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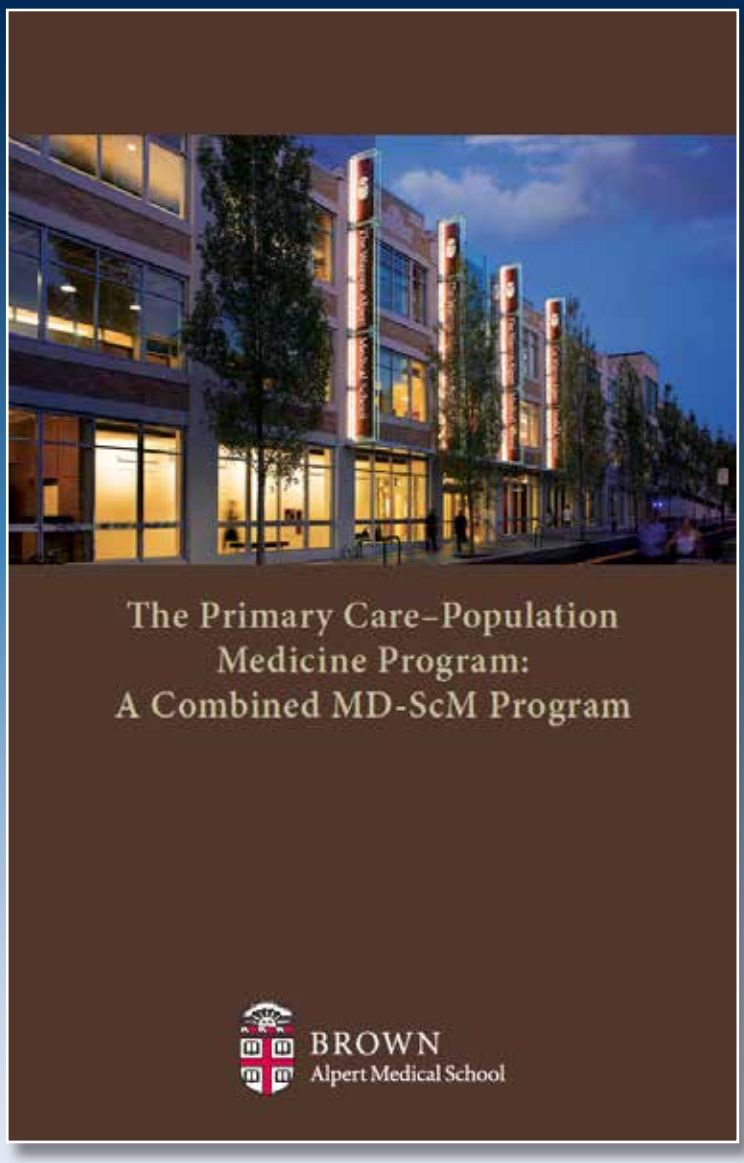

SPECIAL SECTION

PRIMARY CARE-POPULATION MEDICINE PROGRAM

GUEST EDITORS PAUL GEORGE, MD, MHPE; JEFFREY BORKAN, MD, PhD

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P. George, MD, MPHE


J. Borkan, MD, PhD


M. Mello, MD, MPH


G. Epstein-Lubow, MD


J. White, MD, MPH


B. Clyne, MD

Though currently a pilot program for a small group of selected students, the Longitudinal Integrated Clerkship (LIC) will become a standard element of the third year for all students enrolled in the Primary Care – Population Medicine (PC-PM) Program. Students in the pilot program this year, from left: Samantha Roche, Sarah Iosifescu, Jamila Wynter, David Corner, Divya Dethier, Abass Noor, Emily Davis and Zachary Tabb.


BROWN PC-PM PROGRAM

RHODE ISLAND
MEDICAL JOURNAL

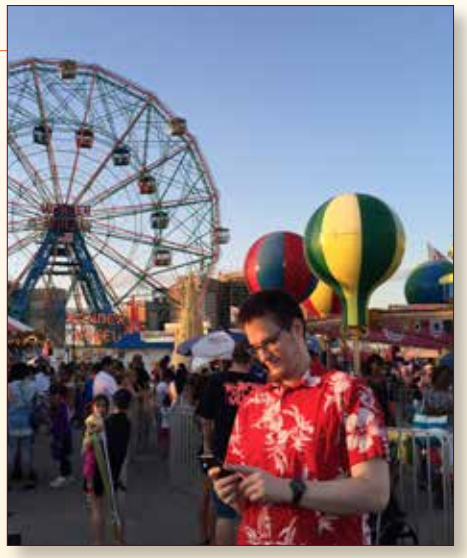
GRAN TEATRO LA FENICE

Per la sera di Domenica 6 Marzo 1853. Recita XLI.

PRIMA RAPPRESENTAZIONE DELL'OPERA NUOVA

LA TRAVIATA

LA LUCERNA MARAVIGLIOSA



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IN THE NEWS

PEOPLE

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NEW: VIDEOS IN CLINICAL MEDICINE

CASE REPORTS

PUBLIC HEALTH

Ten Percent Brain Function: Fact or Fantasy?

JOSEPH H. FRIEDMAN, MD
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I ONLY RECENTLY CAME upon the alleged origin of the theory that people use only a percentage of their brain function. There have been numerous claims for many years that people only use a portion of their "brain power," and the only thing that distinguished Einstein and them was his sneaky ability to use a much higher percentage of the innate wattage that we're all born with. The movie, *Lucy*, develops a story line in which a new drug breaks down the barriers between first and fourth gear for your brain's transmission. Lucy develops superhuman powers that overcome the fundamental laws of physics. Apparently Einstein only got to second or third gear, so he had to be content with merely understanding the laws rather than overcoming them.

First of all, how and where did the idea of fractional brain power arise? According to one source, it began with experiments in the nineteenth century by Jean Pierre Flourens, who demonstrated that large volumes of brain could be removed from a variety of animals, in a variety of locations, without inducing apparent alterations in behavior. While this might seemed far-fetched, one must realize that the ability to measure animal behavior was quite primitive then. Even as recently as the mid-twentieth century, Karl Lashley, an eminent neurophysiologist at Harvard, more or less demonstrated the same thing as Flourens, using primates rather than birds and rodents, and developed a theory quite similar, in which brain volume determined behavioral decline: the more you removed, the more impaired the animal. Since much of the brain loss resulted in no apparent decline, it seems reasonable to argue backwards; that much of the brain must be lying fallow, ready to chip in if only we could access it. (Of course, that might be like asking your appendix to help digest food.) Sad to say, modern methods for evaluating primate behavior would likely undercut these arguments, but, putting this into context, in the 1950s, many mentally ill patients had most of their frontal lobes detached from the rest of their brains in frontal lobotomies, and many doctors didn't seem to notice anything missing. In an aside meant to reveal how far the balance has swung in terms of assessing animal behavior, there now exist experimental paradigms for evaluating depressed and psychotic behavior in rodents and primates, using them as models for developing new treatments for these mental disorders. So we've gone from not seeing any decline when a primate has lost half its brain, to seeing psychotic behavior in rats.

We've learned from MRI that we do, in fact, use all our brain, despite evidence to the contrary by our politicians. It's a common observation, particularly in older people, that small infarcts that were not noted at the time they

In the mid-nineteenth century, French physiologist Jean Pierre Flourens demonstrated that large volumes of the brain could be removed from a variety of animals, in a variety of locations, without inducing apparent alterations in behavior.

occurred, may produce small but measurable declines in cognitive function, often not seen without special testing until several have occurred, at which time a decline in memory and thinking functions of various sorts becomes clinically evident. Although each bit of brain "does something," there are, in fact, some redundancies built into the brain. Our substantia nigra, for example, can do without half their normal number, without causing the body any noticeable change, at least, changes we can identify in our normal interactions. And our brains shrink with age due to the loss of large numbers of neurons, without much noticeable change for years.

Our internal organs have a large amount of redundancy, much like the brain. One can lose a kidney, a lung, a large amount of liver, and function quite well. The fact that one kidney's loss may not be noticed doesn't mean that we're only using our kidneys at 50% and that if we found out how to do it, we could make them work at "full" power. I don't know what that would do. It is unlikely that a movie might be based around having your liver or kidneys function at "full power." Perhaps one could eat more poisonous things safely?

Even as a child I didn't like the concept, perhaps more prevalent then than now, that I wasn't using my full potential. That, smart as I was, I would be a lot smarter if only I could find the magic switch that would elevate my first gear brain into second gear and unlock all that potential. Finding that secret pathway seemed generally to involve buying a book that taught the reader how to concentrate better.

I have learned that the notion of the underutilized brain is not common in other western countries. This supports my own theory about its popularity here. The U.S. is heavily grounded in the idea of equality and for many years has harbored a rather fierce anti-intellectualism that makes flouting of intelligence and educational attainment actual detriments on the campaign trail. Witness presidential candidate Kerry having to hide his fluency in French. Belief in equality and anti-intellectualism, I suspect, are the motivating forces underlying the notion that we all have the same possibility of genius as Einstein, if not the telekinetic powers of Lucy; but only some of us were lucky enough to have the intelligence knob set correctly. The concept should be analogous to thinking that we all could be in the Olympics if we only put in the work, but it really isn't. We all know that we couldn't beat Michael Phelps in any swimming event no matter how many hours we practiced because many of us have tried. But thinking is not like exercising, and creativity and genius seem to gush out of nowhere, like a magic act, the 10% inspiration, with the 90%, perspiration, not seen. It's so much easier to believe that only an accident of fate, a faulty switch somewhere, separates each of us from Newton and Mozart. Finding that switch has been and will continue to be as elusive as finding the Holy Grail; drugs and electrodes aren't going to do it. If you want a smarter brain, choose smarter parents. ❖

Author

Joseph H. Friedman, MD, is Editor-in-chief of the *Rhode Island Medical Journal,* Professor and the Chief of the Division of Movement Disorders, Department of Neurology at the Alpert Medical School of Brown University, chief of Butler Hospital's Movement Disorders Program and first recipient of the Stanley Aronson Chair in Neurodegenerative Disorders.

Disclosures on website

Doctors, Diseases and Divas

HERBERT RAKATANSKY, MD

Doctors abound in literature, movies, theater, etc., but are scarce in operas. When doctors do appear in operas, few of them actually treat patients. For example, Dr. Bartolo (*Barber of Seville, Marriage of Figaro*), Dr. Dulcamara (*The Elixir of Love*), and Dr. Malatesta (*Don Pasquale*) are strictly comic characters.

Doctors practicing on stage include, among others, Drs. Borov and Lorek who treat a wounded man (he dies) in *Fedora* (Giordano). A surgeon in *La Forza del Destino* (Verdi) treats Don Alvaro for trauma (he survives the treatment but not the opera). In the operatic version of *Macbeth* (Verdi), a doctor observes Lady Macbeth's psychotic delusions but is powerless to intervene. And in *Wozzeck* (Berg) we meet "the doctor" who experiments on his patients and is interested only in his own fame. Premiered in 1925, *Wozzeck* is eerily predictive of the behavior of Nazi doctors.

There are three 19th-century operas in which the heroines (all sopranos) die of consumption (TB). Two of them: *La Traviata* (Verdi – 1853) and *Tales of Hoffman* (Offenbach – 1881) predate the seminal 1882 paper by Koch demonstrating that TB is caused by a microbe. *La Boheme* (Puccini – 1896) came later (though the original novel was written earlier). These three operas illustrate changing viewpoints about consumption in the 19th century.

In the early 1900s, TB was thought to be a systemic disorder due to extreme emotions, miasmas and other mysterious causes. And it was associated with a certain beauty. A wan, thin woman, weak, pale and with a flushed face was regarded as attractive. And being consumed by this mysterious affliction could be viewed as redemption for a life ill-lived or other sins.

The character of Violetta in *La Traviata* (The Fallen Woman) was based on a real person, Marie Duplessis, the lover of Alexander Dumas fils (1824–1895). After her death from TB at the age of 23, he wrote a novel (*The Dame of the Camellias)*, followed by a play romanticizing her persona. The play was wildly popular and was the basis for the libretto for *La Traviata*.

Perhaps the most famous operatic doctor who actually attends a patient onstage is Dr. Grenvil in *La Traviata*. He visits Violetta in her final agonies of consumption in the last scene but has no medical treatment to offer the deathly ill soprano.

Perhaps the most famous operatic doctor who actually attends a patient onstage is Dr. Grenvil in *La Traviata*.

GRAN TEATRO LA FENICE

Per la sera di Domenica 6 Marzo 1853. Recita XLI.

PRIMA RAPPRESENTAZIONE DELL'OPERA NUOVA

LA TRAVIATA

Libretto di F. M. PIAVE. – Musica del Maestro G. VERDI

PERSONAGGI — ARTISTI — PERSONAGGI — ARTISTI

Dopo l'Opera avrà luogo il gran Ballo in cinque Atti composto e messo in Scena dal Coreografo sig. A. MOTTICINI.

LA LUCERNA MARAVIGLIOSA

PERSONAGGI — ARTISTI — PERSONAGGI FANTASTICI — ARTISTI

DANZE. — GRAN MARCIA DANZANTE — TERZETTO — BALLABILE CINESE e INDIANO

Il prezzo del Biglietto d'Ingresso

Pei Piccoli Fanciulli

Original poster from the opening of *La Traviata*.

He visits Violetta in her final agonies of consumption in the final scene but has no medical treatment to offer the deathly ill soprano.

Dr. Grenvil's scene:

DOCTOR*: (feeling her pulse)* How do you feel?

VIOLETTA*:* My body suffers, but my soul is in peace…Religion is a great consolation to the suffering.

DOCTOR*:* And during the night?

VIOLETTA: I slept quite peacefully.

DOCTOR*:* Courage, then. Your convalescence is not far off**.**

VIOLETTA*:* Oh, the little white lies permissible in a doctor.

DOCTOR*: (pressing her hand)* Goodbye – I'll come back later.

VIOLETTA*:* Don't forget me.

DOCTOR *(to the maid):* She has only a few hours left.

Although Dr. Grenvil knew nothing of the true cause of TB he did understand the doctor-patient connection, albeit in the context of 19th-century medical paternalism.

Dr. Grenvil does not inform Violetta of her prognosis though she knows and "plays the game." He understands the need to touch the patient, however. He takes her pulse and presses her hand.

In the play, Marguerite (Violetta's name in the book and play) offers her hand to the doctor. In the opera it is ambiguous who initiates this contact. And, importantly, Violetta's poignant request to not be forgotten reminds us that patients, then and now, fear abandonment and need care and support even when no medical treatment is available. In the original novel a priest attends the dying woman and gives absolution. In the play and the opera, however, it is only the doctor who attends her. But her death still is considered expiation for her sins.

Just before her death, Violetta has a sudden surge of energy, and in a moment of musical ecstasy declares her joy.

"A newborn strength revives me
Fills me with life again
Ah – I am coming back – to life –
Ah – joy"

This was called "spes phthisica," a creative and emotional surge thought to be inherent to the disease.

In *The Tales of Hoffman*, Dr. Miracle (a quack) urges the consumptive Antonetta to sing though he knows that singing will cause her demise. She "inherited" the disease from her mother. Rokitansky (1804–1878) and Virchow (1821–1902) had proposed gross and microscopic changes in specific organs as the cause of disease. Martin (1720) and Villemin's (1865) suggestions of a transmissible etiology were ignored and Koch's definitive paper was still a year away.

Antonetta also experiences a brief "spes phthisica."

"What ardor draws and devours me…
What flame dazzles my eyes…"

She loses her reason and her death is recognized to result from lung disease rather than being a redemptive solution for past follies.

In *La Boheme*, premiered after Koch's paper, Mimi, a 22-year-old poverty-stricken seamstress, dies of TB with no reference to the then current state of medical knowledge and with no doctor in attendance. However, in accordance with the changing views on social structure and poverty, Mimi lives in a garret with other "bohemian" artists. This is in contrast to the romantic, idealized characterization of Violetta or the doomed character of Antonetta. TB was then known to be a transmissible disease rampant in the poor and not the result of sin, behavior or mysterious miasmas. No moral dilemma is resolved by Mimi's death. It is simply human tragedy.

All three sopranos die accompanied by tragic orchestral chords and glorious singing (seemingly incongruent with their terminal illness). But this is opera and is part of the emotional drama that one experiences only in opera.

Using TB as a metaphor, these medical-musical odysseys inform us a little about our evolving approach to disease, But that is not the reason to attend opera. Rather, these three tragic tales, among many others, enhanced by music at its best, are deeply affecting, even for the most inured doctor among us. ❖

Author

Herbert Rakatansky, MD, is Clinical Professor of Medicine Emeritus,The Warren Alpert Medical School of Brown University.

We are read everywhere

BROOKLYN, NEW YORK

Andrew Migliori, filmmaker/partner at AnderImage LLC (and RIMS' Bicentennial filmmaker) paused amidst the spectacle that is Coney Island to view the August issue.

Wherever your travels take you, be sure to check the latest edition of RIMJ on your mobile device and send us a photo: **mkorr@rimed.org.**

Pulsatile Proptosis

MICHAEL E. MIGLIORI, MD, FACS

A patient with a known history of Neurofibromatosis type I complained of pulsations around her left eye in 2004. The pulsations became more prominent over the years. Her visual acuity is not affected by the pulsations. In addition to the pulsations, she has multiple cutaneous neurofibromas and Lisch nodules on her irides. Although she could feel the pulsations, her vision was not affected.

Pulsatile proptosis in neurofibromatosis is due to progressive dysplasia of the sphenoid wing. Pulsations may be quite pronounced, but the vision is rarely affected. The differential diagnosis of pulsatile proptosis includes Neurofibromatosis type I, carotid cavernous fistula, orbital roof fracture, and arterio-venous malformation. The presence of the characteristic cutaneous findings of neurofibromatosis in this patient along with the characteristic imaging established the diagnosis.

Click to watch video

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The new **IMAGES/VIDEOS IN CLINICAL MEDICINE** feature is open for submissions. Original, high-resolution videos, which have not been published elsewhere, will be considered. In a separate Word document please include a brief title, and description (150 words or less) providing relevant clinical information, findings, clinical course, and response to treatment if initiated. Any information that might identify the patient or hospital, including the date, should be removed from images and videos. If an image of an identifiable patient is used, the patient should complete and sign our Patient Release Form. Refer to our Guide for Authors for complete information.

Please include authors' names (limited to two authors), academic positions, address, email and telephone number.

Submissions should be sent to Dr. Joseph H. Friedman, editor-in-chief, joseph_friedman@brown.edu and Mary Korr, managing editor, mkorr@rimed.org.

The Primary Care-Population Medicine Program at The Warren Alpert Medical School of Brown University

PAUL GEORGE, MD, MHPE; ALLAN R TUNKEL, MD, PhD; RICHARD DOLLASE, EdD; PHILIP GRUPPUSO, MD; LUBA DUMENCO, MD; BRENDA RAPOZA, MBA; JEFFREY BORKAN, MD, PhD

ABSTRACT

The United States healthcare system has been in a period of rapid evolution over the past decade, a trend that is anticipated to continue for the foreseeable future. Physicians are increasingly responsible for the quality of care they provide, and are being held accountable not just for the patient in front of them, but also for the outcomes of their patient panels, communities, and populations. In response to these changes, as well as the projected shortage of primary care physicians, the Warren Alpert Medical School of Brown University (AMS) developed the Primary Care-Population Medicine (PC-PM) program, which builds upon the traditional curriculum with major integrated curricular innovations. The first is a Master of Science Degree in Population Medicine that requires students to take nine additional courses over four years, complete a thesis project focused on an area of Population Medicine, and take part in significant leadership training. Another significant innovative element is the development of a Longitudinal Integrated Clerkship (LIC) during the 3rd year of medical school in which the students complete a longitudinal outpatient experience with the same preceptors and patients. During the LIC students will follow a panel of patients wherever care is provided, while focusing on population health and healthcare delivery issues, in addition to medical topics throughout their clinical and didactic experiences. Though several of the innovative elements are being piloted, the inaugural PC-PM class of up to 24 students will only begin in August 2015. While the outcomes from this program will not be known for many years, the potential impact of the program is significant for AMS, medical education, and the future of healthcare delivery.

