RHODE ISLAND MEDICAL JOURNAL

THANKS TO RIMJ'S 2014 GUEST EDITORS

The editor-in-chief describes the role guest editors serve in assembling the special theme sections of RIMJ on Page 14

SPECIAL SECTION

NEPHROLOGY

GUEST EDITOR

MAROUN AZAR, MD

DECEMBER 2014 VOLUME 97• NUMBER 12 ISSN 2327-2228

Your records are secure.

Until they're not.

Data theft can happen to anyone, anytime. A misplaced mobile device can compromise your personal or patient records. RIMS-IBC can get you the cyber liability insurance you need to protect yourself and your patients. Call us.

401-272-1050

RIMS-IBC

IN COOPERATION WITH

BMI BUTLER & MESSIER, INC. INSURANCE

RIMS-IBC 235 PROMENADE STREET, SUITE 500, PROVIDENCE RI 02908

MEDICAL PROFESSIONAL/CYBER LIABILITY PROPERTY/CASUALTY LIFE/HEALTH/DISABILITY

RHODE ISLAND
MEDICAL JOURNAL

M. Azar, MD

17 RI Clinicians Share Timely Reviews in Nephrology
MAROUN AZAR, MD
GUEST EDITOR

18 The Elderly Patient with Low eGFR: Beyond the Numbers
MAROUN AZAR, MD

D. Shemin, MD

23 Anemia and Bone Disease of Chronic Kidney Disease: Pathogenesis, Diagnosis, and Management
DOUGLAS SHEMIN, MD

R. Kremsdorf, MD

M. K. Faizan, MD

27 Ambulatory Blood Pressure Monitoring in Children: A Safe and Effective Diagnostic and Screening Tool for the Diagnosis of Hypertension in Children
ROBIN KREMSDORF, MD; M. KHURRAM FAIZAN, MD, FAAP

K. Richman, MD

J. O'Bell, MD

G. Pareek, MD

30 The Growing Prevalence of Kidney Stones and Opportunities for Prevention
KATHERINE RICHMAN, MD; JOHN O'BELL, MD; GYAN PAREEK, MD

RHODE ISLAND
MEDICAL JOURNAL

8 COMMENTARY
Aiming Low
Advice to residents considering a research project
JOSEPH H. FRIEDMAN, MD

A Refuge for the Medical Student, the Dissident and the Pilgrim
STANLEY M. ARONSON, MD

Thanks to our guest editors
JOSEPH H. FRIEDMAN, MD

16 RIMJ AROUND THE WORLD
We are read everywhere:
Rwanda, Hawaii, San Francisco

41 RIMS NEWS
Working for You

Why You Should Join RIMS

58 PHYSICIAN'S LEXICON
The Hesitant Pathway to the Humours
STANLEY M. ARONSON, MD

60 HERITAGE
December 1917:
RI Medical Teams
Rush to Halifax Disaster
MARY KORR

RHODE ISLAND
MEDICAL JOURNAL

IN THE NEWS

IN MEMORIAM 44
David S. Greer, MD

DEPARTMENT OF HEALTH 46
links PMP to Connecticut

CHARLES B. EATON, MD 46
study on statin, diabetes

47 MEMORIAL HOSPITAL
earns AHA 'gold' for stroke care

47 RI HOSPITAL
leads in LGBT equality index

47 NEWPORT HOSPITAL
recognized by Joint Commission

48 NEWPORT HOSPITAL
adds midwife service

PEOPLE

ANNIE DE GROOT, MD 50
Vaccine Group receives $100,000 Gates grant

SIMIN LIU, MD 52
earns groundbreaking CVGPS grant

DINA MORRISSEY, MD 52
named to national safety board

53 HOSPITAL ASSOCIATION OF RHODE ISLAND
honors hospital heroes

54 MEMORIAL HOSPITAL
graduates nurse anesthetists

56 OBITUARIES
Steven Charles Brin, MD
David S. Greer, MD
Howard A. Hall, MD

DECEMBER 2014
VOLUME 97 • NUMBER 12

RHODE ISLAND MEDICAL JOURNAL

PUBLISHER
RHODE ISLAND MEDICAL SOCIETY
WITH SUPPORT FROM RI DEPT. OF HEALTH

PRESIDENT
PETER KARCZMAR, MD

PRESIDENT-ELECT
RUSSELL A. SETTIPANE, MD

VICE PRESIDENT
SARAH J. FESSLER, MD

SECRETARY
BRADLEY J. COLLINS, MD

TREASURER
JOSE R. POLANCO, MD

IMMEDIATE PAST PRESIDENT
ELAINE C. JONES, MD

EXECUTIVE DIRECTOR
NEWELL E. WARDE, PhD

EDITOR-IN-CHIEF
JOSEPH H. FRIEDMAN, MD

ASSOCIATE EDITOR
SUN HO AHN, MD

EDITOR EMERITUS
STANLEY M. ARONSON, MD

PUBLICATION STAFF

MANAGING EDITOR
MARY KORR
mkorr@rimed.org

GRAPHIC DESIGNER
MARIANNE MIGLIORI

ADVERTISING
STEVEN DETOY
SARAH STEVENS
ads@rimed.org

EDITORIAL BOARD
STANLEY M. ARONSON, MD, MPH
JOHN J. CRONAN, MD
JAMES P. CROWLEY, MD
EDWARD R. FELLER, MD
JOHN P. FULTON, PhD
PETER A. HOLLMANN, MD
KENNETH S. KORR, MD
MARGUERITE A. NEILL, MD
FRANK J. SCHABERG, JR., MD
LAWRENCE W. VERNAGLIA, JD, MPH
NEWELL E. WARDE, PhD

RHODE ISLAND MEDICAL JOURNAL (USPS 464-820), a monthly publication, is owned and published by the Rhode Island Medical Society, 235 Promenade Street, Suite 500, Providence RI 02908, 401-331-3207. All rights reserved. ISSN 2327-2228. Published articles represent opinions of the authors and do not necessarily reflect the official policy of the Rhode Island Medical Society, unless clearly specified. Advertisements do not imply sponsorship or endorsement by the Rhode Island Medical Society.

Advertisers contact: Sarah Stevens, RI Medical Society, 401-331-3207, fax 401-751-8050, ads@rimed.org.

PUBLIC HEALTH

35 Missed Opportunity to Provide HPV Vaccine and Educate Adolescents: Rhode Island Middle and High School Students' Self-Reported HPV Vaccination, 2013 RI YRBS
JUNHIE OH, BDS, MPH; TRICIA WASHBURN, BS; HANNA KIM, PhD

39 Vital Statistics
COLLEEN A. FONTANA, STATE REGISTRAR

RIMJ Mission Statement

The Rhode Island Medical Journal (RIMJ), published by the Rhode Island Medical Society, is an independent, monthly, electronic publication which aims to reflect the views and purposes of the entire medical community of Rhode Island.

We see the Journal as a vehicle aimed at the practicing physicians of Rhode Island – whether they are in private practice, on the staff of the state's hospitals or as part of the many colleges and universities of the state. It offers a venue for them to express their clinical or investigative findings, and for the academic faculty to publish their clinical or research results. It also serves as a platform for local medical students, resident physicians and fellows to contribute to the medical literature while honing the rudiments of medical writing.

In addition, it offers the opportunity for medical professionals to make the community aware of testing or clinical expertise that may not be widely known, even within our small state. And finally, RIMJ is a forum where allied health professions such as local schools of public health, pharmacy and nursing may share their concerns and aspirations as the business of health care takes on new and unanticipated challenges.

Joseph H. Friedman, MD
Editor-in-Chief

Sun Ho Ahn, MD
Associate Editor

Stanley M. Aronson, MD
Editor Emeritus

Having the right risk management program is

COVERYS® IMPORTANT

Cover your risk with Coverys

Every day, you're exposed to risk. That's why you should join the 25,000 physicians, dentists and allied healthcare professionals and more than 500 hundred hospitals, health centers and clinics that choose Coverys for medical professional liability insurance and risk management. We bring the experience, financial strength, support services, and strategic insight to protect you and your practice.
Get Coverys. Because it's very important.

COVERYS®
Better Intelligence
for Better Outcomes℠

www.coverys.com
800.225.6168
ProSelect Insurance Company

Aiming Low

Advice to residents considering a research project

JOSEPH H. FRIEDMAN, MD
joseph_friedman@brown.edu

I recently joined my colleagues in an evening meeting with neurology residents. The objective was to share our research interests. In part this was to let them know what we were doing, thus completing their picture of us, expanding it beyond the teaching and clinical care arenas. This is one area that partly distinguishes medical school faculty and private practitioners, although more about this later. The other objective was to try to excite an interest in some residents to try their hands at research and for them to find out if they might be as excited by doing this sort of work as the faculty are.

My colleagues were very good about describing their work. There were six minutes allotted for each of us and they kept to it. They were succinct and positive. Some participated in large clinical trials. Some used sophisticated equipment. All, most importantly, were enthusiastic about their work. I was, as well. I mentioned the unfunded projects I was about to embark on, using college student volunteers, and some projects that were being completed by a resident, as well as one that was started and never completed by another resident. I finished in less than six minutes and was asked what advice I had for resident research. This is where I got into trouble.

I am an enthusiastic researcher. Every day there are either questions raised that need to be answered, or the same question asked day after day that no one has yet answered. I want others to do research. I sometimes wonder how the vast bulk of doctors do their work, seeing patients from morning to night, day after day, and not getting pulled in to answer the many questions that must enter their minds every day. But, I've learned many lessons in my lengthy career. One of them is that I'm considered opinionated. Not unreasonable, I don't think. Not irrational or dogmatic, just strongly skeptical. Another is that clinical research takes a lot lot longer than anyone would think possible in a universe where light travels at 186,000 miles per second. I made two points to the residents. One was that everything took at least four times longer than you could conservatively and reasonably estimate; that if you wanted to do a project at two hospitals in the Brown system to not waste your time trying because getting approval from two institutional review boards during one residency would be sufficiently unlikely that the project would never be completed. I explained the KISS principle of research: Keep It Simple, Stupid. Novices believe that once you start a project you should try to gather as much data as possible since the incremental effort is always small. That slippery slope, of adding a test here and a measurement there, is often the cemetery of "doable" projects. Finally I recommended, "Aim low."

After I said this I realized that it might have been a faux pas. After all, these were doctors. They were all pretty smart, all very hard working, dedicated and high achievers. Had they ever in their lives heard anything after the word, "aim," but "high?" I think I should have said, "aim for low hanging fruit." That's a common phrase that we use when we talk about projects that will have long-term, sometimes difficult to achieve ends, but may, in the beginning, produce some interesting and useful results, easy to harvest. For example, I'm interested in the problem of fatigue in Parkinson's disease. I got interested because of one particular patient in whom fatigue was his main problem and when I turned to the literature on fatigue in PD I found that there was none. It was not known to be a problem. The "low hanging fruit" was to find out how common and severe a problem it was, whether it was related to disease severity, depression, age, gender, duration of disease, medication side effects, sleepiness, etc. Anyone can do that. The harder part is figuring out what causes it and how to treat it. Twenty years later we have a large number of papers describing the epidemiology of fatigue in PD around the world, three on its treatment and none on its causes.

The higher hanging fruit are not so easy to harvest. Residents and students need to aim for the low hanging fruit so that they can get the job done in their limited amount of time. Another issue related to time is the fact that time passes much more quickly for old people than young. A project that takes two years may be fine for an older researcher who is used to events unfolding slowly, hoping he'll get the result while he still can understand it, but a young researcher needs a faster reward to maintain interest. Short, easily attainable projects are the goal.

Research of all types should be fun, although a lot more satisfying when the results are what we want. Medical practice is, for most of us, rewarding for a number of reasons, helping sick people, helping families, preventing illnesses, getting to know patients and families over long time periods. We all learn from our patients, whether we're aware of it or not. We learn when to take a complaint seriously and when reassurance rather than an expensive test is in order. We learn humility. We are not gods and cannot make most bad things go away. Patients can be intellectual challenges as well. While we are not generally faced with challenges like Dr. House on television, we all have our share of unexplained problems that nag at our thought centers. Clinical research aims at solving those problems. Studying the problem hones our skills and keeps us sharp. And you don't necessarily need a university title or funding to do it. We rely on clinical researchers to turn experience-based medicine into evidence-based medicine.

It's always better to learn something, even if not earthshaking, than to have to give up an unrealistic quest. So when you start a research project, I suggest that you aim low. ❖

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

Rhode Island Medical Journal Submissions

The Rhode Island Medical Journal is a peer-reviewed, electronic, monthly publication, owned and published by the Rhode Island Medical Society for more than a century and a half. It is indexed in PubMed within 48 hours of publication. The authors or articles must be Rhode Island-based. Editors welcome submissions in the following categories:

CONTRIBUTIONS

Contributions report on an issue of interest to clinicians in Rhode Island. Topics include original research, treatment options, literature reviews, collaborative studies and case reports. Maximum length: 2000 words and 20 references.

JPEGs (300 ppi) of photographs, charts and figures may accompany the case, and must be submitted in a separate document from the text. Color images preferred.

CREATIVE CLINICIAN

Clinicians are invited to describe cases that defy textbook analysis. Maximum length: 1200 words. Maximum number of references: 6.

JPEGs (300 ppi) of photographs, charts and figures may accompany the case, and must be submitted in a separate document from the text.

POINT OF VIEW

The writer shares a perspective on any issue facing clinicians (eg, ethics, health care policy, patient issues, or personal perspectives). Maximum length: 600 words.

ADVANCES IN PHARMACOLOGY

Authors discuss new treatments. Maximum length: 1000 words.

ADVANCES IN LABORATORY MEDICINE

Authors discuss a new laboratory technique. Maximum length: 1000 words.

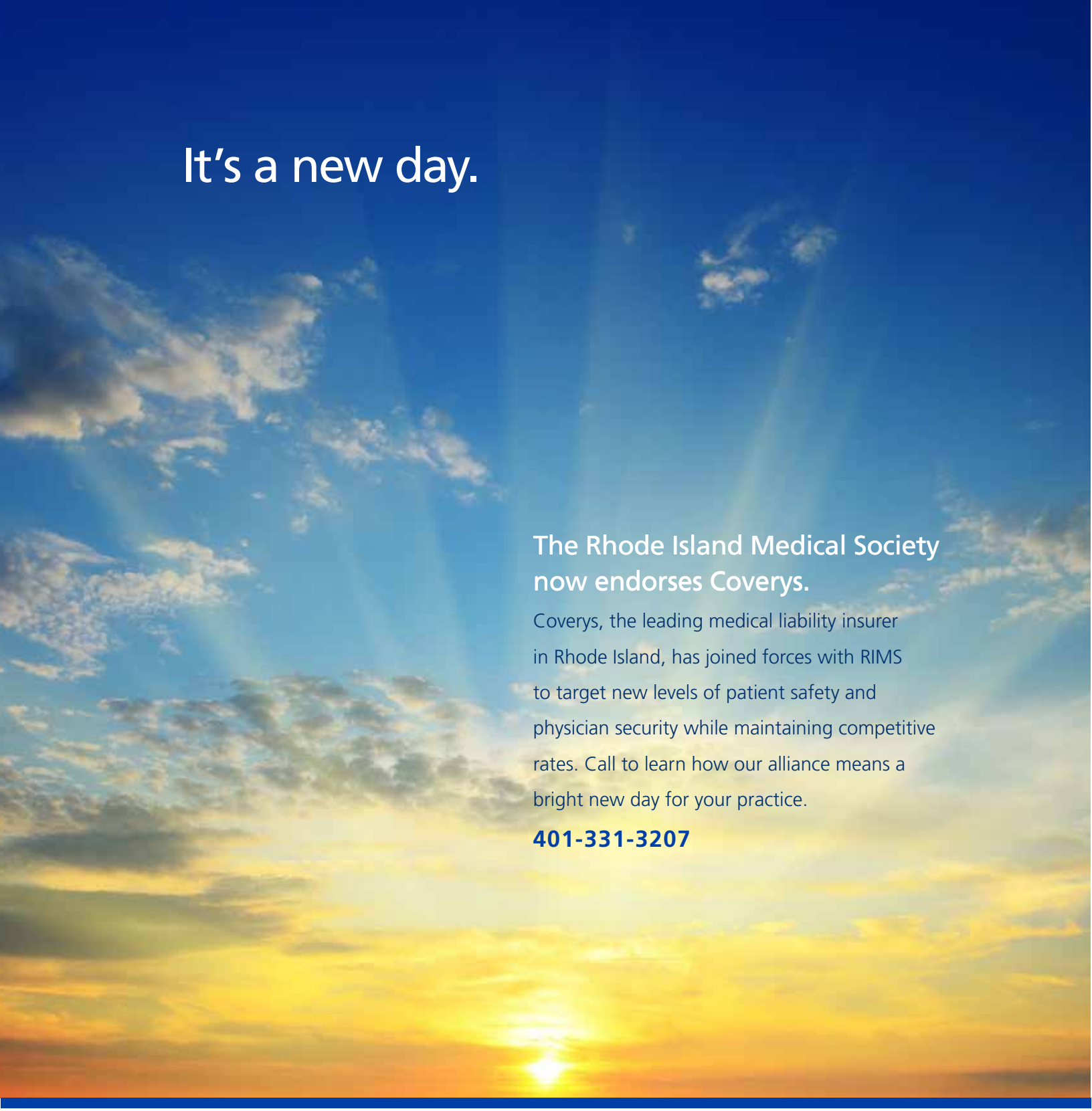
IMAGES IN MEDICINE

Authors submit an interesting image or series of images (up to 4), with an explanation of no more than 500 words, not including legends for the images.

Contact information

Editor-in-chief
Joseph H. Friedman
joseph_friedman@brown.edu

Managing editor
Mary Korr
mkorr@rimed.org



RHODE ISLAND MEDICAL SOCIETY · 1812 ·

COVERYS®
We understand healthcare®

A Refuge for the Medical Student, the Dissident and the Pilgrim

STANLEY M. ARONSON, MD
smamd@cox.net

The Romans constructed a fort overlooking the Rhine River's entrance into the North Sea. The Celts then established a small settlement on the hill, called it Lughdunum, later corrupted to Leithen. By the 10th Century, Leithen, now called Leyden, had grown to be a prosperous trading center specializing in textiles.

In 1574 Leyden was besieged by Spain attempting to suppress the Protestant insurgency. The lengthy siege was broken when the Dutch breached their dikes flooding the countryside and thus allowing ships to bring in food.

A year later William of Orange established a university in Leyden to commemorate the valiant struggles of the community. The academic center, based at the Convent of Saint Barbara, tolerated, even encouraged, departures from orthodox religious belief; and so, from its modest parochial origins as a retreat for religious studies, it evolved into an international center for the scholarly disciplines of law, exotic languages, ethnology, botanical science and, in 1597, medicine.

Preeminent amongst its medical faculty was the immortal Herman Boerhaave (1668–1738) considered to be the father of modern bedside medicine. Boerhaave was born in Voorhout, neighboring upon Leyden. Boerhaave's method of bedside clinical examination, by the 18th Century, became the criterion of acceptable medical practice. Many European nations sent their most promising students to be taught in Leyden; and even Russia's tsar Peter the Great, went personally to listen to Boerhaave's lecture.

In 1655, Dr. Francis de la Boe, called by history Franciscus Sylvius, joined Leyden's medical faculty. Sylvius stressed the importance of proper nutrition, adequate rest, and a stress-free lifestyle in the restoration of those with chronic, debilitating disease. He sought out botanically derived preparations that might stimulate the flagging appetites of his anorectic patients. His search finally centered upon the berries of the juniper bush (in Dutch, *genever*). He dissolved the berry juice in warm alcohol to form a decoction with an alleged capacity to enhance appetite. The name of this preparation, which achieved astonishing popularity amongst the Dutch, was *genever schnapps*, a designation corrupted by the British to the word, gin.

Scotland was compelled to develop its own schools of medicine in the 16th and 17th Century when England's medical schools, Cambridge and Oxford, required their matriculants to sign oaths adhering to the rules of the Church of England, thus excluding nonconformist Christian groups such as the Quakers.

Edinburgh's inaugural faculty-physicians were all trained in Leyden and Boerhaave became the spiritual father of Scotland's four medical schools: Edinburgh, Glasgow, Aberdeen and St. Andrews. Edinburgh, in turn, educated the bulk of the medical education leadership in colonial America including the founders of this nation's first medical

NATIONAL LIBRARY OF MEDICINE

Portrait of Dutch physician Herman Boerhaave, MD, by artist J. Chapman

THIS IMAGE IS IN THE PUBLIC DOMAIN BECAUSE ITS COPYRIGHT HAS EXPIRED.

Portrait of Dr. Francis de la Boe, who concocted the 'herbal' remedy of juniper berries mixed in alcohol (gin), by painter Cornelis van Dalen.

schools and teachers such as Benjamin Rush and Benjamin Waterhouse. Thus, if Edinburgh had been father to America's system of medical education, then surely Leyden was its grandfather.

The Pilgrims

The principal role of Leyden in American history, however, rests upon another happening. In the early decades of the 17th Century England had undergone much religious turmoil. A group of Dissenters from the village of Scrooby abandoned their ancestral homes and fled to Leyden. And for eleven years these religious dissidents found refuge in this city of textiles. In 1620 they resolved to find a new place to practice their faith. Their ship, called Mayflower, left Europe on September 6, 1620 and sailed west to the Americas. In the words of William Bradford, their leader, "In our hearts we knew that we were pilgrimes." And by the name, pilgrims, was this group henceforth known.

An astonishing little city: Leiden (as it is now spelled) was the focal point in the Netherlander rebellion against Spanish tyranny; the location of an intellectually permissive university; a haven of scholars and the site of a medical school without religious requirements; the center of experimental and bedside medicine, the academic seeds of which spread to Edinburgh and then to England's Atlantic colonies; the site where a great botanical garden was established and where Linneaus developed the science of taxonomy; the city where gin was invented; the birthplace of Rembrandt; and the refuge and organizational center for those remarkable men and women, the Pilgrims, who had ventured west to the wilderness of New England in search of a new Jerusalem. "And thus," in Bradford's words, "out of small beginnings greater things have been produced by His hand that made all things of nothing." ❖

Author

Stanley M. Aronson, MD, is Editor emeritus of the *Rhode Island Medical Journal* and dean emeritus of the Warren Alpert Medical School of Brown University.

Disclosures

The author has no financial interests to disclose.

Guidelines for Letters to the Editor

Letters to the Editor are considered for publication (subject to editing and peer review) provided they do not contain material that has been submitted or published elsewhere.

The *Rhode Island Medical Journal* prefers to publish letters that objectively comment on or critically assess previously published articles, offer scholarly opinion or commentary on journal content, or include important announcements or other information relevant to the Journal's readers.

Letters in reference to a Journal article must not exceed 175 words (excluding references), and must be received within four weeks after publication of the article. Letters not related to a Journal article must not exceed 400 words (excluding references).

A letter can have no more than five references and one figure or table. A letter can be signed by no more than three authors. The principal author will be asked to include a full address, telephone number, fax number, and e-mail address. Financial associations or other possible conflicts of interest must be disclosed.

Annual Physicals Are Crucial...

So is your Annual Insurance review

Just like yearly check-ups, your insurance coverage must be reviewed annually to ensure that it is meeting your current needs and that you are properly insured.

