Missouri Medicine

The Journal of the Missouri State Medical Association www.msma.org January/February 2013



Feature Review:
Telomeres, Cancer & Aging: Live Long & Prosper?

The Debate Continues:
Excessive High-Intensity Endurance Exercise

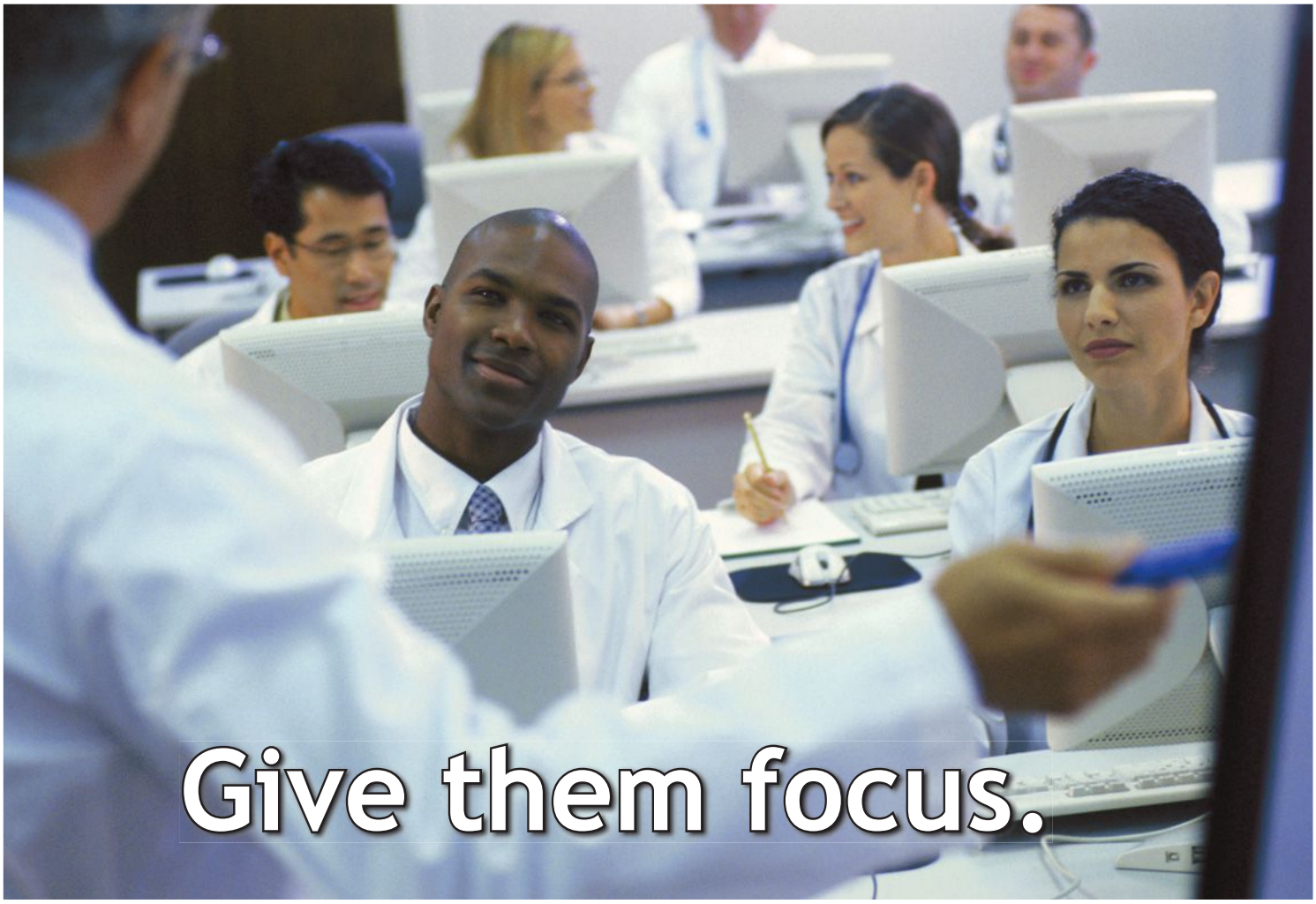
Micro-Series:
Physician Practice Acquisition

Technology:
Medical Mobile Apps

PRO/CON:
Should Ophthalmologists Test & Sell Hearing Aids?

Scientific:

- ✧ Heart Disease in Women
- ✧ Danger Assessment in Your Practice
- Pain Management Mini-Series Part 1



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Helping students focus on their medical education for over 50 years, the Missouri State Medical Foundation has benefitted hundreds of medical students statewide. We thank the many donors who have committed their energy and resources to fulfilling the Foundation's mission, and we are grateful for their generosity.

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Missouri Medicine

The Journal of the Missouri State Medical Association - Since 1904

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Missouri State Medical Association

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About Missouri Medicine

About Missouri Medicine

In publication since 1904, Missouri Medicine, a peer-reviewed, award-winning* medical journal printed on acid-free paper, is indexed by MEDLINE, the National Library of Medicine, and is linked to PubMed Central, which is the U.S. National Institutes of Health digital archive of biomedical and life sciences journal literature. Missouri Medicine can be found on EBSCOhost databases, which provides researchers with the ability to search full-text articles, and are the most-used, premium online information resources for tens of thousands of institutions worldwide, representing millions of end-users. Missouri Medicine also provides featured content for www.medhelp.org, a top world health care website and the MedHelp.org e-newsletter, which has a quarter million subscribers.

** Ranly Award for Journalism Excellence, established in 2007 by the Missouri Association of Publications: 2007, 2008, 2009, 2011.*

Scan code with your mobile device to read more on how to submit an article for *Missouri Medicine.*

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Letters to the Editor or General Comments

Send an email to jhagan@bizkc.rr.com and copy lfleenor@msma.org. Letters to the editor for publication should be 300 words in length or shorter and should include your full name, specialty and association. Letters are edited for length and clarity.

In the News

To submit yourself or a colleague for a mention, send an email to lfleenor@msma.org. Include information on the significant event, promotion or award. Note that we only include Association members in this column.

Perspectives & As I See It

Missouri Medicine publishes *Perspectives* on a variety of medical trends, topics and policy matters including legal, legislation, advocacy, insurance, practice management, and public health issues. *As I See It* is a forum for opinion pieces, whimsy, humor, irony, and reflection on the practice of medicine. All pieces should be referenced and not exceed 1,500 words.

Scientific Submissions

Scientific articles are peer-reviewed and original articles are accepted for publication on the condition that they have not been published or submitted to other medical journals. MSMA members are given publishing preference and priority. Material appearing in *Missouri Medicine* is protected by copyright. Authors should e-mail copies of the complete article, contact information, references, tables, illustrations, photos to both jhagan@bizkc.rr.com and lfleenor@msma.org. Notification of receipt of your manuscript is within 10 days. Peer review is completed within 30-45 days of receipt. Refer to the American Medical Association Manual of Style, 9th Ed., AMA, Chicago, 1998, to answer questions regarding style or visit www.msma.org/MissouriMedicine for the "Instructions for Authors/Style Sheet."

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MoMed: Second to One
BLOWING OUR OWN HORN

by John C. Hagan, III, MD



***Missouri Medicine* is the second best state medical journal in the United States; for the present number two will do!**



John C. Hagan, III, MD, FACS, is a Kansas City ophthalmologist and *Missouri Medicine* Editor since 2000.
Contact: jhagan@bizkc.rr.com

Disclaimer

Clip, clop, clip, clop…squeak…slam. Humility and modesty have just left the building.

