriate staffing to the patient volume levels. Additionally, action plans across the system are all addressing the critical components of quality, service, and access. ❖

## URI researchers embark on autism study with Yale, UConn-affiliated Haskins Labs

KINGSTON – JULY 16, 2019 – **ALISA BARON, PhD**, and **VANESSA HARWOOD, PhD**, Assistant Professors of Communicative Disorders at the University of Rhode Island, who are researchers with clinical certifications as speech language pathologists, working at URI's new Collaborative Cognitive Neuroscience Lab, are partnering with research scientists, **JULIA IRWIN, PhD**, and **NICOLE LANDI, PhD**, at Haskins Laboratories to better understand how children with autism spectrum disorder (ASD) learn language.

Haskins is a private, non-profit research institute located in New Haven affiliated with Yale University and the University of Connecticut. Specifically, researchers will study how children with autism integrate visual information with what they hear compared to their typically developing peers and how that affects their ability to learn language.

The University of Rhode Island's portion of the study, led by Drs. Baron and Harwood, will focus on children, ages 10 through 18, with autism spectrum disorder. The study will incorporate electroencephalogram (EEG) sensors that monitor brain activity with eye-tracking technology to determine the level of audio-visual integration occurring as children observe human and computer-animated faces speaking.

"One way we learn language is by looking at people's faces and expressions and watching how their mouths move in addition to listening to what they are saying," said Baron. "In children with autism, we find that they have difficulty making eye contact or looking at people's faces as they speak. So they are missing out on critical information regarding language and communication."

URI will work through its Speech and Hearing Center as well as through the Rhode Island Consortium on Autism Research and Treatment to recruit participants. Recruitment is expected to begin late summer. Researchers will



From left, undergraduate student Marland Chang, Assistant Professor Alisa Baron, graduate student Jillian Caduto, and Assistant Professor Vanessa Harwood, at the University of Rhode Island, are collaborating with scientists at Haskins Laboratories on a research study to determine how children with autism spectrum disorders learn language.

work with participants to acclimate them to the research process. Study participants will be required to participate in several sessions, which will include behavioral testing and an experimental portion.

"This is a very special population and we appreciate their willingness to be a part of this study. We want to make certain that we are doing everything we can to ensure their comfort and successful participation," said Harwood. "Our goal for the end result of this study is to develop effective interventions that will support and reinforce those types of looking behaviors that may help improve language processing."

In addition to recruiting children with ASD, researchers also invite parents of children with autism to participate in the study to learn more about how they process language.

The Collaborative Cognitive Neuroscience Lab at the University of Rhode Island's College of Health Sciences is a multidisciplinary team of researchers dedicated to translational research that bridges innovative neuroscience with clinical practice. The lab draws from multiple disciplines including communicative disorders, psychology, neuroscience, education, kinesiology and foreign language.

In addition to its formal affiliations with the University of Connecticut and Yale University, Haskins Laboratories maintains collaborations and partnerships with institutions around the world. This is the first collaboration between Haskins and URI.

Added Baron and Harwood, "We are grateful for this partnership and the opportunity to contribute in a meaningful way to moving autism research and interventions forward. We look forward to a long and successful relationship." ❖



Marland Chang testing EEG sensors and eye-tracking technology as part of a dry run for research on how children with autism integrate visual information with what they hear. [URI PHOTOS BY NORA LEWIS]



Dr. Noah S. Philip, director of Psychiatric Neuromodulation at the Providence VA Medical Center, and Associate Professor of Psychiatry and Human Behavior at the Alpert Medical School of Brown University, demonstrates theta burst transcranial magnetic stimulation with Emily Aiken, a research assistant at the Providence VAMC, Oct. 2, 2017. [PROVIDENCE VA MEDICAL CENTER PHOTO BY TORI LARSON]

## Providence VA researchers publish Theta-Burst Stimulation study for treatment of PTSD

PROVIDENCE – Researchers at the Providence VA Medical Center published a study Monday, June 24, finding that theta-burst stimulation may be a promising new treatment for posttraumatic stress disorder, commonly known as PTSD.

The article, “Theta-Burst Transcranial Magnetic Stimulation for Post-traumatic Stress Disorder,” was published in the American Journal of Psychiatry, summarizing a controlled study of 50 Veterans with PTSD. Transcranial magnetic stimulation has previously shown promise as a treatment for PTSD, and intermittent theta-burst stimulation, or iTBS, is a new, more rapid process that has been shown to be effective in treating depression.

Outcomes measured in the study included comparing changes in PTSD symptoms, depression, and social and occupational function in participants, compared with a control group who only received simulated treatment. The team was also able to identify participants most likely to improve with iTBS using functional magnetic resonance imaging, also known as MRI.

“Our results indicate that iTBS appears to be a promising new treatment for PTSD, a condition more common among Veterans than in the general population,” said lead researcher **DR. NOAH S. PHILIP**, director of Psychiatric Neuromodulation at the Providence VA Medical Center, and Associate Professor of Psychiatry and Human Behavior at the Alpert Medical School of Brown University. “Further investigation is needed, to develop the optimal treatment course and duration.”

The study was supported by U.S. Department of Veterans Affairs grants, and the VA Rehabilitation Research and Development Service’s Center for Neurorestoration and Neurotechnology at the Providence VA Medical Center. The article can be found online at <https://ajp.psychiatryonline.org/doi/full/10.1176/appi.ajp.2019.18101160>. ❖

## University Orthopedics use AI to support spinal implant procedure

PROVIDENCE – Physicians from University Orthopedics (UOI) are the first doctors in Rhode Island to use a patient-specific spinal implant designed by artificial intelligence. **DR. ALAN DANIELS** and **DR. DOMINIC KLEINHENZ** partnered with Medicea® to deliver the advanced medical procedure that could improve spine surgery outcomes throughout the state.

Medicea, a medical manufacturing company that uses data science, analytics, and artificial intelligence to lead device development in the spine industry, assisted UOI physicians with the use of its proprietary software called UNiD ASI™. The systems-based technology platform, UNiD ASI, is designed to help surgeons improve their patients’ outcomes by embedding artificial intelligence within the platform – giving surgeons updated visual surgical plans based on the specific needs of patients.



Alan Daniels, MD



Dominic Kleinhenz, MD

“Spine surgery is one of the most complex procedures because of the high number of variables to take into consideration. Being able to predict how different parameters will affect a patient’s outcomes is critical in both large deformities as well as in smaller degenerative settings,” said Dr. Daniels, a board-certified spine surgeon at University Orthopedics and an Associate Professor of Orthopaedic surgery at the Warren Alpert

Medical School of Brown University.