Through our partnership with the Rhode Island Medical Society, Butler & Messier Insurance offers an exclusive Concierge Program designed specifically so physicians may receive the best rates for home, auto and office insurance policies.

We would be happy to provide you with a complimentary policy review. Please call David White or John Divver at Butler & Messier at 728.3200 today.

RHODE ISLAND MEDICAL SOCIETY · 1812 ·

www.ButlerandMessier.com

BMI BUTLER & MESSIER, INC. INSURANCE

EXCLUSIVE INSURANCE PARTNERS

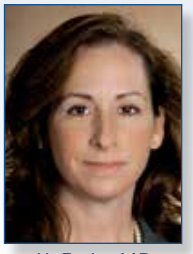
R.K. Aaron, MD

G. Anandarajah, MD

M. Azar, MD

R. Boland, MD

S. Duffy, MD


K. Furie, MD

C. J. Harrington, MD

D.C. Lewis, MD

J.R. Racine, BA

S. Rasmussen, MD

B. Roberts, MD

J.A. Robson, PhD

R.M. Shalvoy, MD

L. E. Taylor, MD

A. R. Tunkel, MD

Thanks to our guest editors

We would like to thank our many guest editors for producing the themed issues we've published this year. Many of the readers probably have no idea how issues come to be. Most issues have a theme. In some cases, a member of the medical community steps forward and offers to guest edit an issue of the journal, devoted to a topic of interest to that person, and, presumably, to a large percentage of the membership of the RI Medical Society (RIMS), which sponsors this journal. The guest editors are responsible for choosing topics and finding authors within the RI medical community. The hard part of their job is getting the authors to actually complete their manuscripts, which the guest editor then edits and makes publication ready. My job, as editor-in- chief, is to make sure primarily that our average member will understand the writing, since RIMS is comprised of physicians from all branches of medicine; and also, that the articles are not duplicative and are at a certain level of sophistication and literary quality. The sophistication threshold is, if this neurologist can understand it, then probably everyone else can as well. Not all the editors stepped forward with an idea of their own. Our staff approached some. Few doctors have declined to help the journal, although this is a time consuming and sometimes aggravating venture.

The mission of the journal is to advance medicine in the state of Rhode Island. We are not interested in becoming a national journal with an impact factor. We would like to have a high impact factor in RI, but don't care about our impact elsewhere. We particularly like to see articles specifically focused on RI issues, and view our journal as a stepping stone for junior members of the medical community, house staff, fellows, students, and junior faculty to hone their skills writing medical articles, whetting their appetite for achievement by starting with early publications. In the coming year we will have an issue devoted to medical student research, and another on long-term care and nursing homes in RI. We've had issues on biotech in RI, and a variety of other topics grounded in our state. We intend to keep that focus.

We have been very fortunate. We believe our contributors have done extremely well and we wish to thank them. We are grateful. We are proud of the journal, and that is because of the high quality work of our guest editors, contributors, our two outstanding staff members, Mary Korr and Marianne Migliori, and the support of our associate editor, Sun Ho Ahn, MD.

Readers who would like to see a particular topic addressed are welcome to offer themselves as a guest editor, or to simply contact me with their idea. Chances are that if there's a topic you want to see in the journal, a lot of others would like to see it as well.

Thank you all.
Best wishes for the New Year.

Joseph H. Friedman, MD

We're not LIKE A Good Neighbor,

WE ARE

The Good Neighbor Alliance

Specializing in Employee Benefits since 1982

Health Dental Life Disability Long Term Care
Pension Plans Section 125 Plans

The Good Neighbor Alliance Corporation

The Benefits Specialist

Affiliated with

RHODE ISLAND MEDICAL SOCIETY

RIMS-INSURANCE BROKERAGE CORPORATION

401-828-7800 or 1-800-462-1910

P.O. Box 1421 Coventry, RI 02816

www.goodneighborall.com

We are read everywhere

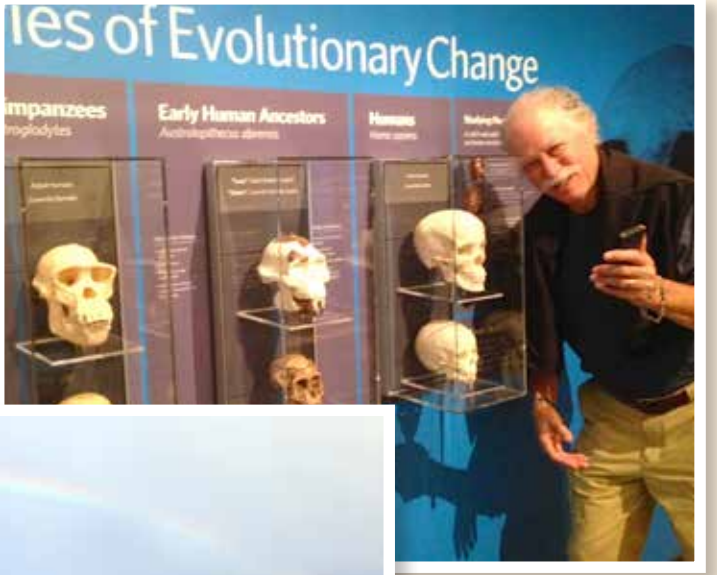
KIGALI, RWANDA

Joseph H. Friedman, MD, RIMJ Editor-in-Chief, consults the November issue from the University Teaching Hospital of Kigali. Dr. Friedman is volunteering in Rwanda for six weeks.

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.**

OAHU AND KAUAI

Never attempt to read RIMJ while piloting a helicopter or confronted with rainbows, as demonstrated by RIMJ Managing Editor **Mary Korr** at the Pacific Aviation Museum on Ford's Island outside Honolulu, and **Ken Korr, MD**, on the Na Pali cliffs in northern Kauai.



SAN FRANCISCO

Ken Korr, MD, at the California Academy of Science's Skulls exhibit in November. On page 4, **Mary Korr** at the Conservatory of Flowers in Golden Gate Park.

MEDICAL PROFESSIONAL LIABILITY INSURANCE FOR PHYSICIANS BY PHYSICIANS

NORCAL MUTUAL®

SAY HELLO TO NORCAL

EXPERIENCE THE MUTUAL BENEFIT

Our mission begins and ends with you, the policyholder. That means connecting our members to the highest quality products and services at the lowest responsible cost. As a policyholder-owned and directed mutual, you can practice with confidence knowing your Medical Professional Liability Insurance provider puts physicians first. **Contact an agent/broker today.**

HELLO.NORCALMUTUAL.COM | 844.4NORCAL

©2014 NORCAL Mutual Insurance Company

RI Clinicians Share Timely Reviews in Nephrology

MAROUN AZAR, MD
GUEST EDITOR

Much has changed since the launching in the US of the End-Stage Renal Disease (ESRD) Program under Medicare on July 1, 1973, a unique entitlement program based solely on the presence of a clinical condition. Dialysis, initially a privilege for a select few, has exploded since then to become a multi-billion dollar industry today, with over 600,000 patients on dialysis in the US, and over 1.6 million worldwide.

The first patient on chronic hemodialysis was 39-year-old American Clyde Shields who had glomerulonephritis; he survived for 11 years. Today, the elderly population has the fastest growing ESRD rate, with often a large burden of comorbidities and very high mortality rates. Close to half of patients older than 75 years of age have some degree of chronic kidney disease (CKD), many of whom are at increased risk of cardiovascular disease and death. It is then very timely that this year's theme for World Kidney Day, which occurred on March 13, 2014, was "CKD and aging."

On the other end of the age spectrum, the obesity epidemic has led to an increase in the rate of hypertension in the pediatric population. The metabolic syndrome/obesity epidemic is also likely responsible for the dramatic increase in nephrolithiasis rate. Previously largely regarded as a benign condition, nephrolithiasis is associated with huge costs of care and increased risk of acute kidney injury and CKD.

Contributions

This issue of the *Rhode Island Medical Journal* features a series of review articles in various nephrology topics relevant to clinicians.

My contribution, "The Elderly Patient with Low eGFR: Beyond the Numbers," presents many considerations in the care of older adults with low renal function, with the goal of promoting individualized care based on shared decision making.

In "Anemia and Bone Disease of Chronic Kidney Disease: Pathogenesis, Diagnosis, and Management," **DOUGLAS SHEMIN, MD,** reviews the pathogenesis and diagnosis of anemia and bone disease in CKD, and summarizes recent consensus guidelines for treatment.

In "Ambulatory Blood Pressure Monitoring in Children: A Safe and Effective Diagnostic and Screening Tool for the Diagnosis of Hypertension in Children," **ROBIN KREMSDORF, MD**, and **M. KHURRAM FAIZAN, MD**, review the technique of ABPM and its value in the work-up of children with elevated blood pressure.

In "The Growing Prevalence of Kidney Stones and Opportunities for Prevention," **KATHERINE RICHMAN, MD**, **JOHN O'BELL, MD**, and **GYAN PAREEK, MD**, offer an updated review on nephrolithiasis with an emphasis on prevention through a multidisciplinary approach.

Guest editor

Maroun Azar, MD, is a nephrologist at University Medicine, Division of Kidney Diseases and Hypertension, practicing at Rhode Island and the Miriam Hospitals, Kent Hospital and the Veteran's Administration Medical Center (VAMC) of Providence and an assistant professor of medicine at the Alpert Medical School of Brown University. He has a special interest in the geriatric aspects of nephrology and is board-certified in both nephrology and geriatrics.

The Elderly Patient with Low eGFR: Beyond the Numbers

MAROUN AZAR, MD

ABSTRACT

Chronic Kidney Disease (CKD) is widely prevalent in the elderly population. The recent "Kidney Disease: Improving Global Outcomes (KDIGO) 2012 Clinical Practice Guideline on the Evaluation and Management of CKD" builds on the previous Kidney Disease Outcomes Quality Initiative (KDOQI) guideline and addresses many of its gaps. However, older adults with CKD have unique characteristics that may not be addressed by general guidelines. This review presents many of the challenges and considerations in the care of elderly patients with CKD, with the ultimate goal of promoting an individualized management plan based on shared decision-making.

KEYWORDS: chronic kidney disease, elderly, prognosis, conservative management, shared decision-making

INTRODUCTION

The introduction of the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines by the National Kidney Foundation (NKF) in 2002 established the classification of chronic kidney disease (CKD) based on glomerular filtration rate (GFR) or realistically, estimated GFR (eGFR) [1]. Applying this classification to the NHANES 1999-2004 cohort, it was estimated that 16.8% of the US general population has CKD. The prevalence was much higher, 39.4%, in those aged 60 and older, most of whom have early stages of CKD [2]. This raised concern that CKD may be over diagnosed, especially in the elderly without albuminuria, since some decrease in eGFR may simply represent normal kidney aging. The Kidney Disease: Improving Global Outcomes (KDIGO), now independent from NKF, published new CKD guidelines in early 2013. Among the numerous updates were the addition of albuminuria - a major prognosis modifier - into the classification by GFR, the division of CKD stage 3 into 3a and 3b, focus on CKD outcomes, guidance on specialist referral and promotion of multidisciplinary CKD chronic care models, including the ability to provide conservative (non-dialytic) management (CM) [3]. Age, however, was not incorporated into CKD classification and the issue of kidney senescence versus disease still stirs debate [4]. While the referral rate for CKD has increased significantly since 2002, there continues to be a surprising lack of guideline awareness among many non-specialists. Older patient age, among other factors, tends to decrease the odds of referral [5]. Certainly, not all elderly with CKD may benefit from specialist care, but many would. Older adults have unique characteristics. The following sections will review several key considerations relevant to the care of older patients with low eGFR.

DIAGNOSTIC CHALLENGES: KIDNEY SENESCENCE OR DISEASE?

Kidney Senescence: selected attributes

Most anatomical and histological changes attributed to kidney aging stem from cross-sectional studies such as autopsies and biopsies. The number of glomeruli is determined prenatally and varies widely from 330,000 to 1,100,000 among adults. Renal mass generally starts decreasing around the 4th decade of life, which may also be seen radiographically and corresponds mostly to cortical loss. Histological changes on light microscopy are generally termed "nephrosclerosis" and include glomerulosclerosis, arteriosclerosis, tubular atrophy and interstitial fibrosis [6]. In a large cohort of living donors at the Mayo Clinic, the prevalence of nephrosclerosis varied from 2.7% at ages 18–29 to 75% at ages 70–77 [7].

Functionally, there are very few longitudinal studies looking at decline in GFR. Perhaps the most notable is the Baltimore Longitudinal Study of Aging, where 254 "normal" adults of ages 22–97 were followed with serial (5–14x) creatinine clearance (CrCl) measurements from 1958–1981. Overall, there was an average decline in measured CrCl (mCrCl) of 0.75 mL/min/year but there were 3 patterns: a group with slow decline in serial mCrCl, a group with faster decline and a group with no change to a small improvement[8]. This led some to believe that renal functional decline with age is not universal. However, it is important to note that diabetics were not excluded if they had no proteinuria (diabetes may be associated with an initial increase in GFR due to hyperfiltration) and CrCl measurement itself is not without flaws. Nonetheless, it has been widely quoted since that "GFR" decreases at an average rate (0.75–1 mL/min/1.73m2/year) in healthy aging.

Living donors, being especially well screened, are typically a good representation of "healthy" older adults, although some may have treated hypertension. The Mayo Clinic cohort mentioned above offers some additional notable observations (cross-sectional): GFR overall declined by age;

none of the 1203 donors (max age 77) had a measured GFR (mGFR) < 60 mL/min/1.73m2 (using iothalamate); there was no correlation between mGFR and nephrosclerosis; the only characteristics associated with nephrosclerosis independent of age and sex in this healthy population were urine albumin, nocturnal blood pressure, and treated hypertension; finally, 5% would have had CKD by eGFR, but had normal mGFR and no nephrosclerosis [7].

Measuring Kidney Function in the Elderly

Based on the above, a hypothetical healthy 90-year-old woman with no comorbidities, starting off with a GFR of 100 mL/min/1.73m2 and losing GFR after age 30 at an annual rate of 0.75, would have a GFR of 55 mL/min/1.73m2 that could be attributed to aging and not "disease." However, measuring GFR using exogenous substances (inulin) is not practical or readily available in many places and is replaced in clinical practice by estimates (eGFR). Most labs automatically report eGFR using the 4-variable MDRD or the more recent CKD-EPI equation. The latter is slightly more accurate [9]. While these equations are very practical and useful for epidemiological studies, it is important to remember that no matter which one is used, the difference between eGFR and mGFR can be substantial, in some cases more than 30 mL/min/1.73m2. The incorporation of cystatin C may improve the accuracy of eGFR [10] but is costly and not widely used yet. Measured creatinine clearance (mCrCl) is another option but it is cumbersome for many elderly and errors in collection are common. It may not necessarily be more accurate than eGFR, since it typically overestimates mGFR by a variable degree, which gets worse as GFR decreases, due to an increase in creatinine secretion by the proximal tubules and extra renal degradation. Surprisingly however, one study found that mCrCl underestimates mGFR in the elderly [11]. Still, it may be useful in extremes of weight, amputees, vegetarians and those taking creatine supplements [12], as all of these factors are not taken into account in eGFR equations.

Senescence or disease: does it matter?

Hard outcomes in the elderly with low eGFR

Studies in nephrology have traditionally focused on hard outcomes such as mortality and End-Stage-Renal-Disease (ESRD). From an epidemiological stand point, an association between moderately low eGFR (stage 3a) and poor outcomes is (arguably) useful in distinguishing kidney aging from CKD. Many such studies have provided conflicting results in the elderly. However, a very large recent meta-analysis encompassing intercontinental high risk and CKD cohorts totaling over 2 million patients (age 18 to >75 years), showed increased mortality and ESRD rates in all stages of CKD regardless of age category. The relative mortality in the elderly was attenuated but the absolute mortality was higher. Age did not affect ESRD risk [13]. Population–level associations however, may not necessarily apply to an individual patient. For example, the above meta-analysis also showed increased mortality at very high eGFR values in patients >55y, likely reflecting the influence of patients with muscle wasting (due to malnutrition or other comorbidities) [13]. Does that mean that a healthy and active 65-year-old individual with eGFR 100 mL/min/1.73m2 is at risk? Probably not. The same concept goes for an older adult with eGFR 50 mL /min/1.73m2. The new KDIGO CKD classification system does not distinguish between age groups [3]. The author agrees with this decision, with the acknowledgment that no guideline is designed to be a substitute for individual judgment.

THERAPEUTIC CHALLENGES IN THE CARE OF ELDERLY PATIENTS WITH CKD AND THE ROLE OF THE NEPHROLOGIST

General referral guidelines

The KDIGO guidelines suggest a list of criteria for referral to a nephrologist. These include: Acute kidney injury (AKI), CKD stage 4-5, significant albuminuria or proteinuria, progressive CKD, RBC casts, unexplained hematuria, refractory hypertension, persistent serum potassium abnormalities, recurrent and extensive nephrolothiasis and hereditary kidney diseases[3]. Some of the benefits of early versus late referral include: reduced mortality and hospitalization, better uptake of peritoneal dialysis and earlier placement of dialysis access [14]. Patients with early stages of CKD often can be managed by their primary care providers (PCP).

Traditional facets of typical CKD care, some of which may be done by PCPs, may include treatment aimed at delaying progression, managing complications such as anemia, bone-mineral disorders, hyperkalemia, metabolic acidosis, blood pressure and glycemic control, correct dosing of medications, preparing for ESRD and other interventions aimed at cardiovascular risk reduction.

Beyond the guidelines

Regardless of whether reduced eGFR is attributed to aging or CKD, the older adult with low eGFR presents unique challenges. Many interventions are often of unproven benefit and sometimes harmful in the elderly. Outcomes of particular interest to the elderly, such as maintaining independence and quality of life (QOL), are often lacking in many clinical trials. Older adults with limited life expectancy may not live long enough to realize the benefits of certain therapies. Guidelines are inherently incapable of addressing individual situations and may conflict with recommendations aimed at another comorbidity. It is up to the provider to reconcile guidelines with patient preferences and to individualize therapy after judging risk/benefit ratio. For example, in an 85-year-old frail hypertensive woman with CKD and frequent falls, it may be unsafe to aim for a blood pressure of 130/80 mmHg. In a similar patient who has hyperphosphatemia, the increased pill burden of phosphate binders may

outweigh the potential long- term benefits.

In an interesting survey of provider decision-making, the strongest factor that influenced PCP decision to refer older adults with CKD was the expectation that the nephrologist will discuss goals of care. Initiation of dialysis per se was not a factor [15]. Decades after its introduction, dialysis therapy has boomed and has automatically been assumed to prolong life. However, the elderly population with ESRD often has poor outcomes and very high mortality rates [16]. CM may be a better alternative for some of them. The nephrologist's role includes assessing, educating and counseling elderly CKD patients and their caregivers to determine the best course of action in the event of ESRD. Estimation of CKD prognosis and understanding outcomes of renal replacement therapy (DT) versus CM (including outcomes that may be relevant to the patient, other than mortality) is crucial for proper "shared decision-making" to occur.

Who progresses to ESRD?

In a very large VA cohort (n = 209,622) with CKD stages 3-5 followed for a mean of 3.2 years, risk of death was higher than risk of treated ESRD in adults >65-84 years of age for eGFR >15 mL/min/1.73 m2. For adults >85 years age, mortality always exceeded risk of treated ESRD. There was not enough information to identify patients who had indications for DT but elected not to start it [17]. Complementing this information, a large community-based CKD cohort from Alberta, Canada (n=1,813,824) was studied retrospectively with a median follow up of 4.4 years. Among those 75 years of age and older, the rate of untreated ESRD was significantly higher (2–10 fold) than the rate of treated ESRD, while the opposite was observed in younger adults. Possible reasons for this include a competing risk of death in older adults, lower rate of uremic symptoms or less acceptance to RRT and transplantation. Still, the rate of combined treated and untreated ESRD was elevated in the elderly [18]. According to USRDS data, the elderly show the highest ESRD incidence and prevalence rates [16].

Using the rate of eGFR decline to predict ESRD is intuitive. However, what constitutes rapid progression is controversial. Data from the Alberta Kidney Disease Network show a graded increase in treated ESRD risk of approximately 2-fold for each 1 mL/min/1.73m2/year increase in eGFR decline slope. Albuminuria is also a major risk factor although changes in albuminuria over time require more studies [3].

However, CKD progression is often non-linear. Acute kidney injury (AKI) can significantly alter the course of CKD. A meta-analysis (n=5529 patients) showed that patients 65 and older with AKI were 28% (95% [CI] 1.01- 1.55, p<0.05) less likely to recover renal function than younger ones [19]. In a US cohort of 233,803 hospitalized elderly patients who survived to discharge, the adjusted hazard ratio for developing ESRD was 41.2 (95% [CI] 34.6 to 49.1) for patients with AKI and CKD relative to those without kidney disease, compared to 8.4 (95% [CI] 7.4 to 9.6) for patients with CKD and without AKI [20]. There is growing interest in predictive models for CKD progression to ESRD. For example, Tangri et al. developed and validated a predictive model of kidney failure from 2 large Canadian cohorts with CKD stage 3–5 [21]. It is available online and in mobile applications such as QxMD. Drawz et al. developed and validated a 1-year predictive model from 2 VA cohorts, which was comparable to Tangri's model in the validation cohort (C-index 0.823 vs 0.780 respectively) [22]. While the utility of these models needs to be evaluated prospectively, they may be useful in the shared decision-making process. Caution is warranted however, when using them (if at all) in populations with different characteristics than the original cohorts.

Survival with or without DT

While older adults can have favorable outcomes after kidney transplantation, the reality is that only very few get this opportunity – 3.4% of ESRD patients 70 or older, 0.5 % of patients 80 and older [23]. This topic is beyond the scope of this review.

In the absence of randomized controlled trials of CM versus DT, retrospective studies offer important insights. In a UK cohort of elderly ESRD patients (n = 129), DT provided better survival (measured from when eGFR <15) compared to CM (12 months of multidisciplinary treatment - MDT). However, patients with high comorbidity scores, especially ischemic heart disease, did not have better survival on DT compared to CM [24]. In a larger UK cohort (n = 844), DT only provided a marginal, non-statistically significant survival advantage of 4 months (measured from a putative eGFR in CM patients) when adjusted for age >75, comorbidity and diabetes [25]. From a different perspective, another UK observational study of 202 elderly patients showed an advantage of DT compared to CM (37.8 versus 13.9 months). However, DT patients had significantly more hospital days and CM patients were more likely to die at home. When accounting for hospital days and time spent on dialysis (whole day for many patients), the difference in "hospital/dialysis free" survival shrinks between the 2 groups to just a few months [26].

There is also interest in predictive mortality models for incident and prevalent dialysis patients. For example, Cohen et al. developed and validated a prognostic tool to estimate 6-month mortality in prevalent dialysis patients in the US [27]. It is available online and in some mobile applications.

Tamura et al. provide a useful framework for individualizing decisions in elderly ESRD patients by considering life expectancy, risks and benefits of competing treatments (including "number needed to treat" comparisons) and patient preferences. They apply it to choice of dialysis modality, choice of dialysis vascular access and referral for transplantation [28]. Using a predictive model to calculate life expectancy would come in handy when following such framework.