KEYWORDS: Population health; Undergraduate Medical Education; Curriculum

INTRODUCTION

The healthcare system in the United States has been in a period of rapid evolution over the past decade, a trend that is anticipated to continue for the foreseeable future.[1] Major changes to US healthcare delivery and financing, such as the passage and implementation of the Affordable Care Act[2] and the recent repeal of the sustainable growth rate, are impacting physician roles and expectations. Physicians are increasingly asked to provide evidence of the quality of care they are providing, and are being held accountable not just for the patient in front of them, but also for the outcomes of their panels, communities, population of patients.[3] These new roles require skills not commonly taught in the traditional medical school curriculum. Medical schools must now make room for the "third science" of healthcare delivery, along with the basic and clinical sciences, and include topics such as quality improvement,[4] leadership,[5] and working in interprofessional teams.[6]

As the U.S. healthcare system continues to evolve, an anticipated shortage of physicians, both primary care and specialists, is expected to worsen over the next ten years. Current workforce projections predict a shortage of between 46,000 and 90,000 physicians by 2025,[7] with a potential deficit of 33,000 primary care physicians by 2035.[8] To alleviate the anticipated shortage of primary care physicians, authorities suggest increasing recruitment of medical students into primary care specialties using means as diverse as increasing the attractiveness of ambulatory rotations in medical schools, increasing team-based care,[9] and improving the parity between primary care and specialty incomes.[10]

In response to the changing healthcare system and a projected shortage of primary care physicians both locally and nationally, the Warren Alpert Medical School of Brown University (AMS) began planning for the development of a Primary Care-Population Medicine (PC-PM) program in 2011. The origins of the idea for such a program date back to the initiation of the medical school, which was originally conceived of as a "primary care medical school." Serious discussions to unite training in the three primary care specialties (Internal Medicine, Family Medicine, and Pediatrics) took place at Brown in the late 1980s and early 1990s, and Brown gained national prominence in this area.

Momentum for designing a unique primary care-population medicine program surfaced in 2011 and 2012 for several reasons:

- AMS moved into a new facility at 222 Richmond Street in the Providence Jewelry District, allowing for innovative medical education programs and an expansion of class size.
- The AMS faculty's depth of experience and comfort

with innovative approaches in the areas of primary care, population medicine, public health, and medical education enabled the design and implementation of the PC-PM program.

- Senior administrators from AMS including then Associate Dean for Medical Education, Dr. Philip Gruppuso, and then Dean of Medicine and Biologic Sciences, Dr. Edward Wing, proposed the program to Brown University leadership, including then President Ruth Simmons, along with leaders in Rhode Island (RI) health care and state government, receiving enthusiastic support for the concepts and were encouraged to develop the program.
- The American Medical Association (AMA) began a grant initiative in 2013, "Accelerating Change in Medical Education" (ACE), in which they sought bold proposals for schools to change how medical students are educated.[11] AMS and the PC-PM program, under the leadership of Dr. Paul George, Dr. Jeffrey Borkan and Dr. Gruppuso, received one of these $1 million dollar grants, boosting the visibility of the project and engaging national collaborators at the cutting-edge of medical education.
- The Rhode Island Foundation provided generous support, consistent with their aim to improve primary care in the State.
- Broad support for the initiative and its elements arose from students, faculty, and stakeholders across Rhode Island in government, medicine, healthcare, and elsewhere.

VISION OF THE PRIMARY CARE-POPULATION MEDICINE PROGRAM

The Planning Committee for PC-PM program, in 2012, consisting of senior administrative leaders at AMS and faculty physicians, set forth the following vision:

- The PC-PM program will be innovative and consistent with the reputation for excellence in medical education already held by Brown. It will enhance education in such areas as community engagement, non-traditional care settings and longitudinal educational experiences, areas that will attract outstanding students and facilitate their ability to achieve their career goals.
- Beyond training excellent primary care doctors, the program will train "clinicians plus" – leaders in education, research, and advocacy with a focus on generalist medicine and values consistent with service to the needs of patients.
- The program will be scholarly. It will provide opportunities for further academic and professional development in public health, medical education, health policy, health administration and business, as well as in clinical areas such as care of the underserved, quality improvement, and global health.
- Evidence-based approaches to pedagogy will be considered and used whenever possible – in development of curricular content, timing, sequence of experiences, extensive use of case study methods, and longitudinal clerkship experiences.
- Though established as a program with unique curricular and administrative aspects, the program will be integrated, wherever possible, with the existing medical education program in terms of administration, curriculum, space, and oversight by the Liaison Committee for Medical Education (LCME).

This vision was fashioned into a specific plan for a four-year program in which students receive both a Doctorate of Medicine and a Master of Science (ScM) degree in Population Medicine from AMS and Brown. In order to reduce the student loan burden, there will be no additional cost for the additional degree. As part of the ScM, there will be a research requirement in primary care, population medicine, or health policy, as well as interdisciplinary and leadership training. Methods for integrated, active learning will be central to its design and execution. The hope is that the graduates of this program will continue into residencies in primary care, ideally in Rhode Island; towards this end, there may be opportunities for PC-PM students to stay in Rhode Island to complete their residency training.

ADMISSIONS

The PC-PM program can accommodate up to 24 students per year. Students are admitted to the PC-PM program through the standard processes. Students complete an initial application through the American Medical College Application Service (AMCAS) and receive a secondary application from AMS; students have the option to indicate their interest in the PC-PM program on the secondary application. Once they indicate their interest, students complete two additional essays focused on the U.S. Healthcare System and Population Medicine. They are then screened by the AMS admission staff and offered an interview if they meet AMS' requirements. Students are interviewed by two members of the admissions committee, with one member typically faculty in the PC-PM program. They are then admitted to AMS by a vote of the Admissions Committee.

CURRICULAR ELEMENTS

There are two major curricular innovations within the PC-PM program. The first is the Master of Science Degree in Population Medicine, which requires students to take nine additional courses, over four years, complete a thesis with research focused on Population Medicine, and undertake an extensive leadership program.

These courses and programs include (see Mello et al in this issue for further details):

- Health Systems and Policy I: Taught in the 1st semester of 1st year, this course focuses primarily on health disparities and social determinants of health.
- Research Methods in Population Health: Taught in the 2nd semester of 1st year, this course focuses on research methods, including formulation of a population medicine research question, study design and manuscript preparation.
- Health Systems and Policy II: Taught in the summer between 1st and 2nd year, this hybrid course (partially in-class and partially web-based) will focus on the US Healthcare System.
- Quantitative Methods: Taught in the summer between 1st and 2nd year, this hybrid course (partially in-class and partially on-line) will focus on biostatistics and epidemiology.
- Research Independent Study: In this course, students will begin the research that will form the basis for their thesis project.
- Leadership: Taught primarily in 2nd year with elements integrated through the four years, this course will focus on the principles of leadership in healthcare settings.
- Clinical and Population Medicine I and II: Taught in the 3rd year, these courses will focus on the intersection between clinical and population medicine. These courses will have a focus specifically on quality improvement, the social and community context of healthcare and leadership.
- Capstone Seminar in Population Medicine: Taught in 4th year, this hybrid course (partially in-person and partially online) will revisit topics taught in the first three years while consolidating the skills students will need to be leaders in population health through residency and beyond.

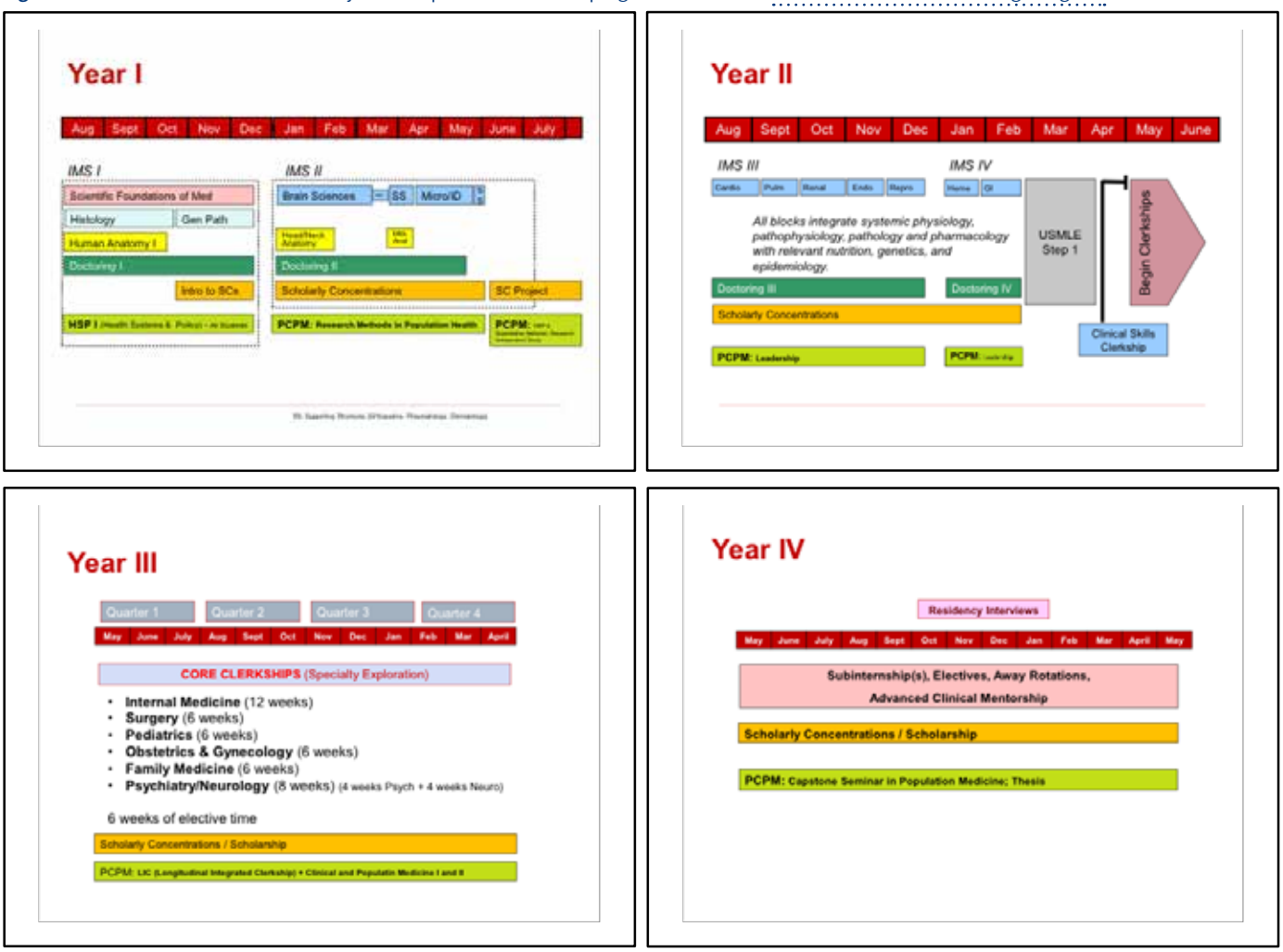
As part of the integrated ScM, students will undertake research in an area related to population medicine and complete a thesis on that research. The end product will be a manuscript suitable for submission to a peer-reviewed journal. While the Master's degree is integrated into the curriculum and designed for completion in four years, some students may consider an additional 5th year, at no tuition cost, to complete their research.

The second major element to the PC-PM program is a Longitudinal Integrated Clerkship (LIC) (see Epstein-Lubow et al in this issue for further details). Rather than moving from rotation to rotation every 6 or 12 weeks, the majority of a 3rd year student's time in the PC-PM program will be spent in the LIC. **Table 1** describes the differences between the traditional clerkship structure and the LIC at AMS. Over the course of 32 weeks, PC-PM students will spend one half-day per week with a mentor in family medicine, internal

Table 1. Comparison of Alpert Medical School Longitudinal Integrated Clerkship and Traditional Clerkship Structure

	Longitudinal Integrated Clerkship	Traditional Clerkship Structure
Specialties represented	Family Medicine, General Surgery, Internal Medicine, Obstetrics and Gynecology, Neurology, Pediatrics, Psychiatry	Family Medicine, General Surgery, Internal Medicine, Obstetrics and Gynecology, Neurology, Pediatrics, Psychiatry
Number of required inpatient weeks	12	23
Number of required outpatient weeks	32	21
Elective weeks	4	4
4th year requirements	ICU (4 weeks; preliminary); Sub-Internship (4 weeks)	Sub-Internship (4 weeks); Surgery selective (6 weeks)
Evaluation	Comprised of Shelf examination, OSCE and Direct Observation (in most cases, same as traditional clerkship structure)	Comprised of Shelf examination, OSCE and Direct Observation
Shelf exams administered…	Throughout the year after didactic content for a subject area delivered, with at least 1 month and typically six weeks separating exam administration	At the end of a block rotation
OSCEs administered	Intermittently throughout 3rd year	At the end of a block rotation
Clerkship directors	Same as traditional block clerkships	N/A
Didactics	Integrated, scheduled across entirety of LIC and includes Population Medicine content	Scheduled per block
Sites	For pilot, Rhode Island Hospital, Memorial Hospital and VA with inpatient rotations also at Women and Infants Hospital, Hasbro Children's Hospital, and Butler Hospital	Rhode Island Hospital, Memorial Hospital, VA, Miriam Hospital, Butler Hospital, Bradley Hospital, Women and Infants Hospital and Hasbro Children's Hospital

Figure 1. Schematic illustration of Primary Care-Population Medicine program Years 1–4 [click here to download enlarged figures]



medicine, obstetrics and gynecology, pediatrics, psychiatry/neurology, and surgery; emergency medicine experiences will also be included. Wherever possible, experiences will occur in the same hospital, hospital system, and geographic areas. PC-PM students will work with their preceptors to establish their own patient panel of approximately 30–50 patients and they will be expected to follow these patients to whatever healthcare setting they are sent. Using a protocol for prioritization, they may be present for their patients' deliveries and surgeries, visit them on the inpatient units and nursing homes, and even participate in home care. Finally, PC-PM students will participate in didactics on clinical and population medicine topics during the LIC. The LIC is currently being piloted for 8 AMS students, with support from both the American Medical Association and the Rhode Island Foundation, during the 2015–16 academic year. Feedback will be used to assess the experience. There are plans to expand the LIC pilot with 12 to 16 students during the 2016–2017 academic year.

Students in the PC-PM program will share many of the same experiences as those in the traditional medical program. For example they will have the same basic science courses and the same Doctoring (Introduction to Clinical Medicine course) experience as the students in the traditional program. However, to encourage the start of a primary care identity, during the Doctoring course, these students will be placed in advanced Patient-Centered Medical Homes for their Doctoring mentor sites. **Figure 1** depicts the curricular elements for all four years of the PC-PM program.

As part of the PC-PM program, elements of the curriculum have been or are being piloted. For example, the first course in the Master's degree sequence, entitled Health Systems and Policy I, was taught to all 1st year medical students during the 2014–2015 academic year.

EVALUATION PLAN

In order to evaluate the efficacy of the PC-PM program, program faculty and staff created a multi-faceted approach employing both qualitative and quantitative strategies. These methods include evaluating the entire AMS student body on items such as empathy, tolerance of ambiguity and

attitudes in working with underserved populations using previously validated surveys.[12,13,14] In addition, we will conduct both interviews and focus groups with AMS students in the PC-PM program and the standard program to ascertain commonalities and differences between these populations of students.

Finally, we will look at a number of measures of success for the PC-PM program and LIC. These include the following:

1. The number of students who successfully complete the PC-PM program and graduate with both an MD and Master of Science degree in Population Medicine.
2. The number of students who enter primary care residency programs.
3. The number of students who remain in Rhode Island for residency and attending positions.
4. The number of students who become physician leaders (such as Medical Directors, Academicians, and Public Health Directors and Assistant Directors).
5. The number of physician practices recruited to be part of the LIC and the impact of students on these practices.
6. The successful introduction by students of quality improvement projects.
7. The number and range of visits to healthcare settings that students attend with patients on their LIC patient panel.
8. The ability of students to work effectively in interprofessional health care teams. This will be measured through validated surveys, including the Readiness for Interprofessional Learning Scale1 and direct observations by faculty.
9. Clinical competency as measured through student scores on the discipline-specific Shelf Exams, the National Board of Medical Examiner's Licensing Examinations (i.e., USMLE Steps 1, 2, and 3), and Year 4 OSCEs (Objective Structured Clinical Examinations).
10. Student satisfaction with the PC-PM program.

DISCUSSION

The rapidly evolving US healthcare system and the projected shortage of primary care physicians are requiring the reassessment of how medical students are educated and trained. New knowledge, attitudes, and skills are needed for the increased demands of practice, and medical schools must adapt, adding the third science of healthcare delivery to the basic and clinical sciences. Other institutions, such as Duke with their Primary Care Leadership Track[15] and The University of Virginia with their Generalist Scholar Track,[16] have implemented potential solutions. However, the PC-PM program at AMS is unique among programs with its longitudinal emphasis on seamlessly integrated population medicine throughout the four years of medical school and the awarding of a Master of Science degree in Population Medicine at its conclusion. In addition, by developing a sizable number of assured primary care residency positions in the state, this program will provide the next generation of primary care "clinicians-plus" who will be the future practitioners, leaders, educators, researchers and advocates for primary care and population medicine.

There are potential barriers for the PC-PM program. As with any expansion of medical school class size, there must be increased capacity for clinical training. This is especially true with LICs, which are resource consuming. AMS is working on engaging partners, new and old, to ensure the same high level of training for its students. In addition, recruiting talented and dedicated students into primary care specialties remains a challenge, as student loan debt increases and primary care physician salaries lag. Finding partners (such as foundations, hospital systems or others) to offset the cost of medical education is a priority.

Barriers notwithstanding, the Primary Care-Population Medicine program is an innovative and exciting program that provides students with the knowledge, skills and attitudes they need to function as physician leaders in an ever-changing healthcare system. We anticipate the PC-PM program will lead to improvements in the outcomes, quality and organization of healthcare in the state, while at the same time fostering research in primary care, population medicine and health policy. While the evaluation of the program outcomes will not be known until students graduate and move on to residencies and practice, there is great potential of the program to affect medical education at AMS, in Rhode Island and nationally.

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Advancing the Integration of Population Medicine into Medical Curricula at The Warren Alpert Medical School of Brown University: A New Master's Degree Program

MICHAEL J. MELLO, MD, MPH, FACEP; EDWARD FELLER, MD, FACP, FACG; PAUL GEORGE, MD, MHPE; JEFFREY BORKAN, MD, PhD

ABSTRACT

Additional knowledge, attitudes and skills are required for the next generation of medical students as they expand the traditional focus on individual patients to include population-based health and scholarly investigation. The Warren Alpert Medical School of Brown University (AMS) is initiating a master's degree program as a key component of the new Primary Care-Population Medicine program at AMS leading to both a Doctorate in Medicine (MD) and Master of Science in Population Medicine (ScM) degrees in four years. The ScM is composed of a series of nine courses, integrated into the four-year MD curriculum, as well as a thesis. Additional attention will be given to leadership and quality improvement training. The goal is to produce graduates competent in the care of individual patients, panels, communities, and populations.

KEYWORDS: Population health; Undergraduate Medical Education; Curriculum

INTRODUCTION

Expanding the traditional focus on individual patients to include population-based health and scholarly investigation are core principles of current undergraduate medical education. The American Association of Medical Colleges (AAMC) via its Medical School Objective Project (MSOP) Report II, notes the importance of "a population health perspective which encompasses the ability to assess the health needs of a specific population, implement and evaluate interventions to improve the health of that population."[1] The Warren Alpert Medical School of Brown University (AMS) leadership, encouraged by stakeholders across Rhode Island in healthcare, government, and academia, recognized and responded to the need for increasing its educational efforts regarding population medicine by increased attention to this topic in the curricula for all students. In addition, motivated by the need to produce physicians who care for patient panels, communities and populations, as well as individual patients, AMS created the Primary Care-Population Medicine (PC-PM) program. The impetus for this program was supported by the Institute of Medicine 2012 report that strongly encouraged consolidation of primary care and public health, "in ways that will yield substantial, lasting improvements in the health of individuals, communities, and populations."[2] Early in the development of the new PC-PM program, program faculty felt it vital for students in this program to have mastery of population medicine, defined by Kindig as "the health outcomes of a group of individuals, including the distribution of such outcomes within the group."[3] This skill set must be robust in developing future clinicians, educators, investigators and leaders who can contribute to scholarly investigation in the field.