Dr. Kleinhenz emphasized the importance of technology in delivering better results for patients going forward. “Medicea is the first spine company to make custom rods industrially manufactured to precisely match the pre-operative plan of the surgeon. This process preserves the rod’s structural integrity, and limits stress points that could lead to rod fracture,” Dr. Kleinhenz said. ❖

## Sen. Sheldon Whitehouse tours CODAC's newest facility and discusses treatment provider's impact within the community

*CODAC Pawtucket sees 30 percent increase in its patient base*



PAWTUCKET – CODAC Behavioral Healthcare has welcomed more than 60 new patients in need of recovery services since it opened its doors at 600 Pawtucket Ave., Pawtucket. This is one of several updates that **LINDA HURLEY**, President/CEO of CODAC, shared with **SEN. SHELDON WHITEHOUSE** during a tour of the facility on July 1st.

“Ease of access and space has allowed us to offer special programming as well as opioid dependence services to a wider community,” Hurley said. “With the continued support of Senator Whitehouse and other state leaders, I am confident that we can expand treatment capacity across the state.”

Sen. Whitehouse, who co-authored the legislation guiding the national response to the opioid epidemic, praised CODAC's recent success and highlighted the need to continue to innovate amid the ongoing crisis.

“As the opioid crisis sweeps the country, we can take pride in what is happening in Rhode Island,” Sen. Whitehouse said. “Rhode Island has been a leader in treatment and recovery, and the result is that we are starting to reduce the level of opioid overdoses.”

Hurley agreed with Sen. Whitehouse

about the need to keep the momentum going with regards to the development of programs and initiatives across the state. “As the senator said, ‘we aren't where we need to be,’ but we are certainly bending the curve on overdoses,” Hurley added.

Among the services offered at CODAC Pawtucket, Hurley explained that patients have access to tobacco cessation services, infectious disease specialists, a successful HCV program, assistance for housing, and other important resources that are especially essential for individuals in recovery.

**CARLOS LOPEZ ESTRADA**, Chief of Staff for Pawtucket Mayor **DONALD R. GREBIEN**, also expressed support for CODAC and explained that the City of Pawtucket is soon launching its Safe Stations initiative, where individuals can meet with public safety officials and immediately get connected with treatment providers.

With experience in helping maximize Newport's Safe Stations initiative, Hurley immediately offered to help Pawtucket launch their program – one of many projects on the horizon for the outpatient treatment provider in the months ahead. Most recently,

Senator Sheldon Whitehouse and Linda Hurley, President/CEO of CODAC Behavioral Healthcare, discuss Rhode Island's progress in reducing overdoses and how the new facility in Pawtucket is improving access to care. Carlos Lopez Estrada, Chief of Staff for Pawtucket Mayor Donald R. Grebien, joined the tour of the facility and expressed gratitude for the state's leadership in addressing the opioid crisis.

[PHOTO: CODAC]

CODAC has been supporting Rhode Island State Police's Hope Initiative and in collaboration with the University of Rhode Island, CODAC is offering integrated medical services for substance use disorder on the “Rhode to Health” mobile medical unit. Individuals are able to receive or be connected to services ranging from blood pressure checks or health education to mental health assessments and treatment for opioid use disorder.

“Substance use disorder is a disease that impacts not only the individual, but also the families and our communities. We are proud of what we've accomplished in the last two months and look forward to helping even more Rhode Islanders receive the services they need,” Hurley said. ❖

## URI, CODAC launches statewide initiative with mobile health unit



From left to right: Mary Walton, Rebecca Boss, Linda Hurley, Adam Nitenson, Linda Mahoney, and Dustin Alvanas.

CRANSTON – CODAC Behavioral Healthcare is set to launch a statewide initiative with the assistance of the URI Rhode to Health mobile unit that will offer integrated medical and behavioral healthcare services. The mobile unit will offer yet another opportunity to remove barriers to care for people living in rural communities, where cases of opioid overdoses are higher.

On an early July morning, CODAC Behavioral Healthcare stationed the mobile unit near the Hazard Building on the Pastore Center Campus to introduce the staff that will be bringing medical and behavioral healthcare services to Rhode Island's underserved community.

**MARY WALTON**, Assistant Medical Director at CODAC, was on site to discuss the range of services available to representatives from the Substance Abuse and Mental Health Services Administration (SAMHSA), a federal agency that advances national behavioral healthcare efforts, and staff from the R.I. Department of Behavioral Healthcare (BHDDH), Developmental Disabilities and Hospitals.

"The people we serve always have something going on that prevents them from seeking care. This mobile unit is giving us a chance to go to their neighborhood and help them receive immediate access to care in their time of need," Walton said.

**REBECCA BOSS**, director of BHDDH and a co-chair of Governor Gina Raimondo's Task Force on Overdose Prevention and Intervention, praised CODAC's response to a growing issue in Rhode Island. "We applaud CODAC Behavioral Healthcare for their commitment to integrate medical

and behavioral healthcare services and to ensure that these services are brought to individuals wherever they live, particularly those in Rhode Island's rural communities," Boss said. "Once again, Rhode Island is leading the country in this new, innovative practice thanks to CODAC and URI's Rhode to Health mobile unit."

The 37-foot mobile unit, Walton says, is unique because of the holistic approach to care that will be available. Besides providing medication assisted treatment, the medical team on the mobile unit will be able to provide HIV and Hep C testing, crisis stabilization, medical care and help individuals acquire health insurance.

Additionally, patients will have access to telehealth services, which helps improve the response time for new cases of opioid use disorder within the community.

"Lack of transportation and resources as well as stigma remain significant barriers to care, and our work will help address those challenges directly," said **LINDA HURLEY**, President/CEO of CODAC Behavioral Healthcare. "We look forward to working more closely with Rhode Island towns and cities in the coming months to help even more people receive much needed access to treatment."

The \$400,000 mobile unit – which includes two sound-proof exam rooms and equipment typically found in a medical office – was funded by the state of Rhode Island through the Ryan White Foundation. It was first unveiled in late 2018, but it is making its debut to the recovery community now.

**LINDA MAHONEY**, who serves as a State Opioid Treatment Authority for SAMHSA and is an administrator at BHDDH, praised CODAC's ongoing efforts to curb opioid overdoses. "We can't wait for people to come to us, we have to go to them," Mahoney said. She says the services will provide an opportunity to help individuals bring the "mind and body together."

CODAC will begin offering services on the mobile unit on Monday, July 29. Services will be provided five days a week, and patients will have access to a medical provider, a nurse, and an addiction counselor. CODAC is also working with community partners such as Thundermist Health Center and the Community Care Alliance to make sure that all patients' medical needs are being met. ❖

## CODAC, Thundermist using Telehealth to expand MAT treatment access

CRANSTON – Amidst the ongoing opioid crisis, CODAC Behavioral Healthcare and Thundermist Health Center will use telehealth services to improve access to medication assisted treatment (MAT) for substance use disorder. Beginning on Monday, June 17, Thundermist nurse case managers can teleconference with CODAC treatment prescribers so patients can be prescribed suboxone when they first seek treatment.

“Lack of transportation, medication shortages, and stigma continue to be a barrier to care for Rhode Island’s recovery community, and we now have an opportunity to reach more people before it is too late,” said **LINDA HURLEY**, President/CEO of CODAC Behavioral Healthcare.