The sound of music you just heard was me blowing *Missouri Medicine's* own horn. It takes hubris, immodesty, and hutzpah to claim that *Missouri Medicine* is the second best state medical journal in the United States; second only (but not always as we shall see later) to the venerable *New England Journal of Medicine* (NEJM) owned and published by the Massachusetts Medical Society. However, that is the collective opinion of our Editorial Board, Contributing Editors, and the leadership and staff of the Missouri State Medical Association. Other contenders are welcome to come forward and state their case. You can be the judge.

Volume 1, Number 1 of our forebear *The Journal of the Missouri State Medical Association* was published July 1904 with C.M. Nicholson, MD, as the first Editor. The May/June 2004 *Missouri Medicine* reproduced that 1904 original cover. As further celebration of its Centennial during 2004 we reproduced excerpts, reprints, and reflections from this 100-year period. July 2013 we shall celebrate 110 years of publication excellence.

Scientific Bona fides

Your current *Missouri Medicine* is peer-reviewed, indexed by MEDLINE, The National Library of Medicine, and PubMed Central. By the end of the first quarter of 2013, we should have our most current content linked to PubMed Central. This is an arduous and demanding process, and our Managing Editor Liz Fleenor has done most of the heavy lifting. We are included in EBSCOhost databases, the largest premium online information resource for researchers. This is quite a pedigree. Just this past year the Editor of a certain state to the west of us contacted me seeking information

on how the Sunflower State medical journal could get indexed and its content covered.

Every year over the past dozen years the number of non-solicited articles to *Missouri Medicine* has increased. As with any first class journal, papers are not published without critical peer-review. A minimum of two, and often three, highly qualified physicians vet each paper to determine suitability for publication; if the paper is to be published reviewers also submit recommendations to improve the manuscript construct, presentation, and content. Acceptance standards equal or exceed many national journals and free circulation newspapers/magazines. For example in 2012, there were 38 non-request manuscripts submitted for peer-review, only 44.7% were accepted for publication.

Missouri Medicine gives acceptance and publication preference to MSMA members in good standing. If at all possible, the editorial staff will extend themselves to help with re-drafting a MSMA member's paper to publication standards.

Engaging All Missouri Medical Schools in Publication

In 2000, when I took over as Editor, *Missouri Medicine* was published each month. This caused a frenetic, rushed publication schedule with uneven content from issue to issue. After much thought and study we moved to our present method: one issue every two months. May/June issue is for open papers and November/December is the legislative preview and also open papers. For the other four issues we turn to Missouri's six medical schools to produce a "theme issue" of high clinical relevance. The package they submit has up to six papers and an editorial overview. We are proud to regularly partner with these medical schools: University of Missouri, University of Missouri-Kansas City, Kansas City University of Medicine & Biosciences, Saint Louis University, Washington University, and Kirksville College of Osteopathic Medicine-A.T. Still University. An alternative form of contribution ("mini-series") is sequential preparation and publication of one paper every two months for up to a year.

Enhancements to Each Issue

Visual presentation of Missouri Medicine has modernized with improvements and redesigns to: covers, the masthead, font and page layout, QR bar codes. A completely electronic version of each issue is created by Liz; to save postage costs the e-issue goes to students, residents, and fellows with free membership, as well as regular members that wish to opt out of the mailed paper issue. The e-issue is posted to a "members only" section of the MSMA website (www.msma.org). In the fourth quarter, all issues from the previous year are moved to full public access. This and our affiliation with MedHelp.org, which I will describe in further detail later, have dramatically increased MSMA website traffic. In an average month www.mama.org receives 6,700 visits by a diverse group of internet users.

A Very Distinguished and Invested Editorial Board

Being on the *Missouri Medicine* editorial board is a great honor and recognition of high regard by physician peers and the leadership of MSMA. Membership is not a sinecure, and all members are asked to participate in peer-review, contribute articles, and solicitation of highly qualified authors on issues we wish to publish. Most Editorial Board physicians remit, in a timely manner, thoughtful and helpfully critical peer-reviews. Those that don't receive a tutorial on quality peer-review, and repeated tardiness with reviews is considered unsatisfactory.

Appointment to the Editorial Board is for one year, and annually the performance of the entire Board is reviewed by the Editor and the Publication Committee. The performance of the Editor is reviewed annually by MSMA leadership. Special thanks to my fellow editors for their good work year after year: Drs. Milamari Cunningham, David Fleming, Art Gale, William Reynolds, and Charles Van Way, III. On behalf of *Missouri Medicine* we wish to thank Douglas B. Bogart, MD, a longtime friend and colleague for his exemplary service to our Editorial Board in Cardiology. Dr. Bogart has just retired from medicine. Jerry Kennett, MD, a former MSMA President, has joined *Missouri Medicine* as our new cardiology editor.

Exceptional Content, World Class Reviews & First Literature Reports

Missouri Medicine authors and staff regularly receive reprint requests from across the United States and as far away as China, South America, and the Middle East. First literature reports included "Use of Angio-Seal after Iatrogenic Trauma" (May/June 12),



"Spontaneous Renal Artery Dissection" (March/April 10), and "Wave Front Ground Glasses" (July/August 11). World class reviews included: "Cuppa Joe: Friend or Foe? (November/December 2011). [I note that the *Missouri Medicine* coffee review is not only more comprehensive but appeared in print seven months before the NEJM published their coffee article (May 17, 2012).] This "David Slews Goliath; Avis Beats Hertz; The Chiefs or Royals Beat Anyone" moment was authored by Harshal Patil, MD, Carl Lavie, MD, and James O'Keefe, MD. Cuppa Joe gives us "grounds" to claim Number One status on occasion over the NEJM.

The May/June 2011 article about the EF-5 tornado striking St. John's Medical Center in Joplin authored by ER physician Kevin J. Kikta, DO, was the first such report in the nation. It was reprinted in numerous medical journals and newspapers, and quoted on local and national television.

Kenneth Haller, MD, and Anthony Slocum, MD, of SLUSM/Cardinal Glennon Children's Medical Center (January/February 2012) comprehensively addressed the problem of children not being vaccinated due to fears such as inducing autism. MSMA and Missouri state health organizations conducted a very effective immunization education program based on this stellar publication.

In the nation's most authoritative review to date, "Legalization, Decriminalization & Medical Use of Cannabis: A Scientific and Public Health Perspective." (March/April 2012) Dragan M. Svrakic, MD, and co-authors disabused any valid reason to make 'Mary Jane' an honest woman. Need I point out the irony and hypocrisy of many of these left-leaning social engineers trying to legalize marijuana while working to ban sugar and large-size soft drinks?

A totally new paradigm that is shaking the core of cardiology and exercise physiology while upsetting ultra-exercise addicts and the various fitness industries they support, was reported in July/August 2012. The authors, many runners themselves, are Drs. Harshal Patil, James O'Keefe, Carl Lavie, Anthony Magalski, Robert Vogel, and Peter McCullough.

This radical new concept postulates that chronic, excessive endurance exercise can adversely alter cardiac rhythm, damage heart muscle, endothelium, coronary arteries, and cause cardiac events including death. Their first report was in the Mayo Clinic Proceedings, second world publication - featuring elaboration and detailed exercise guidelines - was in *Missouri Medicine* and recently editorialized in the international journal *Heart*. The authors have had over 100 media interviews. Articles based on this research have appeared all over the world, including *The Wall Street Journal* (November 27, 2012). See follow up article in this issue, "The Lady Doth Protest Too Much, Methinks," on page 17. There were many outstanding others, such as the two-part Post Traumatic Stress Disorder (Drs. Juan Corvalan and David Klein), but alas, I have not room to mention them all.