This report describes the rationale and structure of a novel master's degree program that is a key component of AMS' PC-PM program leading to both a Doctorate in Medicine (MD) and Master of Science in Population Medicine (ScM) degrees in four years. The Master's program in Population Medicine may be the first of its kind in the US. Embedded in Brown's ScM program is a thesis model that conforms to the AAMC's Population Health Perspective Panel guidelines which state that medical students must be able to define and describe a population or community and must understand the methodology needed to gather this health information.[1]

As described in detail elsewhere in this edition of the *Rhode Island Medical Journal*, faculty leadership and PC-PM Working Groups began designing the Master's degree in 2012. Originally, there were discussions about having students pursue master's degrees in public health, medical education or even public policy. Brown University has outstanding resources and educational experiences in these areas, including existing master's programs in Public Health and Public Affairs. However, after long productive deliberations about the pros and cons, the PC-PM leadership and Working Groups chose a less traditional, and perhaps more arduous path by designing a completely new degree. This innovation was selected for content, pedagogic and pragmatic reasons. The most significant content factor was a clear sense that students would require a different subset of knowledge, attitudes, and skills than those provided by existing master's programs if they were to be successful in providing care to individuals, patient panels, communities, and populations in a complex, rapidly evolving US healthcare delivery system. Although a new master's degree program required much more up-front curriculum design, resource acquisition, and regulatory steps, once assembled, it would be more rapidly adaptable as healthcare evolves and can be constructed to focus on producing physician-leaders, well versed in population medicine and engaged in relevant scholarship. At the

same time other pragmatic decisions involving the degree were made. For example, medical student debt is related to career choice;[4] since this program is designed to encourage careers in primary care, increasing the tuition burden with a master's degree was thought to be counter-productive. In order to control tuition costs for students enrolled in the PC-PM program, AMS senior level administrators and program faculty made the decision to design the degree without the requirement of additional tuition cost to students. Additionally, scheduling and calendar conflicts between medical school courses and university courses are common issues faced around the country, including at Brown. Constructing a new master's program from scratch allowed intentional design and flexibility in scheduling to fit both the developmental stage of the learner and to integrate relatively easily with students' other scheduled curricular requirements. The goal was to provide the right experiences at the appropriate times for PC-PM students in a synergistic, complementary fashion.

In 2014, after several stages of a rigorous review process, the Brown University Corporation approved a medical school initiative to offer the ScM degree in Population Medicine in conjunction with the MD degree. The program will receive its initial cohort of up to 24 first-year medical students in Fall 2015. This initiative consists of a didactic nine-course sequence delivered over four years that is focused on health disparities and social determinants of health, biostatistics, epidemiology, intersection between clinical and population medicine, leadership, health care systems and has a research requirement that culminates in a master's thesis (see **Table 1**). Parts of the curriculum will be delivered to all AMS students, but some are unique to this program. All ScM students will take the same coursework; however their scholarly investigations leading to a thesis will be individually based.

CURRICULAR ELEMENTS

The master's curriculum requires students to develop research skills and scientific writing proficiency and demonstrate these in a thesis.[5] The ScM thesis could be 1) Descriptive Research - examining population patterns of a health-related outcome; 2) Investigative Research - quantifying the relation between an intervention or exposure and a health-related outcome; 3) Health Policy Research – developing and evaluating policy uptake and impact; 4) Program Evaluation – assessing the efficacy of a population-based intervention intended to prevent or control a poor health outcome; or 5) Quality Improvement or Patient Safety Research – examining a medical practice or institution's compliance with establish guidelines or quality indicators.

Barriers have been identified that impede student research during medical school.[6,7] (See **Table 2.**) Successful strategies of medical school investigative initiatives for students are diverse. Formal curricular structures to optimize scholarly efforts commonly involve long-term basic science or clinical investigative efforts. Models may include a specific student research scholar track or longitudinal elective,[8] formal population-based research time,[6] curricular or non-curricular research electives,[10, 11] leaves of absence, and departmental or medical school-level research infrastructure including research workshops.[11] These structural components may be aided by having a student research coordinator or dean leading the program.[12]

During the first academic medical school year (see **Table 1**), ScM candidates will participate in a newly established medical school course, Research Methods in Population Medicine, led by two experienced faculty (MM and EF). This course will prepare students to develop and demonstrate the necessary research skills to formulate a population medicine research question and then design and conduct an investigational study culminating in a manuscript to satisfy thesis requirements. Its educational objectives include having (1) students interpret relevant population health literature and analyze its applicability to community-based practice; (2) compose a research question and formulate a study design to examine it; (3) use biostatistics and epidemiologic methodology in their research design; (4) demonstrate commitment to responsible conduct of research and employ these values in working with an IRB and human subjects; (5) interpret data in the context of the proposed research question, and (6) disseminate their research findings including creating a poster presentations and composing a manuscript of publishable quality.

The course will use multiple educational components including online modules to prepare students for in-person and online discussions. Students will learn different study designs to utilize in answering their specific research question. They will develop basic quantitative and qualitative data- analysis skills and have access to faculty with expertise in these areas. There will be content to educate students about conflict of interest, responsible conduct of research, research misconduct and research finances that interface with research ethics. Additionally, multiple interactive journal clubs will be held regularly to have students develop and obtain mastery in critically reading and assimilating the medical literature in this field.

A representative example of the curriculum content is its focus on quality improvement in health care and use of patient and community safety data. An online class discussion will formulate a research study to answer a specific quality improvement issue, such as "Reducing the number of avoidable hospital re-admissions." Preparatory assigned readings for this module explore issues in measuring quality in health care. In-class discussion will access implementation barriers and opportunities for improvement. A journal club will examine a published hypothesis-based quality improvement intervention and its research methodology.

In a large survey of faculty clinical investigators, 98% of respondents identified lack of a mentor as a prime limitation

Table 1. Master of Science (ScM) in Population Medicine Timeline

THESIS TIMELINE	DEGREE COURSEWORK
Medical School Year One	
Overview Meeting with PC-PM students • Thesis topics/list of mentors • Timeline and policies • Resources available	Health Systems and Policy I (MED 2010) • Elizabeth Tobin Tyler, JD Assistant Professor of Family Medicine • Gowri Anandarjah, MD Professor of Family Medicine Research Methods in Population Medicine (MED 2030) • Michael Mello, MD, MPH Professor of Emergency Medicine • Edward Feller, MD Clinical Professor of Medicine
Individual Student Meetings • Approach to clinical investigation • Discuss research interests • Discuss potential mentors	
Development of Thesis Proposal • Selection of thesis mentor (and reader) • Meeting with thesis mentor • Completion of thesis proposal form and submission for approval	
Thesis Proposal Submission • Thesis proposal due to ScM director • Summer 1 proposed milestones due	
Human Subject Protection Training	
Summer Between Medical School Year One and Two	
Summer Research Assistantship with thesis mentor for project-related work	Health Systems and Policy II (MED 2040) • Elizabeth Tobin Tyler, JD Assistant Professor of Family Medicine Quantitative Methods (MED 2045) • David Anthony, MD, MSc Associate Professor of Family Medicine Independent Study – Thesis Research (MED 2980) • Varied Faculty
Medical School Year Two	
Continued work on research project with mentor • Use scholarly concentration time and independent learning time • Check-in meetings with Drs. Mello and Feller on progress of project Present summer research at AMS Symposium	Leadership (MED 2046) • Brian Clyne, MD Associate Professor of Emergency Medicine
Medical School Year Three	
Continued work on research and/or writing thesis manuscript including use of LIC free ½ days	Clinical and Population Medicine I (MED 2050) Clinical and Population Medicine II (MED 2060) • Jordan White, MD, MPH Assistant Professor of Family Medicine • Alison Riese, MD, MPH Assistant Professor of Pediatrics
Individual Student Meetings • Discussion of fifth-year pathway for ScM • Plan research time into 4th year schedule • Discussion on writing manuscripts, targeting journal for publication	
Medical School Year Four	
Thesis manuscript development continues • Submit thesis to thesis mentor (and reader if appropriate) for review and comment • Submit manuscript to peer reviewed journal • Present research findings at conference Submit thesis to Brown University Graduate School	Capstone Seminar in Population Medicine (MED 2070) • Jeffrey Borkan, MD, PhD Professor of Family Medicine

Table 2. Barriers to medical student research[13] and ScM strategies for success

Barrier	Strategy for Success
Limited training in research methods	Research methodology curriculum; journal club
No protected time for research	Dedicated curricular time for independent ScM project study, summer research assistantship stipend
Lack of a supportive research environment	Medical school librarian; statistical support; two senior faculty advisors
Poor scholarly writing skills	AMS Writing Center component of Brown University Writing Center, scientific writing sessions embedded in curriculum

to trainee.[7] A unique component of the AMS ScM program confronts this vital element with multiple levels of mentorship. The master's thesis project has two dedicated senior faculty (MM, EF) leading the program, advising students in choosing a mentor, implementing a population-based research project and collaborating longitudinally with the students throughout their progress through the degree program. An innovative feature of the program is assembling a cohort of productive faculty members as potential master's thesis mentors. The thesis mentor-ScM mentee collaboration will be a multiyear relationship that will allow for a substantive project of publishable quality. Each thesis mentor will receive an annual stipend. Additionally, students have the option of having an additional mentor as a thesis reader. Thesis readers do not have the continuous relationship but rather a focused expertise or data set that they will share with the student and agree to later review the student's final thesis manuscript.

THESIS PROJECTS

All course content and each student's research project is designed to be completed over four years of study integrated with the entire medical school curriculum. ScM program time is built into the schedules during each academic year. Students will be supported by a medical school stipend to work with their mentor on the research project during the summer between the first and second academic years. This dedicated block of time allows for a project's foundation to be established and built upon during the remaining academic years. A few students may choose additional time to complete the degree requirements; thus, students have the option to utilize a fellowship year between years three and four to advance their research project.

Student thesis projects will be varied and may use both qualitative and quantitative research methodology. They could include policy evaluation at either a state or institutional level. An example would be examining the state 's prescription monitoring program's uptake by health providers and its impact on prescribing patterns. It could address implementation of an interpersonal violence screening program within a primary care practice and linking victims to community resources. Another example would be a quality improvement project within a clinical practice that measure adherence to established disease specific quality indicators, such as a diabetes monitoring initiative or methodologies for further engaging patients using advanced electronic health record patient portals.

There is structured course content on scientific writing, constructing a manuscript, selecting an appropriate journal for submission and the peer review process. Additionally students will develop and demonstrate the skill in creating a scientific poster presentation. Students will have also access to other university resources, including a component of Brown's Writing Center based at AMS, to assist them in manuscript development.

DISCUSSION

We anticipate that this initiative will advance an AMS culture of student scholarship and create an incubator for improved and increased student research productivity. Elements of the program that can contribute to a sustained student investigational infrastructure include (1) a Research Methods course in the curriculum; (2) establishment of a roadmap for all students to approach their entry into research endeavors; and 3) integration of existing institutional resources (dedicated medical librarian, statistical support, AMS-specific Writing Center and Writing Fellows Program) to support medical student research.

Concerns about this program range from apprehensions about the level of rigor to whether the required course work and thesis can be completed in four or even five years. Other concerns include the long-term commitment of scholarly mentor and sites and whether thesis projects will be considered "added value" to the institutions supporting this initiative. Most notably, since students will have freedom of choice regarding careers, there are concerns that students will not enter primary care or generalist fields and that the additional knowledge, attitudes, and skills acquired during the PC-PM program will not be put to use. However, having expertise in population medicine in other fields outside of generalist medicine also confers important benefits.

Evaluation of the program will include collecting prospective data on the effectiveness of the ScM program, measuring short- and long-term results of quality and quantity of scholarly publications and presentations as well as effects on graduates' career choices and productivity. We will continuously

monitor the ScM curriculum by pre- and post-curriculum assessment measures and by student course evaluations.[14] In addition, the PC-PM program will follow graduates as they progress to residency and beyond, measuring markers related to program success. We anticipate that such a major initiative will continually evolve. Ongoing evaluation of data will drive assessment documenting achievements as well as identifying limitations and gaps.

This unique curriculum fulfills a vital gap in medical education – a structured, didactic program to develop physician leaders who have a population-based emphasis in their clinical, investigational, teaching and administrative careers. Program graduates will be sophisticated proponents and practitioners of population medicine as well as future productive clinical investigators. This master's program in Population Medicine, perhaps the first in the US, may provide a valuable example to other medical schools and be translatable to other health professional colleges and universities.

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Development of a Longitudinal Integrated Clerkship at The Warren Alpert Medical School of Brown University

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ABSTRACT

The Warren Alpert Medical School of Brown University is introducing a longitudinal integrated clerkship for third year students in the Primary Care-Population Medicine Program as an alternative to more traditional clerkship models. In developing the longitudinal integrated clerkship, program faculty incorporated a historical perspective of medical education, modern knowledge about students' development of clinical skills, and educational science as it relates to faculty development and learner evaluation. The longitudinal integrated clerkship is being tailored to the fit the Brown University system; as such, it will be unique in its attention to population medicine, including its exposure of students to several distinct health care systems within a single geographic region, and integration of clinical training with completion of a Master's in Population Medicine.

KEYWORDS: Undergraduate Medical Education; Longitudinal Integrated Clerkship

INTRODUCTION

The Warren Alpert Medical School of Brown University is introducing a longitudinal integrated clerkship (LIC) in the 2015-2016 academic year. An LIC is a method of clinical medical education in which traditional specialty-specific block rotations lasting several weeks and occurring sequentially are replaced by longitudinal experiences for all core specialties occurring concurrently over many months and largely in the outpatient setting. Though currently a pilot program for a small group of selected students, the LIC will become a standard element of the third year for all students enrolled in the Primary Care – Population Medicine (PC-PM) Program, a four-year dual-degree program in which students earn both an MD degree and a Master's in Population Medicine (see the lead article in this issue, George, et. al., for further details).

A HISTORY OF LONGITUDINAL INTEGRATED CLERKSHIPS

The LIC model for core clinical education in medical schools was first introduced in the 1970s. The LIC model is similar to the historical medical apprenticeship, such as those that occurred in the United States in the 1700–1900s in which the doctor in training gained medical knowledge by participating in clinical care delivery alongside one or more experienced physicians and other clinicians. Innovators in medical education re-popularized this form of clinical training beginning in the late 1990s when LICs were implemented by medical schools in Australia, Canada, South Africa, and the United States in both rural and urban areas and more recently at academic centers.[1,2] LICs are based on the organizing principle of continuity of the learning environment which fosters patient-centeredness and learner-centeredness.[3] The International Consortium of Longitudinal Integrated Clerkships defines the LIC as an educational experience in which medical students participate in the comprehensive care of patients over time, participate in the continuing learning relationships with these patients' clinicians, and meet the majority of the year's core clinical competencies across multiple disciplines simultaneously.[4] This model provides students with an understanding of the continuum of health and disease, and transitions in care, by participating in the care of patients wherever it is delivered – from the outpatient setting to the hospital, rehabilitation, and care in the home. Studies show that students trained in LICs achieve academic results equivalent or better as compared to students in traditional models, while maintaining empathy and patient-centered values at a rate surpassing their colleagues.[5,6,7]

THE WARREN ALPERT MEDICAL SCHOOL'S LONGITUDINAL INTEGRATED CLERKSHIP

The goals of the AMS LIC are to: 1) gain longitudinal experience in each of the six core clerkships (including internal medicine, surgery, family medicine, pediatrics, obstetrics and gynecology, and integrated neurology and psychiatry); 2) promote continuity with patients and their care environments; 3) integrate population health with clinical medicine; 4) longitudinally follow and participate in treatments of patients over time and across specialties; and, 5) complete a quality improvement and/or patient safety project focused on population medicine.

Students in the LIC will seek to longitudinally follow at least 3–5 patients per specialty area (up to a maximum of 30 patients) for up to one year, including pregnant women, newborns, pre- and post-surgical patients, geriatric patients, and

persons near the end of life. It will require effort from both students and faculty to collaboratively develop a diverse panel of patients that includes common chronic conditions plus a variety of important case material that students will apply to their study of clinical medicine. For most of the year, the student's schedules include one-half day per week in each of the six core clerkships; the remaining half days are devoted to seminars, other study, and participating in medical visits of the patients in the student's panel. Didactics will include both morning reports twice weekly and a half-day of clinically relevant seminar experiences; this educational curriculum includes coursework in population health and health care systems as described by White et al in this issue of the *Rhode Island Medical Journal*. PC-PM students will apply this coursework towards completion of the Master's in Population Medicine. Throughout the year, the students are expected to serve as advocates and navigators for their longitudinal patients, attending visits with physicians, other clinicians, clinical tests and procedures or surgeries.

The primary curriculum focus for medical students in the LIC emanates from its emphasis on comprehensive, integrated patient care over time, largely in the outpatient setting. Continuity of both mentors and patients is prioritized. This longitudinal education in the outpatient setting is described by in depth elsewhere (see White at al in this issue for further details). To supplement the outpatient experiences, students participate in shortened, highly-structured versions of traditional inpatient rotations; these 1–3 week "immersion" experiences occur in core areas including internal medicine, surgery, pediatrics, psychiatry, neurology and obstetrics. Students also complete recurrent "pulse" experiences such as in the emergency departments. In addition, there are many "one-time" experiences expected of students, such as home hospice care and the newborn nursery. There are skills workshops in physical examination, radiology, electrocardiogram interpretation, and others as would occur in standard third-year curriculums. Finally, attention is given to students' professional development as they establish doctor-patient relationships as the clinical provider.[8]

SELECTING MEDICAL STUDENTS FOR THE LIC DEVELOPMENTAL PILOTS

The initial AMS LIC pilot, which began in May 2015, involves eight students. Students at AMS were queried about their interest in the LIC during the summer of 2014. More than 20 second-year students demonstrated interest in the program and subsequently applied to be part of the initial cohort. From there, through an application process that encompassed academic markers such as grades, mentor evaluations and interviews with PC-PM faculty, eight students were selected. Special attention was paid to the specific characteristics of students, examining the potential for them to thrive in the LIC. The student characteristics that PC-PM faculty sought included: self-directedness, comfort with uncertainty, the ability to be a caregiver and the ability to function as part of a team. Faculty also focused on students who would advocate for patients. These characteristics were vetted in previous studies as important for success in LICs.[9]

Once the students were selected, we sought to match them with their ideal site. Program faculty met with the students and described the three possible practice settings which would serve as the students home base for the entirety of the LIC: Memorial Hospital of Rhode Island, the Veterans Administration Medical Center and Rhode Island Hospital. Students ranked their preferences and seven of the eight were placed at their top choice site.

RECRUITING FACULTY MEMBERS TO TEACH AND SUPERVISE LIC STUDENTS

The process of recruiting faculty members to teach and supervise LIC students has been an ongoing intensive process that began even before sites were chosen. Whenever possible, the medical school and LIC leadership attempted to recruit faculty who were not already involved in the traditional AMS clerkships, so as not to draw away resources from current clerkship rotations. Preference was given to clinical practice opportunities at those sites where students could participate fully in patient-centered experiences. Optimally in LICs, clerkship sites engage and integrate the student into the structure of the practice in which the student has the opportunity to learn from medical assistants, nurse case managers, pharmacists, social workers, other clinicians and technicians, and the patients and families. It is expected that preceptors will foster mentoring relationships with students, and work in an environment that facilitates integrated, longitudinal learning experiences.