“We need to respond as soon as a patient says they want treatment,” said **JEANNE LACHANCE**, president/CEO of Thundermist Health Center. “This program ensures we’re providing patients with treatment when they tell us they’re ready.”

“Many patients might seek illicit drugs to prevent the agonizing symptoms of withdrawal when they are unable to obtain immediate treatment. As treatment providers, it is disheartening to learn when patients felt they had to resort to using fentanyl or other dangerous opioids to avoid feeling sick,” said **MARY WALTON**, the first physician assistant at CODAC that will be using telehealth.

CODAC Behavioral Healthcare collaborated with Thundermist Health Center and the Rhode Island Department of Health to develop a grant proposal that was submitted to the Centers for Disease Control and Prevention. The grant funds were applied towards the video conferencing equipment, and the administrative infrastructure needed to realize the project.

After patients meet with a nurse care manager at Thundermist and receive an initial assessment, patients will be able to teleconference with a CODAC provider to start a treatment plan. Thereafter, the nurse care manager gives patients an introduction about the proper use of medication. Patients are able to begin receiving medication that same day.



**Mary Walton**, the first physician assistant at CODAC that will be using telehealth.

Providers are also optimistic about the possibility of reaching more underserved members of the community through telehealth, Hurley says. “Time and time again, we have heard that patients won’t seek services from an opioid treatment program such as CODAC because of the stigma associated with attending OTP facilities. Through telehealth, more patients in need can receive medication assisted treatment while seeing their primary care physician at Thundermist, essentially removing a major barrier to care.”

CODAC Behavioral Healthcare is currently in discussions with other healthcare providers to bring similar telehealth services to Wakefield and Block Island, a move counselors say can expand access to care. ❖

## New initiative improved care for sepsis patients, but black patients saw smaller benefits

*Hospitals with more black patients saw much smaller increases in compliance with new sepsis protocols than hospitals that treat mainly white patients*

PROVIDENCE [BROWN UNIVERSITY] – The New York Sepsis Initiative was launched in 2014 with the goal of improving the prompt identification and treatment of sepsis. A new study has found that while the program has improved care over all, there were racial and ethnic disparities in the implementation of the best-practice protocols.

Sepsis is a life-threatening condition that occurs when the body's extreme response to an infection triggers a chain reaction, said **DR. MITCHELL LEVY**, a professor of medicine and chief of the division of Pulmonary, Critical Care and Sleep Medicine at Brown University's Warren Alpert Medical School. "Even with the best care, the mortality rate is between 15 and 25 percent."

Early identification and treatment of sepsis is essential for saving lives, and the multi-stage best practices for sepsis identification and treatment were codified in the New York Sepsis Initiative's protocols. The new research, published July 1 in the July issue of the journal *Health Affairs*, found that during the first 27 months of the initiative, the percent of patients who received the complete 3-hour-long, best-practice protocol increased from 60.7 percent to 72.1 percent. At the same time, the in-hospital mortality rates for sepsis patients decreased from 25.4 percent to 21.3 percent, which aligned with prior research by Levy, who is also the medical director of the Medical Intensive Care Unit at Rhode Island Hospital.

However, the paper highlights a disparity in sepsis care between black and white patients.

Specifically, during the first 27 months of the initiative, black patients only experienced an increase of 5.3 percentage points in the completion of the best-practice protocol, while white patients experienced an increase of 14 percentage points. Hispanic and Asian patients experienced an increase of 6.7 and 8.4 percentage points respectively.

Being aware of these disparities is critical because the Centers for Medicare and Medicaid Services is considering trying sepsis protocol completion rates to hospital reimbursement, said **DR. AMAL TRIVEDI**, senior author on the paper and a professor at Brown's School of Public Health and medical school. "If our study findings extend beyond New York, it raises concerns about the possibility of these quality improvement initiatives for sepsis exacerbating racial disparities in care."

The researchers found that hospitals that serve higher proportions of black patients had smaller improvements in protocol completion. Within the same hospital, white and



Dr. Amal Trivedi

[PHOTO: BROWN UNIVERSITY]

black patients received similar care, in terms of protocol completion rates, Trivedi said.

Prior research found that minority-serving hospitals tend to have more financial stress, fewer resources and less infrastructure to devote toward quality improvement measures, which is likely the reason why minority-serving hospitals had smaller improvements in sepsis protocol completion, Trivedi said. These hospitals also tend to treat more uninsured patients and those on Medicaid.

After adjusting for risks, such as type of infection, age and other chronic health conditions, the team did not find a statistically significant change in hospital mortality rates between racial and ethnic groups, despite the disparities in care delivery. During the first three months of the initiative, 25.8 percent of white sepsis patients and 25.4 percent of black sepsis patients died while in the hospital. Two years into the initiative, 21.3 percent of white sepsis patients and 23.1 percent of black sepsis patients died while in the hospital.

"Our work highlights the need for state and federal policy makers to anticipate and monitor the effects that quality improvement projects, such as the New York State Sepsis Initiative, have on racial and ethnic minority groups," said **DR. KEITH CORL**, first author on the paper and an assistant professor of medicine in the division of Pulmonary, Critical Care and Sleep Medicine at Warren Alpert Medical School. "Racial and ethnic minority groups can get left behind. Knowing this, it is our job to better design and monitor these programs to ensure racial and ethnic minority patients realize the same benefits as white patients."

Trivedi added that in order to improve health equity, policymakers may need to devote additional funding to under-resourced hospitals that experience challenges in improving sepsis care so that their performances can match that of other hospitals.

Other authors on the paper include Gary Phillips, a statistical consultant who is retired from Ohio State University; Kathleen Terry, a senior director at IPRO, a non-profit health care improvement organization; and Dr. Marcus Friedrich, the chief medical officer of the Office of Quality and Patient Safety at the New York State Department of Health. The research was approved by the New York State Department of Health's Institutional Review Board.

The research was supported by a fellowship from the Department of Veterans Affairs as well as internal Warren Alpert Medical School funding. ❖



## Southcoast Health launches mobile app for 24/7 care

NEW BEDFORD – Southcoast Health has launched a new virtual service that gives patients immediate access 24/7/365 to

board-certified doctors through the convenience of phone, video or mobile app visits.

When patients cannot get an appointment with their primary care provider, or when urgent care is closed, they can now use Southcoast Health On Call. Southcoast Health On Call connects patients to virtual appointments with a licensed medical provider through the convenience of a mobile app. Typically, within minutes, a provider will contact the patient, ready to listen and diagnose the medical issue. If appropriate and medically necessary, a prescription will be sent to the patient's choice of pharmacy.

Through Southcoast Health On Call, patients can receive diagnoses, recommended treatments and prescription medication, if appropriate and medically necessary, from licensed providers for many medical issues, including:

- Sore throat and stuffy nose
- Allergies
- Cold and flu symptoms
- Bronchitis
- Poison ivy
- Pink eye
- Urinary tract infection
- Respiratory infection
- Sinus problems
- Ear infection
- And more...