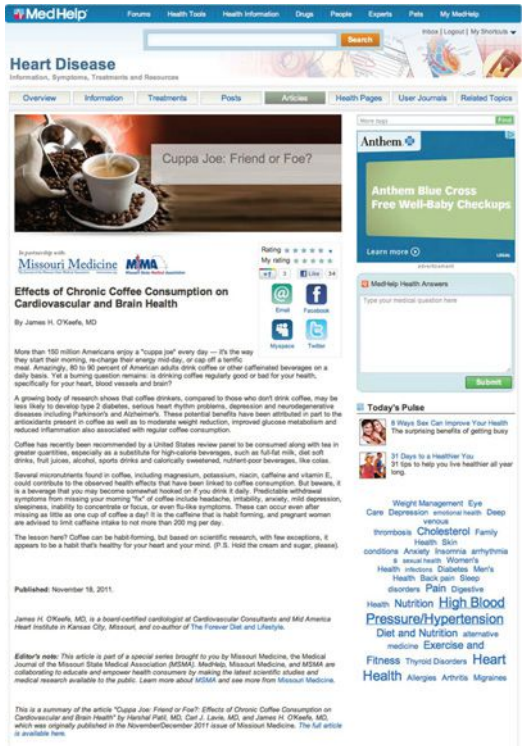


Figure 1
The first Missouri Medicine article to go worldwide is the definitive review on coffee and its health benefits by Editorial Board member James H. O'Keefe MD



Figure 2
Missouri Medicine joins world class health care organizations on www.medhelp.org.

The Global Reach of *Missouri Medicine* Publications

MedHelp.org (www.medhelp.org) is a top world health internet site with over 12 million unique visitors per month and likely 150 million visits in 2012. *Missouri Medicine* became the first medical journal in the United States to enter into an agreement to provide content to a top internet health destination. The long version of how this beneficial partnership

developed can be found in my editorial "World Wide Web Window Opens to Missouri Medicine" (January/February 2012). The short version is, it began out of a serendipitous friendship with Cindy Thompson, one of MedHelp's co-founders, and mirrored a partnership that she and I engineered with the American Academy of Ophthalmology. *Missouri Medicine* went live on MedHelp November 21, 2011 (See Figure 1). *Missouri Medicine* joined an exclusive pantheon of world class institutions when selected to partner with MedHelp (See Figure 2).

Missouri Medicine and MedHelp Editor Katherine Solem review our upcoming articles, and we mutually pick the two with the widest public interest. A 400-word "patient language" summary precedes the full text article. Katherine posts these papers to the appropriate forums and communities from among the more than 350 forums and communities they have. *Missouri Medicine* papers are consistently highly ranked by MedHelp viewers. An active link at the end of the article connects with the MSMA website. MedHelp has an electronic health newsletter with a subscription of over a quarter of a million readers. Our articles are included in the e-newsletter also.

Missouri Medicine has an informal agreement to provide reprinted papers selected by the Editors of *General Surgery News, Anesthesia News, Clinical Oncology News,* and *Pain Management News*. Articles they have reprinted include our Pro/Con on wearing ties in the hospital, and the Pro/Con "Should physicians be paid by industry for research and medical education?" Articles based on *Missouri Medicine* content have appeared in the *St. Louis Post-Dispatch,* the *Kansas City Star,* the *Wall Street Journal, Runner's World, NBC, Outside Magazine, EyeNet, the Journal of the American Medical Athletic Association, the Journal of Cataract & Refractive Surgery Today, Ophthalmology Times,* and *Ocular Surgical News,* to name a few.

Missouri Medicine selectively reprints articles from *St. Louis Metropolitan Medicine,* the *Journal of the Greene County Medical Society* and the *Medical Bulletin of the Metropolitan Medical Society of Greater Kansas City.* Select national articles appropriate to Medicine in Missouri are also occasionally reprinted. A textbook-based on a series of articles edited by David Fleming, MD, has been published (See Figure 3).

Missouri Medicine is a Prize-Winning Publication

In 2007 the Missouri Association of Publications (MAP) set up a contest for in-state publications. The award was named after Missouri University journalism Professor Donald Ranly. The judges are professors at the MU School of Journalism. *Missouri Medicine* has had entries every year and has won various categories including best article and best publication in 2007, 2008, 2010, and 2011. It is worth noting that we regularly compete with publications that have production staffs of more than 100, and budgets as large as a quarter million dollars. We have a one-person staff, and all our Editors and Editorial Board serve without compensation while maintaining their clinical practice and research.

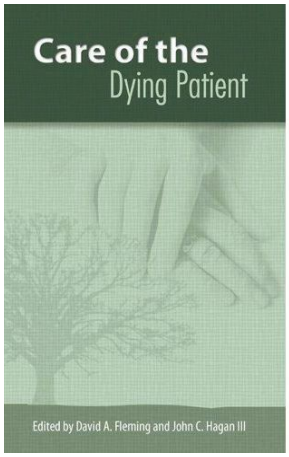


Figure 3

Care of the Dying Patient

by David A. Fleming, MD Editor and John C. Hagan, III, MD, Co-Editor. 170 pages; 2010 University of Missouri Press. Available at Amazon.com

Review

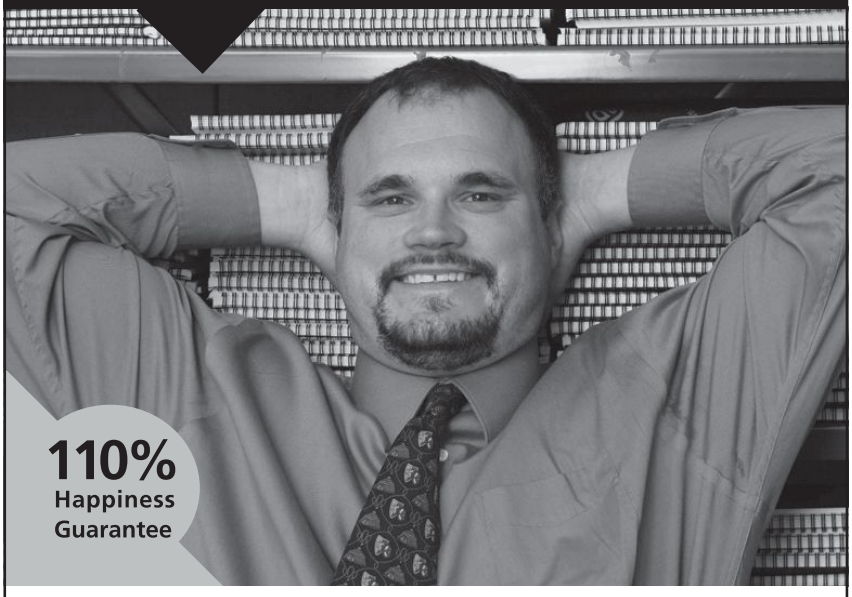
"A fine book that will function as a guide to excellent care of the dying patient. It offers a wealth of accurate medical information, carefully developed rationales for care, and explanations of clinical usefulness."
—Daniel H. Winship, M.D., Secretary, Council on Medical Education American Medical Association

What's Next for Missouri Medicine?

Our new goals for 2013 are to construct on the MSMA website in the public section a virtual textbook on keeping the heart healthy. Chapters will be those papers we've published in our two-year Preventive Cardiology mini-series and other germane papers. We also plan to create a place on the MSMA website to advertise books by members and link to sources for purchase. Through the generosity of a Contributing Editor Arthur H. Gale, MD, we are pleased to announce the Freedom of Expression Award selected from our published authors by a special MSMA committee. Other challenges and goals are perennial: claiming another Ranly Award, getting the issue to members as early as possible in the publication months; keeping the stream of theme issue and other promised papers moving along towards timely publication. For an Editor, the phrase, "I'll have that paper to you within the next week or two," is the equivalent of "The check is in the mail."