When recruiting faculty for the LIC, a number of obstacles were anticipated. Any medical school clerkship expansion requires increased faculty participation and an LIC expansion demands both more faculty and a different approach to medical student clinical training. Willingness to learn new educational approaches must come from both veteran faculty who are familiar with the traditional "6-week" block rotations, plus new community physicians who have not yet chosen to affiliate with an academic center and who may have little teaching experience. Thus, the recruitment of faculty to this new process must be successful in convincing seasoned preceptors to change aspects of their teaching style, and the faculty recruitment must also provide incentive for new community physicians to join. Both groups will also require significant faculty development.

AMS addressed these potential barriers in several ways. There was a process of directly reaching out to group practices by holding informational seminars on-site plus invited "retreats" at the medical school including national experts in the LIC model. Program leaders engaged early in the planning process to personally and directly speak with clinical

sites and practitioners throughout Rhode Island. Incentives included a Brown University clinical appointment plus access to general faculty development programs, live lectures/conferences, and skills-based workshops. In addition, there will be regularly scheduled faculty development, targeted to LIC faculty, with a focus on topics such as integrating learners into clinical settings and providing feedback.

Recruitment into any new program takes time, patience, due diligence and hard work, and this LIC is no exception. We expect that once new faculty preceptors see firsthand the rewards of meaningful year-long teaching relationships, and witness the students becoming active contributors to their health teams, expansion to additional clinical sites will naturally occur. In fact, for selected specialties in 2015, there was over-enrollment from interested faculty, who will now wait to accept students for the 2016 class. Ultimately, we believe that as preceptors experience their longitudinal student(s) facilitating patient-centered care and building meaningful multifaceted relationships, even seasoned skeptical clinical educators will find new vigor for their teaching.[10]

THE VISION FOR FACULTY TEACHING AND SUPERVISION IN THE LIC

As described above, the principle feature of the LIC is that students have longitudinal experiences with faculty preceptors in each of the core clerkship disciplines (**Figure 1**). Whenever possible, these specialists all work within one healthcare network, allowing for maximal coordination between disciplines and for students to follow patients between healthcare settings (e.g., a student may see a patient referred to a surgeon from a family physician's office and then see the same patient at the surgeon's office and in the operating room). From a preceptor's perspective, this allows for the development of a robust and increasingly trusting relationship with the student, as the two work together weekly for nine months. Experience from other schools indicates that LIC preceptors feel able to develop authentic and meaningful relationships with their students, which allows for robust mentoring and coaching and an expansion of the roles preceptors feel comfortable assigning to their students.[11,12] Students in LICs report that the feedback they receive from their preceptors is authentic and enhanced by the continuity relationship.[13] At AMS, LIC preceptors receive initial orientation through a kick-off event and meet in groups periodically to review the progress of their students. This process affords preceptors the opportunity to iteratively assess the abilities of their students and foster students' development into competent professionals.[14]

ASSESSMENT AND EVALUATION OF STUDENTS IN THE LIC

The Longitudinal Integrated Clerkship offers the opportunity to repeatedly assess students' skills, provide feedback and monitor progress. In addition, it creates the possibility of implementing new methods of student assessment. Like AMS students in traditional clerkships, LIC students will take the National Board of Medical Examiners subject examinations ("shelf exams"). These exams will be spread out over the course of the LIC starting after the first 3 months, beginning with the broadest specialties of family medicine and internal medicine and progressing to the more focused specialties of surgery, pediatrics, obstetrics and gynecology, psychiatry and neurology. The LIC students will also take four integrated Objective Structured Clinical Examinations (OSCEs), specifically designed for the LIC, over the course of the year, and each OSCE will have stations containing content from multiple specialties. To make the OSCE program successful in the LIC model, clerkship directors identified OSCE cases best suited for delivery to students early in the year as well as complex cases requiring an integration of skills at the year's end.

At each clinical site, students will complete a monthly clinical encounter (mini Clinical Evaluation eXercise or "mini-CEX") observed by their preceptors, and these will be used to provide formative feedback. Each clinical preceptor will also complete a quarterly clinical evaluation for the student, using a new clinical evaluation form developed on the Association of American Medical College's Entrustable Professional Activities (EPAs) for entering residency.[15] Some domains of this tool are familiar: "Evaluate patients with new or undiagnosed symptoms," and some reflect new areas felt to be important: "Give or receive a patient handover to transition care responsibility to another health provider or team." Evaluations from patients and clinical site staff will be used to provide "360 degree" evaluation[16] of the students from multiple perspectives, which has high reliability and

Figure 1. Sample weekly schedule for LIC student

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
MORNING (8am–Noon)	Internal Medicine	*White Space (Patient panel visits, specialty experiences)*	Neurology & Psychiatry	Pediatrics	Family Medicine
AFTERNOON (1–5pm)	*White Space (Patient panel visits, specialty experiences)*	OB/GYN	*White Space (Patient panel visits, specialty experiences)*	Surgery	Core Education Sessions @ Alpert Medical School

validity in assessing physician competency. Each student will receive a LIC grade for each specialty, weighted approximately (with differences across specialties) 25% for the shelf exam, 25% for the OSCE, and 50% for clinical evaluations.

ASSESSMENT AND EVALUATION OF THE LIC CURRICULUM AND FACULTY

For the 2015–2016 academic year, the LIC is a pilot; however, for the 8 selected students participating in this LIC, it is the required core clinical education for medical training. From these students reports, and the program's assessments of itself and the students' performance, the 2016–2017 LIC schedule and core experiences will be adjusted to better aid student learning and overall functioning of the LIC program within the affiliated healthcare systems. Over time, the LIC will be tailored to best support the Primary Care – Population Medicine students integrated degree program. In addition, the Alpert Medical School may consider offering the LIC as an optional alternative for third-year students in the traditional MD training program.

INNOVATIONS OF THE WARREN ALPERT MEDICAL SCHOOL'S LIC

Several innovations will enhance AMS students' experiences, making the LIC at Brown University unlike other programs. First, the AMS LIC is part of the four-year dual degree Primary Care – Population Medicine program. Students completing this program will 'experience' population medicine by functioning as clinical service providers while concurrently completing coursework in clinical medicine alongside didactic classes and preparation of a thesis in population medicine. Whereas most LIC students learn only about the care of individual patients, students in the AMS LIC will be exposed to the intricacies of panel and population management. Second, students will have opportunity to compare and contrast healthcare system successes. All LIC students will participate together in weekly experiences, however, each individual student will complete all clinical experiences within only one of three clinical systems (two private, non-profit and one Veterans' Affairs). This intermingling of experiences will allow AMS students and educators to comparatively view separated healthcare system responses to similar population health problems. Finally, new medical school courses specific to the PC-PM program will empower students with a) the language of population medicine science and b) practical skills in quality improvement and patient safety.

CONCLUSIONS

The LIC at AMS, and the PC-PM program are innovative models designed to train physician leaders in the core skills of medicine plus necessary contemporary skills in clinical service delivery and practice change. By exposing students to the longitudinal complexities of health care system functioning, and training them how to overcome barriers to high-quality care during the important developmental time of the third year, AMS and other LICs expect to produce physicians equipped with tools to treat individuals and populations at the highest level, improving healthcare delivery in the United States. Assessments of the students, the faculty, and the LIC program will provide valuable insights and help advance and refine this innovative medical education model.

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Integrating Population and Clinical Medicine: A New Third-Year Curriculum to Prepare Medical Students for the Care of Individuals, Panels, and Populations

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ABSTRACT

Population and Clinical Medicine (PCM) I & II constitute two of the nine courses established for the Warren Alpert Medical School of Brown University's (AMS) innovative dual-degree Primary Care-Population Medicine (PC-PM) program. The courses will run consecutively during students' third year in the program, in conjunction with the Longitudinal Integrated Clerkship (LIC). Throughout the courses, students will examine the intersection between population and clinical medicine with a focus on vulnerable populations, the social and community context of care, quality improvement, and leadership. In addition to attending class sessions in which students will engage with leaders in relevant fields, students will also draw from patient and population-level experiences in the LIC to plan and implement two projects: a community-based intervention to address a particular health issue, and a quality improvement project to change a small aspect of care delivery at a clinical site. Finally, leadership skills development sessions will be incorporated, and leadership practice will occur during implementation of student projects.

KEYWORDS: Undergraduate medical education; population medicine

INTRODUCTION

Traditionally, medical education focused on the training of physicians to take care of individual patients. The Flexner Report of 1910 established the biomedical model with basic and clinical science components as the basis for medical education in the United States: a focus on research to improve medical knowledge, combined with hands-on clinical training to gain experience in patient care, has served as the foundation for training physicians for nearly a century.[1] William Osler, too, noted that "the primary work of a professor of medicine in a medical school is in the wards, teaching his pupils how to deal with patients and their diseases." The term "clinical medicine" stems directly from these ideas, and is commonly used to refer to the "study and practice of medicine in relation to the care of patients."[2] This topic receives significant attention in medical education: interviewing and physical examination skills, building rapport with patients, developing differential diagnoses, and other important clinical skills are covered extensively not only in the final two years of medical school during clinical clerkships, but also in the first two years during courses that prepare students to interact with actual patients. However, in a rapidly evolving healthcare system, physicians must be prepared to take care of populations in addition to the individual in front of them. This may include extended families, patient panels, neighborhoods, communities, or larger populations of people.

Various terms are used to describe measures that define the care of populations rather than individuals. Population medicine, a term developed by the Institute for Healthcare Improvement (IHI), refers to healthcare services designed to care for populations of people. Specifically, population medicine aims to improve the patient experience of care (both quality and satisfaction), improve the health of populations, and reduce healthcare associated costs. These three goals together define the Triple Aim, an IHI initiative to optimize health system performance.[3] Population medicine differs from public health and population health in its focus on system design to improve outcomes (see **Table 1**).

The Primary Care-Population Medicine (PC-PM) program at the Warren Alpert Medical School of Brown University (AMS) was developed, in part, to address a deficit in training of physicians skilled in caring for populations. Care that attends to the needs of the community or population – in addition to those of the individual patient – is needed in order to improve the health of Americans, who are participants in a costly system that lags in terms of outcomes and experiences, compared to many other developed countries.[6]

Table 1. Definitions of Public Health, Population Health, and Population Medicine

Public Health	All organized measures (whether public or private) that prevent disease, promote health, and prolong life among the population as a whole[4]
Population Health	The health outcomes of a group of individuals, including the distribution of such outcomes within the group[5]
Population Medicine	The design, delivery, coordination, and payment of high-quality healthcare services to manage the Triple Aim for a population using the best resources we have available within the healthcare system[5]

However, training that includes the necessary knowledge, attitudes, and skills is sorely lacking. Physician leaders who are "trained to understand and improve the community health context of their patients"[7] should be able to more effectively address the needs of their individual patients during the traditional office visit, but also step outside of this model to understand and address the higher-level issues that result in poor health outcomes for certain groups of people. Physicians who develop programs that consider patterns of disease in their communities (for example, combating obesity by addressing the fact that some neighborhoods may lack safe walking space or be food deserts) will better impact the issues that affect the health of their individual patients. Intervening at both the individual and community levels may be part of the answer to many of the health disparities that plague our country, based as they are in systemic issues rather than individual ones. By practicing clinical and population medicine as two parallel processes that use different models to address health issues (see **Table 2**), physicians may most effectively meet the needs of their patients. This article describes the population and clinical medicine courses that make up two of the nine Master of Science in Population Medicine courses in the PC-PM program, and specifically address the integration of these two levels of care.

Table 2. Key Characteristics of Clinical and Population Medicine

Clinical Medicine	Population Medicine
One physician/team; one patient	One physician/team; one or more populations
History and physical	Patterns of diseases
Treatment plan individualized by patient	Programs "treat" groups
Monitor using symptoms, labs, etc	Monitor using population level data

WHY SHOULD POPULATION MEDICINE CONTENT BE TAUGHT IN MEDICAL SCHOOL?

As noted previously, traditional medical school training prepares students well for the practice of medicine. However, the principles of population health and systems improvement are less consistently integrated. The AAMC's Medical School Objectives Project (MSOP) issued a report in 1998 which recognized population health to be one of two key areas where a growing need for physician education existed. The report noted that "in the future, physicians will be expected to be more committed to using systematic approaches for promoting and maintaining the health of both individuals and the populations of which those individuals are members" and called for the "population health perspective" to be included in medical training.[8] For the physician workforce to be prepared to do so, these principles must be introduced *during medical training* and *in conjunction with clinical care.* Specific public health competencies for training physicians have now been established, and should be incorporated into medical student education and evaluation.[9,10] As noted in the MSOP report, students must also be prepared to be leaders beyond the walls of their individual practices, at the community, national, and global levels. While a number of training institutions have begun to incorporate innovative experiences into medical school,[11] there continue to be strong calls for more widespread adoption of these ideas.[12,13]

POPULATION AND CLINICAL MEDICINE COURSE OVERVIEW

As such, two of the nine courses in the master's degree program contained in the PC-PM program at AMS (Population and Clinical Medicine (PCM) I and II) will focus on the integration of population and clinical medicine, with the goal of preparing future physicians to excel in both areas. Given the importance of population-level interventions for impacting the health of vulnerable and underserved patients, the course will pay specific attention to these populations (see **Table 3**), as well as to creative measures by which our system may better care for those groups (see **Table 4**). Small group sessions on these population- and system-based topics will all be facilitated by experts in the relevant field and augmented by relevant required readings.[14] We will address particular conditions that can lead to populations receiving inadequate care; the skills and approaches that can improve care for these groups, and the practical skills required for physicians to manage both individual and population level issues. Additionally, the course contains five case-based sessions, also used for students in the Family Medicine clerkship of the traditional program, which follow a family's interaction with the medical system for various health-related problems.[15] As with the course as a whole, these cases combine principles of caring for vulnerable individuals with specific medical problems such as diabetes, with population-level interventions such as the patient-centered medical home that address the same issue at a higher level.

Table 3. Population Based Topics in the Population and Clinical Medicine Course

Incarceration	Adolescent and Elderly Patients
Homelessness	Lesbian, Gay, Bisexual, Transgender Patients
Race	Patients with chronic pain
Immigrant Health Issues	Patients with substance abuse

Table 4. Systems Based Topics in the Population and Clinical Medicine Course

Group Visits	Behavior Change
Advocacy	Leadership
Quality Improvement	Patient-Centered Medical Home

Importantly, the PCM courses will run during the third year of medical training in conjunction with the Longitudinal Integrated Clerkship (LIC), described elsewhere in this issue of the *Rhode Island Medical Journal*. During the LIC, students will be developing longitudinal relationships not only with their patients and preceptors, but also with their communities. More so than during the two- to six-week time periods that third-year clerkship students typically spend at one site, PC-PM students will gain perspective on the health of the communities that their practices serve, and will be able to identify deficiencies in the system where improvements can be made to better the health of their patients. Students will draw from their experiences in the LIC to propose and implement quality improvement and community-based projects for the PCM courses; equally, they will gain perspective on individual, panel, and population level care during the courses, and use this insight to enhance their clinical experiences.

LONGITUDINAL COMPONENTS

In addition to the sessions focusing on specific populations or systems approaches to care, the course will contain three components that are integrated longitudinally throughout the year.

The Social and Community Context of Care (SACC): Education that improves future physicians' abilities to care for patients with backgrounds different from their own may reduce the health disparities seen in the United States: for example, physicians who better understand the sociocultural factors that impact their patients' health should be better able to provide appropriate, culturally competent, patient-centered care.[16] In the standard Family Medicine clerkship, all students are required to consider the social and community context of a particular health issue affecting the population served by their clinical site, and propose a theoretical intervention to address that issue. As described previously,[17] students first explore the communities surrounding their individual preceptor sites to investigate key resources such as service organizations. Students also use internet resources to understand the demographics and health statistics relevant to that community and to further understand the chosen health issue. They conduct a literature review to inform their intervention design, and compile information about the status, content and quality of existing community resources related to their target health problem. Students next conduct key informant interviews with patients/caregivers affected by the health problem and with non-physician community-based individuals who can provide them with information about the problem from differing perspectives. Finally, students propose a feasible, community-based intervention that is relevant to the needs and resources of their community, is informed by their key-informant interviews, and is targeted to the particular social and community context. During PCM I, students will be responsible for going through these same steps and proposing an intervention to address their chosen health issue; during PCM II, they will actually implement their intervention and report on that experience at the end of the course.

Quality Improvement: Quality improvement (QI), which consists of "systematic and continuous actions that lead to measurable improvement in healthcare services and the health status of targeted patient groups,"[18] is of critical importance for the future of our entire healthcare system, as well as for individual practices and smaller systems. To improve the care of both individual patients as well as populations, physicians, practices, and systems must be able to effectively monitor their own performance and quickly make changes to ensure that the best possible care is being provided. Interspersed throughout the two semesters of PCM, students will participate in active sessions designed to enhance their understanding of quality improvement, specifically how QI methodology can be used to affect the care of vulnerable populations. During these sessions, students will practice quality improvement through hands-on experience, become immersed in the use of data at the practitioner and practice level to inform practice processes and outcomes, and consider the model of the patient-centered medical home to impact the quality of care nationwide. As with the format of the SACC projects described above, during the first semester, students will observe their practice sites and identify an area in the clinical care of their patients in which an improvement could be made. They will then define an aim statement with measurable outcomes, collect baseline data, and identify key drivers to this process including critical team members. This information along with a proposal for a small test of change or plan-do-study-act (PDSA) cycle will be presented at the end of PCM I. During the second semester, students will act on that proposal and implement their proposed PDSA cycle to affect the quality of care for that particular issue at their site, reporting on the results at the end of the course.

Leadership: To fulfill its vision of preparing students to make societal impact through "leadership roles in healthcare on the local, state, or national level in areas ranging from primary care clinical service to research, education, and health policy,"[7] the PC-PM program places an emphasis on longitudinal leadership development. *Leadership in Healthcare*, the first formal leadership curriculum at AMS, is designed to equip students with the skills to be effective in future leadership roles. As described in the accompanying article, students will gain foundational exposure to core leadership topics during their preclinical years. The initial course includes didactics, mentorship, and an experiential "Leadership Action Project." Subsequently, the PCM course will integrate leadership concepts with a more clinical focus, allowing students to explore change leadership as it applies to their SACC and QI projects. Written assignments will require application of Kotter's framework[19] for leading change, as well as reflections on what it means to be an effective clinical leader. This model for longitudinal student

leadership training established for the PC-PM program may serve as a model for future leadership curricula and will give our students the skills they need to become the physician leaders of the future.

EVALUATION AND ASSESSMENT

Student evaluations for the course will be based upon the two projects and one writing assignment described above (SACC and QI projects; leadership paper) as well as participation in small group sessions. Assessment of the course will be ongoing via student feedback to the course directors (verbal and written) as well as, in the future, via more robust evaluation of educational and clinical outcomes.

CONCLUSIONS

It is imperative that students are trained to become facile in managing the health of patient panels, communities, and populations as well as excellent clinical physicians for individual patients. The PCM courses, as an integral piece of the overall PC-PM program, will help students learn to take care of their patients as well as the communities from which they come. As future leaders in our healthcare system, this training in integrated clinical and population medicine will serve them well as they seek to redefine the ways in which we care for all patients, especially those from vulnerable and underserved populations.

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Leadership in Undergraduate Medical Education: Training Future Physician Leaders

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ABSTRACT

To confront the challenges facing modern health care, experts and organizations are calling for an increase in physician leadership capabilities. In response to this need, physician leadership programs are proliferating, targeting all levels of experience at all levels of training. Many academic medical centers, major universities, and specialty societies now sponsor physician leadership training programs. To meet this need, The Warren Alpert Medical School of Brown University, as part of its Primary Care-Population Medicine (PC-PM) Program, designed a four-year integrated curriculum, *Leadership in Health Care,* to engage with leadership topics starting early in the preclinical stages of training. This paper describes the design and implementation of this leadership curriculum for PC-PM students.