### How does it work?

A patient can download and open the Southcoast Health On Call App and request a consult from a provider. The patient must provide medical history and pay the co-pay. Patients can also access these providers through Southcoast Health On Call online at <https://www.southcoast.org/on-call> or toll-free at 855-754-6904.

Within minutes, a provider reviews the patient's medical history and contacts them through their preferred method, a phone call or video chat. A third party like a friend or relative can also be invited to attend the appointment virtually.

The provider then discusses the medical issue with the patient, answers questions and recommends next steps. If appropriate and medically necessary, a prescription can be submitted to a local pharmacy of the patient's choice.

If the patient has a Southcoast Health primary care physician, their doctor will receive a summary of the visit and will be included in the patient's personal health record, ensuring a seamless continuity of care. ❖

## Kent Hospital selects Spaulding Rehabilitation Network to provide inpatient and outpatient rehabilitation services

Kent Hospital announced on July 23rd that effective October 1, 2019, it will contract with the Spaulding Rehabilitation Network to provide all of its inpatient and outpatient rehabilitation services. Previously, Kent Hospital contracted the same services from Kindred Rehabilitation Services.

Specifically, this relationship is inclusive of services located in Kent Hospital, including the Acute Rehab Unit, the outpatient rehab facilities in East Greenwich and Pawtucket. Nearly 17,000 patients received care and services last year through Kent's rehabilitation programs. Kindred and Spaulding have agreed that current rehabilitation staff are expected to be hired as a result of this new provider agreement.

Spaulding Rehabilitation Network is a national leader in rehabilitation care and is currently ranked as the number two rehabilitation hospital in the country by U.S. News & World Report. It is one of only two academic institutions to be awarded the prestigious Model Systems designation in all three areas of care and rehabilitation research at the same time – Spinal Cord Injury, Traumatic Brain Injury, and Burn, selected by the National Institute on Disability, Independent Living, and Rehabilitation Research. With three inpatient facilities, a skilled nursing facility, and 25 outpatient centers throughout eastern Massachusetts, Spaulding, a member of Partners Health-Care, is at the forefront of innovative treatment for a wide variety of conditions including stroke, spinal cord injury, traumatic brain injury and sports injuries among others.

"Spaulding Rehabilitation represents the highest level of quality care and patient outcomes across the spectrum of rehabilitation care," said **ROBERT J. HAFNEY, MBA, MSN, RN**, president and chief operating officer at Kent Hospital. "This announcement represents a strategic initiative that further strengthens our clinical offerings for the community and our patients. We look forward to collaborating on these critical services for the ultimate benefit of those needing this specialty care."

Kent Hospital's rehabilitation programs are accredited by both The Joint Commission and the Commission on Accreditation of Rehabilitation Facilities (CARF), the premier agency for rehabilitation and stroke specialty certification. ❖

## NIH establishes network to improve opioid addiction treatment in criminal justice settings

*Ten clinical research centers, including Brown, will address gaps in accessing high-quality care.*

The National Institutes of Health awarded 12 grants to form the Justice Community Opioid Innovation Network (JCOIN) to support research on quality addiction treatment for opioid use disorder (OUD) in criminal justice settings nationwide. The awards, totaling an estimated \$155 million from the National Institute on Drug Abuse, part of NIH, will support the multi-year innovation network, including 10 research institutions and two centers that will provide supportive infrastructure.

JCOIN will establish a national network of investigators collaborating with justice and behavioral health stakeholders to research promising interventions and other approaches to improve the capacity of the justice system to respond to the opioid crisis. JCOIN is part of the NIH HEAL (Helping to End Addiction Long-term) Initiative, an aggressive, trans-agency effort to speed scientific solutions to stem the national opioid public health crisis. Launched in April 2018, the NIH HEAL Initiative is focused on improving prevention and treatment strategies for opioid misuse and addiction and enhancing pain management.

“Within the broader opioid epidemic, justice-involved populations are disproportionately affected by opioid use disorder. JCOIN will help develop effective intervention and treatment strategies for this crucial setting,” said NIDA Director **NORA D. VOLKOW, MD**. “It is vitally important to provide evidence-based approaches for people leaving criminal justice facilities in order to prevent relapse and opioid overdose which often occurs as they transition back into their communities.”

Awarded research centers will study evidence-based medications, behavioral interventions, digital therapeutics and comprehensive patient-centered treatments in 15 states and Puerto Rico.

Specific research examples include

- Conducting research on the effectiveness and adoption of new medications for OUD
- Evaluating new state mandates around medication services and drug courts
- Assessing effectiveness and implementation of processes to engage and retain individuals in OUD treatment (e.g., telehealth, patient navigation, and peer recovery support services)
- Determining how to implement opioid-related services at the community, state, and national levels

Each grantee will work with five or more communities, where they will engage with organizations in justice settings and service providers in the community. JCOIN will address gaps in OUD treatment and related services in a wide range of criminal justice settings, including jails, drug courts, problem-solving courts, policing and diversion, re-entry, and probation and parole.

The funded institutions and respective site locations include

- New York State Psychiatric Institute – New York
- Baystate Medical Center – Massachusetts
- Friends Research Institute, Inc. – Maryland
- Texas Christian University – Illinois, New Mexico, Texas
- New York University School of Medicine – Connecticut, Delaware, New Hampshire, New York, Oregon
- Brown University – North Carolina, Pennsylvania, Rhode Island
- University of Chicago – Illinois
- Chestnut Health Systems, Inc. – Illinois
- University of Kentucky – Kentucky
- Yale University – Connecticut, Minnesota, New York, North Carolina, Puerto Rico

George Mason University, Fairfax, Virginia, will serve as the JCOIN coordination and translation center and will be responsible for the management of logistics, engagement with practitioners and other key stakeholders in the justice and behavioral health fields, and dissemination of products and key research findings. It will also conduct research to identify effective dissemination strategies for reaching criminal justice stakeholders and provide funding for rapid turnaround innovative pilot studies. An educational component will provide outreach and mentorship to researchers and practitioners working in justice settings.

The University of Chicago will serve as the methodology and advanced analytic resource center and will provide data infrastructure and statistical and analytic expertise to support individual JCOIN studies and cross-site data synchronization. In addition, the center will conduct novel empirical research to understand the changes in state policies and practices within the criminal justice system as they relate to the opioid crisis. ❖

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## Appointments



### Dr. Peter Cohn appointed Physician-in-Chief of Cardiovascular Care at Charlton

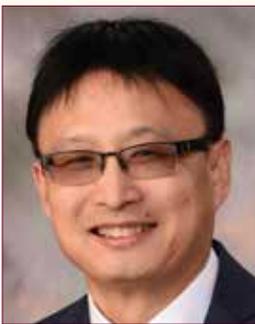
NEW BEDFORD – **DR. PETER COHN**, Interim Physician in Chief of Cardiovascular Care has accepted the role of Physician in Chief of the Cardiovascular Center at Charlton Memorial Hospital.