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The Final Note

As I begin my fourteenth year as Editor, I want to sincerely thank MSMA leadership, members, and staff for the great honor and privilege of serving at the helm of such a distinguished, respected and well known medical publication enterprise. The last and dearest encomium goes to MSMA Director of Communications and Managing Editor of *Missouri Medicine* Liz Fleenor. She is multitalented: artist, writer, graphic designer, computer geek, people-person, and infinitely patient with her type-A Editor.

I leave you on this final note: Liz is the heart and soul of *Missouri Medicine*. MM

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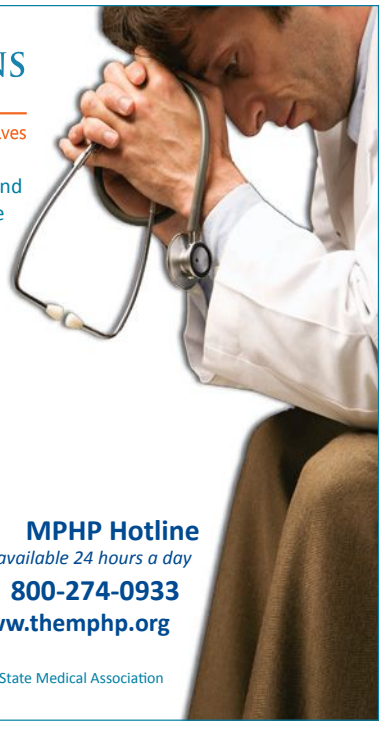
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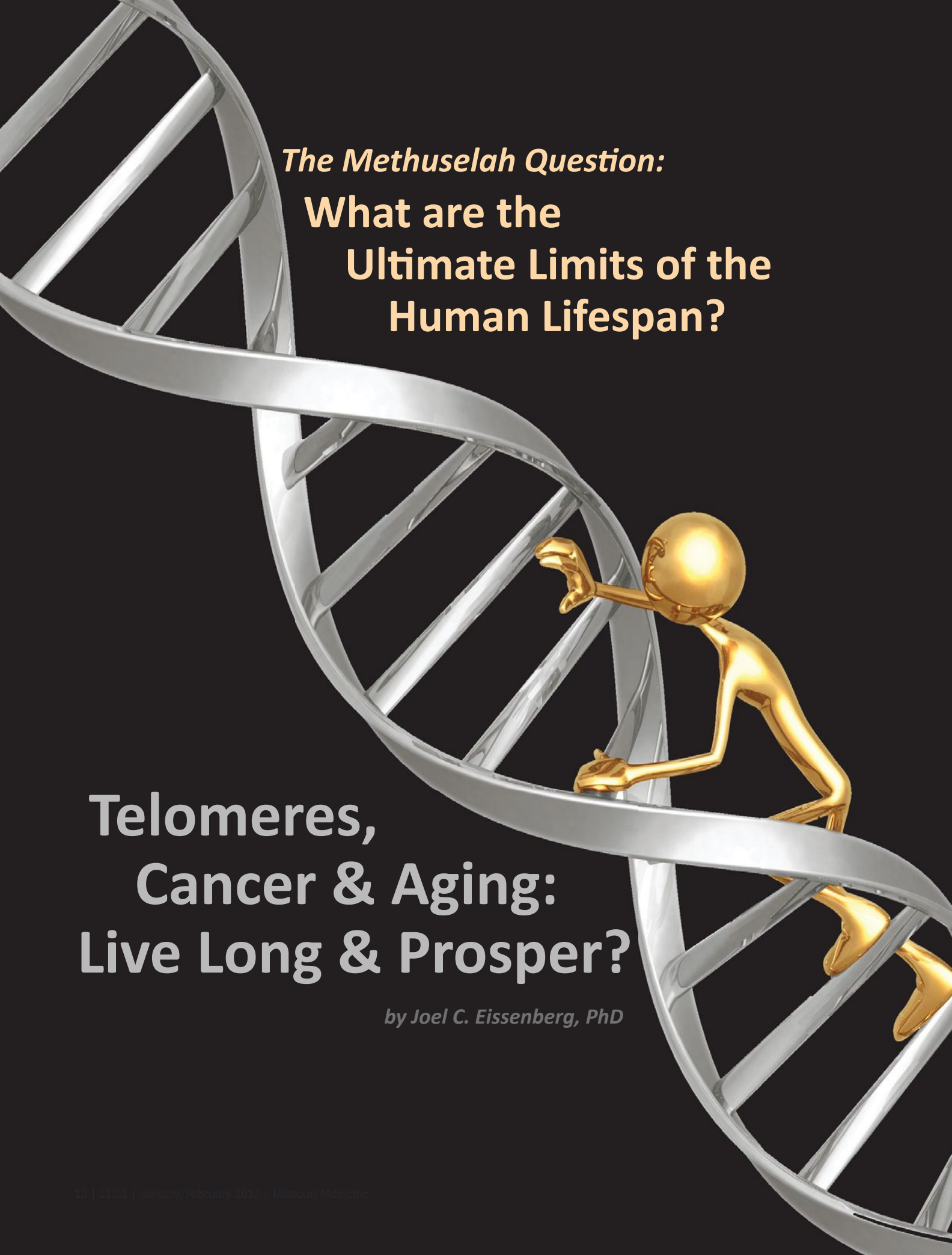
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The Methuselah Question:

What are the Ultimate Limits of the Human Lifespan?

Telomeres, Cancer & Aging: Live Long & Prosper?

by Joel C. Eissenberg, PhD

If we could induce our somatic cells to express significant amounts of telomerase, would we live longer?

The evidence based on studies of human cells in culture makes this appear possible.

"I'm not afraid of death; I just don't want to be there when it happens."
--Woody Allen

"Immortality is a long shot, I admit. But somebody has to be first."
--Bill Cosby



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Abstract

Like our clothes, our chromosomes fray at the edges with age. Some believe that if we could discover a molecular tailor to patch our age-abraded chromosome ends, we could become modern Methuselahs. Notably, cancer cells achieve immortality by protecting their chromosome ends. Drugs that selectively fray the ends of cancer cell chromosomes would be potent and general anti-cancer therapies.

Here, I summarize data on the role of chromosome ends in cellular and organismal aging:

Introduction

One of the big surprises to emerge from the human genome project was the fact that less than 3% of our DNA encodes our genes. While the purpose—if any—of most noncoding DNA is still being determined, the function of some of this gene-free DNA has long been known to be important in preserving our chromosomes during the cell divisions that occur during the normal wear and tear of age and during wound repair after injury. Each of our chromosomes contains three DNA sequences that are key to maintaining healthy chromosome numbers and structure during our lifetimes. One of these sequences defines the centromere, which helps assure that each chromosome is properly sorted at cell division. The other two sequences occur at each end of the chromosome. These sequences define protective caps called telomeres (See Figure 1).

Telomeres Disguise the Ends of Chromosomes

The geneticist Hermann Muller (Nobel Prize in Physiology or Medicine, 1946) noted the peculiarity of chromosome ends in the course of his work on the genetic effects of ionizing radiation in the fruit fly Drosophila melanogaster. He found that X-irradiation caused chromosome breaks that were repaired by fusing the several newly broken ends together, often in abnormal combinations. Strikingly, though, the new chromosome ends created by X-ray-induced chromosome breakage were never repaired by fusion with the naturally occurring ends of chromosomes. From many such studies, Muller concluded that the natural ends of chromosomes were somehow special, and he called these special structures "telomeres," from the Greek telos, meaning "end" and meros, meaning "part."[1]

At around the same time, Barbara McClintock (Nobel Prize in Physiology or Medicine, 1983) noticed a similar property in the chromosomes of corn.