KEYWORDS: Physician Leadership Programs; Training Future Physicians

THE PHYSICIAN LEADERSHIP IMPERATIVE

To confront the challenges facing modern health care, experts and organizations are calling for an increase in physician leadership capabilities.[1,2,3] The Institute of Medicine describes a need to "develop leaders at all levels who can manage the organizational and systems changes necessary to improve health..."[4] The Association of American Medical Colleges (AAMC) calls for "new roles for physician leaders" and a "focus on organizational leadership in a new era of health care."[5] In graduate medical education, the requirement to develop physician leaders is explicit. The Accreditation Council for Graduate Medical Education's (ACGME) requires residents to demonstrate the ability to "work effectively as a member or leader of a health care team or other professional group."[6] Finally, the Royal College of Physicians and Surgeons of Canada's CanMEDS physician competency framework includes "Manager" as one of the essential roles of physicians.[7]

In response to this need, physician leadership programs are proliferating, targeting all levels of experience at all levels of training. Many academic medical centers, major universities, and specialty societies now sponsor physician leadership training programs.[8,9] In the United Kingdom, the National Health Service (NHS) established a Healthcare Leadership Model and development program for all health care providers.[10] At the same time, leadership has become an essential competency for medical students. Among the expected behaviors of medical school graduates, as described by the AAMC, is the ability to "provide leadership skills that enhance team functioning, the learning environment, and/or the health care delivery system."[11]

Despite this changing paradigm and evidence that leadership training should begin in undergraduate medical education (UME) and continue throughout training,[12,13,14] many schools lack formal leadership curricula. This may reflect time constraints in the existing curriculum, limited resources, beliefs that leadership cannot be taught, a lack of consensus about the content in leadership courses, or a host of other factors. Recent developments indicate progress toward addressing the need for student leadership training imperative. For example, the American Medical Association's Accelerating Change in Medical Education consortium (AMA-ACE) includes schools with proposals focused on student leadership development such as the Brody School of Medicine at East Carolina University.[15] In addition, a new special interest group, the Leadership and Innovation in Medical Education (LIME) was formed through the Association of American Medical Colleges (AAMC) with the vision of creating longitudinal, integrated leadership development programs for students. These initiatives will undoubtedly yield more formal, evidence-based training to prepare students as health care leaders.

The Alpert Medical School of Brown University (AMS) was chosen as one of the AMA-ACE schools for its new Primary Care – Population Medicine (PC-PM) program (see George et al in this issue for further details). We describe the ambitious leadership education effort that is one of the central elements of this new effort.

LEADERSHIP EDUCATION AT THE WARREN ALPERT MEDICAL SCHOOL OF BROWN UNIVERSITY

This fall, the first cohort of up to 24 students will enroll in the Primary Care-Population Medicine (PC-PM) program. This unique program allows medical students to earn a Master of Science in Population Medicine (ScM) in addition to their Doctorate of Medicine (MD), through a course of study

that includes research methods, population science, and leadership.

A special four-year integrated course, *Leadership in Health Care,* was designed for PC-PM students to engage with leadership topics starting early in the preclinical stages of training. The course required careful planning and preparation, owing to the challenges of tackling a complex and multifaceted topic that would need to be both relevant and engaging to UME students. The most immediate philosophical question to consider was whether leadership can be taught at all. Is leadership innate, trait-based, or acquired only through experience? If an educational construct does apply, what leadership models should inform the curriculum? What are the program's goals, and what are the most effective learning experiences to achieve them? What specific knowledge, skills, and attributes should be emphasized? What outcomes should be measured to indicate program effectiveness? Answering these questions has been a process, resulting in a longitudinal, integrated curriculum on leadership.

INFLUENTIAL THEORIES AND GUIDING PRINCIPLES

We designed the *Leadership in Health Care* course based on multiple needs assessments, interviews with physician leaders, and consideration of a wide range of leadership theories that are relevant to health care and appropriate to student curriculum. This course is influenced by three major leadership theories: transformational, situational, and servant leadership. Each has features that align with expressed beliefs about physician leadership. The theory of transformational leadership contends that leaders stimulate others to transcend their own self-interest to reach higher-order goals or visions.[16] This approach emphasizes motivating others by raising awareness of idealized goals, and is achieved through role modeling. Servant leadership theory posits that a leader's influence derives from serving the needs of others. Characteristic behaviors of servant leaders include listening, empathizing, accepting stewardship, and actively developing other's potential.[17] In situational leadership theory, effective leadership depends on selecting the right leadership style contingent on the followers or group context. Situational leaders shift flexibly among four behaviors: directing, coaching, supporting and delegating in response to follower readiness.[18] As with all forms of leadership, effective physician leadership likely requires the right combination of personality traits, modifiable behaviors, and context.

While it may seem peripheral to curriculum development, exploring leadership theories and how they relate to the professional role of the physician was an essential step early in the process. Clarifying personal beliefs and assumptions about physician leadership helped articulate the program's guiding principles as well as subsequent goals, objectives, and competencies for the *Leadership in Health Care* course (**Tables 1 and 2**).

DETERMINING COMPETENCIES

While there is growing emphasis on leadership education, there is no consensus on what defines effective physician leadership, nor is there much in the literature about best practices to guide curriculum planning. As a result, medical school leadership curricula vary widely in the competencies they emphasize and their methods of delivery.[19] For example,

Table 1. Guiding Principles for Leadership in Health Care

Leadership is both an essential aspect of the physician identity and a professional responsibility
Leadership is a developmental process, best learned through practical application and experience
Leadership in health care should emphasize teamwork and a service orientation
Leadership training should be competency-based and informed by evidence

Table 2. Leadership in Health Care Course Objectives

At the completion of the course, participants will:
Identify as a physician leader, with the self-awareness to articulate what makes them a leader, in what context, and to what end.
Identify their personal leadership style, strengths, and weaknesses
Explain the definitions and prevailing theories of leadership
Demonstrate core physician leadership attributes including personal integrity, emotional intelligence, patient-centeredness, and selflessness
Apply leadership knowledge to improve team dynamics and effectiveness
Demonstrate effective verbal and nonverbal communication skills to persuade, motivate, influence, and inform followers
Demonstrate critical thinking skills and an understanding of quality improvement principles
Demonstrate the ability to apply leadership skills to a change initiative (the Leadership Action Project)

some curricula stress quality improvement, while others emphasize clinical or academic leadership development.

Most contemporary leadership models are organized by broad domains divided into competencies that describe the specific knowledge, skills, or attitudes desired of learners. One example is the National Center for Healthcare Leadership's (NCHL) Health Leadership Competency Model. Its three domains – transformation, execution, and people – are further defined by twenty-six leadership competencies such as analytical thinking, project management, and interpersonal understanding.[20] The United Kingdom's Healthcare Leadership Model includes nine dimensions (or domains), with detailed descriptions of leadership competencies within each dimension.[21] The Medical Leadership Competency Framework (MLCF), also developed by the NHS, describes five domains: setting direction, demonstrating personal qualities, working with others, managing services, and improving services. Within each MLCF domain are four competencies for leadership directed toward undergraduate medical students.[22] In defining the requisite skills and competencies for *Leadership In Health Care*, we drew on components of these established models. We also mapped leadership to AMS' Nine Abilities – the core competencies that define Alpert Medical School's overall curriculum.

Leadership in Health Care is also based on evidence from the few studies that have examined physician-specific leadership competencies. One study examined physician beliefs regarding nine leadership competencies and determined that interpersonal and communication skills, professional ethics and responsibility, and continuous learning and improvement were the most important.[23] Taylor asked aspiring and established physician leaders about the knowledge, skills and attitudes they believed were fundamental to being a successful physician leader. Participants consistently described the importance of emotional intelligence and vision.[24] Another study examined faculty, medical student, and administrator attitudes regarding the competencies necessary for a UME leadership curriculum and found that communication, ethics, and conflict resolution were the most highly rated.[25] The *Leadership in Health Care* course aligned with known leadership models and evidence, but also considered the specific needs of our students. In a 2014 needs assessment survey, AMS students rated emotional intelligence, communication, and teamwork as the most important competencies to include in the leadership curriculum.

CORE TOPICS AND TEACHING METHODS

Each *Leadership in Health Care* session will focus on one core topic using techniques that address the

Table 3. *Leadership in Health Care* core sessions

Understanding leadership theory and competencies
Becoming a change agent
Leading with personal integrity
Communicating effectively
Speaking persuasively
Managing conflict and negotiating
Exerting influence within health care organizations
Creating and sharing a vision
Developing others
Networking and advocacy
Managing crises: high stakes clinical teamwork
Risk-taking and creativity
Enhancing your EQ: emotionally intelligent leadership
Developing life-long leadership habits

Table 4. An example core session

Session 3
Leading with Personal Integrity

Topics
- Defining and cultivating integrity
- Servant leadership
- Ethical decision-making
- Personal accountability

Goals and Objectives
- Understand how deeply help personal values inform leadership behaviors
- Describe the characteristics of authentic leadership
- Reflect on the relationship between ethics, service and leadership effectiveness
- Explain the components of trust; how it is developed and manifested
- Describe methods for identifying personal core values

Reading/Preparation
- Excerpts from: *"Five Days at Memorial: Life and Death in a Storm-Ravaged Hospital." By: Sheri Fink*
- Collins J. Level 5 Leadership. Harvard Business Review. January 2001
- Leadership integrity case vignettes 1&2; prepared written responses to vignettes DUE this session

Additional Optional Resources
- George B, Sims P, McLean AN and Mayer D. Discovering Your Authentic Leadership. Harvard Business Review. February 2007
- Souba WW. The Being of Leadership. Philosophy, Ethics, and Humanities in Medicine. 2011; 6:5

Class Activities
- Personal core values exercise
- Guided discussion of "Five Days" case summary
- Screening and discussion of: Escape Fire: *The Fight to Rescue American Health Care*; Chapters 6&7
- Integrity case discussion facilitated by expert panel

needs of adult learners (**Table 3**). Sessions are designed to be goal-oriented, related to prior experiences, practical, and interactive. Teaching methods are intended to encourage action, teamwork, and higher-order thinking skills using a variety of techniques. Examples include: cooperative learning activities, demonstrations, debates, expert panels, simulations, public speaking, negotiation exercises, design challenges, case analysis, and reflective writing. **Table 4** describes an example session. The course will run over a period of eight months in the 2nd year of medical school, with curriculum also embedded in the 3rd and 4th years.

EXPERIENTIAL LEARNING

Many leadership programs are centered on the transfer of conceptual knowledge; they teach theory and principles in a traditional lecture format. Like the acquisition of clinical skills that occurs during residency, however, developing as a leader is a process that requires learning new behaviors and skills through experience. It requires experimentation, application, and deliberate practice.

A critical component of *Leadership in Health Care* is the leadership action project (LAP), an experiential learning activity that allows students to apply lessons learned in class to their leadership development. The LAP is a longitudinal, team activity completed over the course of the semester. Teams will focus on an issue or concern related to medicine, and take the required steps to lead change. Projects may arise from clinical, educational, or research experiences. Mentored learning teams will meet regularly to develop the project and prepare briefs at critical junctures – framing the problem, generating and deciding on solutions, communicating with stakeholders, selecting implementation strategies, and preparing a timeline. At the completion of the process, teams will prepare a report and present to a panel of experts and health care leaders as a final project.

FUTURE DIRECTIONS

It is exciting to report on progress towards a formal leadership curriculum at AMS that addresses a well-recognized educational gap. Although it is still in its infancy, *Leadership in Health Care* has been designed with the complementary experiences that predict a successful leadership program: classroom didactics, faculty mentorship, and experiential learning. As the program matures, we hope to measure its outcomes in terms of individual leadership ability, organizational benefit, and societal impact. Developing appropriate measurement tools for these outcomes is the next challenge.

CONCLUSION

If the four years of medical school are the ideal time to introduce integrated physician leadership competencies, then AMS' new Primary Care-Population Medicine program may be the ideal setting. With its mission to *"educate a new type of physician through a course of study that emphasizes teamwork and leadership,"* the program has already attracted students with impressive leadership capacity. *Leadership in Health Care* promises to strengthen their leadership foundations and prepare them to confront the many challenges ahead. If successful, this leadership course may provide a generalizable model for leadership training at AMS (for all students) and US medical schools in the future.

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Leclercia Adecarboxylata Infection in an Immunocompetent Child

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ABSTRACT

Leclercia adecarboxylata is a motile Gram negative rod that is not often pathogenic in immunocompetent patients. We will present the first case report of a *L. adecarboxylata* in a pediatric patient with no systemic medical disease and present a detailed literature review.

KEYWORDS: *Leclercia adecarboxylata*, *L. adecarboxylata*, Pediatric infection, Rare bacteria

INTRODUCTION

Leclercia adecarboxylata is a motile Gram negative rod that is rarely pathogenic, especially in immunocompetent patients. We present the first case report of a *L. adecarboxylata* in pediatric patient with no systemic medical disease. The bacterium was discovered in 1962 by Leclerc but was originally called Escherichia adecarboxylata.[1] Additional, biochemical assessments showed it was a distinct genus, therefore it was renamed *Leclercia adecarboxylata* in honor of Leclerc.[2] Due to the similarity with Escherichia species, *L. adecarboxylata* infections may be more common than the literature suggests because until recently bacterial assays often could not distinguish the different bacteria. Additionally, *L. adecarboxylata* tends to be pan-sensitive to standard antibiotics, empiric therapy would likely treat most infections so definitive speciation is not necessary.[3]

CASE REPORT

A healthy two-year-old boy presented with increasing right thumb swelling and pain after suffering a laceration over the base of his thumb two days prior. The mother reported that the laceration initially appeared as a paper cut that she cleaned with soap and water before applying bacitracin ointment to the wound. The next day his thumb became swollen and painful, and he refused to use his hand. He was evaluated by his primary care doctor who prescribed amoxicillin/clavulanic acid. The following day purulent fluid drained from the wound and the patient was brought to a pediatric emergency department. On examination, the patient was afebrile and vital signs were normal. He had swelling and localized erythema about the thenar eminence that was exquisitely tender to palpation. There was an approximately one centimeter healing laceration over the ulnar base of the thumb with expressible purulence. He was otherwise neurovascularly intact. Hand radiographs showed soft tissue swelling of the volar aspect of the thumb and no evidence of a foreign body. Ultrasound evaluation of the thumb revealed an echogenic, approximately 8 mm, foreign body and significant inflammatory changes but no discrete abscess. In the emergency department, the patient was given intranasal versed and local anesthetic and a bedside incision and drainage was performed. Pus was sent for gram stain and culture. A decision was made not to perform an exploration of the wound in the emergency department for the foreign body given the proximity of the foreign body to neurovascular structures. The wound was left open to drain and placed in a soft dressing.

The patient was admitted and started on intravenous ampicillin/sulbactam and hand soaks were performed, with half parts hydrogen peroxide and saline, three times daily. The patient continued to improve. His swelling and erythema subsided and he was able to use his right hand without pain. He remained afebrile throughout his hospital stay. The gram stain revealed no organisms but on the second hospital day, the cultures grew out 1+ *Leclercia adecarboxylata*, identified by a VITEK automated microbiological system (BioMérieux, Inc, Durham, NC). Additional microbiologic testing was not done to confirm this identification. Antibiotic susceptibilities was determined by microtiter (Trek Di-agnostic Systems, Cleveland, OH). The bacteria was pan-sensitive except for intermediate sensitivity for piperacillin/tazobactam.

The patient was transitioned to oral amoxicillin and given his clinical improvement a decision was made not to further explore for the foreign body in the operating room and to allow the body to naturally expel the foreign body. The patient was discharged on hospital day three, on oral amoxicillin and hand soaks three times daily. As an outpatient he failed conservative management and had continued thumb swelling. A repeat ultrasound was obtained which again showed the linear 8mm foreign body. In the operating room a 1 cm Brunner type incision was made at the ulnar thumb base over the visible swelling. After dividing the skin, careful dissection identified the foreign body surrounded by a pseudocapsule. The foreign body was removed and identified as a 1 x 8 mm splinter. The wound was irrigated and closed with 5–0 plain gut suture, followed by Dermabond and a compressive dressing. The patient recovered uneventfully and he has normal function of his thumb.

DISCUSSION

This is the first case of *Leclercia adecarboxylata* infection in a pediatric patient without serious comorbidities or a central line. Pathologic infections with L. adecarboxylata are rare. There are some trends in terms of infection type and context. The bacteria is most often pathologic in patients with underlying immunosuppression or serious systemic disease.[4,5,6,7,8] There are scattered reports of it occurring in immunocompetent patients including a positive blood culture in an asymptomatic platelet donor.[9] *L. adecarboxylata* is often found as a co-infector, in particular wound infections. Central line infections are also well documented.[10,11,12,13,14,15] However, a wide range of infections have been documented including pneumonia[8,15] and pharyngeal and peritonsillar abscess.[16]

A recent PubMed search of the literature found only 7 reported cases of *L. adecarboxylata* infection in children. Most pediatric cases of *L. adecarboxylata* involve sepsis or bacteremia (See **Table 1**). Previous cases of *L. adecarboxylata* involved preterm infants in the NICU[17,18] or children with leukemia[7,19]. Other cases involved children with serious co-morbidities including a boy receiving dialysis for end-stage renal disease[11] and a child with history of gastroschisis and required total parenteral nutrition through a central line.[13] There are two reported pediatric deaths from the infection. The first from an infant born at 24 weeks of gestation who died of multiple organ failure following *L. adecarboxylata* sepsis.[17] Another case involved a 5-year-old with *L. adecarboxylata* infection that developed cerebral herniation.[20] The latter child died of *L. adecarboxylata* sepsis but it is unclear if the cerebral herniation was precipitated by disseminated intravascular coagulation or by hemorrhage of the brain stem from septic emboli.

It would be speculative to say how our patient came in contact with the bacterium. Our patient's course was relatively mild, though he did require surgical intervention despite appropriate antibiotic therapy. The presence of a foreign

Table 1. Case reports of pediatric patients with *Leclercia adecarboxylata* infections

	Age	Underlying condition	Type of infection	Treatment	Outcome
Myers et al.[18]	16-day old	Ex-26 week infant in NICU	Bacteremia	14-day course of cefotaxime	Survived
Nelson et al.[17]	31-day old	Ex-24 week infant in NICU	Bacteremia/ sepsis	21-day course of cefotaxime	Died
Otani and Bruckner[13]	8-month old	Gastroschisis/intestinal atresia (TPN dependent)	Bacteremia	14-day course of ceftazidime and gentamicin	Survived
Longhurst and West[19]	11-month old	Acute lymphoblastic leukemia	Bacteremia	10-day course of IV gentamicin and cefazolin	Survived
Fattal and Deville[11]	5-year old	End-stage renal disease	Peritonitis	10-day course of IV and peritoneal gentamicin and ceftazidime	Survived
Sethi et al.[20]	5-year old	Colonic neuropathy, pseudo-obstruction	Sepsis	Ceftriaxone and amoxicillin/ clavulanic acid	Died

Table 2. Emerging antibiotic resistance in *Leclercia adecarboxylata*

	Culture source	Country	Resistant	Susceptible
Dalamaga et al.[28]	Blood culture	Greece	Meropenem, imipenem, aztreonam, piperacillin/tazobactam, cefuroxime sodium, cefoxitin, ceftazidime, cefriaxone, cefepime, aztreonam, nitrofurantoin, ciprofloxacin, norfloxacin, fosfomycin, amikacin	Gentamicin, tobramycin, ampicillin, amoxicillin/clavulanate, cefazolin, piperacillin, trimethoprim/sulfamethoxazole
Eiland et al.[15]	Bronchial lavage from female patient with pneumonia	Alabama (United States)	Amikacin, cefazolin, levofloxacin, and piperacillin–tazobactam	Ampicillin, gentamicin, tobramycin, and trimethoprim–sulfamethoxazole
Mazzariol et al.[6]	Blood of a man with acute myeloid leukemia	Italy	Ceftazidime, cefotaxime, aztreonam, and cefepime (produced extended-spectrum beta-lactamase)	Resistance reversed with addition of clavulanic acid
Papagiannitsis et al.[27]	Hands of health care professionals	Czech Republic	Aztreonam	Cefepime, cefotaxime, ceftazidime, piperacillin, piperacillin-tazobactam and meropenem
Shin et al.[5]	Blood from catheter in female with breast cancer	Korea	Carbapenems and quinolones	Aminoglycosides (amikacin, gentamicin, tobramycin), most β-lactams, including broad spectrum cephalosporins (cefotaxime and cefixime) and trimethoprim-sulfamethoxazole

body likely served as a nidus for infection and for abscess formation. While pathologic infections with *L. adecarboxylata* are rare, the bacterium is ubiquitous. Our patient lived on a horse farm but our review of the literature found no specific connection between *L. adecarboxylata* and horses but the bacterium has been found in other farm animals such as cattle[21], hen's eggs[22] and as part of the normal gut flora in pigs.[23] *L. adecarboxylata* has been isolated from the mouths of sharks[24] and in the Colorado potato beetle.[25] It has been found as a contaminant in baby formula sold in Japan.[26]

While *L. adecarboxylata* infection is still very rare, it should be considered as a potential human pathogen of concern, as there are reports of antibiotic resistance (see **Table 2**). *Mazzariol et al* found a strain that produced an extended-spectrum beta-lactamase (SHV-12) from the blood of a man with acute myeloid leukemia, which made it resistant to aztreonam, cefotaxime and ceftazidime.[6] A sample of *L. adecarboxylata* cultured from the hands of healthcare professionals in the Czech Republic found a species that was susceptible to aztreonam but resistant to several other commonly used antibiotics.[27] Other strains are resistant to multiple classes of antibiotics.[5] Multiple-drug resistant *L. adecarboxylata* pneumonia has also been reported in Alabama.[15]

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Gastric Perforation Following Nasogastric Intubation in an Elderly Male

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ABSTRACT

In order to provide appropriate and timely treatment for an acute gastrointestinal bleed, it is vital to determine the site of hemorrhage. Historical clues and exam may be insufficient to differentiate upper from lower gastrointestinal bleeds and clinicians may utilize nasogastric lavage for diagnostic clarity. Nasogastric tube placement is a common procedure in the Emergency Department and is often viewed as benign. We present a patient presenting with hematochezia that developed pneumoperitineum secondary to nasogastric tube perforation of the gastric wall and discuss the literature regarding gastric lavage in the setting of gastrointestinal bleed.