Dr. Cohn joined Southcoast in 2011 following 18 years as member of the Truesdale Cardiology group. He has served as the Associate Physician-in-Chief and Cardiology Department Chair and has led the Cardiovascular team as Interim

Physician-in-Chief since June of 2018.

Dr. Cohn earned his medical degree from Rutgers Medical School. He completed a residency in internal medicine at Rhode Island Hospital in Providence and a fellowship in cardiology at the UMass Memorial Medical Center in Worcester. He performs diagnostic cardiac catheterizations as well as pacemaker and defibrillator implants in the Cardiac Catheterization and Electrophysiology Labs at Southcoast Health.

Dr. Cohn is board certified in cardiology and is certified by the Heart Rhythm Society for device implants. ❖



### Dr. Shiqiang Tian joins University Orthopedics

EAST PROVIDENCE – **DR. SHIQIANG "CHRIS" TIAN** has joined University Orthopedics to expand the breadth of available services at the practice and provide patients with additional access to advanced pain management services.

"Dr. Tian's extensive experience in pain medicine and neurosurgery will be invaluable to University Orthopedics as we increasingly look to offer innovative pain management solutions for our patients," said **DR. EDWARD AKELMAN**, President of University Orthopedics.

Specialized in treating musculoskeletal, neuropathic, and visceral pain, Dr. Tian uses advanced approaches for pain management such as epidural steroid injection, radio-frequency nerve ablation, spinal cord stimulation, intra-thecal drug delivery system, and vertebral augmentation to help patients return to their everyday tasks. Dr. Tian, who is certified to practice pain medicine by the American Board of Physical Medicine and Rehabilitation, uses electrical or pharmaceutical agents in targeted areas to treat various causes of pain.

"University Orthopedics is at the forefront of pain management care, and I am proud to join a team of highly accomplished physicians who are passionate about providing the most advanced level of care," Dr. Tian said. His service can help patients manage pain associated with the head, neck and back, post-surgical pain syndrome, osteoarthritis, complex regional pain syndrome, phantom-limb pain, certain types of cancer, and more.

A graduate from the Shandong University School of Medicine in Jinan, China, Dr. Tian most recently completed an ACGME-accredited fellowship in pain medicine at the Medical College of Wisconsin. He received additional training in pain medicine and rehabilitation during his residency at the University of Kansas School of Medicine. Dr. Tian trained as a neurosurgeon for ten years before developing an interest in pain medicine. Before joining University Orthopedics, Dr. Tian served as a pain management physician at the Marshfield Clinic in Wisconsin. ❖

### Joseph A. Gil, MD, joins University Orthopedics

**DR. JOSEPH A. GIL** has joined University Orthopedics (UOI).

After earning his medical degree from Loyola University Stritch School of Medicine, Dr. Gil completed an orthopedic surgery residency and an orthopedic trauma fellowship at Brown University. He later completed a fellowship in hand, upper extremity, and microvascular surgery at the Mayo Clinic.



Dr. Gil specializes in treating a multitude of upper extremity of hand and upper conditions. He has a particular interest in brachial plexus injuries, nerve conditions, tendon transfers, soft tissue reconstruction, wrist and finger arthritis, athletic wrist injuries, and upper extremity trauma.

"University Orthopedics is proud to welcome an accomplished physician like Dr. Gil to our team. His passion for advanced orthopedic research aligns with our mission to deliver care integrated with world class education and research," said **EDWARD AKELMAN, MD**, President of University Orthopedics.

He has co-authored over 120 clinical and basic science research papers, authored several book chapters, and his work has been presented at multiple national and international meetings.

Dr. Gil, who is eligible to join the American Board of Orthopaedic Surgery, will see patients at University Orthopedics' Kettle Point site in East Providence, The Miriam Hospital, and Rhode Island Hospital. ❖

## Recognition



### Gary Bubly, MD, receives Charles “Bud” Kahn, MD, Lifetime Leadership Award

**GARY BUBLY, MD, MHCI, FACEP**, whose long career at The Miriam Hospital includes six years as medical director of the Emergency Department, is the recipient of the 2019 Charles “Bud” Kahn, MD, Lifetime Leadership Award.

The Miriam Hospital Medical Staff Association sponsors the annual award, which recognizes a Miriam physician for “outstanding leadership over a lifetime of service” and who “exemplifies professionalism and leadership in a variety of ways, to include open communication, collaboration, cooperation, commitment, and integrity.” It was presented on June 25 during the association’s annual meeting.

Bubly completed his residency in internal medicine at The Miriam in 1990 and immediately joined the medical staff. He became certified in emergency medicine and served as associate director of the department from 1995 to 2011. He then led the department as medical director from 2011 until 2017 when he became Vice Chair for Clinical Integration and Innovation for Brown Emergency Medicine. Bubly continues to work clinically at The Miriam and is a clinical professor of emergency medicine and clinical professor of medicine at The Warren Alpert Medical School of Brown University.

Bubly has held numerous leadership positions in his field, including president of The Rhode Island Chapter of the American College of Emergency Physicians and president of the Rhode Island Medical Society. He has also worked with FEMA in Micronesia, volunteered on committees with Blue Cross & Blue Shield of Rhode Island, Medicare, and Coastal Medical; and served on the Governor’s Overdose Prevention and Intervention Task Force. Among the awards he’s received are the Alpert Medical School Dean’s Clinical Faculty Excellence in Teaching Award & the Clinical Faculty Advisory Committee Award; the Emergency Department’s Exemplary Service Award, the Brian Zink Outstanding Leadership in Emergency Medicine Award; and The Miriam’s Charles C. J. Carpenter Physician of the Year Award.

Bubly is a 1987 graduate of the University of Massachusetts Medical School. He recently earned a master’s degree in healthcare innovation from the University of Pennsylvania. He has been named a top doctor in emergency medicine 15 times by *Rhode Island Monthly*.

The award, established in 2015, is named after **DR. CHARLES “BUD” KAHN**, a retired endocrinologist who held leadership positions during his career at The Miriam. ❖



### Bryan Jay, MD, named Charles C.J. Carpenter, MD, Outstanding Physician of the Year

**BRYAN JAY, MD**, has been named the 2019 Charles C.J. Carpenter, MD, Outstanding Physician of the Year at The Miriam Hospital.

Jay has been director of interventional radiology at The Miriam since 2008, where he specializes in performing minimally-invasive image-guided procedures to diagnose and treat diseases in nearly every organ system, including treating cancer and cancer-related problems using tumor ablation and catheter-directed vascular therapies. He is a vascular and interventional radiologist with Rhode Island Medical Imaging and a clinical assistant professor at The Warren Alpert Medical School of Brown University.

The Miriam Hospital Medical Staff Association sponsors the award, which is described as “the highest recognition that can be given to a member of our medical staff.” The award recognizes physicians for outstanding contributions to medicine, leadership, professionalism and patient care.” Winners are nominated by their peers. The award was presented at the association’s annual meeting on June 25.

Jay is a graduate of Georgetown University Medical School. He did his residency at Georgetown University Hospital and completed a fellowship at Rhode Island Hospital. He is a clinical assistant professor of diagnostic imaging and interventional radiology at the Warren Alpert Medical School of Brown University.