In these studies, the new DNA breaks were caused by the transposable elements that she later became famous for discovering. As with X-rays, though, the new chromosome ends at the sites of breaks only rejoined with one another and never with the naturally occurring ends of chromosomes.[2,3]

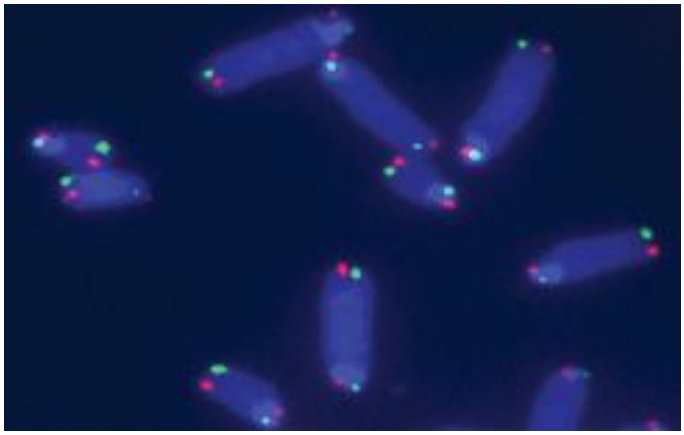


Figure 1
Metaphase chromosomes (blue) with telomeres highlighted in red or green.
Image courtesy of Susana Gonzalo, PhD

Thus, telomeres somehow disguise the ends of chromosomes from each other and from new DNA breaks. All organisms with linear chromosomes, from fungi to plants to animals, have telomeres. The chromosomes of bacteria, which lack telomeres, are circular and so have no ends to protect.

The Biochemistry of Telomeres

When James D. Watson and Francis Crick solved the double helical structure of DNA, they noted that the structure suggested a mechanism for DNA replication. Their prediction was borne out in much subsequent research on DNA replication biochemistry, but the mechanistic details of replication create a problem for linear chromosomes. Because of limitations in DNA polymerase enzymology and the orientation of the DNA strands in the double helix, it is impossible to make complete copies of both DNA strands at each end of linear DNA molecules. Thus, with each cell division, the biochemistry of replication dictates that chromosomes should gradually shorten from each end. This conundrum is called the "end replication problem." However, the fact that so many living organisms have maintained linear chromosomes testifies to nature's ability to solve this problem.

With the advent of DNA sequencing technology in the 1970s, it soon became apparent that the DNA sequences at chromosomes ends are distinctive, consisting of tandem repeats of short sequence motifs. The number of repeats and the sequence of the repeated motif differ between organisms, but the basic repetitious structure is found for telomeres of fungi, protozoa and most animals including humans. Since these sequences don't encode genes, they can be lost without eroding the genetic information carried by the rest of the chromosomal DNA. Additionally, detailed genetic and biochemical studies, primarily using yeast, have shown that the repeated sequences at the end of chromosomes bind to specialized proteins that help conceal the natural ends of chromosomal DNA so that they don't resemble broken DNA.

This protein "cap" explains why Muller and McClintock never saw telomeres fuse with other DNA breaks. It also explains another biological puzzle. DNA breaks normally cause dividing cells to arrest. This arrest provides a window of opportunity for the cell to repair the break before the onset of the next cell division, which otherwise could result in chromosome fragments being mis-sorted or lost. If repair takes too long, the damaged cells will initiate "apoptosis," or programmed cell death. The caps on telomeres prevent dividing cells from seeing their own chromosome ends as DNA breaks, permitting normal cell division to proceed.

But telomere repeats and their associated caps don't actually solve the end replication problem. The answer to this proved to be a novel DNA replication biochemistry uncovered by Elizabeth Blackburn, Jack Szostak and Carol Greider, who shared the Nobel Prize in Physiology or Medicine in 2009 (See Figure 2). Using the peculiar biology of a ciliated protozoan, Tetrahymena thermophila, the versatile genetics of the yeast Saccharomyces cerevisiae and the classical toolkit of enzymology, these scientists discovered an enzyme that could add new DNA sequence to chromosome ends, reversing the erosion due to incomplete replication by the standard DNA replication pathway. Remarkably, this enzyme uses RNA, a type of molecule usually made as a copy of DNA sequence, as a blueprint to make new DNA sequences at telomeres. The RNA blueprint is short, but it is copied over and over, creating the characteristic tandem repeat sequences of telomere DNA. In biochemistry, an enzyme name usually has the suffix –ase added to the process it controls, so the telomere-adding enzyme was called "telomerase."

The importance of telomerase in human health is underscored by the clinical presentation of patients with genetic defects in the telomerase enzyme. One example

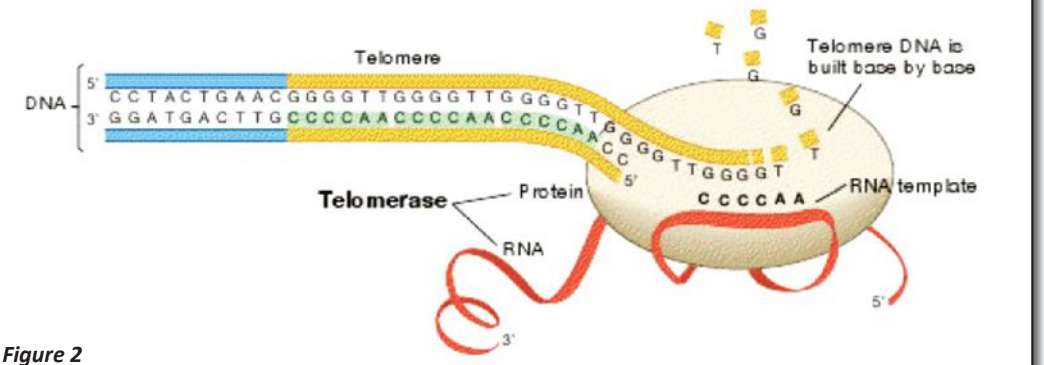


Figure 2
Representation of telomerase (beige oval) and associated RNA (red ribbon) polymerizing new telomere DNA (yellow).
Adapted from The 2009 Nobel Prize in Physiology or Medicine - Illustrated Presentation. Nobelprize.org. 13 Jul 2012 http://www.nobelprize.org/nobel_prizes/medicine/laureates/2009/illpres.html

is Dyskeratosis Congenita (DKC), a rare genetic disease associated with dramatically shortened telomeres. DKC mutations may be inherited in X-linked recessive, autosomal dominant and autosomal recessive forms. The autosomal dominant form of this disease is caused by mutations in genes encoding telomerase components including the RNA component of telomerase, or in genes that encode proteins associated with telomerase. Patients with this form of DKC accumulate much less telomerase RNA but remain healthy until young adulthood. Mortality in these patients is the result of progressive bone marrow failure, although there are accompanying defects in skin, hair, nails, epithelia and lung tissue. From these symptoms, it seems probable that the cells directly affected in DKC are stem cells in tissues with a high cell turnover. It should be noted that the clinical presentation of DKC is not that of premature aging syndromes (progerias), which include atherosclerosis and dementia (See Figure 3). Surprisingly, in light of the requirement for stable telomeres in cancer (discussed below), DKC patients show an elevated risk of leukemia and certain other cancers. It may be that telomere instability in these patients predisposes to telomere fusions, with subsequent chromosome breakage and rearrangements leading to oncogenic transformation.

Telomerase and Aging

The landmark studies of Leonard Hayflick and colleagues established that embryonic cells have a finite potential to divide. Using embryonic fibroblasts, Hayflick found that these cells could only double about 50 times when cultured in vitro before they lost the ability to divide further and underwent growth arrest, also called "replicative senescence."[4] Subsequent studies extended this replicative limit on doubling number to a variety of other cells, a phenomenon termed their "Hayflick limit." Striking correlations have been found between the natural lifespan of different animals and the Hayflick limit of cultured primary cells from those animals. Intriguingly, cells from patients with progerias have a reduced Hayflick limit.