Other important outcomes and considerations

Frailty (and geriatric syndromes in general) is very common in elderly CKD patients. Prevalence dramatically increases with CKD stage and is associated with increased mortality [29]. In a US cohort (n=2275), 78.8% of ESRD patients > 80 years of age met criteria for frailty and had more than 2-fold increase in mortality [30]. Nursing home incident ESRD residents (n=3702) were studied linking USRDS data with Minimum Data Set–Activities of Daily Living (MDS–ADL) scores. Patients experienced a sharp decline in functional status in the first 3 months after dialysis initiation. At 1 year, 58% had died and only 13% had maintained their functional status [31]. Similarly, initiation of dialysis had a negative effect on independent living in a community of patients > 80 years old [32].

Functional status of ESRD patients managed by CM was preserved until the last month before death in a UK single center study [33]. Symptoms in the last month can be significant and may require an integrated multidisciplinary palliative care approach [34].

QOL was assessed in a single UK center in a cohort of patients with ESRD treated with RRT versus CM (n = 170, mean age >70, follow up 3 years). CM patients were older, more dependent, had higher comorbidities, poorer physical health and more anxiety at baseline. Mental health, depression symptoms and global satisfaction with life were similar in all modality groups at baseline. SF-36 and anxiety scores changed little during follow-up in both groups. Satisfaction with life scores decreased significantly after dialysis initiation and did not subsequently recover, but did not change over time in the CM group [35].

Shared Decision Making

Discussing all the elements above and aligning CKD management with the patient's goals of care is at the heart of patient-centered medicine. An interesting Australian survey in CKD 3-5 patients (n=105 completed) aimed to asses factors influencing patient choice of ESRD treatment. Patients were more likely to chose RRT over CM if it increases life expectancy, if it can be done during the day or evening versus day only and if subsidized transport was available. They were more likely to chose CM if RRT meant more hospital days and more restrictions on travel. Patients would trade off 7 months of life expectancy to reduce hospital visits and 15 months of life expectancy to increase ability to travel [36]. Unfortunately, elderly patients are often marginalized in the decision to undergo RRT and are left with many misconceptions.

The Renal Physicians Association offers updated guidelines on shared decision making in ESRD (http://www.renalmd.org/catalogue-item.aspx?id=682).

US Concerns and challenges

Most of the data on CM coming from other countries, there are concerns that its implementation in the US is challenging due to "uneven access to palliative care across health care systems, a shortage of palliative-care physicians, limited training of US nephrologists in these areas, and poor reimbursement for these and other cognitive services" [37]. Furthermore, patient choices and goals of care may not agree with the growing number of imposed reportable and penalizable "quality measures," many of which are of questionable utility, especially in the vulnerable elderly. This introduces conflict of interest when practices may be faced with financial penalties.

However, the US healthcare system is constantly evolving. The interest in patient-centered medical homes is extending into patient-centered neighborhoods, with the promise, if done correctly and with fair incentives, of addressing many of these concerns [38, 39].

The dramatic increase in dialysis rates in the US seems to be substantially slowing down recently, suggesting later dialysis starts and greater use of CM [40].

On an international level, KDIGO convened a "Controversies Conference on Supportive/Palliative Care in CKD" in December of 2013 in Mexico, which can be reviewed online (http://kdigo.org/home/conferences/supportivecare/).

CONCLUSION

The elderly population with CKD is growing fast and often has poor outcomes. Guidelines provide guidance as to the management of CKD but older adults present unique diagnostic and therapeutic challenges that go beyond simple numerical targets. Collaboration between primary providers and nephrologists, often within larger multidisciplinary teams may optimize the care of these individuals through better counseling and a process of shared decision-making. Many may be better served by CM. Obstacles are numerous but can gradually be overcome by the concerted efforts of all the involved parties.

References

1. *K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification.* Am J Kidney Dis, 2002. **39**(2 Suppl 1): p. S1-266.
2. *Prevalence of chronic kidney disease and associated risk factors--United States, 1999-2004.* MMWR Morb Mortal Wkly Rep, 2007. 56(8): p. 161-5.
3. *Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease.* Kidney inter., Suppl. 2013(3): p. 1-150.
4. Hallan, S.I. and R.T. Gansevoort, *Moderator's View: Should we diagnose CKD using the 'one-size fits all' KDIGO 2012 guideline or do we need a more complex age-specific classification system?* Nephrol Dial Transplant, 2014. 29(4): p. 780-2.
5. Navaneethan, S.D., et al., *Referral patterns of primary care physicians for chronic kidney disease in general population and geriatric patients.* Clin Nephrol, 2010. 73(4): p. 260-7.
6. Bolignano, D., et al., *The aging kidney revisited: A systematic review.* Ageing Res Rev, 2014. 14C: p. 65-80.

7. Rule, A.D., et al., *The association between age and nephrosclerosis on renal biopsy among healthy adults.* Ann Intern Med, 2010. 152(9): p. 561-7.
8. Lindeman, R.D., J. Tobin, and N.W. Shock, *Longitudinal studies on the rate of decline in renal function with age.* J Am Geriatr Soc, 1985. 33(4): p. 278-85.
9. Levey, A.S., et al., *A new equation to estimate glomerular filtration rate.* Ann Intern Med, 2009. 150(9): p. 604-12.
10. Fan, L., et al., *Glomerular filtration rate estimation using cystatin C alone or combined with creatinine as a confirmatory test.* Nephrol Dial Transplant, 2014.
11. Fliser, D., et al., *Renal handling of drugs in the healthy elderly. Creatinine clearance underestimates renal function and pharmacokinetics remain virtually unchanged.* Eur J Clin Pharmacol, 1999. 55(3): p. 205-11.
12. Levey, A.S., *Measurement of renal function in chronic renal disease.* Kidney Int, 1990. 38(1): p. 167-84.
13. Hallan, S.I., et al., *Age and association of kidney measures with mortality and end-stage renal disease.* JAMA, 2012. 308(22): p. 2349-60.
14. Smart, N.A. and T.T. Titus, *Outcomes of early versus late nephrology referral in chronic kidney disease: a systematic review.* Am J Med, 2011. 124(11): p. 1073-80.e2.
15. Campbell, K.H., et al., *Patient and provider determinants of nephrology referral in older adults with severe chronic kidney disease: a survey of provider decision making.* BMC Nephrol, 2011. 12: p. 47.
16. *U.S. Renal Data System, USRDS 2013 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2013.*
17. O'Hare, A.M., et al., *Age affects outcomes in chronic kidney disease.* J Am Soc Nephrol, 2007. 18(10): p. 2758-65.
18. Hemmelgarn, B.R., et al., *Rates of treated and untreated kidney failure in older vs younger adults.* JAMA, 2012. 307(23): p. 2507-15.
19. Schmitt, R., et al., *Recovery of kidney function after acute kidney injury in the elderly: a systematic review and meta-analysis.* Am J Kidney Dis, 2008. 52(2): p. 262-71.
20. Ishani, A., et al., *Acute kidney injury increases risk of ESRD among elderly.* J Am Soc Nephrol, 2009. 20(1): p. 223-8.
21. Tangri, N., et al., *A predictive model for progression of chronic kidney disease to kidney failure.* JAMA, 2011. 305(15): p. 1553-9.
22. Drawz, P.E., et al., *A simple tool to predict end-stage renal disease within 1 year in elderly adults with advanced chronic kidney disease.* J Am Geriatr Soc, 2013. 61(5): p. 762-8.
23. Knoll, G.A., *Kidney transplantation in the older adult.* Am J Kidney Dis, 2013. 61(5): p. 790-7.
24. Murtagh, F.E., et al., *Dialysis or not? A comparative survival study of patients over 75 years with chronic kidney disease stage 5.* Nephrol Dial Transplant, 2007. 22(7): p. 1955-62.
25. Chandna, S.M., et al., *Survival of elderly patients with stage 5 CKD: comparison of conservative management and renal replacement therapy.* Nephrol Dial Transplant, 2011. 26(5): p. 1608-14.
26. Carson, R.C., et al., *Is maximum conservative management an equivalent treatment option to dialysis for elderly patients with significant comorbid disease?* Clin J Am Soc Nephrol, 2009. 4(10): p. 1611-9.
27. Cohen, L.M., et al., *Predicting six-month mortality for patients who are on maintenance hemodialysis.* Clin J Am Soc Nephrol, 2010. 5(1): p. 72-9.
28. Tamura, M.K., J.C. Tan, and A.M. O'Hare, *Optimizing renal replacement therapy in older adults: a framework for making individualized decisions.* Kidney Int, 2012. 82(3): p. 261-9.
29. Wilhelm-Leen, E.R., et al., *Frailty and chronic kidney disease: the Third National Health and Nutrition Evaluation Survey.* Am J Med, 2009. 122(7): p. 664-71 e2.
30. Johansen, K.L., et al., *Significance of frailty among dialysis patients.* J Am Soc Nephrol, 2007. 18(11): p. 2960-7.
31. Kurella Tamura, M., et al., *Functional status of elderly adults before and after initiation of dialysis.* N Engl J Med, 2009. 361(16): p. 1539-47.
32. Jassal, S.V., E. Chiu, and M. Hladunewich, *Loss of independence in patients starting dialysis at 80 years of age or older.* N Engl J Med, 2009. 361(16): p. 1612-3.
33. Murtagh, F.E., J.M. Addington-Hall, and I.J. Higginson, *End-stage renal disease: a new trajectory of functional decline in the last year of life.* J Am Geriatr Soc, 2011. 59(2): p. 304-8.
34. Murtagh, F.E., et al., *Symptoms in the month before death for stage 5 chronic kidney disease patients managed without dialysis.* J Pain Symptom Manage, 2010. 40(3): p. 342-52.
35. Da Silva-Gane, M., et al., *Quality of life and survival in patients with advanced kidney failure managed conservatively or by dialysis.* Clin J Am Soc Nephrol, 2012. 7(12): p. 2002-9.
36. Morton, R.L., et al., *Factors influencing patient choice of dialysis versus conservative care to treat end-stage kidney disease.* CMAJ, 2012. 184(5): p. E277-83.
37. Inker, L.A., et al., *KDOQI US Commentary on the 2012 KDIGO Clinical Practice Guideline for the Evaluation and Management of CKD.* Am J Kidney Dis, 2014. 63(5): p. 713-35.
38. Greenberg, J.O., et al., *The "medical neighborhood": integrating primary and specialty care for ambulatory patients.* JAMA Intern Med, 2014. 174(3): p. 454-7.
39. Huang, X. and M.B. Rosenthal, *Transforming specialty practice--the patient-centered medical neighborhood.* N Engl J Med, 2014. 370(15): p. 1376-9.
40. Rosansky, S.J. and W.F. Clark, *Has the yearly increase in the renal replacement therapy population ended?* J Am Soc Nephrol, 2013. 24(9): p. 1367-70.

Author

Maroun Azar, MD, is Assistant Professor of Medicine, Alpert Medical School of Brown University, Division of Kidney Diseases and Hypertension, Rhode Island Hospital, VAMC of Providence & Kent Hospital.

Disclosures

None

Correspondence

Maroun Azar, MD
593 Eddy St, APC 9,
Providence, RI 02903
401-444-5445
Fax 401-444-6849
maroun_azar@brown.edu

Anemia and Bone Disease of Chronic Kidney Disease: Pathogenesis, Diagnosis, and Management

DOUGLAS SHEMIN, MD

ABSTRACT

Anemia and metabolic bone disease accompany chronic kidney disease (CKD), and worsen as CKD progresses. It is likely that both processes contribute to the increased morbidity and mortality seen in CKD. This paper briefly reviews the pathogenesis and diagnosis of anemia and bone disease in CKD, and summarizes recent consensus guidelines for treatment.

KEYWORDS: Chronic kidney disease, anemia, hyperparathyroidism

INTRODUCTION

Chronic kidney disease (CKD) affects 10–15% of adults in the United States, is a group of disorders characterized by a progressive decline in the glomerular filtration and renal excretion of low molecular weight solutes. The severity of CKD is measured by the estimated glomerular filtration rate (eGFR), derived from the serum creatinine (SCr) level, and demographic criteria: age, sex, and ethnicity. The normal eGFR is over 120 ml/min; as CKD worsens, the eGFR declines. The current classification of CKD was introduced in 2002 by the National Kidney Foundation (NKF)[1] and subsequently adopted by the international group, Kidney Disease Improving Global Outcomes (KDIGO).[2] The cause of CKD may be diabetes mellitus, hypertension, polycystic disease, chronic glomerulonephritis or other causes, but regardless of diagnosis, the NKF/KDIGO classification defines stage III as an eGFR of 30–60 ml/min, stage IV as an eGFR of 15–30 ml/min, and stage V CKD as an eGFR below 15 ml/min.

Many large observational studies demonstrate that cardiovascular morbidity and mortality increase as the stage advances.[3] Recently, it has been shown that albuminuria (> 30 mg/gram creatinine/24 hour urine), independently of the eGFR predicts morbidity and mortality.[4] Patients with CKD are at highest risk of all cause mortality if their eGFR is < 15 ml/min and urinary albumin excretion is > 300 mg/gram creatinine, but in all age groups, mortality risk increases below an eGFR of 60 ml/min.[4]

CKD involves many pathophysiologic abnormalities: fluid overload, hypertension, accelerated atherosclerosis, inflammation, malnutrition, metabolic acidosis, hyperkalemia, anemia, and metabolic bone disease and it is difficult to ascribe the increased mortality risk to one or even a few causes. As part of a broad approach, these abnormalities can be evaluated and treated, thereby potentially decreasing the mortality risk. Reviewing the treatment of all of these processes is beyond the scope of a short paper. But two abnormalities associated with the decreased renal synthetic function of CKD: anemia, due to decreased production of erythropoietin, and bone disease, due to decreased production of calcitriol, decreased excretion of phosphorus, and increased synthesis of parathyroid hormone (PTH), may present early in CKD. They are relatively easy to diagnose and treat, and provide an opportunity to the primary care provider to potentially decrease some risks associated with CKD. This paper will review the diagnosis and management of anemia and bone disease due to CKD.

Anemia

Anemia, defined as a Hgb < 11.0 g/dL, is common in CKD and worsens as the CKD stage increases: data from a large observational study showed an anemia prevalence of 1.3 % in stage III, 5.2% in stage IV, and 44.1% in stage V CKD; once patients progress to dialysis, it exceeds 90%.[5] The cause of anemia is multifactorial, including deficiencies of vitamin B12 or folate, defective intestinal absorption of iron due to the presence of hepcidin, occult bleeding due to a qualitative defect in platelet function, hemolysis, or bone marrow disease. But the likely greatest contributor relates to CKD itself: a defect in erythropoietin (EPO) production.

EPO is a 165 amino acid protein, which stimulates bone marrow receptors to produce red cell precursors and promote their differentiation into mature erythrocytes. EPO is primarily synthesized in kidney cells, so progressive loss of kidney function leads to decreased EPO production. EPO production normally can be increased thousandfold in response to tissue hypoxia in a process mediated by hypoxia inducible factor 1, and loss of this augmentation occurs in CKD. These abnormalities are present in all causes of CKD, with some exceptions: polycystic disease, for example, may be associated with normal or high EPO production.[6]

Until the mid to late 1980s, the only therapy for the anemia of CKD was vitamin and iron supplementation and blood transfusions. Besides depleting the blood supply, over-reliance on transfusions caused increase in hepatitis B and C in CKD patients, iron overload, and development of antibodies, increasing sensitization to potential renal transplants.

The gene for EPO production was cloned in 1985; immediately, EPO production began, and soon, many clinical trials showed that administration of exogenous EPO increased the Hgb in patients at all stages of CKD, and decreased transfusion dependence. Also, most clinical trials showed that administration of EPO and its structural analogue, darbepoietin (with a longer half life) tends to improve subjective symptoms (fatigue, exercise tolerance, sexual dysfunction, cognitive function, and depression) in CKD in treated patients compared to controls[7]). These findings, along with suggestions that cardiovascular morbidity and mortality was decreased with EPO treatment, and Medicare payment for erythropoietin in dialysis patients on dialysis, led to virtually universal EPO treatment of the anemia in dialysis patients and common treatment at earlier stages of CKD.

But the Hgb target to which EPO therapy should be directed was not well established. Three large, randomized, placebo controlled trials, published between 2006 and 2009 addressed this issue. The trials all randomized anemic patients with CKD to either a high or low Hgb target by varying the dose of EPO or darbepoietin. The Correction of Hemoglobin and Outcomes in Renal Insufficiency (CHOIR) study randomized patients to Hgb normalization (mean achieved Hgb 13.5 g/dL) or partial correction (mean achieved Hgb 11.3) and found that normalization of the Hgb was associated with a statistically greater rate of a composite outcome of cardiovascular death or morbidity.[8] The Cardiovascular Risk Reduction by Early Anemia treatment with Epoetin beta (CREATE) trial randomized patients to full anemia correction (target Hgb 13 -15 g/dL) or partial correction (target Hgb 10.5–11.5 g/dL). There was a non-statistically significant trend towards a higher incidence of cardiovascular events in the full correction group.[9] Finally, the Trial to Reduce Cardiovascular Events with Aranesp Therapy (TREAT) trial compared targeting a Hgb of 13 g/dL with darbopoietin to placebo in CKD patients with diabetes, and found treatment to a higher Hgb target was not associated with a cardiovascular benefit, and was associated with a higher risk of stroke, and cancer associated mortality.[10]

The results of these trials have greatly influenced treatment of CKD associated anemia with EPO or darbopoietin. In 2011, The Food and Drug Administration (FDA) released an advisory statement that the target Hgb level in CKD patients should no longer be 10–12 g/dL, but should be replaced by a program of using the lowest possible EPO or darbepoetin dose necessary to avoid transfusions.[11] The FDA later specified that although that treatment of CKD associated anemia should be individualized, dosing of EPO or darbopoietin in an anemic patient with CKD should be decreased once the Hgb level exceeds 11.0. The FDA guidelines were endorsed by the KDIGO advisory group in 2012 and the American advisory group KDOQI (Kidney Disease Outcomes Quality Initiative) in 2013.[12,13]

Bone Disease

Bone disease in CKD results from abnormalities of metabolism of two ions: phosphorus and calcium, and two hormones: 1,25 vitamin D (calcitriol) and PTH. Phosphorus in the diet is absorbed in the gastrointestinal tract, has a molecular weight of 31 daltons and is water soluble, is filtered by the kidney and its excretion decreases, and the serum level rises, as the eGFR decreases in CKD. The increase in the phosphorus level decreases the concentration of ionized and albumin bound calcium, as a greater proportion of calcium is bound to phosphorus. Renal hydroxylation of 25-vitamin D to its active form (calcitriol) also decreases as a result of progressive CKD. The presence of calcitriol is necessary for absorption of dietary calcium, and decreasing calcitriol, in addition to the high phosphorus level, leads to a drop in the serum calcium concentration.[14]

The decrease in the serum calcium level stimulates calcium sensing receptors in the parathyroid gland to increase transcription and synthesis of PTH. High serum phosphorus and low calcitriol level also independently increase release of PTH. The high PTH, which may be present as early in CKD as an eGFR of 40 ml/min, increases as CKD progresses. Most laboratories in the United States use an intact PTH (i-PTH) assay, which measures both the biologically active PTH molecule and renally excreted inactive fragments, so as GFR worsens, the high intact PTH is due, in part, to this artifactual effect.[15] In a patient with normal renal function, the elevated PTH would correct the low calcium and high phosphorus levels by increasing renal tubular reabsorption of calcium and decreasing reabsorption of phosphorus, but this fails to occur as CKD progresses. So the metabolic bone abnormalities of CKD include hyperphosphatemia (phosphorous level > 5.5 mg/dL), hypocalcemia, a low circulating calcitriol level, and a high level of PTH.

Sustained elevation of the PTH causes two major problems in CKD. PTH regulates bone mineral content, and elevation of the PTH increases osteoblastic, and more importantly, osteoclastic activity, leading to decreased bone mineralization and growth, and an increased risk of fractures. In addition, release of calcium and phosphorus from bone can lead to deposition of calcium and phosphorus in soft tissue and blood vessels, contributing to accelerated atherosclerosis and arterial stiffening. There is an incremental relationship between elevation of the PTH level and cardiovascular morbidity and mortality.[16] Low circulating levels of calcitriol are also associated with increased mortality.[17] A high phosphorus level is clearly identified with mortality in CKD patients treated with maintenance dialysis[16] and there is now new evidence suggesting a relationship between elevation of the serum phosphorus and mortality in individuals with less advanced CKD.[18]

Therapies for the metabolic bone abnormalities of CKD are aimed at correcting the abnormal levels of calcium, phosphorus, calcitriol, and PTH, and hopefully decreasing the effects of bone abnormalities on mortality. Unfortunately,

most of the data on these therapies are present in retrospective, observational, or short-term prospective trials. But, similar to guidelines on treatment of anemia in CKD, two main consortiums of experts, the KDIGO group, in 2009, and the KDOQI group in 2010, have established guidelines for the evaluation and treatment of metabolic bone disease in CKD, and the guidelines are largely in agreement.[19,20]

In stage III CKD, both groups recommend measuring the calcium and phosphorus every 6–12 months, and the PTH level once, with follow-up levels depending on the circumstance. In stage IV CKD, they recommend calcium and phosphorus levels every 3–6 months and PTH levels every 6–12 months, and in stage V CKD, calcium and phosphorus measurements every 1–3 months, and PTH levels every 3 –6 months. In all CKD stages, the 25-vitamin D level should be measured at least once, with follow-up levels depending on the circumstance.

In all CKD stages, if 25–vitamin D deficiency (< 30 ng/ml) is detected, patients should be given nutritional vitamin D (ergocalciferol). Because of decreased hydroxylation of 25-OH vitamin D in advanced CKD, some experts suggest administration of calcitriol instead.[21] In CKD stages III–V, the calcium and the phosphorus level should be maintained in the reference range, (for phosphorus, 2.7–4.6 mg/dL in stage III-IV, and 3.5–5.5 in stage V CKD). Although earlier position papers suggested tight control of the PTH level), KDIGO and KDOQI suggest maintaining the PTH level at 2–9 times the upper limit of normal of the reference range; this works out to be 150–600 pg/ml.

The details of achieving these targets are not specified, but usually involve a combination of vitamin D, dietary phosphorus restriction, and phosphorus binders. As above, ergocalciferol, 50,000 to 100,000 IU per week, with substitution of calcitriol, 0.25 mcg daily as renal function worsens, should be prescribed to vitamin D deficient patients; calcitriol will also independently decrease the PTH level. However vitamin D products will increase the phosphorus level, by increasing gastrointestinal phosphorus absorption. Dietary phosphorus restriction (5–10 mg/kg/day, compared to a usual phosphorus intake of 15–20 mg/kg/day) is the first step. Phosphate restriction may entail protein restriction, so this may require the involvement of a dietitian to avoid malnutrition. Ingestion of plant- based proteins leads to less hyperphosphatemia than ingestion of animal based proteins.[22]

If dietary restriction fails to control the phosphorus level, phosphate binders, which prevent gastrointestinal phosphorus absorption, should be used, and there is some evidence that phosphorus binders improve morbidity and mortality in CKD.[23]

Phosphorus binders are calcium-based (calcium carbonate, calcium acetate) or non-calcium based (sevelamer, or lanthanum). All phosphorus binders will lower the serum phosphorus. There is no proven superiority of one class or agent over another.[24] Calcium containing agents, have, in small observational studies, been linked with a greater degree of vascular calcification,[25] and they should be avoided in patients with hypercalcemia.