INTRODUCTION

Gastric perforation is a surgical emergency that requires prompt diagnosis and treatment. Spontaneous gastric perforations most commonly occur secondary to peptic ulcer disease, non-steroidal anti-inflammatory drugs, and gastric cancer. Iatrogenic sources of perforation include esophagogastroduodenoscopy (EGD), but are an uncommon complication. Esophogeal perforation secondary to nasogastric intubation has been described, but gastric perforation appears to be exceedingly rare.

CASE REPORT

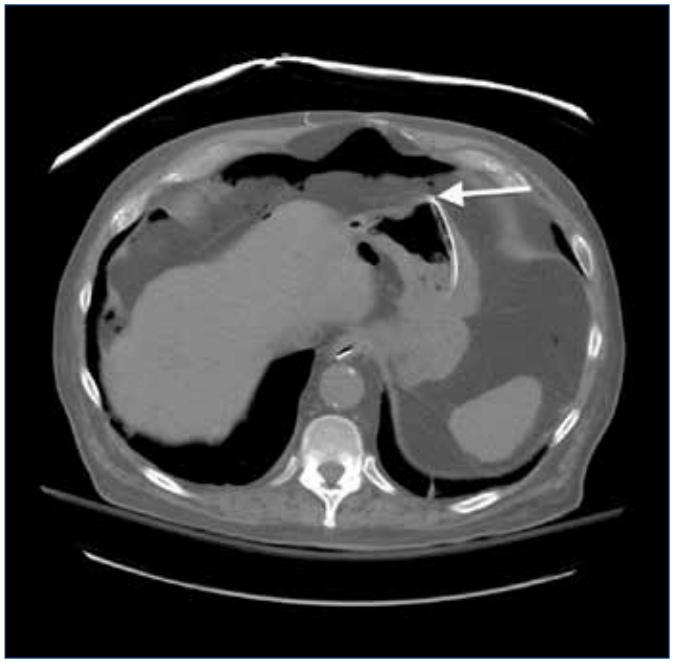
A 78-year-old male presented to the emergency department with history of several maroon-colored stools. He denied abdominal pain, nausea, and hematemesis, but did endorse symptoms consistent with orthostasis. After additional hematochezia, he became increasingly tachycardic and hypotensive requiring packed red blood cell transfusion. Gastroenterology and surgery were consulted.

Given the patient's history of peptic ulcer disease, surgical consultants opted to perform a nasogastric intubation for gastric lavage to rule out a brisk upper gastrointestinal bleed, as this would have been an indication for emergent operative management. Five hundred milliliters of saline were injected into the nasogastric tube and clear effluent was aspirated from the stomach.

Subsequently, a computed tomography (CT) scan with contrast of the abdomen and pelvis was obtained and showed large amounts of free air within the peritoneum. Reconstructions of the gastric portion of the CT were performed displaying the tip of the nasogastric tube piercing the gastric wall with air tracking through the muscular layer of the stomach (**Figure 1**). The patient was taken to the operating room for exploratory laparotomy and intraoperative esophagogastroduodenoscopy (EGD).

In the operating room, excision of two gastric ulcers located on the lesser and greater curvature of the stomach with primary closure was performed and EGD with gastric insufflation demonstrated no gas leak. The patient was admitted to the surgical intensive care unit and improved post-operatively, but was found to have increased pneumoperiteneum on postoperative day seven. He was brought back to the operating room and an air leak was discovered at the excision site of the anterior gastric ulcer. This site was repaired using a double layer technique. Despite clinical improvement post-operatively, the patient developed pneumonia resulting in increasing respiratory distress requiring intubation. A family meeting was held resulting in the decision to make the patient comfort measures only and the patient died 32 days after admission.

Figure 1. Axial CT image demonstrating perforation of the gastric wall by nasogastric tube (arrow) and associated pneumoperitoneum.



DISCUSSION

The differentiation of an upper gastrointestinal bleed (UGIB) versus lower gastrointestinal bleed (LGIB) presents a difficult clinical scenario. Historical clues such as hematemesis can be helpful, but many UGIBs, especially those originating from a post-pyloric location, may not present with hematemesis. In addition, other historical clues, such as melena and hematochezia, can be difficult for patients to describe accurately.[1] To further complicate the issue, a brisk UGIB may present with massive hematochezia.[1]

One method that has been described to differentiate LGIB and UGIB is nasogastric lavage.[2] Aspiration of gastric contents after lavage and discerning acute blood or clots, indicating UGIB, from clear or bilious aspirate, suggesting a LGIB, is the most common technique. Despite its use, current literature does not support its reliability in distiguishing between UGIB and LGIB. In a recent study by Huang et al., nasogastric lavage was found to reduce time to upper endoscopy, but was not associated with decreased mortality, length of hospital stay, or units of blood transfused.[3] In response to this study, there has been a movement to discontinue the use of nasogastric lavage in UGIB.[4]

Although it is often viewed as a benign procedure, nasogastric tube placement is associated with multiple adverse complications.[5] Esophageal perforation is well documented.[6,7,1,8,9,10,12] Gastric perforation has been described in patients with prior gastric surgery and with baseline connective tissue disease; this patient had neither.[13,14] While this patient had two risk factors for spontaneous gastric perforation – peptic ulcer disease and chronic corticosteroid use – it is not known if these factors increase susceptibility to perforation from nasogastric tube placement.[3,15] Despite its theoretical clinical utility, the use of nasogastric lavage to differentiate UGIB from LGIB may not be appropriate as it puts patients at unnecessary risk for serious complication. In addition, when one performs nasogastric intubation for any indication, a review of risk factors for gastric perforation, along with risks and benefits, should be addressed before performing the procedure.

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Travel Associated Cases of Chikungunya Fever, Rhode Island, 2014

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Large outbreaks of chikungunya fever can occur when chikungunya virus (CHIKV) is introduced into a susceptible population where the appropriate vectors are present (1). It has been long known that many countries located within the Carribean have conditions appropriate to support a CHIKV outbreak (2). On December 7, 2013, the World Health Organization reported the first local autochthonous transmission of CHIKV in the Americas. Subsequently, on December 13, 2013, the CDC released a health advisory instructing U.S. public health officials and clinicians how to recognize, manage and report CHIKV infections in travelers returning from the Caribbean. By the end of 2014, the America's had over 1.1 million cases of chikungunya fever (3).

Chikungunya fever is characterized by an acute onset of fever (typically > 102°F) and polyarthralgia. Other common symptoms may include myalgia, headache, arthritis, conjunctivitis, nausea/vomiting and a macropapular rash. Acute symptoms usually resolve in 7–10 days, but joint pains and other symptoms may persist for months to years in some individuals (4). Rare complications have been documented (5).

CHIKV is an Alphavirus that is transmitted to humans by infected Aedes aegypti and Aedes albopictus mosquitoes. Humans and other primates serve as the main amplification reservoir. Individuals infected with CHIKV are viremic from the day of symptom onset up to seven days post onset, after which the virus becomes undetectable by RT-PCR (6). Once exposed to the virus, most individuals exhibit symptoms and only 3% to 28% remaining asymptomatic. The incubation period is typically 3–7 days (range, 1–12 days) (4). The human immunogenic response to CHIKV is rapid with IgM detectable as early as four days after illness onset and IgG detectable a day later on the fifth day (6).

METHODS

Rhode Island's initial suspect cases of chikungunya fever were reported to the Rhode Island Department of Health (RI DOH) by physicians who determined that an individual's clinical features and past travel history were consistent with the possibility of infection with CHIKV. Upon initial report, RI DOH investigators interviewed the reporting physician and/or suspect case by utilizing RI DOH's Arboviral Case Reporting Form. The interview ensured that suspected cases met the appropriate criteria for specimen submission to the CDC's Division of Vector-Borne Diseases Arboviral Testing Laboratory. If deemed appropriate, specimens from suspected cases were initially submitted to the RI DOH Laboratory which subsequently submitted them for testing at the CDC. On June 13, 2014, RI DOH issued a press release stating that two travel-associated chikungunya fever cases were confirmed in Rhode Island. A RI DOH Provider Advisory requesting that physicians report suspected cases of chikungunya fever to the Center for Acute Infectious Disease Epidemiology was also issued.

Cases were defined as confirmed or probable by utilizing the 2014 provisional CDC chikungunya case definition. Confirmed cases had to have a history of fever or chills as reported by the patient or healthcare provider and either the presence of virus-specific IgM antibodies in serum with confirmatory neutralizing antibodies or the presence of nucleic acid in blood. Probable cases had to have the same clinical features, but only required virus-specific IgM antibodies in serum with no other testing. Although not part of the 2014 provisional CDC chikungunya case definition, history of travel to a country where CHIKV was circulating was a key component for providers to identify individuals who may have been infected. Probable and confirmed cases were entered into Rhode Island's disease reporting database (National Electronic Disease Surveillance System).

Once CHIKV infections were confirmed in Rhode Island, physicians were encouraged to submit specimens from suspected cases directly to reference laboratories without having to initially report them to RI DOH. A RI DOH Provider Advisory was released on July 15, 2014 to instruct providers of this change, as well as how to report cases going forward. Positive CHIKV test results were faxed to RI DOH by laboratories and these cases were subsequently interviewed by RI DOH investigators. If the cases could not be located, medical records were requested from their providers.

The CDC recommended testing for dengue in individuals suspected of and tested for chikungunya fever. This was due to a number of reasons: both viruses are transmitted by the same mosquitos, both diseases have similar clinical features, and the viruses can circulate in the same area and cause co-infections. Therefore, it is important to rule out dengue, as proper clinical management for dengue can improve outcomes.

RESULTS

HEALTH confirmed its first two cases of chikungunya fever on June 13, 2014 in individuals who had traveled to the Dominican Republic. The onset of illness for both cases began while they were in the Dominican Republic and neither sought medical care until after returning to Rhode Island. Once in Rhode Island, both cases presented with fever, arthralgia and myalgia.

Overall, from June 13, 2014 through December 31, 2014, 54 cases of chikungunya fever were reported to RI DOH. A majority of cases were Hispanic, 40-59 years of age, female, resided in Providence County, and had traveled to the Dominican Republic. Although a high proportion of cases spent 5 – 15 days in the country they were visiting (22 cases, 41%), a significant number stayed in the country they were visiting for 16 – 30 days (14 cases, 26%), or greater than 30 days (12 cases, 22%). (See **Table 1**)

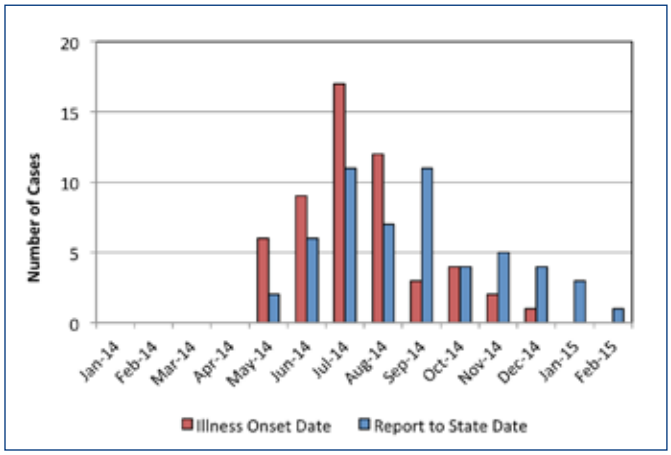
All 54 cases (100%) reported having arthralgia. This was followed by myalgia in 45 cases (83%), fever in 44 cases (81%), asthenia in 39 cases (72%) and the presence of a rash in 35 cases (66%). Other reported symptoms included stiff neck in 19 cases (35%), altered mental status in 10 cases (19%), headache in 6 cases (11%), seizures in 1 case (2%) and Acute Flaccid Paralysis in 1 case (2%). Three cases (6%) were admitted to a hospital. A majority of cases had their illness begin after returning to Rhode Island (22 cases, 41%). A significant number of other individuals had an illness onset within 7 days of returning to Rhode Island (10 cases, 19%) or on the day of their return to Rhode Island (6 cases, 11%). Combined, these three categories contain individuals who may have been viremic at some point upon their return to Rhode Island (38 cases, 70%). Three cases were co-infected with dengue. (**See Table 1**)

An average delay of 31 days (range 0–188 days) from illness onset to specimen collection was noted. Although some of this lag could be due to individuals waiting to return to Rhode Island before seeking medical care, further analysis of cases with an illness onset on the day of return to Rhode Island or soon after showed a delay of 24 days (range 1–157 days) from illness onset to specimen collection date. Overall, 27 (50%) cases had specimens collected more than 20 days after illness onset. An additional factor contributing to the delay in reporting cases was introduced after July 15 when RI DOH advised providers to submit CHIKV specimens directly to reference laboratories without the need to report suspect cases to RI DOH. After this point in time, there was an average delay of 15 days (range 5 to 51 days) from when specimens were collected to when positive test results were reported to RI DOH from the reference laboratory. (**See Figure 1**)

Table 1. Characteristics of Chikungunya Fever Cases Reported in Rhode Island, 2014

Characteristic	Number of Cases	Percent of Cases
Age (Years)		
0-19	7	13
20-39	12	22
40-59	23	43
>= 60	12	22
Race/Ethnicity		
Hispanic	47	87
White/Non-hispaninc	5	9
Black/Non-Hispanic	1	2
Unknown	1	2
Sex		
Female	35	65
Male	19	35
County of Residence		
Providence County	52	96
Washington County	2	4
Country where CHIKV Infection Acquired		
Dominican Republic	39	72
Puerto Rico	11	20
Haiti	3	6
Colombia	1	2
Illness onset related to return to Rhode Island		
> 7 days before return to R.I.	14	26
<= 7 days before return to R.I.	10	19
On day of return to R.I.	6	11
After return to R.I.	22	41
Unknown	2	4
Illness onset related to specimen collection		
<= 7 after illness onset	14	26
8 – 20 days after illness onset	13	24
>20 days after illness onset	27	50
Length of Time Spent in Country Visited		
5 – 15 days	22	41
16 – 30 days	14	26
> 30 days	12	22
Unknown	6	11
Co-Infected with Dengue	**3**	**6%**

Figure 1. Comparison of the illness onset month of Rhode Island's chikungunya fever cases versus the month the cases were reported to RI DOH for subsequent investigation.



Of the 48 cases that had mosquito exposure history captured within Rhode Island's disease reporting database, 88% had been to at least one high-risk location in the country they had visited. Of the 51 cases interviewed, 65% remember being bitten by a mosquito while traveling abroad.

DISCUSSION

The emergence of CHIKV in the America's during 2014 had an impact on the health of Rhode Islanders who visited the Caribbean, specifically the Dominican Republic. It is not known how many of these cases will suffer from long-term sequelae, as the RI DOH surveillance system does not specifically collect this information. Although the RI DOH data cannot be used to determine how many cases had long-term sequelae, the fact that 50% of the cases sought care more than 20 days after illness onset indicates that it is more than likely that a number of individuals had ongoing issues with joint pain, arthralgia, and other symptoms after the acute phase of the disease had passed.

As mentioned previously, a majority of the Rhode Island cases were associated with travel to the Dominican Republic. The Dominican Republic confirmed their first case of chikungunya fever on April 3, 2014 (7) and a little over a month later, Rhode Island's first cases began their illness onset while still present in the Dominican Republic. According to the 2011–2013 American Community Survey 3-Year Estimates calculated by the Unites States Census Bureau, the Dominican Republic was the most common country of origin for foreign-born Rhode Islanders. Of the 138,488 individuals residing in Rhode Island who were foreign-born, 21,995 (16%) were born in the Dominical Republic (8). In addition, in the same survey, 39,949 individuals residing within Rhode Island considered themselves of Dominican descent regardless of their country of origin (9). With the large number of individuals residing in Rhode Island who were either born in the Dominican Republic or consider themselves of Dominican descent, it is likely that a large number of individuals residing in Rhode Island travel to the Dominican Republic at any one point in time and possibly for extended periods of time visiting family and friends.

Rhode Island's chikungunya fever cases provide an example of how easily the transmission of CHIKV can emerge if the appropriate vectors and conditions are present in a population. The analysis of Rhode Island's data show that as many as 70% of Rhode Island's cases could have been viremic at some point after returning to Rhode Island. If the appropriate vectors were present in Rhode Island, this 'reservoir' of infected humans could have provided ample opportunity for mosquitoes in Rhode Island to become infected with CHIKV and subsequently infect other humans whom they might feed on. Also, as described above, there were considerable delays from when a symptomatic individual sought medical care, as well as the time between specimen collection and when results were available. Only 25% of Rhode Island's cases sought medical care within 7 days of illness onset when the risk of local transmission could be mitigated by isolating viremic cases from mosquitos. This information is particularly important for geographical locations where Aedes aegypti and Aedes albopictus are abundant. The risk in Rhode Island is minimal as both species have yet to become established in the state (10), though changing climate may impact this in the decades to come as appropriate environmental conditions move northward (11).

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Rhode Island Monthly Vital Statistics Report
Provisional Occurrence Data from the Division of Vital Records

VITAL EVENTS	REPORTING PERIOD		
	MARCH 2015	12 MONTHS ENDING WITH MARCH 2015	
	Number	Number	Rates
Live Births	917	11,406	10.8*
Deaths	955	10,254	9.7*
Infant Deaths	10	58	5.1#
Neonatal Deaths	9	47	4.1#
Marriages	262	6,936	6.6*
Divorces	291	3,000	2.8*
Induced Terminations	241	2,820	247.2#
Spontaneous Fetal Deaths	49	601	52.7#
Under 20 weeks gestation	47	539	52.6#
20+ weeks gestation	2	62	5.4#

* Rates per 1,000 estimated population
# Rates per 1,000 live births

Underlying Cause of Death Category	REPORTING PERIOD			
	SEPTEMBER 2014	12 MONTHS ENDING WITH SEPTEMBER 2014		
	Number (a)	Number (a)	Rates (b)	YPLL (c)
Diseases of the Heart	177	2,322	220.5	3,141.5
Malignant Neoplasms	176	2,392	227.1	6,362.0
Cerebrovascular Disease	27	375	35.6	490.0
Injuries (Accident/Suicide/Homicide)	57	756	71.8	11,231.0
COPD	39	497	47.2	470.0

(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 1,055,173 (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.