Taken together, these observations suggest a causal relationship between replicative senescence and organismal aging. This inference should be approached with some caution, however. The correlation can disappear when patient samples are corrected for health status.[5] With an estimated 2^{36} cells in an average adult, fifty population doublings (2^{50} cells) is more than enough to provide for even the longest recorded human lifespan. Indeed, most human tissues lack detectable telomerase and the cells of many tissues whose degeneration marks the progression of



Figure 3
Leslie B. Gordon, PhD, and her son Sam, who has Hutchinson-Gilford Progeria Syndrome. In this photo, Sam is 14 years old.
From http://news.brown.edu/features/2011/06/progeria

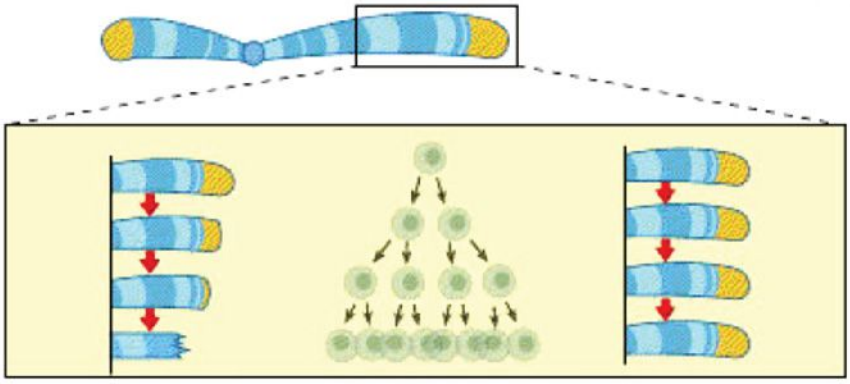


Figure 4
In the absence of telomerase activity (left), teleomeric repeat sequences are progressively lost with each cell division (center). With balancing telomerase activity (right), telomere length is maintained during cell proliferation.
Adapted from The 2009 Nobel Prize in Physiology or Medicine - Illustrated Presentation. Nobelprize.org. 13 Jul 2012 http://www.nobelprize.org/nobel_prizes/medicine/laureates/2009/illpres.html

age, such as the central nervous system and the heart, show little or no evidence of telomere erosion.

Are telomeres limiting in replicative senescence? Here again, the scientific literature is replete with paradoxes. There is a correlation between telomere length and replicative senescence in cultured cells.[6] On the other hand, mouse cells have a lower Hayflick limit than human cells and the typical lab mouse lives for only two years, yet laboratory mice have an average telomere length three times longer than that of humans. Mice engineered to lack telomerase activity are viable for up to six generations, clearly demonstrating that a normal mouse does not die from telomere insufficiency. Humans have the shortest telomeres, but the longest life spans, of all the primates. In a survey of over 60 mammalian species, the short-lived species tended to have the longest telomeres.[7]

Our germ line cells, the cells that produce sperm and eggs, express the telomerase enzyme. This insures that each generation inherits chromosomes with an adequate length of telomere repeat sequences to support the many cell divisions between fertilization and adulthood (See Figure 4). We are born with an average of ca. 10,000-20,000 nucleotides of telomeric DNA on the ends of our chromosomes, although the exact amount depends on the chromosome and the individual. Our stem cells, the cells that replace the regular loss of cells that turn over during our lifespan, also express telomerase. It is estimated that, without telomerase, our cells lose about 100 nucleotides from each telomere with each cell cycle.

However, there is evidence that aging is accompanied by the loss of telomeric DNA sequences, suggesting that the level of telomerase activity in somatic stem cells is not sufficient to completely compensate for telomere loss over decades. This possibility was first suggested by the finding that telomeres in human germ line cells are considerably longer than those of somatic cells.[8]

So if we could induce our somatic cells to express significant amounts of telomerase, would we live longer? While the clinical trials necessary to test this idea in human patients are not yet underway, the evidence based on studies of human cells in culture make this appear possible. Artificially inducing telomerase expression in primary retinal epithelial cells, foreskin fibroblasts, and vascular endothelial cells extends the proliferation of each of these cell types in culture for many cell divisions beyond their Hayflick limit.[9] Importantly, these cells also lack markers for malignant transformation, so they are not being turned into cancer cells. Instead, they simply maintain the appearance and behavior of younger cells. If these benefits at the cellular level could be achieved throughout all the cells of our bodies, it would represent rejuvenation beyond that achievable by any cosmetic or surgical intervention.

While correlations have been reported between telomere shortening and age in humans, these correlations often disappear when the epidemiological data are corrected for other variables that also correlate with age. A recent review of the literature suggests that the use of telomere length as a biomarker for aging is premature.[10] Longitudinal studies spanning decades of the lives of the same individuals would provide a strong test of the utility of telomere length as an aging biomarker.

At this point, telomere shortening could best be described as a frequent concomitant of aging, much like gray hair or wrinkled skin. Certainly, people with gray hair and wrinkled skin have fewer years of life left, on average, than those with smooth skin and pigmented hair. But nobody would say that gray hair or wrinkled skin cause aging, nor would anyone conclude that we would live longer if we just colored our hair and got a facelift.

Telomeres and Cancer

The defining feature of cancer is uncontrolled cell proliferation. In effect, cancer cells are immortal. In culture, cancer cells escape the Hayflick limit. Unlike most of our somatic cells, 85-90% of cancer cells express

telomerase, and compared to normal somatic cells that do express telomerase, cancer cells achieve much higher telomerase expression levels.

Are tumor cell telomeres the Achilles heel of cancer? Telomerase inhibition can induce senescence in certain cancer cells.[11] Mice engineered to lack telomerase activity have a lower incidence of cancer than telomerase-replete strains, although they are not cancer-free.[12,13] This contrasts with DKC patients, who have a significantly elevated risk for several forms of cancer. On the other hand, mice engineered to over-express telomerase do have a higher incidence of cancer.[14] Thus, drugs that target telomerase would seem to hold great promise for cancer therapy. Importantly, since telomerase is dispensable in most cells, there should be little or no toxicity to the patient, in contrast with current cancer chemotherapies. Indeed, telomerase-targeted anti-tumor drugs (imetelstat, a lipidated nucleic acid that targets the catalytic site of telomerase) and immunotherapies (GV1001, GRNVAC1) are in clinical trials.

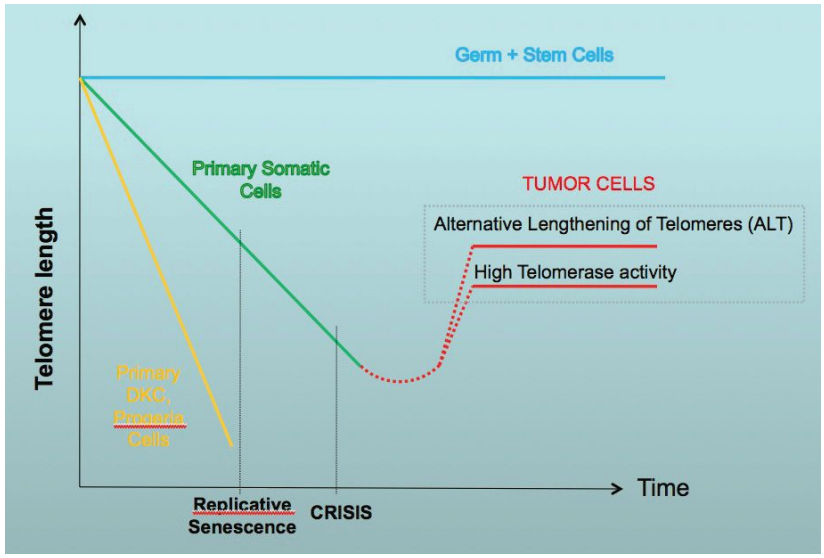


Figure 5
Time-dependent change in telomere length in germline and somatic stem cells (blue), primary somatic cells (green) and primary cells from DKC and progeria patients (yellow). Tumor cells arising from primary somatic cells (red) stabilize their telomeres either through activation of telomerase or through the ALT pathway.
Graph courtesy of Susana Gonzalo, PhD

Unfortunately, 10-15% of cancers achieve telomere stability through a telomerase-independent mechanism. This mechanism, first described in yeast cells in which telomerase was genetically inactivated, is termed "Alternative Lengthening of Telomeres" (ALT) (See Figure 5).The ALT mechanism involves the use of the cell's homologous recombination machinery to copy longer telomere sequences onto chromosomes with shorter telomeres. ALT-dependent tumors would be resistant to telomerase-based therapies. While ALT-dependent tumors are relatively rare, ALT-dependent cells could emerge among tumors cells under strong selective pressure from anti-telomerase therapy. There are currently no therapies that target this mechanism.