CONCLUSION

Anemia and bone disease commonly occur as consequences of CKD, become more severe as CKD progresses, and contribute to the increased morbidity and mortality seen in CKD. Both abnormalities can be relatively easily diagnosed. The specifics of treatment are subject to some debate, but initial treatment, as summarized above, can readily be administered by a primary care physician.

References

1. National Kidney Foundation. K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. *Am J Kidney Dis.* 2002;39:S1-S266.
2. Kidney Disease Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. *Kidney Int Suppl.* 2013;3:1-150.
3. Go AS, Chertow GM, Fan D, et al. Chronic Kidney Disease and the Risks of Death, Cardiovascular Events, and Hospitalization. *N Engl J Med*. 2004; 353[13]:1296-1305.
4. Hallan SI, Matsushita K, Sang Y, et al. Age and Association of Kidney Measures with Mortality and End-stage Renal Disease. *JAMA*. 2012; 308[22]:2349-2360.
5. Astor BC, Muntner P, Levin A, et al. Association of Kidney Function with Anemia: the Third National Health and Nutrition Examination Study (1988 – 1994). *Arch Int Med*. 2002;162[12]:1401-1408.
6. Goodkin DA, Fuller DS, Robinson BM, et al. Naturally Occurring Higher Hemoglobin Concentration Does Not Increase Mortality among Hemodialysis Patients. *J Am Soc Nephrol*. 2011;22[2]358-365.
7. Stevens L, Stigant C, Levin A. Should Hemoglobin be Normalized in Patients with Chronic Kidney Disease? *Semin Dialysis*. 2002;15[1]8-13.
8. Singh AK, Szczech L, Kang TL, et al. Correction of Anemia with Epoetin Alfa in Chronic Kidney Disease. *N Engl J Med.* 2006;355[20]2085-2098.
9. Drueke TB, Locatelli F, Clyne N, et al. Normalization of Hemoglobin Level in Patients with Chronic Kidney Disease and Anemia. *N Engl J Med.* 2006;355[20]: 2071-2084.
10. Pfeffer MA, Burdmann EA, Chen CY, et al. A Trial of Darbopoietin Alfa in Type II Diabetes and Chronic Kidney Disease. *N Engl J Med*. 2009;361[21]:2019 –2032.
11. Food and Drug Administration. FDA Drug Safety Communication: Modified Dosing Recommendations to Improve the Safe use of Erythropoiesis Stimulating Agents in Chronic Kidney Disease. 2011; http://www.fda.gov/drugs/drugsafety/ucm259639.htm.
12. KDIGO Anemia Work Group, KDIGO Clinical Practice Guideline for Anemia in Chronic Kidney Disease. *Kidney Int Suppl.* 2012;2[4]:279-335.
13. Kliger AS, Foley RN, Goldfarb DS, et al. KDOQI US Commentary on the 2012 KDIGO Clinical Practice Guidelines for Anemia in CKD. *Am J Kidney Dis.* 2013;62[5]:849–859.
14. Moorthi RN, Moe SM. CKD—Mineral and Bone Disorder: Core Curriculum 2011. *Am J Kidney Dis*. 2011;58[6]:1022-1036.
15. Souberbielle JP, Roth H, Fouque DP. Parathyroid Measurement in CKD. *Kidney Int*. 2010;77[2]93-100.

16. Block GA, Klassen PS, Lazarus JM, et al. Mineral Metabolism, Mortality, and Morbidity in Maintenance Hemodialysis. *J Am Soc Nephrol*. 2004;15[8]:2208-2218.
17. Ravani P, Malberti F, Tripepi G, et al. Vitamin D Levels and Patient Outcome in Chronic Kidney Disease. *Kidney Int.* 2009;75[1]88-95.
18. Foley RN. Phosphate Levels and Cardiovascular Disease in the General Population. *Clin J Am Soc Nephrol*. 2009;4[11]:1136-1139.
19. Kidney Disease Improving Global Outcomes (KDIGO) CKD-MBD Work Group. KDIGO Clinical Practice Guidelines for the Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney Disease-Mineral and Bone Disorders (CKD-MBD*). Kidney Int Suppl.* 2009;113:S1-S130.
20. KDOQI US Commentary on the 2009 KDIGO Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of CKD-Mineral and Bone Disorder. *Am J Kidney Disease*. 2010;55**[**5]:773-799.
21. Shoben AB, Rudser KD, de Boer IH, et al. Association of oral Calcitriol with Improved Survival in Nondialyzed CKD. *J Am Soc Nephrol.* 2008;19[8]:1613-1619.
22. Moe SM, Zidehsarai MP, Chambers MA, et al. Vegetarian Compared to Meat Dietary Protein Source and Phosphorus Homeostasis in Chronic Kidney Disease. *Clin J Am Soc Nephrol*. 2011; 6[2]:257-264.
23. Kovesdy CP, Kuchmak O, Lu JL, et al. Outcomes associated with Phosphorus Binders in Men with Non-Dialysis Dependent CKD. *Am J Kidney Dis.* 2010; 56[5]:842-851.
24. Block GA, Wheeler DC, Persky MS, et al. Effects of Phosphate Binders in Moderate CKD. *J Am Soc Nephrol*. 2012;23[10]:1407-1415.
25. Goodman WG, Goldin J, Kuizon BD, et al. Coronary Artery Calcification in Young Adults with End Stage Renal Disease who are Undergoing Dialysis. *N Engl J Med*. 2000;342[20]:1478-1483.

Author

Douglas Shemin, MD, is Medical Director, Rhode Island Hospital Dialysis Program, Division of Kidney Diseases and Hypertension, and Associate Professor of Medicine, The Alpert Medical School of Brown University, Providence, RI.

Correspondence

Douglas Shemin, MD
Division of Kidney Diseases and Hypertension
Rhode Island Hospital
593 Eddy Street
Providence, RI 02903
401-444-5445
Fax 401-444-8453
DShemin@lifespan.org

Ambulatory Blood Pressure Monitoring in Children: A Safe and Effective Diagnostic and Screening Tool for the Diagnosis of Hypertension in Children

ROBIN KREMSDORF, MD; M. KHURRAM FAIZAN, MD, FAAP

INTRODUCTION

Hypertension is becoming an increasingly recognized health problem in children. The obesity epidemic has led to a greater frequency of hypertension diagnosis in children. In adults, hypertension is a leading cause of preventable death, heart attack, stroke, and kidney disease. For all patients, the goal of identifying and treating hypertension is to prevent end-organ damage and reduce mortality.

DEFINITION OF HYPERTENSION IN CHILDREN

The definition and classification of pediatric hypertension was put forth in The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents published in 2004.[1] Using demographic data from approximately 64,000 children including NHANES surveys from 1999–2000, definitions of pediatric hypertension and prehypertension were published for children ages 1-17 years, using height percentiles of 5th, 25th, 50th, 75th, 90th and 95th respectively. Hypertension in children is defined as average Systolic and/or Diastolic BP that is > 95th percentile for gender, age and height on > 3 occasions. Prehypertension in children is defined as average Systolic or Diastolic blood pressures that are > 90th percentile but < 95th percentile. The term White Coat Hypertension is used when a child has blood pressures that are > 95th percentile in the clinic or office but < 90th percentile when measured outside of a clinical setting. Ambulatory Blood Pressure Monitoring (ABPM) is usually required to make this diagnosis.

In addition to defining hypertension cutoffs, the Fourth Report also provided valuable guidelines for the measurement of blood pressure in the pediatric population **(Tables 1 & 2).**

AMBULATORY BLOOD PRESSURE MONITORING (ABPM)

Ambulatory Blood Pressure Monitoring (ABPM) refers to a non-invasive procedure in which a portable blood pressure device, worn by a patient, periodically records BP over a specified period of time, usually 24 hours.[1] ABPM is an important tool in evaluating pediatric hypertension. The information obtained during an ABPM study offers a more detailed and nuanced profile of an individual's blood pressure than can be gathered from a series of clinic measurements. It allows for assessment of White Coat Hypertension. It measures the average systolic and diastolic blood pressure during both wakefulness and sleep. It measures the proportion of time that the systolic and diastolic blood pressure is abnormally high. The proportion of time above normal is referred to as the blood pressure load. Each of these components of blood pressure contributes to understanding the particular cardiovascular and renal risk of an individual patient. Among children and adults, abnormalities of ambulatory blood pressure predict the development of hypertensive end-organ damage, specifically left ventricular hypertrophy.[2] Among adults, ambulatory blood pressure predicts cardiovascular events better than clinic blood pressures.[3]

During an ABPM procedure the patient has a blood

Table 1. Measurement of BP in Children.

Children >3 years old who are seen in a medical setting should have their BP measured
The preferred method of BP measurement is auscultation
Correct measurement requires a cuff that is appropriate to the size of the child's upper arm
Elevated BP must be confirmed on repeated visits before characterizing a child as having hypertension
Measurements obtained by oscillometric devices that are greater than 90th percentile should be repeated by auscultation

Table 2. Conditions under which Children Under 3 Years Old Should Have BP Measured.

History of Prematurity, very low birth weight, or other neonatal complication requiring intensive care
Congenital heart disease (repaired or non-repaired)
Recurrent urinary tract infections, hematuria, or proteinuria
Known renal disease or urologic malformations
Family history of congenital renal disease
Solid-organ transplant
Malignancy or bone marrow transplant
Treatment with drugs known to raise BP
Other systemic illnesses associated with hypertension (neurofibromatosis, tuberous sclerosis, etc)
Evidence of elevated intracranial pressure

pressure cuff placed by a nephrology nurse who measures the arm circumference to determine appropriate cuff size. The patient wears the cuff and a small electronic device which can be worn on a belt or in a pocket. The device prompts the cuff to inflate every 20 minutes during the day and every 30 minutes at night to measure blood pressure and also records the blood pressure readings. Patients are advised to avoid heavy physical activity during the study, because this raises blood pressure and can therefore cloud interpretation of the results. The patient wears the monitor for 24 hours. The monitor is then returned to the nephrology clinic and the readings are downloaded for analysis. The nephrologist reviews these results with the patient and family during a clinic visit.

ABPM is the best way to distinguish true hypertension from white coat hypertension. White coat hypertension exists when the blood pressure is elevated in a medical setting, but normal when a patient is in their usual environment. Some case series indicate that 30% of children with elevated clinic blood pressure actually have white coat hypertension. It is imperative that these children understand their true cardiovascular risk, and that they be spared from unnecessary medical therapy. Children with white coat hypertension are also at increased risk for true hypertension and cardiovascular disease compared to their peers.[4] For these children, ongoing blood pressure monitoring (sometimes with annual ABPM) may be necessary.

Blood pressure normally declines during sleep. This is referred to as the "nocturnal dip." Blunted dipping is when the mean systolic or diastolic blood pressure declines by <10% during sleep. This occurs in association with renal disease, poor sleep quality, and the use of glucocorticoids. It is more common among African-Americans.[3] Blunted dipping is commonly seen in patients with diabetes.[2] Adolescent diabetic patients with blunted dipping are more likely to develop microalbuminuria than adolescent diabetic patients with normal ABPM profiles.[5] When blunted dipping is present, nocturnal administration of anti-hypertensive medication can restore a normal dip.

ABPM can be used to distinguish primary from secondary causes of hypertension in children. Awake diastolic blood pressure load >25% or asleep systolic blood pressure load >50% are both highly specific for diagnosing secondary hypertension in children.[6] Children with secondary hypertension require a much more detailed evaluation to determine the cause of their blood pressure elevation than children with primary hypertension.

In the research setting, ABPM is frequently used to evaluate the effects of anti-hypertensive therapy. The use of ambulatory blood pressure (as opposed to casual blood pressure) offers to opportunity to evaluate duration of action of medications and assess patient compliance. It also allows measurement of changes in blood pressure variability and nocturnal dipping. Placebo medication has negligible effect on ambulatory blood pressure.[3]

The goal of all treatment of pediatric hypertension is to reduce cardiovascular risk. As such, accurate understanding of a child's blood pressure is especially important for those whose cardiovascular risk is already increased. Masked hypertension is the phenomenon of elevated ambulatory blood pressure when clinic blood pressure is normal. In the CKiD study, a cohort study of pediatric chronic kidney disease, children with masked hypertension had increased risk of left ventricular hypertrophy compared to those with normal ambulatory blood pressure.[7] Children with diabetes, renal disease, dyslipidemia, or obesity are all at increased cardiovascular risk. Ambulatory blood pressure monitoring can be a useful tool in evaluating and screening for this risk.

PEDIATRIC HYPERTENSION AND ABPM PROGRAM AT HASBRO CHILDREN'S HOSPITAL

Pediatric Ambulatory Blood Pressure Monitoring has been available at the Pediatric Nephrology and Hypertension clinic at Hasbro Children's Hospital in Providence since 2007. Twenty-four hour ambulatory blood pressure measurement is performed using programmable portable oscillometric devices (Spacelabs Healthcare). The program is supported by a team comprising of pediatric nephrologists, a clinical nurse and a pediatric nutritionist. All children undergo ambulatory blood pressure monitoring for a 24-hour period. Patients also undergo screening with a random urine sodium to estimate their dietary salt intake as well a urinary microalbumin measurement to assess cardiovascular and endothelial injury risk. Demographic data including weight, height and BMI is obtained on all children. A detailed family, dietary and physical activity history is obtained to assess lifestyle risk and genetic risk factors. Children identified with metabolic syndrome and obesity are provided extensive nutritional and lifestyle counseling and undergo follow-up ABPM studies. Children fulfilling criteria for hypertension are evaluated for secondary causes of hypertension. Indications for drug therapy as recommended by the Fourth Report[1] are shown in **Table 3**.

As of June 2013, 606 successful ABPM studies have been performed at Hasbro Children's Hospital. Twenty-eight percent of children were found to be clinically hypertensive on ABPM study by definitions put forth by the Fourth Report.[1] Seven percent of children fulfilled criteria for prehypertension. Sixty-five percent of children had a normal 24-hour average blood pressure. Since the latter group was referred to the Pediatric Hypertension clinic on the basis of elevated

Table 3. Indications for Pharmacologic Therapy for Treatment of Hypertension.

Persistent hypertension despite non-pharmacologic measures
Symptomatic hypertension
Secondary hypertension
Evidence of hypertensive target organ damage
Diabetes (Type 1 and 2)

office blood pressures, these patients fulfill the diagnostic criteria for White Coat Hypertension. The fact that almost two-thirds of the children referred to our clinic for suspected hypertension turn out to have normal 24-hour ABPM studies (White Coat Hypertension) greatly underscores the importance of this modality as a screening and diagnostic tool.

The economic importance of using ABPM for the diagnosis of hypertension in children cannot be understated. Numerous studies have validated the primary use of ABPM for the diagnosis of hypertension in both children and adults as a cost-effective, safe and accurate tool.[8,9] In addition, to providing cost savings, ABPM can avoid pain and anxiety in children from unnecessary and invasive tests ordered for work-up of hypertension. Judicious use of ABPM can reduce both physician and parental anxiety and increase productivity by reducing time lost from work and school. Standardized use of ABPM eliminates misdiagnosis of clinic hypertension from improper measurement technique, incorrect cuff size, patient anxiety and inter-observer variability since these are very common sources of erroneous blood pressure measurements in children.

CONCLUSION

Ambulatory blood pressure monitoring has been validated as a safe, painless, non-invasive and scientifically valid diagnostic and screening tool for the diagnosis of hypertension in both children and adults. Our experience indicates a high incidence of White Coat Hypertension in children referred for evaluation of suspected hypertension. When available, ABPM can provide significant economic benefit by reducing unnecessary workup as well as avoid patient and parental anxiety related to misdiagnosis of this important clinical condition. As the incidence of elevated blood pressure in children continues to rise, ABPM should be considered in all children at risk for developing hypertension so that appropriate preventive and therapeutic strategies can be implemented in early life to avoid long term morbidity and mortality related to this important clinical diagnosis.

References

1. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. *Pediatrics*. 2004;114:555-576.
2. Flynn JT. Ambulatory Blood Pressure Monitoring in Children: Imperfect yet Essential. *Pediatr Nephrol.* 2011;26:2089-2094.
3. Pickering TG, et al. Ambulatory Blood-Pressure Monitoring. *N Engl J Med.* 2006;354:2368-74.
4. Urbina E, et al. Ambulatory Blood Pressure Monitoring in Children and Adolescents: Recommendations for Standard Assessment. *Hypertension*. 2008;52:433-451.
5. Ettenger LM, et al. Microalbuminuria and abnormal ambulatory blood pressure in adolescents with type 2 diabetes mellitus. *J Pediatr*. 2005;147:67-73.
6. Flynn JT. Differentiation between primary and secondary hypertension in children using ambulatory blood pressure monitoring. *Pediatrics*. 2002:110:89-93.
7. Mitsnefes M, et al. Masked hypertension associates with left ventricular hypertrophy in children with CKD. *J Am Soc Nephrol.* 2010;21:137-44.
8. Swartz SJ, et al. Cost-effectiveness of Ambulatory Blood Pressure Monitoring in the Initial Evaluation of Hypertension in Children. *Pediatrics*. 2008;122:1177-81.
9. Wang YC, et al. Cost-effectiveness of Secondary Screening Modalities for Hypertension. *Blood Pres Monit*. 2013;18:1-7.

Authors

Robin Kremsdorf, MD, is a Pediatric Nephrologist, affiliated with Hasbro Children's Hospital, Providence, RI, and Assistant Professor of Pediatrics (Clinical), The Warren Alpert Medical School of Brown University.

M. Khurram Faizan, MD, FAAP, is a Pediatric Nephrologist, and the Director of the Division of Pediatric Nephrology and Hypertension, Hasbro Children's Hospital, Providence, RI, and Associate Professor of Pediatrics (Clinical), The Warren Alpert Medical School of Brown University.

Correspondence

Robin Kremsdorf, MD
RIH Dept. of Pediatrics
593 Eddy Street Potter 200
Providence, RI 02903
401-444-5672
Fax: 401-444-3944

The Growing Prevalence of Kidney Stones and Opportunities for Prevention

KATHERINE RICHMAN, MD; JOHN O'BELL, MD; GYAN PAREEK, MD

ABSTRACT

The prevalence of kidney stones is climbing in the United States. Several investigators have demonstrated an association between metabolic syndrome and kidney stones and some have proposed a causal link. Risk factors for nephrolithiasis can be identified with a 24-hour urine collection and preventive measures can be customized to meet the needs of individual patients. Dietary and pharmacologic interventions are available to address urinary risk factors such as inadequate urine volume, hypercalcuria, hyperoxaluria, hyperuricosuria and hypocitraturia. Given that morbidity and healthcare costs associated with nephrolithiasis are on the rise, deterring stone formation is increasingly important. Multidisciplinary clinics that foster collaboration between urologists, nephrologists and dieticians offer patients effective prevention and treatment strategies.

KEYWORDS: kidney stones, nephrolithiasis, metabolic syndrome, risk factors

INTRODUCTION

The prevalence of nephrolithiasis in the United States is increasing [1, 2]. Patients with kidney stones often have a benign course, but life-threatening complications like acute kidney injury and infection can arise. Moreover, the financial burden from medical expenditures and lost productivity is substantial. By one estimate, more than 4 billion dollars were spent treating nephrolithiasis in the year 2000 and since that time costs have been steadily rising [3]. Healthcare providers practicing preventive care should be mindful of risk factors for nephrolithiasis and implement risk-reduction therapy when possible.

EPIDEMIOLOGY

In 1994, the National Health and Nutrition Examination Survey (NHANES) reported a kidney stone disease prevalence of 5.2%. More recent NHANES data, from 2007-2010, revealed an overall prevalence of 8.8%[1]. The prevalence of stones among men increased from 6.3% to 10.6% and from 4.1% to 7.1% among women. Nephrolithiasis continues to be most common in white individuals but the prevalence has increased by 150% (from 1.7% to 4.5%) in African Americans [1].

NHANES data also shows a 91% rise in emergency department (ED) visits for kidney stones since the 1990s. In 1992-1994, 178 per 100,000 ED visits were coded for nephrolithiasis. By 2004-2006 ED visits for stones had increased to 340 per 100,000[2]. ED visits for stones increased by 70% in men and by 128% in women, which is consistent with other observations that the gender gap in stone patients is narrowing [1, 2].

Data from Rhode Island Hospital (RIH) mirrors national data. In 2004, the RIH emergency department (ED) reported 111 cases of kidney stones. By 2013, ED visits coded for nephrolithiasis had grown to 695. As the prevalence of stones increases and medical expenditures mount, the need to focus on prevention intensifies.

Calcium oxalate and calcium phosphate calculi account for more than 80% of kidney stones. Less common stone types include uric acid, magnesium ammonium phosphate (struvite) and cysteine stones. Prevention and treatment strategies vary according to the stone composition. The remainder of this discussion will focus primarily on calcium stones.

RISK FACTORS

The growing prevalence of diabetes and metabolic syndrome and the rise in the number of patients with kidney stones may be more than a coincidence. Multiple studies have demonstrated a heightened risk of nephrolithiasis in patients with metabolic syndrome [4-6]. According to NHANES 3 data from 1988 to 1994, having just two metabolic syndrome traits (abdominal obesity, hypertension, hypertriglyceridemia, low high-density lipoprotein, impaired glucose tolerance) was associated with a significant increase in self-reported kidney stone disease. Study participants with 4 or 5 traits were twice as likely to report kidney stones as those with no features of metabolic syndrome [5].

More recent data from Korea identified hypertension and metabolic syndrome as independent risk factors for radiographically-proven kidney stones. Patients with hypertension had an odds ratio of 1.47 for nephrolithiasis, while those with metabolic syndrome had an odds ratio of 1.25 [6]. Obesity, weight gain, fasting glucose $\geq$ 100, and glycosylated hemoglobin $\geq$ 6.5% have also been associated with an increased risk of stone formation [7, 8]. Although calcium oxalate stones remain the most common stone type in patients with metabolic syndrome, there has been a

substantial increase in the frequency of uric acid nephrolithiasis as well, which appears to be correlated with insulin resistance [9, 10].

While bariatric surgery is increasingly used to treat the morbidity associated with obesity, patients who have undergone Roux-en-Y gastric bypass are at higher risk for nephrolithiasis than obese controls [11]. Hyperoxaluria and hypocitraturia, two urinary risk factors for stone formation, have been observed in nearly half of patients post gastric bypass [12]. Malabsorption of fatty acids results in saponification of calcium which decreases calcium-oxalate complex formation in the gut. In turn, more oxalate is available for absorption from the intestine and is ultimately excreted in the urine [12].

Other medical conditions that confer an increased risk of kidney stones include hyperparathyroidism, renal tubular acidosis, recurrent urinary tract infections, inflammatory bowel disease and medullary sponge kidney [13].