The award is named after **CHARLES CARPENTER, MD**, who served as The Miriam’s physician-in-chief from 1986 to 1998 and became a leader in responding to the HIV/AIDS epidemic by establishing the hospital’s Immunology Center. He has served as director of the Lifespan/Tufts/Brown Center for AIDS Research (CFAR) and as a professor of medicine at Brown. He achieved widespread recognition for his work in treating diseases in developing countries and for training a generation of researchers in the field of international health. ❖

## Recognition



### Dr. Patricia Recupero receives 2019 Manfred S. Guttmacher Award

**PATRICIA RECUPERO, JD, MD**, was recently awarded the prestigious 2019 Manfred S. Guttmacher Award, by the American Psychiatric Association (APA), the American Academy of Psychiatry and the Law (AAPL), and APA Foundation. Dr. Recupero is senior vice president for education and training at Care New England. A member of Butler Hospital's staff since 1989, she served the hospital both administratively and clinically, as president and CEO of Butler Hospital for 15 years, and previously as medical director, chief of forensic psychiatry, and director of Alcohol and Drug Inpatient Services. She was recently named President Emerita of Butler Hospital by the Care New England and Butler Hospital Board of Trustees.

Established in 1975, The Manfred S. Guttmacher Award recognizes an outstanding contribution to the literature of forensic psychiatry in the form of a book, monograph, paper, or other work published or presented at a professional meeting between May 1 and April 30 of the award year cycle. Honored at the APA annual meeting in San Francisco, CA, in May, Dr. Recupero delivered an honorary lecture and was recognized for her contributions and exceptional achievements in the field of forensic psychiatric literature and her editing work in the publication titled, *"Geriatric Forensic Psychiatry: Principles and Practice."*

Upon receiving the award, Dr. Recupero stated that she was "very pleased the APA and AAPL recognized the field of geriatric forensic psychiatry as it is greatly underserved and will need to expand as the aged population increases." She also added, "Collaboration between elder care attorneys and forensic psychiatrists will play a key factor in protecting the rights of our aging population."

Mary Marran, president and chief operating officer of Butler Hospital credited Dr. Recupero's textbook as "an important advancement in education and a comprehensive review of varied topics that will speak to a broad audience of clinical, mental health, and legal professionals who work with the older population."

Board certified in forensic psychiatry and addiction psychiatry, Dr. Recupero is a clinical professor of psychiatry at The Warren Alpert Medical School of Brown University and has been a member of Brown's Department of Psychiatry and Human Behavior since 1989, including serving as the psychiatry residency training director.

She was presented with a \$1,000 honorarium, to be shared with her co-editors, and an engraved plaque. ❖

### Gyan Pareek, MD, honored with 2019 Excellence in Teaching Award

#### **GYAN PAREEK, MD**,

a urologic surgeon, has received the 2019 Riesman Family Excellence in Teaching Award, which recognizes a Miriam Hospital physician who teaches at The Warren Alpert Medical School of Brown University.

Pareek serves as a professor of surgery (urology) at Brown and vice president of operations at Brown Urology, Inc.

Pareek is co-director of the Minimally Invasive Urology Institute and director of the Kidney Stone Center at The Miriam Hospital. His areas of expertise include kidney stones, prostate cancer and benign prostatic hyperplasia. He is board certified in urology and is a fellow of the American College of Surgeons.

The award was presented at the annual meeting of The Miriam Hospital Medical Staff Association, held at the hospital on June 25.

Pareek earned his medical degree from St. George's University School of Medicine and completed his residency at Lenox Hill Hospital in New York. He also completed his laparoscopy and endourology fellowship at the University of Wisconsin. In 2006, Pareek was part of a team at The Miriam Hospital that performed the first robotic prostatectomy in the state of Rhode Island. Pareek has served in a number of leadership roles at the New England American Urological Association and the Rhode Island Urological Association.

The Riesman Family Excellence in Teaching Award was created in 2007 by a gift from the Robert A. and Marcia S. Riesman family to recognize excellence in teaching by a Miriam Hospital/Brown Medical School faculty member who is currently and actively involved in the education of medical students, resident physicians and other colleagues. ❖



## Recognition

### Newport Hospital receives Stroke Award

Newport Hospital has received the American Heart Association/American Stroke Association's Get With The Guidelines® Stroke Gold Plus Quality Achievement Award. The award recognizes the hospital's commitment to ensuring stroke patients receive the most appropriate treatment according to nationally recognized, research-based guidelines based on the latest scientific evidence.

Newport Hospital earned the award by meeting specific quality achievement measures for the diagnosis and treatment of stroke patients at a set level for a designated period. These measures include evaluation of the proper use of medications and other stroke treatments aligned with the most up-to-date, evidence-based guidelines with the goal of speeding recovery and reducing death and disability for stroke patients. Before discharge, patients should also receive education on managing their health, get a follow-up visit scheduled, as well as other care transition interventions

"Newport Hospital is dedicated to improving the quality of care for our stroke patients by implementing the American Heart Association's Get With The Guidelines-Stroke initiative," said **ORLA BRANDOS**, vice president of patient care services and chief nursing officer. "The tools and resources provided help us track and measure our success in meeting evidenced-based clinical guidelines developed to improve patient outcomes."

"We are pleased to recognize Newport Hospital for their commitment to stroke care," said **LEE H. SCHWAMM, MD**, national chairperson of the Quality Oversight Committee and Executive Vice Chair of Neurology, Director of Acute Stroke Services, Massachusetts General Hospital in Boston. "Research has shown that hospitals adhering to clinical measures through the Get With The Guidelines quality improvement initiative can often see fewer readmissions and lower mortality rates." ❖

### Total Joint Center at Miriam retains JC Gold Certification

PROVIDENCE – The Total Joint Center at The Miriam Hospital has once again attained The Joint Commission's Gold Seal of Approval® for Advanced Total Hip and Keep Replacement Certification.

The Total Joint Center, a program of the Lifespan Orthopedics Institute, achieves clinical and quality outcomes that rank among the nation's best.

To maintain certification, The Miriam Hospital underwent a rigorous, on-site review over two days last spring. During the visit, a Joint Commission reviewer evaluated compliance with related certification standards, developed in consultation with health care experts and providers, measurement experts and patients. The reviewers also conducted onsite observations and interviews. ❖

### Kent receives Get With The Guidelines Target: Stroke Honor Roll Gold plus Quality Achievement Award

Kent Hospital, a Care New England hospital, has received the American Heart Association/American Stroke Association's Get With The Guidelines® Target: Stroke Honor Roll Gold plus Quality Achievement Award. The award recognizes the hospital's commitment to ensuring stroke patients receive the most appropriate treatment according to nationally recognized, research-based guidelines based on the latest scientific evidence.