Are Telomeres the Fountain of Youth?

The case for telomeres as the "fountain of youth" for cancer cells is strong.[15] The alternative lengthening of telomeres (ALT) pathway poses a challenge to telomerase-based anti-tumor therapies, but the evidence that targeting of telomeres of cancer cells should have a high therapeutic index is compelling.

Much less compelling is the evidence that telomere length, per se, is limiting for the human lifespan. This could reflect technical limitations in the published studies. For example, telomere lengths are typically estimated using blood samples. If leukocyte telomeres are not representative of telomere erosion in other tissues, important correlations could be missed. Also, in most studies, comparisons are made between average telomere lengths, while it is likely that the shortest telomeres are physiologically relevant for age-dependent senescence.

Recent work has shown a correlation between chronic severe stress and shorter telomeres, at least in white blood cells.[16] However, studies by some of the same authors suggest that telomerase activity is enhanced in stressed patients and in stressed rats. Since enhanced telomerase activity would be expected to extend telomeres, the mechanistic connections between acute stress, enhanced telomerase activity, shorter telomeres and long-term health are still unclear. It is safe to say, however, that minimizing acute stress has long-term health benefits.

The most consistent predictor of longevity in every organism tested is caloric restriction.[17] Thus, any model for a rate-limiting effect of telomeres on organismal aging must account for this observation. Correlations pointing to telomere length as a potential driver for organismal longevity are balanced by other studies showing a lack of a relationship, as noted above. The weight of evidence at present supports the view that telomere shortening could magnify the morbidity associated with other stressors

and the pathophysiology of certain diseases. By this view, telomere-extending therapies would be expected to have only an incremental effect on prolonging life span. Furthermore, evidence from transgenic mice suggests that telomere-extending therapy could increase the risk of cancer. For the foreseeable future, the best hope for our longevity, as with our wardrobe, is to take good care of what we already have.

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None reported.

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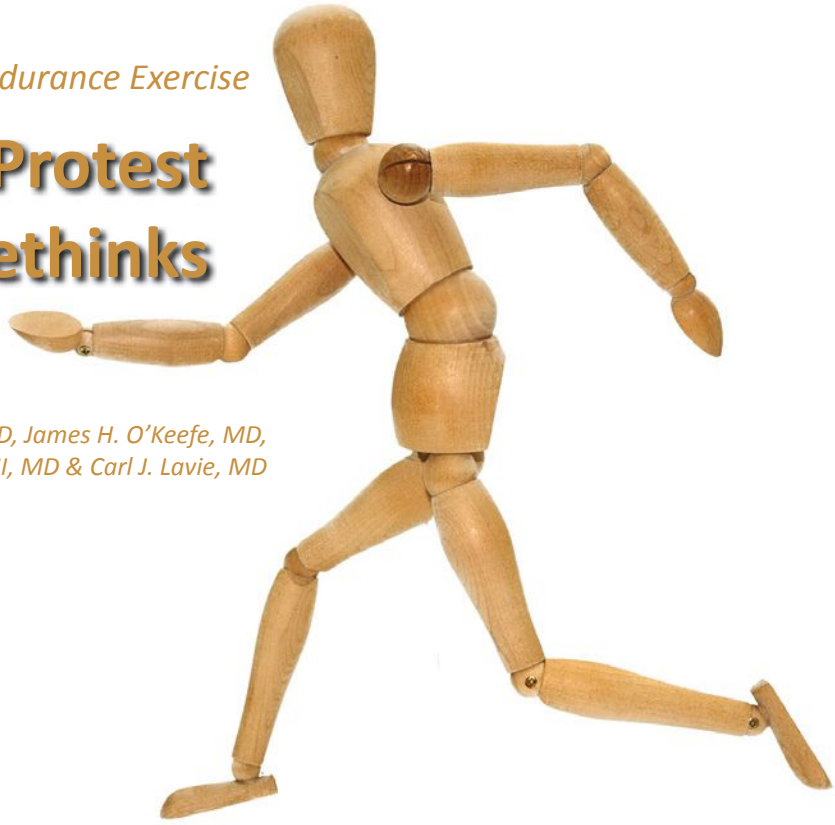
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The Debate on Excessive High-Intensity Endurance Exercise

The Lady Doth Protest Too Much, Methinks



by Salman K. Bhatti, MD, James H. O'Keefe, MD, John C. Hagan, III, MD & Carl J. Lavie, MD

The most important public health concern about overdoing exercise is that it may erase the potent cardio-protective effects of long term moderate-dose exercise.

A major public health problem for our society as a whole is too little exercise - not too much exercise!

One of our concerns about presenting research that cardiovascular (CV) damage may develop from chronic extreme exercise is that this debate may confuse the public. People may misinterpret our message as saying that all exercise is harmful and invoke this chronic extreme exercise debate as an excuse for continuing their sedentary lifestyles. Without question, people who exercise regularly are much better off than those who do not.

We spend a great deal of time and energy in our academic pursuits and when interacting with our patients emphasizing and promoting the benefits of regular exercise to improve cardio-respiratory wellness. We want to be certain this message is not



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diluted by debate on the ideal dosage of the "exercise drug," as well as our argument that excessive dosages of maximal endurance exercise can be counter-productive even harmful compared to moderate exercise.

First, the research presentation June 2, 2012, at the American College of Sports Medicine in San Francisco [2] was only an abstract and did not contain all of the details of a full peer-reviewed journal article. However, at that presentation it was made clear that if the data were only corrected for age and gender (which would not be affected by running), the mortality difference between runners and non-runners is even larger. Also, the relationship between running dose (mileage) and prognosis generally remains consistent with what was reported: specifically, with regard to mortality, higher running dosages did not appear to be better, and possibly could even be worse, than those running at lower dosages. It is important to recognize that even the higher dose runners did not have a worse survival than did non-runners. These findings are entirely consistent with what researchers from Copenhagen have reported in a cohort of 20,000 Danes followed for decades.[3]

"To keep in health these rules are wise: exercise moderately, shun wantonness, and pay attention to diet." [10]
--Leonardo Da Vinci

Second, the Wen et al. paper in *Lancet*[4] appeared to demonstrate maximal benefits from moderate-to-vigorous exercise at approximately 40 minutes; thereafter the curve appears to level off. In a *Lancet* letter responding to us, Wen stated that there was no point where longer exercise was not associated with a better hazard ratio. We maintain it is clear that there were not significantly greater benefits at higher levels and that their study probably did not have adequate statistical power to fully assess this point.