PREVENTION

Patients presenting with nephrolithiasis for the first time have a 50% chance of recurrence by 10 years [13]. In order to prevent recurrence, a detailed medical history and basic metabolic evaluation should be completed in all patients with nephrolithiasis. Available calculi should be analyzed. Serum calcium, phosphorous, potassium, bicarbonate, blood urea nitrogen, creatinine, uric acid and a basic urinalysis should be checked. Abnormalities such as hypercalcemia suggestive of hyperparathyroidism, or low serum bicarbonate consistent with a metabolic acidosis should be thoroughly explored. Recurrent kidney stones, bilateral or multiple stones, age younger than 25, solitary kidney, diabetes or a strong family history of nephrolithiasis should prompt a 24-hour urine collection to identify specific urinary risk factors [13].

Kidney stone formation occurs when the urine is supersaturated with dietary minerals such as calcium, oxalate and phosphate. Crystals precipitate from solution and aggregate to form stones. A 24-hour urine collection that measures volume, sodium, calcium, phosphorous, oxalate, uric acid, pH and citrate identifies risk factors for supersaturation and stone formation [14]. Knowing the type of stone formed by a patient is important in determining preventive measures, but urinary risk factors may vary among patients with the same type of stone. An intervention that is effective in one patient with calcium oxalate stones may not be effective in another patient with the same stone type. For example, not all patients with calcium oxalate stones have hyperoxaluria and prescribing a low oxalate diet is not always necessary.

At least two 24-hour urine collections should be done to confirm risk factors. Collections should not be done within three months of passing a stone. Testing should be done on an outpatient basis when the patient is free to maintain a typical self-selected diet. Using the results of the 24-hour urine collection, the clinician can customize preventive strategies to meet the needs of the individual patient [14]. Once interventions are made, the urine collection should be repeated to make sure that the prescribed therapy is effective in attenuating risk factors.

URINARY RISK FACTORS AND PREVENTIVE STRATEGIES

Inadequate Urine Volume

The cornerstone of preventing stone formation is avoiding supersaturation of the urine with a stone-forming substance. Thus all stone formers are advised to maintain dilute urine. Drinking enough to maintain urine output of at least 2 to 2.5 liters per day could cut the risk of stone recurrence in half [15].

Although increasing fluid intake is a relatively low-cost intervention and has few adverse effects, barriers to utilization do exist. Some patients report not liking the taste of water and forgetting to drink. Other patients are highly motivated to prevent stone recurrence but are unable to void frequently because of occupational demands and workplace restrictions [16].

Increasing intake of any low-calorie fluid is generally recommended. A recent prospective study of 194,095 health professionals found that participants who consumed one or more servings of sugar-sweetened cola per day were 23% more likely to develop stones than those who consumed less than one serving per week. Consuming sugar-sweetened non-cola carried a 33% higher risk of nephrolithiasis. Conversely, daily caffeinated coffee intake appeared to decrease the risk of stones by 26%. Decaffeinated coffee, tea, wine, beer and orange juice were also associated with a lower risk of nephrolithiasis [17].

Hypercalcuria

Hypercalcuria is usually idiopathic but can be the result of hyperparathyroidism. Parathyroid hormone levels should be checked in patients with electrolyte abnormalities like hypercalcemia and hypophosphatemia. Dietary calcium restriction is unnecessary and may, in fact, increase the risk of calcium stone formation [18]. In a prospective study of more than 78,000 women, the average daily dietary calcium intake was 39 mg lower in women who developed kidney stones than in those who did not. On the other hand, average sodium intake was 60 mg higher in stone formers [19]. Italian men, with recurrent calcium oxalate stones and hypercalcuria, randomized to a normal-calcium, low-salt and low-animal-protein diet had a relative risk of stone recurrence of 0.49 compared to men placed on a low-calcium diet [18].

Limiting sodium intake to 2300 mg per day is recommended to decrease urinary calcium and stone risk [20]. Thiazide diuretics also reduce urinary calcium and a recent systematic review of six randomized controlled trials found moderate-strength evidence that thiazide diuretics are

effective in lowering the likelihood of stone recurrence. Hydrochlorothiazide, chlorthalidone and indapamide seemed to be equally effective [15]. Dosing has not been well studied, but quantification of urinary calcium with repeat 24-hour collections can be used to titrate therapy.

Hyperoxaluria

A low calcium diet might augment the risk of nephrolithiasis by increasing free oxalate in the gut. Enhanced oxalate absorption could ultimately lead to hyperoxaluria, thereby increasing stone risk. Although evidence is lacking for the efficacy of a low oxalate diet in stone prevention, restricting oxalate-rich foods like spinach, nuts and chocolate in patients with hyperoxaluria is generally recommended [21]. High doses of vitamin C amplify oxalate excretion and should be avoided [22]. As previously noted, bariatric surgery or small bowel disorders like Crohn's disease can result in fatty acid malabsorption and hyperoxaluria. Restriction of dietary fat and oxalate and increasing calcium intake with meals may attenuate the risk of calcium oxalate stones in patients with malabsorption [20].

Hypocitraturia

Citrate chelates calcium in the urine and inhibits formation of calculi. Chronic diarrhea, renal tubular acidosis and diets high in animal-protein may all be accompanied by a decrease in urinary citrate and a higher risk of stone formation [23]. Urinary citrate can be increased via pharmacologic or dietary intervention. A number of investigations, including four small randomized controlled trials, have shown a decrease in stone recurrence with citrate supplementation, usually given in the form of potassium citrate [15]. For patients who are unable to tolerate pharmacologic therapy or prefer dietary intervention, consuming 4 ounces of lemon juice diluted in water or 32 oz of sugar-free lemonade daily results in a significant increase in urinary citrate [24].

When citrate is used in patients with a history of calcium phosphate stones the urine pH should be monitored closely. Citrate alkalinizes the urine which can be advantageous in preventing uric acid and cysteine stones but promotes the formation of calcium phosphate stones.

Hyperuricosuria

Hyperuricosuria is associated with both uric acid stones and calcium stones. Uric acid decreases calcium oxalate solubility and encourages stone formation. A high purine diet often underlies hyperuricosuria but myeloproliferative disorders and uricosuric drugs are other possible etiologies[20]. Decreasing intake of animal protein may be of benefit and a few randomized controlled trials suggest that allopurinol decreases the risk of calcium oxalate stones [15].

TREATMENT

When prevention fails and calculi form, urologic intervention may be required. Approximately 10–20% of symptomatic stones do not pass spontaneously[20]. Most stones smaller than 5 mm will pass freely while calculi >10 mm usually require intervention [13]. According to the American Urological Association's treatment guidelines, shock-wave lithotripsy and ureteroscopy are first-line procedures for stone removal. For larger stones (>1.5 cm) minimally invasive percutaneous surgery may be required through a 1 cm incision in the flank. Uncommonly, open surgical methods may be necessary to render a patient stone-free.

Multi-disciplinary clinics that combine the services of urologists, nephrologists and dieticians provide an effective approach to prevention and management. Hosking coined the term, "stone clinic effect" after demonstrating a significant decrease in stone recurrence in patients who had visited a clinic and received basic instruction on dietary modification and fluid intake [25]. When calculi form despite preventive efforts, regular surveillance in a stone clinic fosters timely intervention and can minimize morbidity.

CONCLUSION

The incidence of kidney stones is on the rise but preventive measures can be deployed. A 24-hour urine collection can determine risk factors for stone formation and be used to customize preventive strategies for individual patients. Maintaining dilute urine is an important prophylactic measure for any stone type. Hypercalcuria, hyperoxaluria, hypocitraturia, and hyperuricosuria are urinary risk factors for calcium-containing calculi, the most common type of stone. Dietary and pharmacologic measures can be taken to address these risk factors. Primary care providers and specialists have an opportunity to decrease morbidity and health care costs by working with patients to design individualized prevention strategies.

References

1. Scales CD, Jr., et al. *Prevalence of kidney stones in the United States.* Eur Urol, 2012. 62(1): p. 160-5.
2. Fwu CW, et al. *Emergency department visits, use of imaging, and drugs for urolithiasis have increased in the United States.* Kidney Int, 2013. 83(3): p. 479-86.
3. Saigal CS, et al. *Direct and indirect costs of nephrolithiasis in an employed population: opportunity for disease management?* Kidney Int, 2005. 68(4): p. 1808-14.
4. Sakhaee K, et al. *Metabolic syndrome and the risk of calcium stones.* Nephrol Dial Transplant, 2012. 27(8): p. 3201-9.
5. West B, et al. *Metabolic syndrome and self-reported history of kidney stones: the National Health and Nutrition Examination Survey (NHANES III) 1988-1994.* Am J Kidney Dis, 2008. 51(5): p. 741-7.
6. Jeong IG, et al. *Association between metabolic syndrome and the presence of kidney stones in a screened population.* Am J Kidney Dis, 2011. 58(3): p. 383-8.
7. Taylor EN, Stampfer MJ, Curhan GC. *Obesity, weight gain, and the risk of kidney stones.* JAMA, 2005. 293(4): p. 455-62.
8. Kabeya Y, et al. *Associations of insulin resistance and glycemic control with the risk of kidney stones.* Intern Med, 2012. 51(7): p. 699-705.

9. Cho ST, et al. *Correlation of metabolic syndrome with urinary stone composition.* Int J Urol, 2013. 20(2): p. 208-13.
10. Abate N, et al. *The metabolic syndrome and uric acid nephrolithiasis: novel features of renal manifestation of insulin resistance.* Kidney Int, 2004. 65(2): p. 386-92.
11. Matlaga BR, et al. *Effect of gastric bypass surgery on kidney stone disease.* J Urol, 2009. 181(6): p. 2573-7.
12. Maalouf NM, et al. *Hypocitraturia and hyperoxaluria after Roux-en-Y gastric bypass surgery.* J Urol, 2010. 183(3): p. 1026-30.
13. Johri N, et al. *An update and practical guide to renal stone management.* Nephron Clin Pract, 2010. 116(3): p. c159-71.
14. Marchini GS, et al. *Patient-centered medical therapy for nephrolithiasis.* Urology, 2013. 81(3): p. 511-6.
15. Fink HA, et al. *Medical management to prevent recurrent nephrolithiasis in adults: a systematic review for an American College of Physicians Clinical Guideline.* Ann Intern Med, 2013. 158(7): p. 535-43.
16. McCauley LR, et al. *Factors influencing fluid intake behavior among kidney stone formers.* J Urol, 2012. 187(4): p. 1282-6.
17. Ferraro PM, et al. *Soda and other beverages and the risk of kidney stones.* Clin J Am Soc Nephrol, 2013. 8(8): p. 1389-95.
18. Borghi L, et al. *Comparison of two diets for the prevention of recurrent stones in idiopathic hypercalciuria.* N Engl J Med, 2002. 346(2): p. 77-84.
19. Sorensen MD, et al. *Impact of nutritional factors on incident kidney stone formation: a report from the WHI OS.* J Urol, 2012. 187(5): p. 1645-9.
20. Worcester EM, FL Coe. *Nephrolithiasis.* Prim Care, 2008. 35(2): p. 369-91, vii.
21. Worcester EM, FL Coe. *Clinical practice. Calcium kidney stones.* N Engl J Med, 2010. 363(10): p. 954-63.
22. Daudon M, P Jungers, *Drug-induced renal calculi: epidemiology, prevention and management.* Drugs, 2004. 64(3): p. 245-75.
23. Mandel EI, EN Taylor, GC Curhan. *Dietary and lifestyle factors and medical conditions associated with urinary citrate excretion.* Clin J Am Soc Nephrol, 2013. 8(6): p. 901-8.
24. Penniston KL, TH Steele, SY Nakada. *Lemonade therapy increases urinary citrate and urine volumes in patients with recurrent calcium oxalate stone formation.* Urology, 2007. 70(5): p. 856-60.
25. Hosking DH, et al. *The stone clinic effect in patients with idiopathic calcium urolithiasis.* J Urol, 1983. 130(6): p. 1115-8.

Authors

Katherine Richman, MD, is a Physician in University Medicine's Division of Hypertension and Kidney Diseases and Assistant Professor of Medicine, The Warren Alpert Medical School of Brown University.

John O'Bell, MD, is Assistant Director of the Kidney Stone Center at The Miriam Hospital and an Assistant Professor of Medicine at The Warren Alpert Medical School of Brown University, where he also serves as Program Director for the Renal Fellowship Program.

Gyan Pareek, MD, FACS, is Director of the Kidney Stone Center at The Miriam Hospital and Director of minimally invasive urologic surgery at The Warren Alpert Medical School of Brown University, where he also is an Associate Professor of Surgery (urology).

Correspondence

Katherine Richman, MD
University Medicine, Division of Hypertension & Kidney Diseases
593 Eddy Street, APC Building, 9th Floor
Providence RI 02903
401-444-5445
Fax 401-444-8453

Missed Opportunity to Provide HPV Vaccine and Educate Adolescents: Rhode Island Middle and High School Students' Self-Reported HPV Vaccination, 2013 RI YRBS

JUNHIE OH, BDS, MPH; TRICIA WASHBURN, BS; HANNA KIM, PhD

The nation's cancer status report in 2013 highlighted that cancers attributable to human papilloma virus (HPV) increased in the past decade, particularly cancers in the oropharynx and anus.[1] HPV vaccine is crucial in reducing the burden of HPV-associated cancers, by protecting against HPV infections that cause cervical, vulvar, vaginal, anal and oropharyngeal cancers.[2,3] Non-cancerous lesions, such as genital warts, are also prevented by the currently licensed HPV vaccine.[3] The Centers for Disease Control and Prevention (CDC)'s Advisory Committee on Immunization Practices (ACIP) has recommended vaccination against HPV for young females since 2007, and young males since 2011.[3] Despite the robust evidence on vaccine efficacy, safety and cost benefit, only 56% of girls and 43% of boys ages 13–17 years in Rhode Island, were estimated to be up-to-date on the three-dose HPV vaccine series, according to the 2013 National Immunization Survey (NIS)-Teen.[4] The national Healthy People 2020 goal (IID-11.4) is to reach at least 80% coverage among female adolescents ages 13–15 years.[5]

To identify challenges and opportunities in current HPV vaccine coverage, Rhode Island adolescents' self-reported receipt of HPV vaccine was examined in this study. With the study aimed to assess any missed opportunity in provision of HPV vaccine, the authors further evaluated demographic and other characteristics of adolescents who had a recent primary care visit but did not receive HPV vaccine or were not aware of their vaccination status.

METHODS

Data Source and Study Population

The data used for this analysis were obtained from the 2013 **Rhode Island Youth Risk Behavior Survey (YRBS)**. The YRBS is a biennial statewide survey of public middle and high school students, developed by the CDC to monitor health risk behaviors related to leading causes of injury, violence, morbidity and mortality among youth.[6] In collaboration with the Rhode Island Department of Elementary and Secondary Education, the Rhode Island Department of Health has conducted the YRBS since 1997. During the spring of 2013, 2,338 students from 23 public middle schools and 2,453 students from 22 public high schools completed the self-administered paper survey. Overall response rates, determined by school and student response rates, were 81% and 71% for middle and high school surveys, respectively. Data from middle and high school surveys combined for adolescents aged 13–18 years were included in this study (sample size of 3,728 that represents 59,374 adolescents). The age range was determined taking into consideration the current ACIP recommendations of routine HPV vaccination at ages 11–12 years, and catch-up vaccination for 13 years and older, if not previously vaccinated.

Variables Analyzed

The outcome variable, *self-reported receipt of HPV vaccine,* was derived from a state optional question that was included for the first time in the Rhode Island YRBS, and asked respondents if they ever received HPV vaccine ("a vaccine to prevent human papillomavirus or HPV infection, also called the cervical cancer vaccine, HPV shot or GARDASIL"). Adolescents' receipt of HPV vaccine was cross-examined with receipt of a regular check-up or physical exam in the past 12 months. To assess demographic and potential explanatory characteristics of adolescents who *did not* reportedly receive or *were not sure* of receiving HPV vaccine, although they had a primary care encounter in the past year through a regular check-up or physical exam, the following variables were analyzed: 1) gender, 2) age, 3) race/ethnicity, 4) having ever had sexual intercourse, and 5) having ever been taught about AIDS or HIV infection in school as a proxy indicator of exposure to sexual health education.

Statistical Analyses

Data were weighted to the probability of selection and adjusted to reflect the grade, gender and race/ethnicity distribution of the Rhode Island public middle and high school students.[6] All analyses were stratified by gender, considering differential HPV vaccine uptake by gender; the routine HPV vaccine recommendation for boys was added in later years. Bivariate analyses using the chi-square test were done to identify any significant differences between the various groups (at $p<.05$), with respect to *not having received HPV vaccine or not knowing of HPV vaccination status.* To identify important predictors of the outcome variable, gender-stratified multivariate logistic regression analyses were conducted. The statistical significance of the regression coefficients was tested using the Wald statistics (at $p<.05$). SAS survey procedures were used for all the analyses in the study to account for the complex sampling design.

RESULTS

Characteristics of the Study Population

As summarized in **Table 1**, among adolescents aged 13–18 years, approximately three of ten girls and boys, respectively, ever had sexual intercourse (girls: 29.4%, 95% CI=24.7%-34.2%; boys: 31.6%, 95% CI=26.8%-36.3%). The majority of adolescents responded they had ever been taught about AIDS or HIV infection in school and had a regular check-up or physical exam in the past 12 months. No gender difference was observed, regarding sexual experience, AIDS/HIV education, and recent primary care visit.

Self-reported Receipt of HPV Vaccine

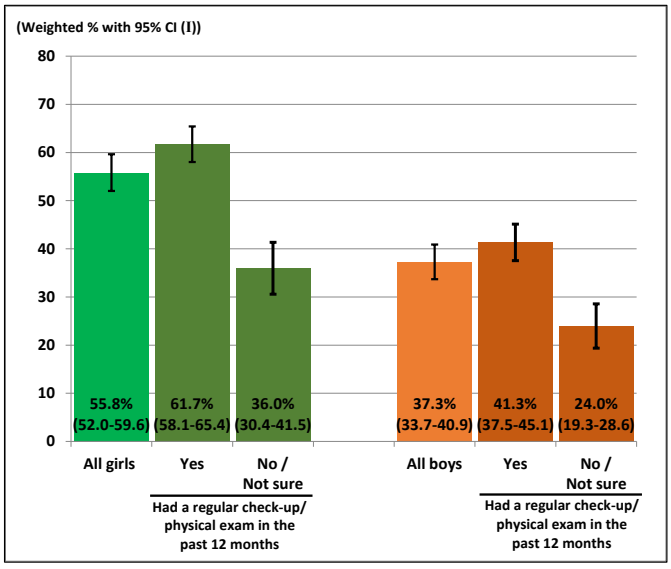
Among girls 13 years and older, 56% (55.8%, 95% CI=52.0%–59.6%) reported ever having the HPV vaccine. A significantly lower percentage of boys in the same age group reported they ever received HPV vaccine (37.3%, 95% CI=33.7%–40.9%, p<0.0001) (**Table 1** and **Figure 1**). For both genders of the adolescents, those who had a regular check-up or physical exam in the past year were more likely to report their receipt of HPV vaccine, compared with counterpart adolescents who did not have a primary care visit (p<0.0001, **Figure 1**).

Table 1. Number and Percent of the Rhode Island Adolescents Ages 13-18 Years by Gender and Study Variables, 2013 RI Youth Risk Behavior Survey (YRBS)

Variable Category	GIRL		BOY	
	n* (unweighted)	Weighted % (95% CI)	n* (unweighted)	Weighted % (95% CI)
Age				
13-14 years	815	38.1 (33.9–42.4)	751	37.0 (32.2–41.8)
15-16 years	713	36.6 (30.9–42.3)	674	38.3 (33.1–43.6)
17-18 years	395	25.3 (20.8–29.7)	380	24.7 (20.3–29.1)
Race/Ethnicity				
Non-Hispanic White	956	65.6 (53.1–78.1)	852	62.9 (51.2–74.5)
Non-Hispanic Black	154	7.4 (3.1–11.7)	178	9.7 (4.3–15.1)
Non-Hispanic Other	196	5.7 (4.1–7.3)	211	6.8 (5.1–8.5)
Hispanic	577	21.3 (12.8–29.8)	517	20.6 (13.2–28.0)
Ever had sexual intercourse				
Yes	481	29.4 (24.7–34.2)	500	31.6 (26.8–36.3)
No	1,326	70.6 (65.8–75.3)	1,136	68.4 (63.7–73.2)
Ever been taught about AIDS or HIV infection in school				
Yes	1,402	78.0 (72.1–84.0)	1,311	76.9 (72.9–80.9)
No/Not sure	471	22.0 (16.0–27.9)	425	23.1 (19.1–27.1)
Had a regular check-up or physical exam in the past 12 months				
Yes	1,425	78.1 (74.7–81.5)	1,285	76.9 (73.7–80.1)
No/Not sure	424	21.9 (18.5–25.3)	429	23.1 (19.9–26.3)
Ever had HPV vaccine				
Yes	992	55.8 (52.0–59.6)	600	37.3 (33.7–40.9)
No	306	16.0 (13.1–18.8)	409	23.6 (20.9–26.2)
Not sure	568	28.2 (25.0–31.4)	699	39.1 (36.9–41.4)
TOTAL	**1,923**	**48.9 (46.4–51.3)**	**1,805**	**51.1 (48.7–53.6)**

* Frequency for each category may not add up to total because of missing data. CI=confidence interval

Figure 1. Rhode Island Adolescents (13-18 years old) Who Reportedly Ever Received HPV Vaccine by Gender and Recent Primary Care Visit, 2013 RI Youth Risk Behavior Survey (YRBS)

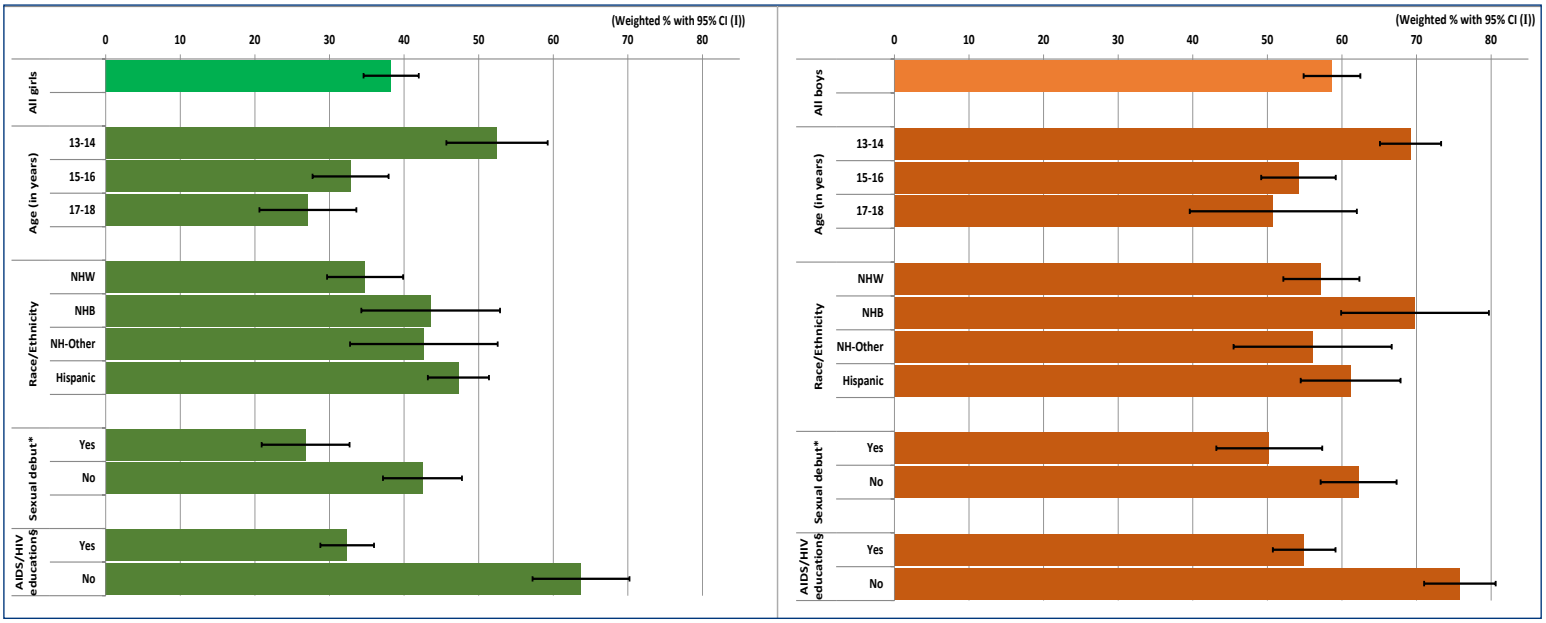


Not Having HPV Vaccine or Not Knowing of Vaccination Status among Adolescents Who Had a Check-up or Physical Exam

About 4 of 10 girls and 6 of 10 boys reported they ***did not*** receive or ***were not sure*** of receipt of the vaccine, although they had a primary care visit in the past year (Girls: 38.3%, 95% CI=34.6%–41.9%; Boys: 58.7%, 95% CI=54.9%–62.5%) (**Figure 2**). The proportions of these girls and boys were significantly higher among younger cohorts than older ones.