Kent earned the award by meeting specific quality achievement measures for the diagnosis and treatment of stroke patients at a set level for a designated period. These measures include evaluation of the proper use of medications and other stroke treatments aligned with the most up-to-date, evidence-based guidelines with the goal of speeding recovery and reducing death and disability for stroke patients. Before discharge, patients should also receive education on managing their health, schedule a follow-up visit, and understand other care transition interventions.

"Kent Hospital is dedicated to improving the quality of care for our stroke patients by implementing the American Heart Association's Get With The Guidelines-Stroke initiative," said **SUSAN MOORE, BSN, RN**, nursing director, Stroke Program at Kent Hospital. "The tools and resources provided help us track and measure our success in meeting evidenced-based clinical practice guidelines developed to improve patient outcomes."

Kent additionally received the association's Target: Stroke<sup>SM</sup> Honor Roll award. To qualify for this recognition, hospitals must meet quality measures developed to reduce the time between the patient's arrival at the hospital and treatment with the clot-buster tissue plasminogen activator, or tPA, the only drug approved by the U.S. Food and Drug Administration to treat ischemic stroke.

"We are pleased to recognize Kent Hospital for their commitment to stroke care," said **LEE H. SCHWAMM, MD**, national chairperson of the Quality Oversight Committee, executive vice chair of neurology, and director of acute stroke services, Massachusetts General Hospital. "Research has shown that hospitals adhering to clinical measures through the Get With The Guidelines quality improvement initiative can often see fewer readmissions and lower mortality rates." ❖

## Recognition

### Southcoast Health hospitals receive top awards for stroke treatment

FALL RIVER – Southcoast Health’s three hospitals – Charlton Memorial, St. Luke’s and Tobey – have received awards for stroke treatment from the American Heart Association/American Stroke Association.

Charlton Memorial and St. Luke’s have been named recipients of the Get With The Guidelines-Stroke Gold Plus Quality Achievement Award with Target: Stroke Honor Roll, the highest designation, while Tobey earned Silver Plus Quality Achievement Award with Target: Stroke Honor Roll designation. The awards recognize the hospitals’ commitment and success in ensuring that stroke patients receive the most appropriate treatment according to nationally recognized, research-based guidelines and the latest scientific evidence.

“It takes teamwork, dedication and a passion for excellence to deliver life-saving measures in the nick of time,” said **KEITH HOVAN**, President and Chief Executive Officer of Southcoast Health. “I am proud of the fine work of our physicians, nurses and EMS partners in earning these prestigious awards.”

“We appreciate Southcoast and our employees being recognized for their efforts towards systematic stroke care,” said **DR. DANI HACKNER**, Chief Clinical Officer for Southcoast Hospitals Group. “Stroke is an emergent and treatable condition. Collaborative care saves lives and improves patient functional recovery. This AHA honor is a testament to the commitment of our excellent providers and staff to improving stroke care for the community.”

To receive the Gold Plus Quality Achievement Award, hospitals must achieve an 85 percent or higher adherence to all Get With The Guidelines-Stroke indicators for two or more consecutive 12-month periods and achieve a 75 percent or higher compliance with five of eight Get With The Guidelines-Stroke Quality measures.

“Coordinated stroke care delivers clot-busting medications that save brain tissue and in turn improves functional recovery. Receiving quick treatment can lessen the acuity of effects a stroke has on a patient,” said Hackner. “At Southcoast, our integrated stroke care treats the whole patient with timely therapies, nutrition, management of heart-related risk factors and approaches to reduce risk of future stroke or complications. By beginning the rehabilitative process early in care, Southcoast stroke efforts shorten time to recovery.”

To qualify for the Target: Stroke Honor Roll, hospitals must meet quality measures developed to reduce the time between the patient’s arrival at the hospital and treatment with the clot-buster tissue plasminogen activator, or t-PA, the only drug approved by the U.S. Food and Drug Administration to treat ischemic stroke. If given intravenously in the first three hours after the start of stroke symptoms, t-PA has been shown to significantly reduce the effects of stroke and lessen the chance of permanent disability.

These quality measures are designed to focus hospital teams on providing the most up-to-date, evidence-based guidelines with the goal of speeding recovery and reducing death and disability for stroke patients. ❖



Michelle Boyle, MD; Wendy Regan, MD, and Jay Schachne, MD, of Southcoast Health at the Warren Alpert Medical School at Brown University’s Dean’s Excellence in Teaching Award ceremony.

### Southcoast Health physicians receive Excellence in Teaching Awards from Brown University

PROVIDENCE – Three Southcoast Health physicians recently received Dean’s Excellence in Teaching Awards from Brown University’s Warren Alpert Medical School.

**DR. JAY SCHACHNE**, a cardiologist, and **DR. MICHELLE BOYLE** and **DR. WENDY REGAN**, both primary care physicians at the Polo Center in Middletown, Rhode Island, were honored on June 18 for their exemplary teaching of preclinical courses, core clerkships, and clinical electives.

“I love teaching. The medical students at the Warren Alpert School of Medicine at Brown University are the best of the best,” said Dr. Schachne. “They keep me on my toes and help me be a better doctor. I am humbled by this honor.”

Dr. Michelle Boyle has been teaching at the Alpert Medical School for 25 years.

“I enjoy introducing young doctors to family medicine,” said Dr. Boyle. “I want them to see how much they can learn in a positive and supportive environment.”

Dr. Boyle and Dr. Wendy Regan share teaching duties and stated that they are gratified to be honored and recognized for their work.

“I enjoy teaching because it keeps me up to date with the latest treatments, medications, and recommendations,” said Dr. Regan. “I feel proud because teaching and influencing medical students is very important for the future.”

Southcoast Health and the Warren Alpert Medical School of Brown University participate in a teaching collaboration. In addition, Southcoast Health is part of the Brown University Oncology Research Group (BrUOG), known for its cutting edge clinical trials and innovative therapies in oncological care. ❖

## Obituaries



**THOMAS ARED BENNETT, III, MD**, 76, passed away Wednesday, June 26, 2019 in Providence, RI.

Dr. Bennett was a graduate of the University of Michigan Medical School and completed his training at Rhode Island Hospital with a specialty in Internal Medicine and Hematology. In his practice, Dr. Bennett frequently made house calls to his elderly patients. Dr. Bennett was greatly admired for his compassionate care for vulnerable HIV and AIDS patients, regardless of their ability to pay, during the early years of the AIDS epidemic.

Dr. Bennett worked for some forty-four-years at the Rhode Island Disability Determination Services. At the time of his demise, Dr. Bennett served as Chief Medical Consultant. He was greatly respected by his colleagues.

Dr. Bennett was an adventurous and curious traveler to all parts of the world. He loved the theater, Broadway musicals, movies and the Avon Cinema. He was devoted to his dogs and will be greatly missed by his constant and faithful companions, the beautiful Miniature Schnauzers, Panache and Giovanni.

Dr. Bennett was a humble and kind man. He will be deeply missed by those who loved him dearly for his wit and adventurous spirit as well as his passion for helping others. ❖



**FRANK MARIO D'ALESSANDRO, MD**, passed away at the age of 85 on June 8, 2019. He was the beloved husband of Marta (Mimmi) D'Alessandro for 59 years.