RIMS and Coverys announce new partnership

In October 2014, the Medical Society entered into a new strategic partnership with Coverys, the 40 year-old medical liability insurance giant headquartered in Boston.

Coverys and RIMS have pledged to combine and coordinate their complementary strengths for the purpose of enhancing patient safety. The two organizations share the conviction that safety is fundamental to promoting and maintaining the kind of professional liability environment that everyone wants for Rhode Island: one that is stable and responsive to the needs of the medical profession and the public. RIMS and Coverys are uniquely positioned to support each other in this endeavor.

Key elements of the new collaboration will be peer review, risk management and continuing education. RIMS' peer review prowess is well established, particularly in the highly sensitive and all-important area of physician health. In addition, RIMS is recognized by the American Council for Continuing Medical Education (ACCME) as the agency responsible for accrediting the CME programs of all the hospitals within the state of Rhode Island. RIMS has been a consistent star nationally in earning an unbroken string of long-term recognitions from ACCME.

For its part, Coverys is one of a tiny number of medical professional insurers that have devoted the necessary and substantial resources to gaining and maintaining full accreditation by the ACCME as a source of Category 1 CME credits for physicians. RIMS regards this extraordinary commitment to CME as particularly meaningful and praiseworthy in an insurance company. Of course, medical peer review and continuing medical education, each in its own way, provide targeted risk management and serve to enhance quality and safety.

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for Better Outcomes℠

RIMS has also agreed to advise Coverys and to offer the company additional eyes and ears focused on the evolving insurance market, the medical practice environment and the medical liability climate, as each of these is affected by legislative, regulatory, judicial, economic, demographic and political developments in the Ocean State. In recognition of their strong relationship and mutual support, RIMS and Coverys will also engage in joint marketing.

Coverys is the sixth largest medical liability insurer in the nation. It protects more than 32,000 physicians, dentists and other health professionals nationally, as well as over 500 hospitals, health centers and clinics. It is rated A ("excellent") by A.M. Best. It writes over $400 million in premium, has net assets of $3.5 billion, and maintained a policyholder surplus of $1.5 billion as of the end of last year. Member companies include Medical Professional Mutual Insurance Company ("ProMutual") and the ProSelect Insurance Company.

Coverys is the dominant insurer of physicians and surgeons in Rhode Island. The Rhode Island Medical Society Insurance Brokerage Corporation (RIMS-IBC) is proud to have been appointed as an agent for Coverys three years ago. The RIMS-IBC is a full-service agency that specializes in medical professional liability.

RIMS-IBC

Robert A. Anderson, Jr, Director of the IBC, can be reached at 401-272-1050.

Working for You: RIMS advocacy activities

August 3, Monday

Meeting with Blue Cross Blue Shield of RI, Drs. Settipane, Fessler, and RIMS staff

August 3-6, Monday-Thursday

AMA Advocacy Resource Center State Legislation Meeting

August 4, Tuesday

Physician Health Committee, Herbert Rakatansky, MD, Chair

Brown Medical Student Leadership Fair

August 12, Wednesday

Board of Medical Licensure and Discipline

Department of Labor and Training Workers Compensation Fee Schedule Task Force

August 13, Thursday

Physician Health Program planning session

Rhode Island Health Center Association 50th Anniversary Celebration

August 19, Wednesday

RI Department of Health Primary Care Physician Advisory Committee

SIM State Innovation Model Steering Committee, Peter Hollmann, MD

Governor's Workgroup on Health Care Innovation

August 27, Thursday

Meeting with Executive Office of Health and Human Services (EOHHS) regarding Physician Advisory Committee

August 31, Monday

Board of Directors Meeting

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6:30pm

RIMS ANNUAL MEETING

Inauguration of Officers and Presentations

Dr. Charles L. Hill Award

Dr. Herbert Rakatansky Award

Dr. John Clarke Award

Dr. Stanley M. Aronson Award

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RHODE ISLAND MEDICAL SOCIETY

Lyme Disease Center opens at Newport Hospital

Unique multidisciplinary center dedicated entirely to treatment of Lyme disease and other tick-borne illnesses

NEWPORT – The Lifespan Lyme Disease Center at Newport Hospital recently opened. The first of its kind in the state, the center unites academic and clinical infectious diseases experts. Complementary therapies, such as cognitive behavioral therapy and physical therapy, and nutrition guidance and more is available to those who need it.

"This is a big medical problem and a big challenge, particularly in Rhode Island," said infectious diseases specialist **TIMOTHY P. FLANIGAN, MD**, medical director of the Center. "Reported cases of Lyme disease in Rhode Island alone rose fourfold over the past six years, and the rise in other tick-borne illnesses, such as babesiosis, ehrlichiosis and anaplasmosis, is almost as steep."

"Our team of infectious diseases specialists is highly experienced in treating patients with these conditions," he added, "particularly those coping with Post-treatment Lyme Disease Syndrome, sometimes called chronic Lyme disease. We collaborate with specialists in neurology, rheumatology and other fields to provide integrated, seamless care for patients with acute tick-borne illnesses, especially those who continue to struggle with symptoms after the initial infection has been treated."

To help patients achieve their own health and wellness goals, a wide range of services is available to them at the Lifespan Lyme Disease Center, including:

- Diagnosis and testing – The most current, reputable methods are used to test for and diagnose Lyme disease. Testing is also done for other rare and co-occurring tick-borne illnesses, such as babesiosis, ehrlichiosis and anaplasmosis.
- Evaluation of symptoms – The center assesses all chronic symptoms that are difficult to classify and address to rule out the involvement of Lyme disease. However, the center treats tick-borne diseases exclusively.
- Individual treatment plans – Customized treatment plans are developed for each patient based on unique needs and goals.
- Management of symptoms – As with any chronic condition, some symptoms cannot be eliminated, but their effects can be alleviated, allowing patients to feel and function better. Patients' progress and reaction to different therapies and treatments is monitored to identify the best course of care.

The center's multidisciplinary team includes physicians with expertise in infectious diseases and tick-borne illnesses; behavioral, physical and occupational therapists; and specialists in nutrition and other fields. In addition to Dr. Flanigan, the core team includes adult infectious diseases specialist **REBECCA REECE, MD**, pediatrician **JEROME LARKIN, MD**, and behavioral therapist **ANNE DAVIDGE, PhD**. Individual treatment plans, which feature evaluation and collaborative assessment over a period of six to 12 months, include:

- Appropriate antiobiotic therapy, which is carefully evaluated;
- Cognitive behavioral therapy to assist with the cognitive and emotional issues some patients experience;
- Physical therapy to build strength and resilience and alleviate muscle and joint pain;
- Nutritional consultation to review a patient's current diet and educate them about optimal dietary choices; and
- Complementary therapies, including non-traditional approaches such as yoga, acupuncture and more.

The center also uses a comprehensive team approach to Post-treatment Lyme Disease Syndrome, or chronic Lyme disease, and its impact on patients' health. According to the Centers for Disease Control and Prevention, approximately 10 to 20 percent of patients treated for Lyme disease with a recommended two- to four-week course of antibiotics will have lingering symptoms of fatigue, pain, or joint and muscle aches. In some cases, these can last for more than six months.

"There are newer tick-borne illnesses that we are just starting to discover and all of these can affect patients' lives – their ability to work and live as they wish," said Dr. Reece, a lead physician at the Lifespan Lyme Disease Center. "This is a place where patients will be cared for long term. It's not enough to tell patients that the infection has been treated. We want patients to know that we're going to work through the lingering effects to help them feel better."

"This is a wellness model," added Dr. Flanigan, "and our aim is to help patients build their immune response, their resilience, and quite simply – to feel better and get back to daily living." ❖

Kent performs first elective coronary angioplasty

A 24-hour, emergency angioplasty service will follow early in 2016

WARWICK – Kent Hospital successfully completed its first elective coronary angioplasty in August after receiving state approval earlier this year to move forward with both an elective and emergency angioplasty program.

With the addition of Kent Hospital, there are now four hospitals in the state (two in Providence and one in Woonsocket) offering the procedure.

The successful procedure was performed by interventional cardiologists, **ED THOMAS, MD**, and **ASHISH SHAH, MD**, along with a team of highly trained nurses, technicians and other clinical support staff, who have been participating in additional and intensive training both locally at Kent and at Brigham and Women's Hospital in Boston, a clinical affiliate with Care New England.

A 24-hour, emergency angioplasty service will follow early in 2016 after the completion of construction on a second cardiac catheterization lab. The catheterization lab expansion will essentially double patient capacity and will allow for the cardiac nursing and technical team to be expanded. Elective PCI when done in a high-volume setting builds a strong base for readiness and quick response to emergency PCI patients.

"Let me just say how proud I am of Kent Hospital, Drs. Thomas and Shah and the entire clinical team who performed our first angioplasty. This truly is an important day for this hospital but even more so for those who live in the vicinity of Kent and points south," said Michael Dacey, Jr., MD, Kent Hospital president and COO. "This standard-of-care procedure will result in lives saved because of decreased travel time to access this critical treatment."

Data presented to the state Department of Health during the approval process demonstrated that patients residing south of the metro Providence area (more than 300,000 Rhode Islanders) would benefit greatly from expanded access to coronary angioplasty via the new program at Kent Hospital. ❖

Women's Medicine Collaborative receives $2.7M NIH grant to study impact of sleep apnea on placental function

One-of-a-kind study will explore placental function in women with sleep apnea

PROVIDENCE –The National Institutes of Health (NIH) has awarded $2.7 million to the Women's Medicine Collaborative to study the placenta and its function to determine whether changes in the placenta are linked to sleep abnormalities.

"Sleep disturbances in pregnancy are rarely investigated," says **GHADA BOURJEILY, MD**, lead researcher and attending physician in pulmonary services and obstetric medicine, and director of research at the Women's Medicine Collaborative. "When we and others in the scientific community started identifying the various links between sleep disturbances such as snoring and short sleep duration with adverse pregnancy outcomes such as preeclampsia and gestational diabetes, we decided to start working on better understanding that link in the hope that by treating these sleep disturbances we could modify these outcomes."

As the population – both young and old – becomes more overweight, disorders such as sleep apnea, become more prevalent. As a result, disorders associated with weight problems are also becoming more widespread. Knowing that sleep disturbances are associated with adverse effects in various organs, Dr. Bourjeily and researchers decided to study the placenta and its function to figure out whether changes in the placenta are associated with sleep abnormalities.

In a separate study, Dr. Bourjeily and researchers recently discovered that sleep apnea appears to be associated with alterations in certain placenta secreted proteins. This discovery served as the springboard for this NIH-grant-funded study. Dr. Bourjeily, whose clinical and research interests center around understanding sleep disordered breathing in pregnant women, and researchers found that more than a third of pregnant women now snore.

Additionally, women who snore and have sleep apnea have an elevated risk of developing preeclampsia and gestational diabetes – just as these sleep disturbances are associated with high blood pressure and diabetes in the general population. However, sleep has some unique characteristics in pregnant women. For instance, pregnant women are more sleepy in general than non-pregnant individuals, but also appear to have some distinguishing features in some breathing parameters observed during a sleep study that set them apart from the non-pregnant population.

"We spend about a third of our lives asleep," Dr. Bourjeily says, "so sleep likely plays an important role in regulating many health processes. If we can find a link between sleep disturbances and pregnancy outcomes, it would become more important to ask questions about sleep during pregnancy. These findings will set the stage for future interventions that could, potentially, modify placental function."

The funded grant will recruit women who snore in the early weeks of pregnancy and have obesity; assess them for the presence of sleep apnea; and enroll women with sleep apnea into a trial that will test the effect of a device used for the treatment of the disorder on various markers secreted by the placenta. Women will be recruited at the Women's Medicine Collaborative and at various obstetric practices in Rhode Island. ❖

URI awarded $2.5M grant to educate health care providers, students for improved geriatric care

KINGSTON – The University of Rhode Island has been awarded a $2.5 million grant to implement a program for the state's health care workforce that will lead to higher quality care for older patients.

The Geriatrics Workforce Enhancement Program, an initiative of the U.S. Health Resources and Services Administration, is a $35-million program aimed at preparing the health care professionals for the issues associated with advancing age. The program will train and educate providers, students and patients about the integrated, interprofessional delivery of health care often needed by older adults.

URI is one of 44 universities and organizations to receive the grant and is among 14 – including Johns Hopkins University, the University of North Carolina-Chapel Hill and the University of California-Los Angeles – that received the maximum allocation of $2.5 million over three years. Other schools receiving grants include Yale University, Duke University and the University of Southern California. U.S. Department of Health and Human Service Secretary Sylvia M. Burwell announced the awards July 13 at the White House Conference on Aging.

The Rhode Island Geriatrics Workforce Enhancement Program aims to:

- Prepare health professions trainees to practice in and lead integrated geriatrics and primary care settings.
- Develop providers who can assess and address the needs of older adults and their families by integrating interprofessional geriatrics education into primary care delivery systems to provide coordinated, comprehensive, patient/family-centered health care.
- Develop and offer community-based education programs for patients, families and caregivers to improve the management of multiple chronic conditions.
- Provide Alzheimer's disease and related disorders education to health professions students, providers, patients, families and caregivers.

Rhode Island, in particular, has a clear need for investment in this type of training because it has the highest percentage of residents ages 85 and older in the nation. Geriatric patients – and their physicians – are often unaware of how the effects of aging can alter the type of care delivered to this population, according to Philip Clark, director of URI's Gerontology Program, professor of Human Development and Family Studies and director of the Rhode Island Geriatric Workforce Enhancement Program.

"The reality is, treatment for geriatric patients can be considerably different from that of other adults," Clark said. "These differences can be subtle and, without the very specific training we can provide through this program, some primary care providers may not even be aware of them."

URI, in association with a host of partners – including Care New England, Brown University, Rhode Island College, the Rhode Island chapter of the Alzheimer's Association and Healthcentric Advisors, and networks of primary care providers – worked to identify the specific geriatrics education and training needs of the state's health care workforce. Subsequently, they developed a program responsive to those needs, with the goal of providing more tailored care.

"The partnerships forged as part of this successful collaborative agreement are ones that will bring positive change and increased awareness of the need for improved, individualized, and high-quality care for older adults to the entire state," said Dr. Ana Tuya Fulton, director of geriatric medicine at Care New England.

The variety of partners and the interprofessional nature of the education program will allow for more integrated and thorough care, according to Dr. Jeffrey Borkan, chairman of the department of family medicine at Brown University's Alpert Medical School.

"This grant provides a framework for meaningful collaboration across the state that will improve the care of the elderly through the creation of interprofessional teams, integration of geriatrics into primary care, and outreach to underserved populations," Dr. Borkan said. "This partnership is a model for the future and should help train the future generation of providers."

Rhode Island, in particular, has a clear need for investment in this type of training because it has the highest percentage of residents ages 85 and older in the nation.

Clark emphasized that proper education across all health care professions, and at all levels – from patients, to students to providers – is essential to the delivery of quality health care for older patients.

"The idea is to foster a team environment, with providers – including physicians, nurses, pharmacists, social workers, and other health professionals – learning to work with each other, with students and with their patients to deliver quality health care," Clark said. "Older people are affected by chronic medical issues and have a variety of unique psychosocial needs. For example, their bodies react differently to medications than a younger adult might. Diseases can present very differently in older patients and primary care providers may not recognize the symptoms.

"Physicians are not trained in all of these areas, so we need the expertise of all those professions to meet the challenges faced by an aging population."

Alicia Curtin, director of geriatrics at Brown University's Alpert Medical School, said the grant will ensure that the next generation of health care professionals is prepared to meet the needs of these adults.

"This collaboration with the Rhode Island Geriatric Education Center at URI will strengthen our educational programs in training the next generation of health care professionals in medicine, nursing, pharmacy, nutrition, physical therapy and social work, to improve the care of older adults throughout the state of Rhode Island," Curtin said. ❖

Southcoast Health collaborating with Alpert Medical School

Medical students participating in clinical rotations

NEW BEDFORD, MASS. – Southcoast® Health recently announced a teaching collaboration with the Alpert Medical School of Brown University. Under the collaboration, Brown University medical students started participating in clinical rotations at Southcoast Health.

Third-year Brown medical students began receiving education at Southcoast sites by Southcoast employed physicians during their Core Clerkship in Pediatrics in May, and will be training in other areas, specifically Family Medicine and Obstetrics & Gynecology, in the near future. Education in the "doctoring program" for first and second year students and "clinical elective" rotations for fourth year students will be offered as well.

"Southcoast Health, with its forward thinking focus on patient-centered, integrated care and its emphasis on Population Health, offers unique educational opportunities for medical education in the New England region," said **DR. VICTOR PRICOLO**, Chair of the Department of Surgery at Southcoast, who has been appointed Director of Brown University medical education at Southcoast.

"This collaboration is a wonderful opportunity to expand the clinical experiences for our medical students and engage them in the communities served by Southcoast Health," said **DR. ALLAN TUNKEL**, Associate Dean for Medical Education at Alpert Medical School. ❖

OHIC approves commercial health insurance rates for 2016

CRANSTON – Health Insurance Commissioner **KATHLEEN C HITTNER, MD**, recently announced her final decision on commercial health insurance premiums for 2016. She approved lower rates than those requested by most health insurers. The rising cost of medical care – the prices insurers pay to providers for particular services and the number of services members use – continues to be the main driver of health insurance premium growth.

For a complete breakdown of the rates approved, click here: http://www.ohic.ri.gov/ohic-formandratereview.php

Kent Hospital Laboratory awarded College of American Pathologists accreditation

WARWICK – The College of American Pathologists (CAP) has once again awarded accreditation to the Kent Hospital laboratory and Wickford Junction laboratory based on results of a recent on-site inspection as part of the CAP's accreditation programs. This is a two-year accreditation.

Kent Hospital was advised of this national recognition and commended for the excellence of service provided. The Kent Hospital laboratory is one of more than 7,600 CAP-accredited facilities worldwide, and performs more than 1.5 million tests annually.

"We are very pleased to maintain our CAP accreditation here at Kent Hospital," said **MICHAEL DACEY**, president and COO, Kent Hospital. "The laboratory clinical leadership and dedicated staff work extremely hard to achieve the highest standards for our patients and to provide the excellence of care they deserve. Meeting and exceeding these rigorous standards is an important achievement we continually strive towards."

The U.S. federal government recognizes the CAP Laboratory Accreditation Program, begun in the early 1960s as being equal – to or more-stringent – than the government's own inspection program.

During the CAP accreditation process, designed to ensure the highest standard of care for all laboratory patients, inspectors examine the laboratory's records and quality control of procedures for the preceding two years. CAP inspectors also examine laboratory staff qualifications, equipment, facilities, safety program and record and overall management. ❖

$600K NIH training grant renewed at RIH

Funding for trauma and inflammation research training fellowship program

PROVIDENCE – The Division of Surgical Research at Rhode Island Hospital successfully renewed funding for its trauma and inflammation research training fellowship from the National Institutes of Health. The $600,000 award will support clinician-scientists studying trauma-related diseases and how the body reacts to them.

"Trauma is a leading cause of death and disability in the U.S.," said **WILLIAM CIOFFI, MD**, chairman of the department of surgery. "Because major injuries initiate a wide variety of responses within the human body, the study of traumatic injury and inflammation can advance understanding of all types of diseases and reactions outside of normal conditions. The capacity of well-trained individuals to simultaneously think as scientists and act as clinicians provides the most rapid and efficient path for the identification of new issues to investigate and to drive forth cutting-edge therapies."

"Rhode Island Hospital stands with only 17 other institutions in the U.S. that offer trauma, burn and peri-operative injury research training programs for postdoctoral candidates," said Jorge E. Albina, MD, director of the program.

"We have created an exceptional and competitive fellowship that helps the providers bridge the gap between academia to bedside medicine," said **ALFRED AYALA, PhD**, co-director. ❖

Hasbro study shows protective eyewear mandate reduces eye and orbital injuries

In high school field hockey players without increasing concussion risk

PROVIDENCE – A study conducted by researchers at Hasbro Children's Hospital, Boston Children's Hospital, Fairfax (VA) County Public Schools and the University of Colorado School of Medicine has found that nationally mandated protective eyewear results in a greater than three-fold reduced risk of eye and orbital injuries in high school (HS) girls' field hockey players without increasing rates of concussion.