The results of multiple logistic regression analyses confirm that adolescent's age, sexual experience and sex education, independently, affect the likelihood of not having received HPV vaccine or not knowing about the vaccination. The strengths of associations with each variable category were not uniform by gender. Odds of not having received the vaccine were greater among girls in age 13–14 years (AOR=2.40, 95% CI=1.54–3.75, compared with 17–18 years), and who

Figure 2. Rhode Island Adolescents (13-18 years old) Who Have Never Received HPV Vaccine/Were Not Sure of HPV Vaccination among Those Who Had Primary Care Visit (a Check-Up or Physical Exam) in the Past 12 Months, 2013 RI Youth Risk Behavior Survey (YRBS)



NHW= Non-Hispanic White, NWB= Non-Hispanic Black, NH-Other= Non-Hispanic Other

* measured with question "Have you ever had sexual intercourse?"

§ measured with question "Have you ever been taught about AIDS or HIV infection in school?"

did not have AIDS/HIV education (AOR=2.61, 95% CI=1.79–3.81). Among boys, those who never had sexual intercourse (AOR=1.47, 95% CI=1.05–2.06) and who never had AIDS/HIV education in school (AOR=2.57, 95% CI=1.89–3.49) were significantly more likely not to have received HPV vaccine than those who ever had sexual intercourse and AIDS/HIV education. In respect to racial/ethnic differences, Hispanic girls and non-Hispanic Black boys, compared to non-Hispanic White peers, were more likely not to report their receipt of HPV vaccine, even though they had a primary care visit in the preceding year.

DISCUSSION

Despite the recommended routine HPV vaccination schedule starting at age 11–12 years, this study's findings showed that, among adolescents aged 13 years and older who had a primary care visit in the past year, only 62% of girls and 41% of boys reported they ever received HPV vaccine. Research showed that HPV vaccine is more likely than other recommended vaccines to be refused by parents.[7,8] Low vaccine coverage by younger age adolescents may be determined by parental or provider factors; parents may delay or refuse the

Table 2. Adjusted Odds Ratios for Not Having Received HPV Vaccine/Not Being Sure of HPV Vaccination among Rhode Island Adolescents (13-18 years old) Who Had Primary Care Visit (a Check-Up or Physical Exam) in the Past 12 Months, 2013 RI Youth Risk Behavior Survey (YRBS)

Variable Category	GIRL Adjusted Odds Ratio (95% CI)	BOY Adjusted Odds Ratio (95% CI)
Age		
13-14 years *vs.* 17-18 years	**2.40 (1.54–3.75)**	1.69 (0.92–3.10)
15-16 years *vs.* 17-18 years	1.35 (0.89–2.04)	1.04 (0.65–1.65)
Race/Ethnicity		
Non-Hispanic Black *vs.* NHW	1.17 (0.76–1.81)	**2.15 (1.12–4.11)**
Non-Hispanic Other *vs.* NHW	1.26 (0.69–2.31)	0.83 (0.53–1.30)
Hispanic *vs.* NHW	**1.59 (1.17–2.15)**	1.09 (0.68–1.73)
Ever had sexual intercourse		
No *vs.* Yes	1.47 (0.90–2.38)	**1.47 (1.05–2.06)**
Ever been taught about HIV/AIDS in school		
No/Not sure *vs.* Yes	**2.61 (1.79–3.81)**	**2.57 (1.89–3.49)**

NHW=Non-Hispanic White

CI=confidence interval

Bold font indicates that 95% CI does not include 1.00.

vaccination, or providers do not strongly recommend, delay, or sometimes do not recommend the vaccine at all. Consistent evidence shows that a strong provider recommendation is the most critical factor to reduce non-compliance rates.[8,9]

Because the YRBS solely relies on adolescents' self-report, the reported prevalence rates are understandably lower than those from the NIS-Teen, which uses estimates derived from the parent/guardian survey and verified with immunization records.[10] According to the 2013 NIS-Teen, 77% of girls and 69% of boys aged 13–17 years in Rhode Island initiated at least one dose of HPV vaccine.[4] The reporting gap between the adolescents' self-report in the YRBS and the NIS-Teen may arise from adolescents' lack of awareness and recall bias, supported by this study finding that a large number of adolescents could not provide an affirmative response to the HPV vaccine question (**Table 1**). Adolescents who were actually vaccinated, recently or years ago, may not have recalled the vaccinations because of the following reasons: 1) parental consent is required for vaccine administration for adolescents; and parents and providers may not sufficiently, or at all, discuss with adolescents during primary care visits or afterward; and 2) adolescents may not actively engage in discussion with parents and providers regarding the care and counseling they receive.

The results of this study, along with the NIS-Teen report, indicate that many Rhode Island teens have not been vaccinated or fully vaccinated against HPV. Primary care visits should be fully utilized as opportunities to educate not only parents but *also* the adolescent patient. Reviewing vaccination history with parents *and* adolescent patients, and assuring up-to-date vaccination are core components during primary care visits.[11] Adolescents benefit from information on the type of vaccines they receive and specific diseases they are protected from by getting those vaccines and other preventive measures. A recent study in an urban hospital-based clinic in the US reported most adolescents perceived the benefits of being vaccinated and the importance of safer sexual behavior after receipt of the first HPV vaccination.[12] This Rhode Island YRBS study found that AIDS/HIV education at school was positively associated with adolescents' self-report of HPV vaccine. Even though authors are not able to evaluate the content, delivery, and receptiveness of AIDS/HIV education in school, an implication from this finding is that adolescents' exposure to a type of sexual health education may reinforce their knowledge on safe sex and perception on protection against HPV infection. It is important to provide age-appropriate counseling at the time of vaccination and the benefits and limitations of HPV vaccination, particularly for teenagers.

The findings in this report are subject to at least three limitations. First, the YRBS data rely on adolescents' self-report and self-recall, as mentioned above, and these anonymous reports are not possible to be verified with secondary sources, such as health record review. Second, due to inherent limitations of cross-sectional study, the authors cannot make a causal inference to explain HPV vaccine coverage among adolescents. Third, the YRBS data provided only a limited number of demographic, sexual experience, and sexual education variables. For further study, more explanatory variables (e.g., medical home establishment, relationship/satisfaction with provider, content and effectiveness of sexual health education, awareness/knowledge of sexual health, cultural/linguistic barrier, etc.) need to be developed and included in the survey with the HPV vaccine variable.

References

1. Jemal A, Simard, EP, Dorell C, *et al.* Annual report to the nation on the status of cancer, 1975–2009, Featuring the burden and trends in human papillomavirus (HPV)–associated cancers and HPV vaccination coverage levels. *J Natl Cancer Inst.* 2013;105(3):175-201.
2. CDC. CDC Grand Rounds: Reducing the burden of HPV-associated cancer and disease. *Morbidity and Mortality Weekly Report (MMWR).* 2014;63(4):69-72.
3. CDC. Human Papillomavirus Vaccination. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Report (MMWR) Recommendations and Reports.* 2014;63(5):1-30.
4. CDC. National, regional, state and selected local area vaccination coverage among adolescents aged 13-17 years – United States, 2013. *Morbidity and Mortality Weekly Report (MMWR).* 2014;63(29):625-633.
5. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People – 2020 Topics and Objectives – Immunization and Infectious Diseases. Washington, DC. Available at: http://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives
6. CDC. Methodology of the Youth Risk Behavior Surveillance System – 2013. *Morbidity and Mortality Weekly Report (MMWR) Recommendations and Reports.* 2013;62(1):1–23.
7. Trim K, Nagji N, Elit L, Roy K. Parental knowledge, attitudes, and behaviors towards human papillomavirus vaccination for their children: A systematic review from 2001 to 2011. *Obstet Gynecol Int*. 2012;921236:1-12.
8. Freed GL, Clark SJ, Butchart AT, *et al*. Parental vaccine safety concerns in 2009. *Pediatrics.* 2009;125(4):654-659.
9. Daley MF, Crane LA, Markowitz LE, *et al*. Human papillomavirus vaccination practices: a survey of US physicians 18 months after licensure. *Pediatrics.* 2010;126(3):425-433.
10. CDC. About the National Immunization Survey. Available at: http://www.cdc.gov/nchs/nis/about_nis.htm
11. American Academy of Pediatrics (AAP). *Red Book: 2012 Report of the Committee on Infectious Diseases.* Pickering LK, ed. 29th ed. Elk Grove Village, IL: American Academy of Pediatrics. 2012. Available at: http://aapredbook.aappublications.org/
12. Mullins TL, Zimet GD, Rosenthal SL, *et al.* Adolescent perception of risk and need for safer sexual behaviors after first human papillomavirus vaccination. *Arch Pediatr Adolesc Med.* 2012;166(1):82-88.

Authors

The authors are affiliated with the RI Department of Health.

Junhie Oh, BDS, MPH, is the Senior Public Health Epidemiologist in the Oral Health Program and the Office of Immunization.

Tricia Washburn, BS, is the Chief of the Office of Immunization.

Hyun (Hanna) Kim, PhD, is the Senior Public Health Epidemiologist in the Center for Health Data and Analysis.

Disclosures

The authors and/or spouses/significant others have no financial interests to disclose.

Correspondence

Junhie Oh, BDS, MPH
Rhode Island Department of Health
3 Capitol Hill
Providence, RI 02908-5097
Junhie.Oh@health.ri.gov

VITAL STATISTICS
MICHAEL FINE, MD
DIRECTOR, RHODE ISLAND DEPARTMENT OF HEALTH
COMPILED BY COLLEEN A. FONTANA, STATE REGISTRAR

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

VITAL EVENTS	REPORTING PERIOD		
	JUNE 2014	12 MONTHS ENDING WITH JUNE 2014	
	Number	Number	Rates
Live Births	1,009	11,309	10.8*
Deaths	746	9,894	9.4*
Infant Deaths	3	64	5.7#
Neonatal Deaths	3	49	4.3#
Marriages	883	6,965	6.6*
Divorces	271	3,267	3.1*
Induced Terminations	216	3,152	278.7#
Spontaneous Fetal Deaths	42	613	54.2#
Under 20 weeks gestation	33	492	49.7#
20+ weeks gestation	9	80	7.1#

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

Underlying Cause of Death Category	REPORTING PERIOD			
	DECEMBER 2013	12 MONTHS ENDING WITH DECEMBER 2013		
	Number (a)	Number (a)	Rates (b)	YPLL (c)
Diseases of the Heart	193	2,385	226.5	3,337.0
Malignant Neoplasms	221	2,403	228.2	5,892.5
Cerebrovascular Disease	43	412	39.1	637.5
Injuries (Accident/Suicide/Homicide)	72	738	70.1	10,866.5
COPD	47	484	46.0	420.0

(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 1,051,511 (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.

Exclusive Real Estate Agency for
the Rhode Island Medical Society

RHODE ISLAND MEDICAL SOCIETY

Coastal Newport Real Estate

LUXURY REAL ESTATE ADVISERS

207 Goddard Row (Brick Market), Newport, RI | (401) 849-7000

Tom Chace | (c)401-965-3259 | tom@coastalnewport.com
Kevin Loflin | (c)401-529-1922 | kevin@coastalnewport.com

Nayatt Point, Barrington, RI

Water Front on Three Sides!! Stunning remodel of a landmark beauty. Rhode Island Country Club is within a two minute golf cart ride. A water view from almost every room. This home has been re-done with class and taste to better than ever. This is a special property with historical significance. Call Tom for your showing today! **$1,980,000**

S. TIVERTON, RI **LAND OPPURTUNITY** Extensive property. Water views to the Sakonnet ,waterfalls, open fields, rock ledges, large tracts of wooded areas, frontage from a few roads, Barn , trails, ponds, wildlife. This is a significant and historic site. Bring your Ideas. **Call Tom for details -$899,000**

BRISTOL, RI **CLOSE TO RW CAMPUS.** 3 bedrooms and a large den. Open floor plan with large windows offer bright living areas. New hardwood floors, newer siding and roof less than 5 yrs. AC Heat pump unit, nicely landscaped yard, and easy access to the bike path in downtown Bristol. **Ready to Move in. $259,900**

Working for You: RIMS advocacy activities

November 4, Tuesday

RIMS Physician Health Committee (Herbert Rakatansky, MD, Chair)

November 5, Wednesday

Meeting with Neighborhood Health Plan regarding fee schedules

November 6, Thursday

Meeting with representative of Rhode Island Board for the Certification of Chemical Dependency Professionals (RIBCCDP) regarding potential legislation

November 7–11, Friday-Tuesday

AMA Interim Meeting, Dallas, Texas; Alyn Adrain, MD, AMA Delegate, and Staff

November 12, Wednesday

Department of Health West African Community Ebola meeting

RI House of Representatives' Committee on Health, Education and Welfare; Ebola Preparedness Hearing

November 13, Thursday

DOH Health Services Council meeting

Medical Review Advisory Committee meeting (Peter A. Hollmann, MD, Chair)

November 17, Monday

RI Foundation Health Care Leaders Committee meeting

Meeting with various government relations representatives regarding election results and upcoming General Assembly session

AMA Conference Call on Medicare Sustainable Growth Rate

AMA Advocacy Resource Center Executive Committee conference call regarding upcoming State Legislation Strategy Conference and ongoing issues

Finance Committee (Jose Polanco, MD, Chair)

November 18, Tuesday

Meeting with Lt. Governor's office regarding SIM grants and upcoming legislative session

DOH Health Services Council meeting

Office of the Health Insurance Commissioner Health Insurance Advisory Committee meeting

November 19, Wednesday

Department of Health Primary Care Physician Advisory Committee

Meeting with Lt. Governor-elect transition staff regarding health care and long term care issues

Meeting of Special Senate Commission to Study Health Plan Patient Liability Provisions on Access to Health Care and Provider Financial Condition (RIMS testimony appeared on front page of the *Providence Journal* on November 20, 2014)

Executive Committee Meeting

November 20, Thursday

Presentation on legislation and membership to Massachusetts/Rhode Island Medical Group Managers Association (MGMA)

Meeting with Department of Health, Health Services Council

November 21, Friday

Conference call regarding proposed regulations on opioid prescribing

November 24, Monday

Executive Office of Health and Human Services-RI Public Expenditures Council (EOHHS-RIPEC) conference on "Bending the Cost Curve"

RI Kids Count Annual Meeting and release of "State of the Child in Rhode Island" annual report

November 26, Wednesday

Meeting with Congressman Langevin; Drs. Silver, Migliori, Jones, RIMS Staff

Why You Should Join the Rhode Island Medical Society

The Rhode Island Medical Society delivers valuable member benefits that help physicians, residents, medical students, physican-assistants, and retired practitioners every single day. As a member, you can take an active role in shaping a better health care future.

RIMS offers discounts for group membership, spouses, military, and those beginning their practices. Medical students can join for free.

APPLY FOR MEMBERSHIP ONLINE

RIMS MEMBERSHIP BENEFITS INCLUDE:

Career management resources

Insurance, medical banking, document shredding, and independent practice association

Powerful advocacy at every level

Advantages include representation, advocacy, leadership opportunities, and referrals

Complimentary subscriptions

Publications include *Rhode Island Medical Journal*, *Rhode Island Medical News*, annual *Directory of Members*; RIMS members have library privileges at Brown University

Member Portal on www.rimed.org

Password access to pay dues, access contact information for colleagues and RIMS leadership, RSVP to RIMS events, and share your thoughts with colleagues and RIMS

More time caring for patients.

Less time worrying about finances.

We know there are two sides to your business: *Health care and managing finances. It's not an easy balance. That's why we have a team of business bankers dedicated to health care practices like yours. Whether you need to finance new technology or streamline your day to day banking, they'll know exactly what you need to get the job done. So you can spend more time caring for patients and less time managing finances.*

See what it's like when a bank lives up to your business needs.

To learn more, contact your personal Webster banker Dev Singh at 401.688.3314 or asingh@websterbank.com.

WebsterBank

LIVING UP TO YOU™

EQUAL HOUSING LENDER

©2014 Webster Bank, N.A.
Member FDIC.
All rights reserved.

All credit products are subject to the normal credit approval process.
The Webster Symbol and Webster Bank are registered in the U.S. Patent and Trademark Office.

Colleagues and Friends Remember David S. Greer, MD

MARY KORR
RIMJ MANAGING EDITOR

David S. Greer, MD
Obituary, page 57

David S. Greer, MD, 89, the second dean of medicine at Brown University (1981–1992), died November 18, 2014, just seven weeks after his wife Marion. "This community lost both Dave as well as his wife of six decades. An immense loss – and we are all the poorer," said **STANLEY M. ARONSON, MD**, Brown's first dean of medicine.

He described Dr. Greer's passing as "a profound loss to me and also to Brown University. Dave and I grew up in the same breeding ground, a place called Brooklyn; and we both served in the military during WW II, and were educated by separate branches of the City University of New York."

Dr. Aronson said the then Program in Medicine recruited Dr. Greer in 1974. "Dave was given the task, as our first associate dean, of assembling the many organizations subsumed under the collective title of 'community health.' And under his supervision an approved residency training program was initiated, one of the finest in the nation. Dave chaired the newly gathered Department of Community Health, an academically vigorous and important impetus in improving the health of Rhode Islanders."

At Dr. Greer's funeral service Nov. 21 at Temple Beth El in Fall River, Mass., the city where he began to practice medicine in 1957, **VINCENT MOR, PhD**, professor of health services, policy and practice at Brown, eulogized his longtime mentor and friend as "a giant of a man but with the softness

MARY KORR

The late Dr. David S. and Marion Greer (center), seated next to Dr. Stanley M. and Gale Aronson (left), attended the May 2014 Alpert Medical School celebration to announce the formation of the Dean Stanley M. Aronson Fund for Research and Innovation. Alpert Medical School Dean Jack A. Elias, MD (at the podium), Brown Chancellor Thomas J. Tisch (far left), former Dean Richard W. Besdine, MD, the Greer Professor in Geriatric Medicine, and Terrie Fox Wetle, PhD (right).

and warmth of a father…I love the memory of meetings at the Greer home, sitting beside him in his study as he edited my turgid prose, telling me that simple language was elegant language; like music, extra notes are a distraction."

He said Dr. Greer recruited him to Brown after starting the Center for Gerontology and Health Care Research in 1980. Dr. Greer had been awarded several major grants to develop gerontology training and to evaluate the emergence of Medicare funding for hospice care. "That was when he made me an offer I couldn't refuse – less money, more work, more responsibility! Fortunately, I was smart enough to realize the value of the opportunity to learn from him."

'David Greer's devotion to his patients in Fall River was legendary. He was rounding on Sunday mornings, making house calls at 10 p.m., possibly riding in an ambulance with a patient at 2 a.m. That level of dedication carries with it the obligation to advance science.'

— Richard W. Besdine, MD

Dr. Mor said Dr. Greer was a leader, "offering vision, advice and giving direction. He shaped the direction of Brown Medical School and nudged the University itself. He provided an example of how Brown could offer support and energy to Providence and Rhode Island. This outward looking impulse, that now reflects a new value which the University has adopted is a reflection of David Greer, and will remain his legacy." (Read Dr. Mor's eulogy)

In the days following the memorial service, **DAVID C. LEWIS, MD**, said, "Dr. Greer's funeral was a reminder of the love and respect with which he was held in his hometown. He was remembered as a physician who made house calls and always had time to listen to patients and their families, often scheduling urgent appointments late in the afternoon so that he could give his full attention to their needs. He founded one of the first elderly housing complexes linked to a hospital in the country in order to insure continuity of care for the seniors of Fall River."

Dr. Lewis said Dr. Greer's caring and compassion for his patients translated into his role at Brown. "I'm not sure how many medical school deans come directly from a family practice to the dean's office but I doubt there are many. Most are specialists coming directly from academia with backgrounds in research. David Greer's solid clinical grounding allowed him to embrace and lead the academic enterprise without ever forgetting the role and obligation that medicine has in the community – a value that he stressed to the medical students and faculty.

"He sought to reform medical education by establishing a close connection with Brown's undergraduate college and the medical program. Thus was born the PLME (Program in Liberal Medical Education) that combined admission to college and medical school," Dr. Lewis reflected.

He worked closely with Dr. Greer when he became dean of the medical school. "I was his surprise pick (a surprise to me as well) to succeed him as Chair of the Department of Community Health," said Dr. Lewis. "We worked closely on expanding the academic program of the department and the clinical teaching program which included a combined clerkship sponsored by Primary Care Internal Medicine at Rhode Island Hospital and Family Medicine at Memorial Hospital."

He said Dr. Greer's help in developing the initial plan for the Center for Alcohol and Addiction Studies at Brown, was "invaluable."

In 2000, donors and friends of Brown and The Miriam Hospital established the David S. Greer, MD, Professorship in Geriatric Medicine in 2000 to create a lasting legacy for his work. **RICHARD W. BESDINE, MD**, has held this position since its inception and his arrival at Brown. He described his late friend and fellow geriatrician as a "great physician I have had the privilege of knowing."

Dr. Greer was, he said, "incredibly modest but not shy and very direct in his opinions. He never gave me advice; he would simply state his opinion." The two had monthly dinners at the University Club, especially helpful when Dr. Besdine served as interim dean at the medical school for more than three years. "I spoke to him about the dean's role and activities. During those dinners and my one-on-one with him I got to know the person very well; he was an incredibly reliable and loyal friend."

When asked what future physicians might learn from Dr. Greer, Dr. Besdine said, "knowing that medicine begins with the patient. The patient is everything. If you stay close to the patient you will never go astray."