He was a 1951 graduate of LaSalle Academy, a 1955 graduate of Providence College and received his medical degree from the University of Bologna in 1960. He began an internship at St. Joseph Hospital in 1960 and continued his training in Internal Medicine and Endocrinology at Carney Hospital and Lahey Clinic in Boston. He returned to Providence and opened a medical practice in 1964. He practiced medicine in North Providence for more than 50 years, his final years together with his son, Dr. Frank B. D'Alessandro.

He is survived by his wife, Marta and four children, Frank B. D'Alessandro, MD, and his wife Michelle; Debora D'Alessandro, Esq. and her husband, Edward Medici, Esq.; Natalie D'Alessandro Volpe, MBA, and her husband John Volpe, DPM; and Jules J. D'Alessandro, Esq., and his wife, Amy D'Alessandro,



Esq. He was the proud grandfather of Alexandra Volpe, Jonathan Volpe, Domenic Caniglia, Antonio D'Alessandro, Ariana D'Alessandro, Justin D'Alessandro, Giavanna D'Alessandro and Jaeson D'Alessandro.

Dr. D'Alessandro a/k/a "Doc from North Providence" as he was known on the radio show of his lifelong friend Vincent "Buddy" Cianci, was a popular guest on the show regularly giving his opinions and dispensing his advice to the show's listeners.

Dr. D'Alessandro was the recipient of numerous awards for his dedication, commitment, compassionate contributions and humanitarian efforts to the community. Awards included the DaVinci Center Community Humanitarian Award in 2002. He was invested by the Order of Malta as a Knight of Magistral Grace on November 12, 2004.

A member of the military, United States Army, in 1967, Dr. D'Alessandro was drafted into the Vietnam War. He served stateside at military hospitals in Texas, Missouri, West Point Military Academy, New York and Fort Devens. Having served as a Captain and Major, he was honorably discharged in 1969.

Dr. D'Alessandro had a passion for learning and was a tireless advocate of the Italian heritage. He was a Christopher Columbus scholar and served as chairman of the Christopher Columbus 500 Commission in 1991 and 1992. He was also recognized for his distinguished achievement by the Justinian Law Society. He had a long association with NIAF in Washington, DC, who have published many of his articles and letters and frequently sought his counsel on matters of discrimination of Italian Americans, as did the OSIA (Organization of the Sons of Italy of America) of New York.

Dr. D'Alessandro was a published author of three books, Firemark, Sacco and Vanzetti: The Verdict of History, and the Cassiopeia Grail.

During the mid-1960s, he spearheaded a local effort for the victims of the flood in Florence, Italy and managed to collect thousands of dollars in clothes and money. This effort continued for earthquake victims in Friuli and Naples. Dr. D'Alessandro lobbied local hospitals and pharmaceutical companies for medical supplies, which were sent to Tanzania Hospital in Dar-Es Salaam, Pediatric AIDS Relief in Kenya and locally to the Seaman's Institute and Travelers Aid.

Donations in his memory may be made to: Alzheimer's Association Rhode Island Chapter, 245 Waterman St. #306, Providence, RI 02906. ❖

## A Walking Cane Leads Down Memory Lane to Dr. Lewis Leprilete Miller

MARY KORR  
RIMJ MANAGING EDITOR

An email from an antique cane collector, seeking information on **DR. LEWIS LEPRILETE MILLER**, who served as president of the Rhode Island Medical Society from 1846–1847, engendered this Heritage column.

Phyllis Feigenbaum had recently purchased an antique cane and a daguerreotype belonging to Dr. Miller's estate. In the email, she said the items were part of a collection from the family's estate and sold on eBay. "The cane has an ebony shaft with a gold collar, along with two gold square eyelets and a rectangular gold plaque with an inscription that reads, L.L. MILLER to L. HOWE. As a presentation cane, Dr. Miller had intended to gift the cane to L. Howe;

however, the cane was either never presented or at some point, was returned to the family.

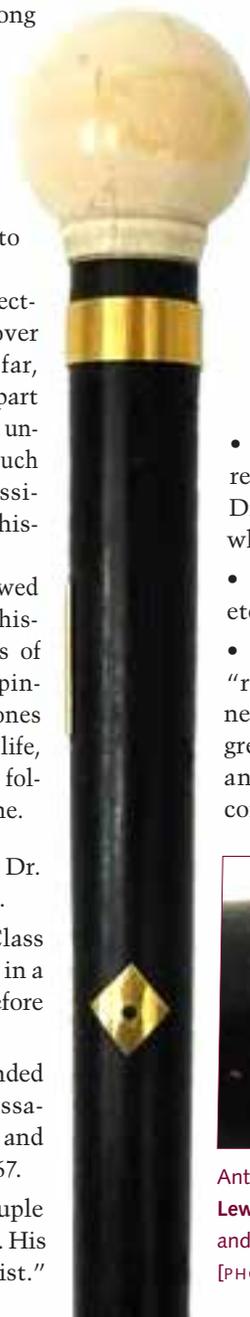
"I have collected canes for over 20 years. By far, my favorite part of collecting is uncovering as much history as possible on these historic gems."

RIMJ reviewed medical and historical records of the era to pinpoint milestones in Dr. Miller's life, shown in the following timeline.



Daguerreotype of Lewis L. Miller, MD, c.1850

- Born in Franklin, Massachusetts, in 1798, to Dr. Nathaniel Miller, and Hannah (Boyd) Miller.
- Brown University, AB, Class of 1817; MD, Class of 1820, stated **CHARLES W. PARSONS, MD**, in a history of Brown's first medical school read before the Rhode Island Historical Society in 1881.
- 1820–1827: Practiced at a private hospital founded by his father, a surgeon, in Franklin, Massachusetts. He then removed to Providence, and practiced at 49 Broad Street from 1827 to 1867.
- 1822, married Electra Smith of Bristol; the couple had three children: Nathaniel, Jane, and Ellen. His son would go on to become a physician "oculist."



This portrait of **Dr. Lewis Leprilete Miller** was presented to the Rhode Island Medical Society in 1905. *The Providence Medical Journal* reported that it is "an excellent likeness as he appeared in his old age." [PHOTO: RI MEDICAL SOCIETY]

- According to the Biographical Cyclopedia of Representative Men of Rhode Island, published in 1881, Dr. Miller experienced a "paralytic shock" in 1867, which forced him to retire.
- He died in 1870 and is buried in Swan Point Cemetery, among the many medical notables of that era.
- The Biographical Cyclopedia eulogized him as "remembered by his friends as possessing firmness of nerve and calmness of temperament, combined with great gentleness of manner...As a surgeon he acquired an enviable reputation, and his services were in constant demand." ❖



Antique cane measuring 35 inches in length once belonged to **Lewis Leprilete Miller, MD**. It has an ebony shaft with a gold collar and plaque inscribed, "L.L.MILLER to L. HOWE."

[PHOTOS: PHYLLIS FEIGENBAUM]