The study, currently online and appearing in the September 2015 print issue of Pediatrics, examined injuries among high school field hockey players 14 to18 years of age two seasons prior (2009–10, 2010–11) and two seasons following (2011–12, 2012–13) the NFHS implementation of a national mandate requiring the use of protective eyewear for all HS field hockey players, effective during the 2011–12 season.

Researchers found that the incidence of eye and orbital injuries was significantly higher in states without mandated protective eyewear (MPE) than in states with MPE (before the 2011/12 mandate) and the post-mandate group. There was no significant difference in concussion rates for the two groups. After the 2011/12 MPE, severe eye and orbital injuries were reduced by 67 percent and severe and/or medically disqualifying head and face injuries were reduced by 70 percent.

"The results of this study support a policy change regarding mandatory protective eyewear in field hockey at all amateur levels, both in practice and competition," said **PETER KRIZ, MD**, the study's principal investigator and co-author, and sports medicine physician at Hasbro Children's Hospital. "Critics of protective eyewear in field hockey have voiced concerns that the eyewear increases concussion rates due to loss of peripheral vision and increased player-to-player contact. Our study found that concussion rates did not change as a result of the national MPE."

Dr. Kriz added, "Other youth sports such as baseball and softball are gradually adopting use of protective facemasks for batters, pitchers and infielders. Just watch how many batters in this summer's Little League World Series tournament now wear a face protector."

"Professional ice hockey has made significant strides in implementing mandated visor use over the past decade," said Dr. Kriz. "In comparison, the governing organizations for amateur field hockey remain reluctant to endorse eye protection in amateur elite field hockey. Meanwhile developmental, college and national level field hockey coaches and programs have voiced concern that MPEs will jeopardize international recruitment efforts, as no other country mandates eyewear protection, and hurt the ability of the U.S. national teams to remain competitive internationally."

"We remain hopeful that our study results will persuade the National Collegiate Athletic Association (NCAA) to mandate protective eyewear use among its student athletes," he said. "Additionally, we are hoping to close some of the loopholes which permit middle- and high-school players to participate in games, practices, camps, tournaments and showcases without protective eyewear."

Data for this study was collected from the National High School Sports-Related Injury Surveillance System, High School RIO™ (Reporting Information Online) and from Fairfax County (VA) Public Schools Athletic Training Program. The study was funded in part by Prevent Blindness America, the Centers for Disease Control and Prevention, and the National Operating Committee on Standards for Athletic Equipment. ❖

ST. JOSEPH PEDIATRIC & FAMILY DENTAL CENTER

In the front row, from the Advanced Education in Pediatric Dentistry Program, are this year's graduates: Robyn Marie Hofelich, DMD; Avani Shah Khera, DMD; Margaret Virginia Maclin, DMD; and Anna Emily Abrahamian Ross, DMD. Pictured in back from the Advanced Education in General Dentistry Program are Dave A. Patel, DMD, and Brittany D. Sloan, DDS.

St. Joseph Pediatric & Family Dental Center residency program graduates six

PROVIDENCE – On June 26, 2015, graduation ceremonies were held for six new dentists from the joint residency program between the St. Joseph Pediatric & Family Dental Center and NYU Lutheran. The program, the first and only pediatric dental residency program in Rhode Island, added adult dentistry to its list of offerings last year.

The graduation ceremony at the Providence Art Club was attended by family, friends, and colleagues from the dental center, along with administration from CharterCARE Health Partners including CEO Lester Schindel and Fatima Hospital President Thomas Hughes.

The health center services low income and immigrant children in Providence. The Center operates satellite dental centers in Pawtucket and Johnston. All three centers offer a full range of preventative and restorative dental services and school-based dental programs. The Center has received national recognition and acclaim for its high quality services. In 2014, visits to the Dental Center and its satellite offices totaled approximately 45,000.

The St. Joseph dental staff includes pediatric dentists, general dentists and other dental specialists (oral surgeons, orthodontists) serving children, adults and patients of all ages with special health care needs and complex medical conditions. In partnership with NYU Lutheran, St. Joseph provides educational programs for dentists seeking advanced training in general dentistry or as pediatric dental specialists. ❖

Recognition

Dr. N. Joseph Espat recognized 'Top Cancer Doctor' by Newsweek

PROVIDENCE – **N. JOSEPH ESPAT, MD, MS, FACS**, Director of the Cancer Center at Roger Williams Medical Center, has been named one of the top cancer physicians in the United States in Newsweek's "Top Cancer Doctors 2015" list.

Newsweek, in conjunction with Castle Connolly Medical LTD, published the list of the "Top Cancer Doctors 2015" in a special cancer issue on July 23. Castle Connolly received nearly 100,000 peer nominations, from which 2,600 leading cancer specialists were selected for the "Top Cancer Doctors 2015" list.

In addition to serving as Director of the Cancer Center, Dr. Espat is also Chairman of the Department of Surgery and Chief of Surgical Oncology at Roger Williams. A Professor of Surgery and Assistant Dean of Clinical Affairs at Boston University School of Medicine, Dr. Espat focuses his practice on Hepatobiliary and Surgical Oncology. Dr. Espat received his fellowship training at Memorial Sloan Kettering Cancer Center in New York. He completed residency and medical School at University of Florida College of Medicine.

His clinical expertise is in the areas of liver surgery, pancreas and bile duct surgery. Dr. Espat is board certified by the American Board of Surgery and has research interests in a number of areas including the effect of fatty acids on pancreas cancer growth and response to chemotherapy, chemo-sensitizing of pancreatic cancer, cancer-induced weight loss/metabolism, thermal means of tumor ablation, and biomaterials for tissue regeneration.

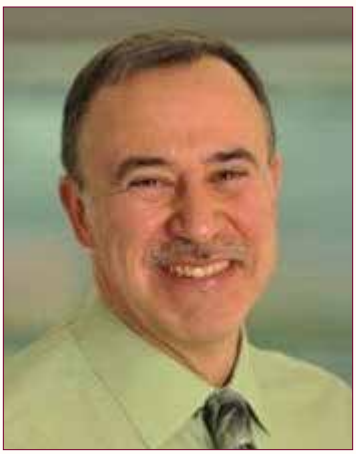
ROGER WILLIAMS MEDICAL CENTER

This "Top Cancer Doctors 2015" list was compiled through peer nominations and extensive research that Castle Connolly Medical LTD. has conducted for more than two decades. ❖

Appointments

Dr. Ruben Alvero named director of reproductive endocrinology and infertility at W&I

PROVIDENCE – Following a national search, **RUBEN ALVERO, MD, FACOG, FACS**, has been appointed director of the Division of Reproductive Endocrinology and Infertility (REI) in the Department of Obstetrics and Gynecology at Women & Infants Hospital and The Warren Alpert Medical School of Brown University.



WOMEN & INFANTS

Most recently, Dr. Alvero was the division director for REI and vice chairman for education in the Department of Obstetrics and Gynecology at the University of Colorado School of Medicine, where he was also a professor of obstetrics and gynecology. He is a founding member of the University of Colorado's Center for Surgical Innovation and served on its board of directors.

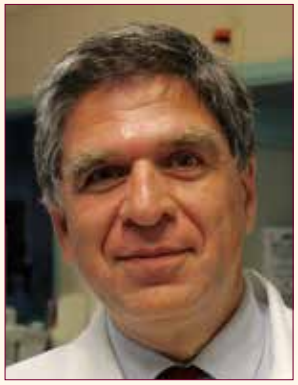
A graduate of Harvard University, Dr. Alvero earned his medical degree at the F. Edward Hebert School of Medicine, Uniformed Services University of the Health Sciences in Bethesda, MD. He completed a residency in obstetrics and gynecology at Walter Reed Army Medical Center in Washington, DC, and a fellowship in reproductive endocrinology and infertility at the National Institutes of Health.

Named one of the Best Doctors in America by Best Doctors, Inc. since 2005, Dr. Alvero serves on the editorial boards of *Reproductive Medicine Insights* and *Clinical Medicine: Case Reports* and is a peer reviewer for *The Journal of Pharmacology and Experimental Therapeutics, American Journal of Obstetrics and Gynecology, Human Reproduction, Fertility and Sterility*, and *Obstetrics and Gynecology*.

A fellow of the American College of Obstetricians and Gynecologists and the American College of Surgeons, Dr. Alvero is a member of the American Society for Reproductive Medicine, the International Gynecologic Society, the National Hispanic Medical Association, the Society for Assisted Reproductive Technologies, the Society for Reproductive Endocrinology and Infertility, and the Society for Medical Decision-Making. ❖

Appointments

Dr. Raffi Calikyan named president of Fatima medical staff


FATIMA

NORTH PROVIDENCE – **RAFFI CALIKYAN, MD**, an internal medicine physician with specific training in pulmonology and critical care, has been named president of the Fatima Hospital medical staff. He has been a member of the Fatima Hospital medical staff since 1999.

Dr. Calikyan graduated medical school from Eberhard Karls University in Germany. He completed his residency in internal medicine at St. John's Episcopal Hospital in New York and his pulmonary and critical care residency from SUNY Health Science Center in Brooklyn.

Dr. Calikyan is board certified by the American Board of Internal Medicine with specific certification in critical care medicine and pulmonary disease.

"I am looking forward to this important role during an especially exciting and eventful time in health care," said Dr. Calikyan. "This is talented and dedicated medical staff committed to working with hospital leadership to ensure quality care is delivered at the highest level."

Dr. Calikyan is the chairperson of the Experience of Care committee at Fatima and is a member of the newly formed Advisory Quality Council. He is also a member of the Fatima Hospital board of directors. He is a resident of Barrington.

"Dr. Calikyan has a distinguished history of service to his patients and Fatima Hospital," said Thomas Hughes, President of Our Lady of Fatima Hospital. "We look forward to his leadership on a number of initiatives designed to improve both the method and delivery of care to our community." ❖

Mariah Stump, MD, joins Women's Medicine Collaborative


LIFESPAN

PROVIDENCE – The Women's Medicine Collaborative announced that **MARIAH STUMP, MD, MA, MPH**, has joined the Women's Primary Care team at the Women's Medicine Collaborative. She began seeing patients on July 1.

Dr. Stump received her medical degree from the University of Vermont College of Medicine in Burlington, Vermont, and a Master's degree in public health with a concentration in women's, reproductive, and adolescent health from Johns Hopkins University, Bloomberg School of Public Health in Baltimore, Maryland. She completed her residency at The Warren Alpert Medical School of Brown University.

"Dr. Stump has a wide range of clinical interests and skill sets, including lifestyle medicine, preventative medicine, and obstetric medicine. She fits perfectly with our Women's Primary Care team and the individualized care we give our patients," said Iris Tong, MD, FACP, director of Women's Primary Care at the Women's Medicine Collaborative.

Dr. Stump's research interests include medical education, particularly in the realm of developing evidence-based integrative medicine curricula. She is a certified instructor in Vinyasa yoga, or flow yoga, a health movement which involves a sequence of breath-synchronized movements.

"Proper nutrition, physical activity, and stress management are among some of the key lifestyle modifications that can play a very significant role in improving health and quality of life," Dr. Stump said. "In using evidence-based lifestyle medicine as one means for delivering personalized care for our patients and their families, we are able to improve their health and wellbeing." ❖

Pulmonologist Samuel Evans, MD, joins Newport Hospital


LIFESPAN

NEWPORT– **SAMUEL EVANS, MD**, has joined the Newport Hospital medical staff as part of Newport Pulmonary Medicine. He began seeing patients on August 3.

Dr. Evans received his medical degree from SUNY Downstate College of Medicine in Brooklyn, New York. He completed his residency and a fellowship in pulmonary and critical care medicine at The Warren Alpert Medical School of Brown University and Rhode Island Hospital and is board certified in pulmonary and internal medicine.

"It's terrific to have Dr. Evans join the Newport Pulmonary Medicine team at Newport Hospital," said Crista F. Durand, president of Newport Hospital. "He is skilled in treating a wide range of pulmonary disorders – from airway problems such as asthma and chronic obstructive pulmonary disease (COPD) to more complicated diseases such as lung cancer and occupational lung disease – and his specialties include bronchoscopy, thoracentesis, and pleural catheter placement. Our patients will surely benefit from his expert specialty care."

Dr. Evans' clinical interests and expertise also include pleural conditions, shortness of breath, pulmonary vascular disease, sleep disorders, pulmonary fibrosis and diaphragm dysfunction.

"Helping people to breathe and live better by managing all types of simple and complex respiratory problems – this is why I became a pulmonologist," said Dr. Evans. ❖

Appointments


LIFESPAN

Physiatrist Josef Fields, DO, joins Newport Hospital

NEWPORT – Newport Hospital announced that **JOSEF FIELDS, DO**, has joined the Newport Hospital medical staff as part of Newport Physiatry. He began seeing patients on July 17.

Dr. Fields is a graduate of Cornell University and received his medical degree from the Lake Erie College of Osteopathic Medicine in Bradenton, Florida. He completed an internship at St. Petersburg General Hospital in St. Petersburg, Florida, and residency at New York University/Rusk Institute of Rehabilitation Medicine in New York City. He is a member of the American Academy of Physical Medicine and Rehabilitation and the American Osteopathic Association, and is board certified in osteopathic medicine.

Dr. Fields' areas of expertise include myofascial pain, musculoskeletal dysfunction, shoulder and knee injuries, hip pain, neck and back pain, neuropathic pain, rehabilitation therapy, electromyography, gait dysfunction, limb loss, wound care, and manipulative therapy or manual therapy used to treat musculoskeletal pain and disability. ❖

Obituary

OMPRAKASH HIRALAL KOTHARI, MD, of East Greenwich, passed away August 20, surrounded by family and friends. Born in 1945 in Maharashtra, India, Dr. Kothari, or "Ko" as he was affectionately called by his colleagues and peers, immigrated to Rhode Island in 1973. He was an accomplished pathologist who worked for 40 years at the Kent County and Rhode Island Hospitals. He officially retired in 2013 after having served as Chief of the Pathology Department at Kent for 21 years.

In spite of his dedication to his work, his family always came first. Dr. Kothari is survived by his wife Renu, son Sunil, daughter Shilpa, and daughter-in-law Fei, in all of whom he instilled his profound love of the English dictionary, dessert, and his childhood home, Bombay. He was a kind soul and a wise friend who will be always remembered for the warmth and unwavering support he gave us.

In lieu of flowers, please send donations in his name to the Leukemia & Lymphoma Society Donor Services, PO Box 4072, Pittsfield, MA 01202.

Joseph Lifrak, MD; Christopher Chihlas, MD, orthopedic surgery and sports medicine, join Southcoast Physicians Group

Lifrak serves on medical staff for Providence Friars men's ice hockey team

SWANSEA, MA – **JOSEPH LIFRAK, MD**, and **CHRISTOPHER CHIHLAS, MD**, orthopedic surgery and sports medicine, have joined the Southcoast Physician Group.


SOUTHCOAST

Joseph Lifrak, MD


SOUTHCOAST

Christopher Chihlas, MD

Dr. Lifrak is a member of the Providence College athletic program's medical staff, with specific responsibility as the team orthopedic physician for the Providence Friars men's ice hockey team.

He graduated cum laude with departmental honors in biology from Tulane University in New Orleans, and then earned his medical degree at the Brown University School of Medicine in Providence.

Dr. Lifrak completed a surgical internship and orthopedic residency at Brown University, Rhode Island Hospital. He then completed an orthopedic trauma fellowship at Rhode Island Hospital and a knee reconstruction/sports medicine fellowship at the Jewett Orthopedic Clinic in Winter Park, Florida. He is a member and past president of the Rhode Island Orthopedic Society.

His clinical interests are focused on sports medicine and knee reconstruction, including total knee replacements, ACL surgery and knee arthroscopy.

Dr. Chihlas received his medical degree at the Medical College of Virginia School of Medicine of Virginia Commonwealth University, Richmond, Va. He completed a general surgery internship and an orthopedic surgery residency with specialty training in foot and ankle surgery and served as the chief resident at the Medical College of Virginia Hospitals.

Dr. Chihlas is a member of the American Academy of Orthopaedic Surgeons, the American Orthopaedic Foot and Ankle Society, the American Medical Association and the Rhode Island Orthopedic Society. He is an adjunct clinical assistant Professor at Boston University School of Medicine.

He is board certified in orthopedic surgery. His clinical interests include orthopedic medicine and surgery and orthopedic fragility/osteoporosis with added expertise in foot and ankle conditions.

Prior to joining Southcoast Health, they practiced orthopedic surgery and sports medicine with Orthopedic Associates in Cranston, RI. ❖

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Charles V. Chapin, MD: 'Dean of City Health Officers'

MARY KORR
RIMJ MANAGING EDITOR

Charles V. Chapin, MD, was Superintendent of Health for the City of Providence from 1884 until 1932 and a pioneer in epidemiology and public health.

The Rhode Island Medical Society described **DR. CHARLES V. CHAPIN** (1856–1941) as "the greatest physician who has yet lived in Rhode Island," Dr. Seebert J. Goldowsky wrote in the August 1979 issue of the *Rhode Island Medical Journal*.

"His credo is best expressed in his words: 'Science can never be a closed book. It is like a tree, ever growing, ever reaching new heights. Occasionally the lesser branches, no longer giving nourishment to the tree, slough off. We should not be ashamed to change our methods; rather we should be ashamed never to do so. We should try new things, but should show common sense about it.' "

Dr. Chapin was a graduate of Brown University, where he later taught physiology, and Bellevue Hospital Medical College in New York City. He became Providence's second superintendent of health in 1884, succeeding Dr. Edgar Snow, at the young age of 28.

In 1910, Dr. Chapin published *The Sources and Modes of Infection,* which became a public health classic and secured his preeminence in the nascent field of epidemiology. Largely through his efforts the Providence City Hospital opened in 1910, for the treatment of patients with communicable diseases.

According to Dr. Goldowsky, Dr. Chapin instituted the aseptic nursing techniques there which "he had seen applied at the immaculate Pasteur Hospital in Paris." Dr. Chapin ultimately proved to many doubting physicians that contagious diseases were not spread airborne, but as the result of contact.

In 1916, Dr. Chapin called for the establishment of sick baby clinics; more nurses in the health department, implementation of bacterial standards for the milk supply; dental dispensaries for children, a medical service for the care of the sick poor in their homes and increased wards for the care of tuberculosis patients.

"It will doubtless be objected this is socialism. So it is, and so is our system of public education, and our city water supply and our municipal pier and garbage collection and the proposed removal of ashes…it is for the citizens to determine whether they wish to purchase it," he wrote.

In 1927, the Rhode Island Medical Society held an appreciation for Dr. Chapin at the unveiling of his portrait in the medical library building. George R. Vincent, president of the Rockefeller Foundation, gave the address.

"We make heroes of men who lead soldiers to death upon the battlefield; tonight we exalt and honor a hero who through his long life of valuable, keen, faithful work, has safeguarded the lives of many, many people in his own city, in his own land and in lands beyond the sea," he said.

During Dr. Chapin's administration the death rate in Providence dropped 30 per cent and infant mortality was reduced by 50 per cent. When he resigned his city post in 1932, the Rhode Island Medical Society adopted a resolution, stating: "In the city, his two greatest achievements lie. First, in lifting Providence from a condition of well nigh medieval squalor in 1884 – to the hygienic and sanitary perfection of today – and second, in the founding of our City Hospital and its later organization, in which he played so important part."

In 1910, Dr. Chapin published *The Sources and Modes of Infection,* which became a public health classic and secured his preeminence in the nascent field of epidemiology.

In 1931, the Providence City Hospital was renamed the Charles V. Chapin Hospital in his honor; it closed its doors in 1966, when a hospital for communicable diseases was no longer needed.

When he retired at age 76, the *American Journal of Public Health* observed: "With no disrespect to anyone, it may be said without any fear of contradiction that Dr. Chapin has occupied for many years the position of Dean of City Health Officers."

Dr. Chapin died on January 31, 1941 at the age of 84. ❖