He elaborated that, "honoring the patient with your career dedication is more than providing clinical care. David Greer's devotion to his patients in Fall River was legendary. He was rounding on Sunday mornings, making house calls at 10 p.m., possibly riding in an ambulance with a patient at 2 a.m. That level of dedication carries with it the obligation to advance science. If you are dedicated to your patients, you want to learn more than there's currently known about the best ways to care for them and that is what research is all about. That's what David would say. It's a lifelong commitment." ❖

HEALTH Announces Prescription Monitoring Data Link with Connecticut

PROVIDENCE – The Rhode Island Department of Health (HEALTH) announced a new data link between Rhode Island and Connecticut that will help further the efforts to detect overprescribing of opioids as well as combat drug diversion and drug abuse.

Through the National Association of Boards of Pharmacy PMP InterConnect program, Rhode Island and Connecticut Prescription Monitoring Program (PMP) data can now be viewed across state lines. This new data link between Rhode Island and Connecticut enhances the benefits of Rhode Island's PMP by providing the ability for physicians and pharmacists to more easily identify patients with prescription drug abuse and misuse problems, especially if those patients are crossing state lines to obtain drugs. This increased interoperability and data sharing makes it harder for doctor shoppers to avoid detection.

The Prescription Monitoring Program is a tool for the prescriber and for the pharmacist. It gives a more complete picture of a patient's pharmacy history with controlled substances and allows healthcare providers to take the best care of patients. "This PMP partnership with Connecticut broadens the scope of available data so we can get a better idea of what is actually going on. It is critically important for prescribers to sign-up for the PMP so they can consult the patient-specific data to check for any patterns that may indicate a substance abuse problem," says Director of the Rhode Island Department of Health, Michael Fine, MD. "Now that we have access to more data, we need to use it to help quell the pattern of over-prescribing opioids in Rhode Island."

Rhode Island continues to experience a prescription drug and street-drug overdose crisis. Data from Rhode Island's (PMP) demonstrate that the amount and volume of prescribed controlled substances is not decreasing. In September, 116,383 individuals filled a prescription for a schedule 2, 3, or 4 drug in Rhode Island. Likewise, in September alone, 1.16 million doses of stimulants, 1.6 million doses of schedule 2 pain medicines, and 5.4 million doses of benzodiazepines were prescribed. Since January 1, 2014, there have been 181 apparent accidental drug overdose deaths, 23 of which occurred in the month of October.

In August of 2014, the Rhode Island Department of Health made data from its PMP available to the public on the Department's website. Thought to be the first state to make this data available, Rhode Islanders can learn how often prescribers utilize the PMP, the number of prescriptions being written for controlled substances, and some of the trends in substance abuse.

Information on HEALTH's PMP: http://www.health.ri.gov/programs/prescriptionmonitoring/

Information on Rhode Island Controlled Substances usage: http://www.health.ri.gov/data/controlledsubstances/

Information on NABP PMP InterConnect: http://www.nabp.net/programs/pmp-interconnect/nabp-pmp-interconnect

Memorial Researcher Co-Authors Study on Statin Therapies and Diabetes

PAWTUCKET – **CHARLES B. EATON, MD, MS**, director of the Center for Primary Care and Prevention (CPCP) at Memorial Hospital and The Warren Alpert Medical School of Brown University, recently co-authored a study that determined statin drugs taken to lower cholesterol can also increase the person's risk for diabetes and weight gain. However, the study determined that the risks were very small compared with the benefits of lowering cholesterol.

MEMORIAL HOSPITAL

Charles B. Eaton, MD

The study – entitled "HMG-coenzyme A reductase inhibition, type 2 diabetes, and bodyweight: evidence from genetic analysis and randomized trials" – was published in *Lancet*, the world's leading general medical journal.

Pooling multiple genetic studies – including the Women's Health Initiative Study, for which Dr. Eaton is the principal investigator in Rhode Island – the authors compared whether a participant had zero, one or two copies of a gene (one for each arm of the chromosome) associated with production of cholesterol and the risk of diabetes. Those with two copies of the gene had a much higher risk of diabetes than those with no copies and those with one gene copy were at immediate risk.

The genes studied, besides affecting cholesterol production, also affects body weight and insulin levels, both known to be associated with developing diabetes. The researchers then validated these findings using a second gene associated with cholesterol production and by looking at the summary of 12 randomized trials of statin-lowering drugs. They found the same increased risk of diabetes.

"This study shows that statin drugs likely cause diabetes but this increased risk is relatively small and the benefits in reducing coronary heart disease far outweigh this risk," Dr. Eaton says of the statins. ❖

Memorial Hospital Receives Award for Stroke Care

PAWTUCKET – The Stroke Center at Memorial Hospital of Rhode Island has received the Get With The Guidelines®–Stroke Gold Quality Achievement Award from the American Heart Association. This is the fifth consecutive year Memorial Hospital has been recognized by the American Heart Association for its ongoing commitment to and success in implementing a higher standard of care by ensuring that stroke patients receive treatment according to nationally-recognized guidelines.

"Memorial's Stroke Center boasts a collaborative, interdisciplinary team approach to stroke care that follows patients from the emergency room to home care. Our CARF-certified Center for Rehabilitation also plays an integral part in providing comprehensive care to our stroke patients," said **JOSEPH DIAZ, MD**, physician-in-chief of Medicine.

"The Stroke Center's teleneurology program bolsters our capabilities to provide expertise 24/7 for stroke and other neurological emergencies," said **MASON GASPER, DO**, director of the Stroke Center. "This program adds to the excellent care our stroke patients are getting," he added.

To receive this recognition from the American Heart Association, The Stroke Center at Memorial achieved and sustained 85% or higher adherence to specific evidence-based guidelines, over a 24-month consecutive time period as measured in the Get With The Guidelines-Stroke program.

These measures include aggressive use of medications such as IV-tPA, antithrombotics, anticoagulation therapy, DVT prophylaxis, cholesterol reducing drugs, and smoking cessation. All of these measures are aimed at reducing death and disability and improving the lives of stroke patients. ❖

Rhode Island Hospital Receives Leader in LGBT Healthcare Equality Status

PROVIDENCE – In October, the Human Rights Campaign (HRC) announced that Rhode Island Hospital achieved Healthcare Equality Index (HEI) leadership status for its commitment to providing the best practices in lesbian, gay, bisexual and transgender (LGBT) care. The HEI LGBT model is based on four foundational criteria: patient non-discrimination, equal visitation, employment non-discrimination and training in LGBT patient-centered care.

"We have worked tirelessly to assess our practices in treating members of the LGBT community here at Rhode Island Hospital," says Laurie Sawyer, chair of Spectrum Lifespan's LGBT employee resource group. "Our patient visitation policies and rights and responsibilities brochures that are handed out in registration areas and posted on the walls throughout the hospital have been changed to qualify for this status. Additionally, the HRC survey has given staff the opportunity to attend LGBT training webinars so they know how to provide the best care for all patients who come to Rhode Island Hospital."

In 2010, Rhode Island Hospital began its pursuit of the HEI designation, though the hospital had begun implementing some of the employment non-discrimination practices before then.

"Lifespan has always been a leader in employment non-discrimination, allowing an employee's same sex partner to be covered as a family member or a dependent on health insurance, before same-sex marriage was legal in Rhode Island," says Nancy McMahon, vice president of human resources, The Miriam Hospital and Lifespan Physician Group.

The Equality Leader designation is designed to ensure LGBT patients know about and can protect their health care rights. It also allows patients to decide who is allowed visitation and who will make medical decisions in times of emergency. Finally, the HEI status gives LGBT patients assurance that they will receive the best care possible. ❖

Joint Commission Recognizes Newport Hospital

NEWPORT – Newport Hospital has been recognized by The Joint Commission as a 2013 Top Performer on Key Quality Measures®. The hospital, the only one in Rhode Island to achieve this distinction, was recognized for its sustained excellence on accountability measures, or core measures, for heart attack, heart failure, pneumonia and surgical care.

"It's exciting and rewarding to have achieved this important quality milestone for our ongoing efforts to improve clinical performance and the patient experience," said Crista F. Durand, president of Newport Hospital. "Receiving this Joint Commission recognition reinforces Newport Hospital's continued commitment to excellence and the high quality care we provide to our patients every day."

The Top Performer program, which recognized 1,224 U.S. hospitals, acknowledges hospitals for improving performance on evidence-based interventions that increase the chances of healthy outcomes for patients with certain conditions, such as heart attack, heart failure, pneumonia and surgical care.

Hospitals had to meet three performance criteria based on 2013 accountability measure data. These included:

Achieving cumulative performance of 95 percent or above across all reported accountability measures;

Achieving performance of 95 percent or above on each and every reported accountability measure where there were at least 30 denominator cases; and

Having at least one core measure set that had a composite rate of 95 percent or above, and (within that measure set) all applicable individual accountability measures had a performance rate of 95 percent or above. ❖

Newport Hospital Expands Women's Care with Addition of Certified Nurse Midwife

NEWPORT – Newport Hospital's Noreen Stonor Drexel Birthing Center is bringing midwifery services to the hospital with the addition of certified nurse midwife **KAROLYN ZAMBROTTA, RN, CNM**. Zambrotta began seeing new patients on November 10.

Zambrotta, who has been practicing midwifery for more than 10 years, provides a comprehensive range of women's services spanning pregnancy and delivery including prenatal, postpartum and newborn care, breastfeeding support and routine gynecological care.

LIFESPAN

Karolyn Zambrotta, RN, CNM

"It's such a pleasure to welcome Karolyn to the Newport Hospital medical staff as part of Newport Women's Health," says Crista F. Durand, president of Newport Hospital. "Midwives, as the ultimate caregiver, play a distinctive but critical role in the community – and Karolyn's expertise and focus on working alongside women makes her a real asset to the hospital and our community."

The addition of midwifery at Newport Hospital enhances the services offered through Newport Women's Health and the hospital's Noreen Stonor Drexel Birthing Center, which is designated as Baby-Friendly by the World Health Organization (WHO) and the United Nation's Children's Fund (UNICEF).

Zambrotta is no stranger to the Newport Hospital community having served in the past as a labor/delivery nurse at the hospital. In addition, she graduated from the hospital's School of Nursing and later received her bachelor's degree in nursing from Salve Regina University. She earned her master's degree in nursing from the University of Rhode Island.

A member of the American College of Nurses-Midwives, Zambrotta is certified in Advanced Midwifery Practice: Surgical Assisting for Cesarean Birth. She has earned the American College of Nurses-Midwives R.I. Chapter scholarship and the University of Rhode Island Professional Nurse Traineeship.

Zambrotta's community and professional service has included working as a facilitator of Newport Hospital's Breastfeeding Support Group and she has instructed the hospital's breastfeeding and early pregnancy classes. She was also a Newport Hospital Rite Care coordinator and served as a volunteer at Newport's Women's Resource Center. ❖

Proud to be endorsed by the Rhode Island Medical Society

COLLECTIONS WITHOUT ALIENATING YOUR PATIENTS

24/7 Online Client Management System

WE CARE BECAUSE YOU CARE

Local
High Recovery
Customized Programs
Improved Patient Retention

DMI
DEBT MANAGEMENT, INC.

While National Companies are sending their collection calls overseas, all our calls to your patients are made from our local office.

For a free consultation call Carmella Beroth at 508-553-1916 or visit www.debtmanagementinc.com

Debt Management, Inc.
"Collecting the Uncollectible"

Recognition

GAIA VF

RISD graduate Eliza Squibb, executive director of the Global Alliance to Immunize Against AIDS Vaccine Foundation, or GAIA VF, with Madame Rokia Sangaré (on left) and Madame Fatoumata Diarra in Mali. The foundation supports a range of projects in West Africa, including building a clinic for HIV care and conducting studies on vaccines to prevent infectious diseases that affect populations, especially women, living in countries in development.

Dr. De Groot's Global Vaccine Foundation receives $100,000 Gates grant

Will use textiles as teaching device to prevent cervical cancer

KINGSTON – The Global Alliance to Immunize Against AIDS Vaccine Foundation, or GAIA VF, founded by University of Rhode Island research professor **ANNIE DE GROOT, MD**, has been awarded a $100,000 Grand Explorations Grant from the Bill & Melinda Gates Foundation to launch a public awareness campaign about the importance of getting vaccinated against the cancer in West Africa.

The Gaia Vaccine Foundation, whose mission is to promote infectious diseases prevention (HIV, TB, and HPV), while developing globally relevant and accessible vaccines that can be distributed on a not-for-profit basis in underdeveloped nations, will use printed West African cloth to educate women on the benefits of screening and vaccinating against Human Papilloma Virus (HPV), which causes cervical cancer. Cervical cancer is the second most common and lethal cancer affecting women in West Africa. This is thought to be partly due to a lack of knowledge about the causes of the disease.

Dr. Annie De Groot, founder of the Global Alliance to Immunize Against AIDS Vaccine Foundation and a research professor at the University of Rhode Island.

ANNIE DE GROOT, MD

According to the GAIA website(www.gaiavaccine.org), and the Gates Foundation, the patterns on clothing in West Africa often have symbolic meaning, but have not yet been exploited for health education. GAIA has designed and field-tested a brightly colored cloth printed with images representing HPV, the cervix and cancer cells, which they will disseminate in Bamako, Mali. By combining this with a media campaign involving renowned Malian singers, they aim to encourage women to be screened for cervical cancer. The success of the campaign will be evaluated by analyzing subsequent screening rates, and surveying women exposed to the campaign for their feedback.

According to a URI press release, Dr. De Groot connected with Eliza Squibb, who graduated from RISD in 2013 with a degree in textiles and spent time in North Africa and the Peruvian Amazon studying traditional textiles.

After months of work, Squibb designed a stunning pattern that shows healthy uteruses, surrounded by spiky, scary viruses. The repeating design creates a West African pagne pattern that tells the story of HPV-associated cervical cancer, how HPV is transmitted, the importance of screening and the potential for a vaccine to protect against cancer.

Squibb and Dr. De Groot went to West Africa in July to show the fabric to doctors, scientists, health care workers and local women.

The Grand Explorations grant was created when the Gates Foundation committed $100 million to encourage scientists worldwide to create groundbreaking solutions to our greatest health challenges. Launched in 2008, more than 1070 grants have been awarded to innovative, early-stage products in more than 60 countries. Initial grants of $100,000 are awarded two times a year. Successful projects have been the opportunity to receive a follow-on grant of up to $1 million. ❖

Planning for Life

Our Financial Planning service was founded on a simple principle: provide quality, confidential service and advice focused on your best interests. Achieving your financial goals requires the guidance of a Financial Planner who is backed by a company that employs a diverse team of specialists. With access to this expertise, your Financial Planner is able to deliver to you cutting-edge solutions that address your specific needs. Your Financial Planner's network of company specialists are:

EXPERIENCED and trained in individual and business planning strategies.

FOCUSED on keeping your financial planner up-to-date on legislative and regulatory changes that might impact your financial goals.

SKILLED in delivering cutting-edge financial strategies, effective product implementation and superior tactics designed to help you either stay on track or change course as your needs dictate.

DEDICATED to delivering state-of-the-art technology, including modeling and illustrative tools that show the "big picture" now and in the future.

COMMITTED to a shared mission with you and your advisors. Your Financial Planner's role is to recommend the most appropriate and cost-effective strategies and products that will help your plan stay aligned with your goals.

That's why Baystate is an industry leader in offering personal, face-to-face financial guidance and product solutions to medical professionals, business owners, executives and families with special needs.

BAYSTATE FINANCIAL

Please contact us at 401-432-8836
401 Wampanoag Trail, Suite 100
East Providence, RI 02915

RIMS IBC

WWW.BAYSTATEFINANCIAL.COM

New England Financial is the registered mark for New England Life Insurance Company NELICO), Boston, MA 02116.Securities products are offered through registered representatives of New England Securities Corporation, (NES) a broker-dealer (member FINRA/SIPC). Investment advisory services and financial planning are offered through New England Securities Corporation. NELICO & NES are affiliated. Baystate Financial Services is not affiliated with NES. Neither New England Securities nor its representatives offer tax or legal advice. Please consult your tax advisor or attorney for guidance. Branch address 200 Clarendon St, 19th Floor Boston, MA 02116. L1213352931[exp0116][AllStates][DC,GU,MP,PR,VI]

Recognition

AHA announces first researchers for groundbreaking CVGPS project

Researchers were awarded CVGPS Pathway Grants funded at $250,000 per year for two years

CHICAGO – The first funded researchers in the groundbreaking Cardiovascular Genome-Phenome Study were announced during the American Heart Association's scientific sessions November 16.

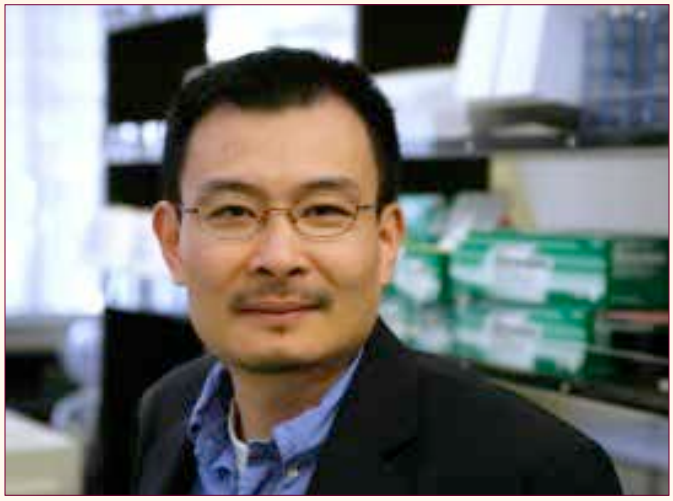
The Cardiovascular Genome-Phenome Study, also known as CVGPS, is designed to speed up the discovery of more personalized treatments and prevention for cardiovascular diseases and stroke. CVGPS does this by enabling researchers for the first time to simultaneously access massive volumes of deeper-level data from multiple studies, including the famed Framingham Heart Study and Jackson Heart Study.

"These scientists are building the future on the power of the past and are following in the footsteps of the American Heart Association's founders in a bold and novel way," American Heart Association President Elliott Antman, MD, FAHA, said while announcing the winners during his Presidential Address.

Brown University award recipient **SIMIN LIU, MD, ScD, MPH**, will focus on integrative genomics of gene-diet interactions in vascular outcomes across ethnicities.

CVGPS combines long-term population studies with the precision of molecular analysis at the individual level to characterize key distinctions within and between patient subgroups. These distinctions will point the way toward more precisely targeted, safer and more effective treatments based on a deeper understanding of individual risk profiles, therapeutic needs and other factors.

Joseph Loscalzo, MD, chair of the American Heart Association Science Oversight Group for CVGPS, has explained the goal of the project very simply:



AHA

Brown University award recipient Dr. Simin Liu

"What we are trying to do with CVGPS is to speed up progress," said Dr. Loscalzo, professor and chair of medicine at Harvard Medical School, physician-in-chief at Brigham and Women's Hospital, Boston, and editor-in-chief of Circulation. "To use an analogy involving the speed of data delivery, we want to go from the days of the Pony Express to email."

Researchers were awarded CVGPS Pathway Grants funded at $250,000 per year for two years. The funding is part of the $30 million over five years provided by the AHA. ❖

HASBRO

Hasbro Expert Appointed to National Child Passenger Safety Board

Dina Morrissey, MD, MPH, to represent injury prevention

PROVIDENCE – **DINA MORRISSEY, MD, MPH,** research associate at the Injury Prevention Center at Hasbro Children's Hospital, has been appointed to The National Child Passenger Safety Board (NCPSB) as the board's representative for Injury Prevention/Healthcare for the 2014-2016 term.

In this role, Dr. Morrissey will support the NCPSB mission to maintain the quality and integrity of the National Child Passenger Safety Certification Training Program. This program is used to train and certify child passenger safety (CPS) technicians and instructors. The board works collaboratively with the National Highway Traffic Safety Administration (NHTSA) and with Safe Kids.

Prior to entering the field of injury prevention, Dr. Morrissey practiced as a primary care pediatrician. After earning her master's degree in public health, she joined the Injury Prevention Center (IPC) at Hasbro Children's Hospital as community outreach coordinator. Dr. Morrissey manages the Kohl's Cares – Kids on the Go and Injury Free Coalition for Kids programs at the IPC. She also serves as the statewide coordinator for Safe Kids Rhode Island. ❖

A new day in data.

Sprint Family Share Pack is the perfect plan for your data hungry family. Get 20GB of data to share on up to 10 lines when you switch to Sprint. Plus, save with the Sprint Discount Program.

Visit a Sprint Store or **sprint.com/save**.

Sprint

SPRINT DISCOUNT PROGRAM

15%

Discount applies to select regularly priced Sprint monthly data service.

Discount for employees of **RI Healthcare Orgs.**

Discounts range from 15-23%.
Visit sprint.com/save to see if you qualify.

Activ. Fee: $36/line. Credit approval required. **Plan:** Offer ends 1/15/2015. No discounts apply to access charges. Includes 20GB of on-network shared data usage, 100MB off-network data usage and unlimited domestic Long Distance calling and texting. Int'l svcs are not included. Max of 10 phone/tablet/MBB lines. **SDP Discount:** Avail. for eligible company employees or org. members (ongoing verification). Discount subject to change according to the company's agreement with Sprint and is avail. upon request for select monthly svc charges. Discount only applies to data service for Sprint Family Share Pack. Not avail. with no credit check offers or Mobile Hotspot add-on. **Other Terms:** Offers and coverage not available everywhere or for all phones/networks. Restrictions apply. See store or sprint.com for details. © 2014 Sprint. All rights reserved. Sprint and the logo are trademarks of Sprint. Other marks are the property of their respective owners. N145495CA

Hospital Association of Rhode Island Honors 'Hospital Heroes'

WARWICK – Individuals from throughout the state were recently honored at "Celebration of Excellence in Hospital Care," an annual awards ceremony held by the Hospital Association of Rhode Island (HARI). Employees of the year from HARI's member hospitals were recognized by the HARI Board of Trustees for exemplary performance and dedication to health care.

In addition, recipients of the Benjamin R. Sturges Distinguished Service Award, Francis R. Dietz Award for Public Service and Edward J. Quinlan Award for Patient Safety Excellence were honored.

The inpatient obstetrics team at Women & Infants Hospital, led by **JAMES O'BRIEN, MD**, was the recipient of the Edward J. Quinlan Award for Patient Safety Excellence. The team was honored for successfully implementing a policy that has eliminated elective delivery at less than 39 weeks gestation. The award is a tribute to Edward Quinlan who championed quality improvement and patient safety initiatives while he served as president of HARI for two decades.

KENNETH BELCHER, FACHE and **ALBERT PUERINI, MD**, were the recipients of the 2014 Benjamin R. Sturges Distinguished Service Award. Belcher was honored for dedicated service to CharterCARE Health Partners where he previously served as CEO. Dr. Puerini was recognized for his work as president of Rhode Island Primary Care Physician Corporation. The Distinguished Service Award is bestowed in honor of Benjamin Sturges, a community leader who devoted his life to health care and to bettering the community. For half a century, Sturges was active in hospital issues as a trustee at South County Hospital and Butler Hospital, and was committed to many educational and environmental causes.

GERARD GOULET, ESQ., and **PAMELA STEADMAN-WOOD, PHD**, were the recipients of the Francis R. Dietz Award for Public Service. Goulet was recognized for his impact on the state's health care industry through his roles as regulator, attorney and educator. Steadman-Wood was honored for her work in providing home-based care to veterans with complex medical, social and behavioral conditions. The Francis R. Dietz Award for Public Service honors individuals for remarkable contributions to health care issues. HARI dedicates its public service award to the legacy of Francis Dietz, a long-time CEO of Memorial Hospital of Rhode Island.

Recipients of the Award for Excellence in Hospital Care include:

- Diane Ferreira, Director of Social Services, Butler Hospital
- Antonio Andrade, Nuclear Medicine Technologist, Kent Hospital
- Gino Olaes, Public Safety/Security Manager, Landmark Medical Center
- Judith Shorter, Clerk/Receptionist-Pulmonary Medicine, Memorial Hospital of Rhode Island
- Kenneth Cotter, General/Boiler Mechanic, St. Joseph Health Services of Rhode Island
- James Sharkey, General/Boiler Mechanic, St. Joseph Health Services of Rhode Island
- Karen Ryan, Supervisory Medical Supply Technician, Providence VA Medical Center
- Dawn Freeman, Distribution Technician, Roger Williams Medical Center
- Lisa Kanakry, Registered Nurse, South County Hospital
- Wendy Tucker, Remote Coder, Westerly Hospital
- Iris Sian, NICU Care Assistant and Certified Nursing Assistant, Women & Infants Hospital

❖

Recognition

MEMORIAL HOSPITAL

Memorial Hospital School of Nurse Anesthesia Program Holds Graduation

Left to right, Mark Foster, CRNA, MA, CRNA program director; Rebecca Fargen, Janet Vaughn, Kimberly Giltner, Natasha Pyykko, Dominic Gentile, William Milner, David Phillips, Katie Szpila, all graduates and Susan Walker, MD, anesthesiologist-in-chief (interim).

PAWTUCKET— Ceremonies for the 48th graduation of the Memorial Hospital of Rhode Island School of Nurse Anesthesia Program took place on October 24, 2014 in the hospital's Medical Staff Auditorium.

This year's graduates are: Rebecca Fargen of Richland Center, WI; Domenic Gentile of Worcester, MA; Kimberly Giltner of Portland, OR; William Milner of Smithfield, RI; David Phillips of Boise, ID; Natasha Pyykko of Los Angeles, CA; Katie Szpila of Easthampton, MA; and Janet Vaughn of Phoenix, AZ.

MARK A. FOSTER, CRNA, MA, director of Memorial's School of Nurse Anesthesia Program, recognized the accomplishments of the eight nurse anesthetists. He noted how the graduates devoted the past 29 months to a comprehensive didactic and clinical curriculum, earning a master's of science in Biological Sciences/Anesthesia.

He also thanked the following individuals who supported the program: Peter Baziotis, MD; Susan Walker, MD, anesthesiologist-in-chief (interim); anesthesiologists with Anesthesia Care; Ruth Rollin, PhD, academic coordinator of Central Connecticut State University; Keith Macksoud and Elena Litmanovich, both CRNA faculty; the surgeons and staff in the Operating Room, Post Anesthesia Care Unit, Surgical Place Recovery Unit; and Pulmonary Function Lab at our hospital; Cyndi Hannaway, secretary for the Department of Anesthesia; and the clinical coordinators and adjunct faculty at the following clinical sites - Susan Roessle, CRNA from St. Luke's Hospital in New Bedford, MA, Helen Mandybur, CRNA Coordinator at Kent Hospital in Warwick, RI; Joseph Criniti CRNA coordinator at St.Francis Hospital, Hartford CT; and Dr. Sana Ata, Chairperson and Coordinator at Lahey Hospital and Medical Center, formerly Lahey Clinic in Burlington, MA.

Domenic Gentile, on behalf of the graduates, thanked the administration, Anesthesia Department's faculty and staff and his fellow classmates for their support. ❖

Are you a Rhode Island independent primary care physician looking to....

RHODE ISLAND
PHYSICIANS CORPORATION
PRIMARY CARE

Maintain your independence.
Collaborate with your colleagues.
Improve the quality of care.
Achieve professional statisfaction.

Learn about how we can get you there by visiting www.RIPCPC.com
or by calling 401.654.4000

Obituaries

STEVEN CHARLES BRIN, MD, passed away on Nov. 2, 2014. He is survived by his wife, Dr. Rita Nenonen, his two children Sara and Elizabeth, his grandson Calvin Rex Jedreski as well as his two brothers, Drs. Kenneth and Mitchell Brin and his mother Phyllis Brin.

Dr. Brin was born in Boston, and attended college at the New York University. He completed a master's degree in genetics at George Washington University and received his medical degree at the Medical College of Pennsylvania. After completing an internship and residency in internal medicine at Roger Williams Hospital in Providence, he worked at the Providence Community Health Center and Harvard Pilgrim Health Care. In 1997, he began practicing internal medicine at Coastal Medical in Providence where he has worked for the past 17 years, attended to patients at Rhode Island Hospital, and provided care at Morgan Health Nursing Home.

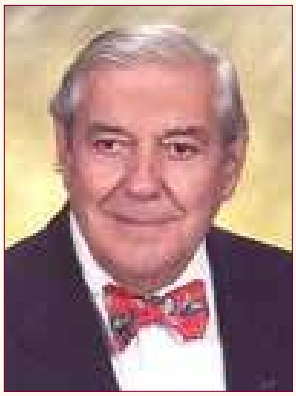
Dr. Brin expressed his dedication to the community volunteering at the Rhode Island Free Clinic. He served on the Board of Coastal Medical and multiple medical committees. He enjoyed spending time with his three girls and his new grandson. His love for his work with patients and the medical community in Rhode Island was rivaled only by his love for his wife and daughters.

He was a sailor, and looked forward to taking family and friends out on his 25-year-old Bristol 35.5 that he nurtured and cared for like a member of the family. He had a passion for music and while in high school, appeared on the Ted Mac Amateur Hour playing his 12-string guitar.

In lieu of flowers, gifts or donations be made to the Rhode Island Free Clinic at 655 Broad Street, Providence, Rhode Island, 02906 or through their website at www.rifreeclinic.org.

HOWARD A. HALL, MD, 80, of South Dartmouth and Providence died at home on Oct. 25, 2014. He was the husband of Myrna (Walker) Hall.

Dr. Hall was an obstetrician and gynecologist in private practice and on the staff of Woman & Infants Hospital and the Warren Alpert School of Medicine at Brown University. He served on numerous medical and professional boards including the board of Medical Licensure and Discipline and the board of Home and Hospice Care of R.I.



He graduated from University of New Hampshire and the Medical College of Virginia. He was an Army veteran of the Korean War.

Besides his wife he leaves a daughter Margaret H. Donabed and her husband Aram of Westwood, MA; two sons, H. Allen Hall Jr. and Charles B. Hall and his wife Anne, all of Philadelphia, a stepdaughter Susannah C. Kavanaugh and a stepson Andrew Kavanaugh, both of Chicago and his grandchildren, Isabel and Aram Donabed, George, Mason, Owen, Miles and Wilson Hall and Grady and Chase Wilkins.

In lieu of flowers donations in his memory may be made to Community Nurse and Hospice Care, 62 Center St., Fairhaven, MA 02719 or to Home and Hospice Care of R.I., 1085 North Main St., Providence RI 02904.

Obituaries

DAVID S. GREER, MD, 89, died November 18, 2014. He was the husband of the late Marion (Clarich) Greer; they were married for 64 years. Born in Brooklyn, NY, the son of the late Jacob and Mary Greenberg, he had been a resident of Fall River since 1957. Dr. Greer received his education in the New York City school system, Brooklyn College, the University of Notre Dame, the University of Chicago, and Yale University. His education was interrupted during World War II when he served two years in the armed forces as an aviation cadet.

Dr. Greer came to Fall River in 1957 to practice medicine at the Truesdale Clinic. He was actively involved in a very large number of community and statewide activities ranging from voluntary service with several Fall River agencies (the District Nursing Association, the Family Service Association, and the Fall River Housing Authority) to membership on several gubernatorial commissions and the Board of Trustees for both Bristol Community College and U. Mass Dartmouth whose board he chaired in 1973 and 1974. In the early 1970s, while he was president of the medical staff of the Truesdale Hospital and medical director of the Earle E. Hussey Hospital, Dr. Greer founded Highland Heights Apartments, renamed Cardinal Medeiros Towers, which was the first hospital-connected public housing facility in the nation for the physically impaired.

In 1974, Dr. Greer joined the administration and faculty of the new medical school at Brown University as an associate dean. There, he founded and chaired the Department of Family Medicine, the Department of Community Health, and the Gerontology Center. He was appointed dean of medicine at Brown in 1981 and served in that position until 1992. Upon retiring from Brown, he served as the medical director of the SSTAR Family Healthcare Center in Fall River until 1998.

Dr. Greer was a member of numerous prestigious organizations including Mastership in the American College of Physicians and the Institute of Medicine of the National Academy of Sciences, and was designated as a Kellogg Foundation Fellow in International Health. His many honors and awards included an honorary Doctorate of Humane Letters from Southeastern Massachusetts University; the Cutting Foundation Award for service to religion in society from the Andover Newton Theological Seminary; the Bristol Community College Distinguished Service Award; the University of Chicago Medical Alumni Association Distinguished Service Award, and the Outstanding Citizen Award from the Jewish Veteran's Auxiliary.

Dr. Greer was a founding director of the International Physicians for the Prevention of Nuclear War, which won the Nobel Peace Prize in 1985.

He is survived by his daughter; Linda Greer and her husband Mike Tilchin of Bethesda, MD; his grandchildren Ross and Carla Tilchin, his daughter-in-law Nancy Smith Greer, his sister-in-law Joyce Greer Stern, and his brother-in-law and sister-in-law Daniel and Eleanor Clarich. He was the father of the late Jeffrey Greer, and brother of the late M. Philip Greer. His wife Marion died in September of this year.

In lieu of flowers, contributions in his memory may be made to Family Service Association of Fall River, 101 Rock Street, Fall River MA 02720.

The Hesitant Pathway to the Humours

STANLEY M. ARONSON, MD

FEW ARE THE WORDS THAT MAINTAIN THE SAME MEANING FROM AGE to age, from continent to continent, from one professional assemblage to another. There are, for example, ordinary words captured by the medical profession, and over the centuries have been given a uniquely Hippocratic slant.

Consider the lexicographic journey of a simple Latin noun, *humanus*, meaning 'person', giving rise to such English terms as humanity, humane and humble. This noun, in turn, had earlier evolved from the Latin, *humus*, meaning 'from the earth', and in turn generating such current words as humus and humility.

Humus then gave rise to the French, *umble,* with a variant meaning 'close to the earth.' And from this source came such English words as humiliate and even chameleon.

Humble pie (sometimes spelled 'umble') from the French, *umble,* suggests now a sense of meekness and humble silence. Expressions such as 'he eats humble pie' denotes the quality of humbleness which is but one step removed from 'humiliated.'

But when we encounter that Latin word, *humere*, we must recall that it is remotely related to the noun, *homo*, meaning a person. And this, through many adaptations, forms the lexical precursor of *humere*, meaning 'to be moist.' This in turn led to the English noun, humor, originally meaning 'liquid or moisture.' And when our professional predecessors developed a theory that disease was caused by some imbalance of the four bodily fluids (bile, choler, phlegm and blood) the word, 'humor' seemed an apt term to define all four of these essential fluids. This pathophysiological theory purported to identify the ailments of humans but also their temperament and mental outlook. And so, humor, embraced many variant meanings of emotional inclination, mood, whim – or, eventually, an appreciation of the comic aspects of life, a sense of humor. Comedy, in this setting, is viewed as a departure, not from the truth but from despair. And, most believe, that everything in life is really comical – as long as it happens to someone else.

PAGE FROM *CATOPTRUM MICROSCOPICUM*, JOHANN REMMELIN, 1619 FROM THE RIMS COLLECTION AT THE HAY LIBRARY

"In healthcare, the security of patient information is critical. Shred-it gets it."

Doctor-patient confidentiality is no longer just a professional promise. It's now a legal requirement.

Shred-it document destruction services can help you meet your compliance obligations with reliable, on-time service.

We can help you prevent identity theft and security breaches, and safeguard your patients' privacy so you can focus on other priorities.

Schedule your Free Security Assessment

Contact Shred-it today.

800 69.Shred

www.shredit.com/providence

Making sure it's secure.™

This offer will expire on December 31, 2013.

December 1917: RI Medical Teams Rush to Halifax Disaster

Described as the most devastating pre-atomic blast ever recorded

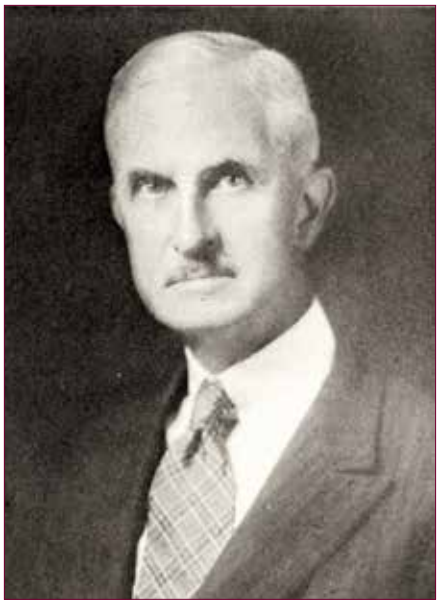
BY MARY KORR
RIMJ MANAGING EDITOR

During his long life, December 6, 1917 was a day Halifax native and Rhode Island physician **DR. EDWIN G. THOMPSON** (1863–1949) would never forget. The dentist and physician, a graduate of Philadelphia Dental's College and Medico-Chirurgical College, was perhaps making his rounds at the Roger Williams Hospital when the tragic events began to unfold in his hometown's harbor, a WW1 hub of Canadian Navy activity.

At about 8:45 a.m., the *Imo,* a steamship carrying supplies for the Belgian Relief Commission, headed south through the Narrows, passing to the port side of incoming ships, rather than on the traditional starboard side.

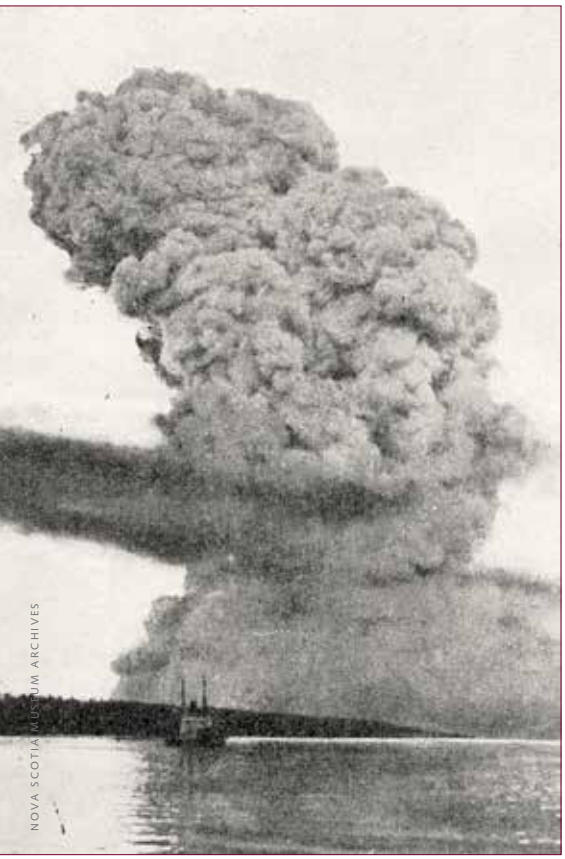
The French steamship *Mont Blanc*, a WW1 munitions transport, was entering the harbor to rendezvous with a military convoy that would escort it across the Atlantic. The ship was packed with 2,300 tons of picric acid, 200 tons of TNT, 35 tons of high-octane gasoline, and 10 tons of gun cotton.

Warning signals and evasion maneuvers proved futile and the ships collided. At 9:05 a.m., the ablaze *Mont Blanc* rammed Pier 6 and exploded, creating a 60-foot tsunami that swept over the harbor. Horrified onlookers were swept out to sea and drowned.



RIMS

Dr. N. Darrell Harvey, later president of the Rhode Island Medical Society, 1931–1932, led one of the relief teams to Halifax.



NOVA SCOTIA MUSEUM ARCHIVES

Explosion caused what has been described as a "mushroom-like" cloud.

LIBRARY OF CONGRESS

Main building of the Nova Scotia Provincial Exhibition, Halifax, Canada, damaged in the explosion.

LIBRARY OF CONGRESS

Victims of the Dec. 6, 1917 explosion at Halifax, Nova Scotia, laid out on sled.

Warehouse windows propelled glass missiles everywhere; 200 lost their eyes and sight. The event has been described as the most devastating pre-atomic blast ever recorded. It killed 2,000; leveled thousands of buildings, and injured tens of thousands.

Rhode Island relief

On the following day, December 7, 1914, at noon, a train chartered by the local chapter of the American Red Cross left Providence bound for Halifax, with a rescue team of 60 doctors and 60 nurses led by Dr. Thompson. A blizzard blanketed the tracks as the train forged northward.

According to the *New York Times* of December 8, 1917, a second provisional unit was sent from Providence on December 8 with 69 physicians and surgeons, 50 nurses, 6 secretaries, and social workers under the charge of ophthalmologist **DR. N. DARRELL HARVEY** of Providence, who also worked at Newport Hospital.

The train carried a complete sterilizing plant, a large quantity of ether, alcohol, compresses and surgical equipment. On the scene, the Red Cross set up 57 makeshift hospitals. The Rhode Island contingent worked in the Ladies College Hospital, the Halifax Infirmary and Bellevue. Many remained for several months.

Upon his return, Dr. Harvey gave an accounting of the Rhode Island Red Cross Relief Unit at the Halifax disaster to the Rhode Island Medical Society on March 30, 1918 and outlined relief plans should such a disaster hit Providence. ❖

Eulogy: David S. Greer

VINCENT MOR

I've been asked to speak about David Greer's career and its impact on Brown Medical School, the country and the world around us. I've known him since the mid 1970's when he first began to drift into the Brown orbit from his busy clinical practice in Fall River.

He left the University of Chicago where he was pursuing a research fellowship to begin private practice in Fall River but he never abandoned the discipline of research. However, he sought to make it more applied, more real, more directly applicable to the people he saw in his everyday practice. When confronted with patients requiring specialized, barrier free housing to remain independent, he sought the funding and political access to build it in Fall River. He was not content with merely building it – he wanted to rigorously document its impact on the residents, his patients. This is how I met him; I was on the team of researchers he worked with under a federal grant to study this unique intervention.

After Dean of Medicine Aronson asked him to become Associate Dean for External Affairs at Brown's new Medical School he continued to engineer applied research, helping Rhode Island plan for the gradual transformation of the state's chronic and mental hospitals in Cranston. I was there as well, working with others, under his tutelage and vision, to develop a plan that deinstitutionalized the hospitals, improved the quality of care for all, resulting in the state being recognized as having the best public mental health system in the country and offering training opportunities to medical and psychiatric students for years.

He started the Center for Gerontology and Health Care Research during an amazing summer in 1980 when he was awarded several major grants to develop gerontology training and to evaluate the emergence of Medicare funding for hospice care. That was when he made me an offer I couldn't refuse – less money, more work, more responsibility! Fortunately, I was smart enough to realize the value of the opportunity to learn from him. He was the perfect leader, offering vision, advice and giving direction. I love the memory of meetings at the Greer home, sitting beside him in his study as he edited my turgid prose, telling me that simple language was elegant language; like music, extra notes are a distraction.

Once the Hospice Study findings were complete, he hosted the federal bureaucrats charged with developing a payment scheme for the new benefit at the "Joe Marzilli's Old Canteen" in Providence. As we designed the benefit on the back of napkins in a private room, Dr. Greer peppered the conversation with anecdotes from the real world of practice to make sure that the design would accommodate real doctors and patients.

The Gerontology Center that he started is now world famous, as is the Center for Alcohol and Addictions which he encouraged David Lewis to start. He understood incentives and how to stimulate those with a vision and desire to build innovative programs. Ultimately, the result is the new Brown School of Public Health where many of these entrepreneurial programs were consolidated.

He became Dean of the Medical School in the early 1980s and out poured a creative litany of initiatives that transformed the school. He developed the Program in Liberal Medical Education, admitting Brown undergraduates directly into medical school with the goal of forging caring physicians who were liberally educated, scientifically oriented and clinically astute. This connected the medical school more closely to the undergraduate college, a completely unique idea at the time that is now increasingly in vogue in medical education. He formalized and expanded the process of giving Rhode Island natives a spot in the medical school by founding and working with the LEAP program designed to help educate Rhode Island and Providence students n order help them succeed at Brown or other medical schools. He became a founding member of the Physicians Against Nuclear War, capitalizing on the great insight that a careful examination of the consequences of Nuclear War on a community's health care infrastructure could help people envision the horror, making it more real, making the decision to use the bomb less cavalier.

David worked diligently to overcome the "town – gown" conflict in Providence in order to enhance the overall quality of medical care in the state. He could get hospital administrators, who would otherwise cross the street when they saw one another, to sit around the same table once a month to discuss common challenges and solutions by reminding them who they serve.

Institute of Medicine member, Nobel Laureate, scholar, author and funded researcher, he had all the trappings of an accomplished academic. Nonetheless, he was the most down to earth human being you'll ever meet. He consulted, advised and lectured all over the world but came back with stories about the people he met, their foibles, their eccentricities and their basic humanity. He could talk to anyone about anything and he did. I've been blessed to have had almost my entire career under his benevolent gaze and I'm not the only one. He's mentored many in this room; we are all grateful and we will all miss him terribly. He was the first person I would tell when I had a success and the first person I'd seek out for advice when I failed. Such a void; I don't know where I'm going to turn, but to my memories of him and his sage advice.

He was a giant of a man but with the softness and warmth of a father. He shaped the direction of Brown Medical School and nudged the University itself. He provided an example of how Brown could offer support and energy to Providence and Rhode Island. This outward looking impulse, that now reflects a new value which the University has adopted is a reflection of David Greer, and will remain his legacy. ❖

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

ANCHOR MEDICAL ASSOCIATES

AQUIDNECK MEDICAL
Member of University Medicine

Blackstone
Orthopedics & Sports Medicine

THE CENTER FOR orthopaedics INC.

COASTAL MEDICAL
LEADERS IN HEALTHCARE

Diabetes & Endocrinology Associates, Inc.

Foundry
Orthopedics & SportsMedicine

GASTROENTEROLOGY ASSOCIATES

HEALTHKEY

BLACKSTONE VALLEY
COMMUNITY HEALTH CARE

NorthMain
Radiation
Oncology

Ob-Gyn Associates
Lifespan Physician Group Practice

Orthopaedic Associates, Inc.

RI ENT

Rhode Island Eye
INSTITUTE

RHODE ISLAND
MEDICAL IMAGING

UEMF
university EMERGENCY MEDICINE foundation

UNIVOTO
University Otolaryngology

Women's Medicine Collaborative
A program of The Miriam Hospital
A Lifespan Partner

East Greenwich Pediatrics • Anesthesia Care, Inc • Urology Associates

For more information about group rates, please contact Megan Turcotte, RIMS Director of Member Services