More importantly, Wen defined moderate-to-vigorous activity as greater than 6.5 METs; basically consistent with fast walking or a very slow jog. Although this level of exercise is associated with health benefits, it is not what serious runners competing in racing events and/or doing hard training would consider vigorous. By way of example, running an 8-minute mile (7.5 miles per hour) is an exertion level of over 12 METs and is more in line with what is generally considered vigorous exercise. Although none of the available studies fully quantify the effects of a wide range of levels of exertion for every period of time, we certainly do not equate a relatively brisk walk for 90 minutes with "extreme endurance exercise."

Additionally, we recognize that most runners and tri-athletes (swim, run, bike) are not doing these activities solely or even primarily for health. People do not climb mountains, jump out of airplanes, race cars, and boats for health benefits. They do so for fun, sport, competition, friendship, stress relief, a sense of accomplishment, and enjoyment of the "adrenaline rush." Still, it appears that the maximal health benefits of exercise, including running, occur at more moderate doses; very high doses may be associated with actual loss of the health benefits noted at less extreme doses. Very high doses of chronic extreme exercise may indeed be associated with some cardiotoxicity. Though this is currently only a hypothesis, we believe it will become the new paradigm for optimal exercise dosage.

The 'canary in the coal mine' is a great analogy to explain the fact that although the overall death rate in marathons is low (1 in 100,000 race participants)[5] the damage one is likely doing to one's heart with extreme endurance efforts, like marathons, over the participating years may be common - but unrecognized till much later - among veteran and "retired" ultra-endurance athletes. The most important public health concern about overdoing exercise is that it may erase the potent cardio-protective effects of long term moderate-dose exercise.

'Cardiac overuse injury' is an instructive term for this problem. Most endurance athletes understand and have experienced orthopedic overuse injuries such as plantar fasciitis, Achilles' tendonitis, shin splints, and patellar chondromalacia. Importantly, cardiac overuse injury might eventually cause premature aging of the heart, potentially dangerous rhythms, and accelerated coronary atherosclerosis, even sudden cardiac death. We suspect that this constellation of abnormalities (which has been labeled Pheidippides' Cardiomyopathy) led to the recent demise of Micah True, the legendary ultra-marathoner who was the protagonist in the 2009 best-seller *Born to Run*.[6,7]

Perfection is the enemy of 'good enough.' By

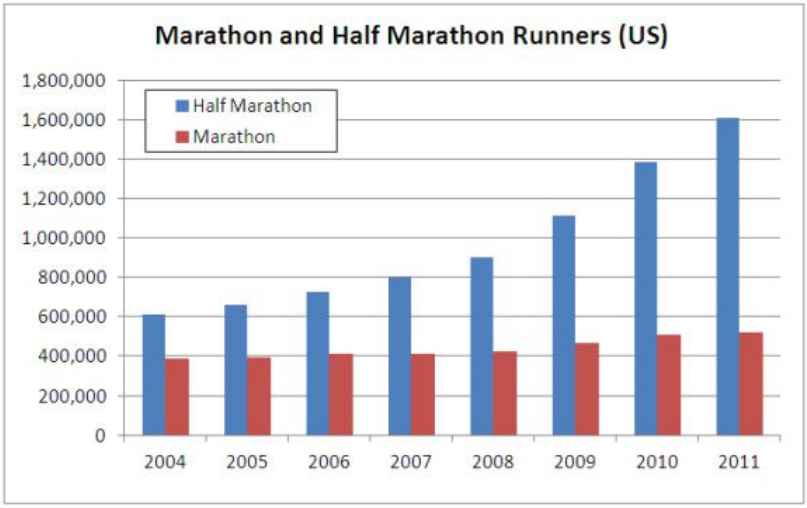


Figure 1
Ultra-exercising such as marathon running is increasing. These ultra-exercisers could be compromising their long term CV health and missing out on the longevity benefits of less extreme levels of exercises. Figure made from information obtained in runningusa.org. [8]

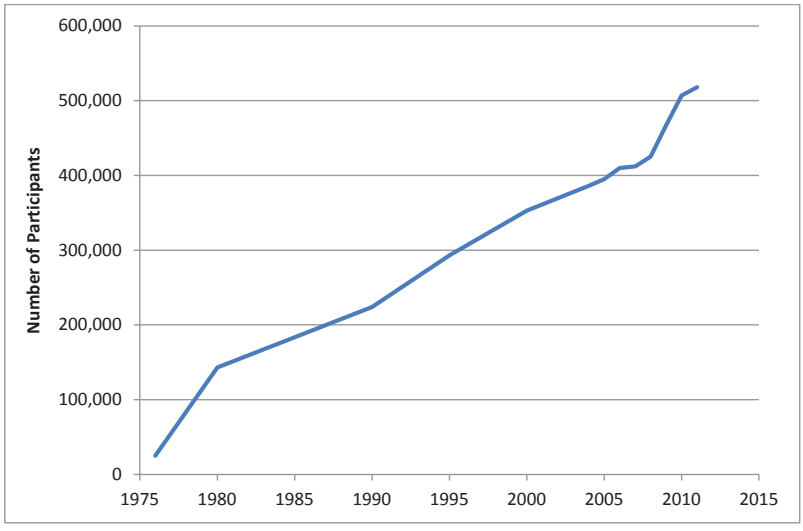


Figure 2
Marathon running trends in the United States from 1975 through 2011. Figure made from information obtained in runningusa.org.[8]

focusing obsessively on peak fitness and ultra-endurance to optimize performance today, ultra-exercisers could be compromising their long-term CV health and missing out on the longevity benefits of less extreme levels of exercise (See Figure 1).[8] To put it another way, logging an excessive number of hard miles on an engine is bound to shorten its durability. 'More' is probably not 'better' when it comes to exercise and participants should not harbor an illusion that if one hour of vigorous activity is good for health, then doing four hours of strenuous physical activity will multiply the health benefits.[9] Accumulating data is suggesting that it does the opposite – abolishes the protective health benefits of exercise. The number of individuals participating in marathons and other extreme endurance events has been on a steeply rising trajectory over the four last decades (See Figure 2).[8] Some of these people might choose to opt for shorter, more reasonable challenges if they understood the potential long-term risks of such efforts.

It is common, in our experience, that mothers tend to urge their offspring not to do marathons and other extreme endurance events. Just as we would all be better off if we heeded our mothers' advice to eat fruits and vegetables, we would likely do well to not make a habit out of doing marathons.

We are open to constructive criticism and have no agenda other than discovering, understanding and promoting the ideal exercise patterns for conferring CV health and overall longevity. We all move our bodies for a wide variety of very personal and valid reasons. Evidence is mounting that suggests exercise patterns that are best for promoting health and longevity are not exactly the same as the patterns that develop maximal endurance and CV fitness as measured by peak aerobic capacity. As we age, peak aerobic capacity naturally declines, albeit slowly, and the potential for CV damage due to extreme endurance exercise appears to increase.[6,7] Thus, it would seem especially important to not routinely overdo exercise with respect to intensity and/or duration after age 45 or 50.



PERSPECTIVE

In our opinion an "ideal exercise regimen" for long-term CV and general health as well as maximizing vigorous longevity would look something like this:

Running is the most common form of excess, endurance exercise. We recognize that many people, for various reasons, will decide to exercise and/or run beyond these CV health promoting levels. It is important to note that habitual runners, even at relatively high levels, do not appear to have worse survival than do non-runners. Running 25-30 miles or more per week may not amount to the deleterious "extreme endurance exercise" if done sub-maximally over an hour or less. Marathons and triathlons require very prolonged, often maximal exertion, exercise bouts that have some CV risks that are just recently being identified. The repeated, regular performance of "all out" efforts for more than an hour over many years could compound these risks, so minimizing this over-exposure as much as possible should be strongly considered.

For more information, see our recent editorial in Heart,[11] and view the TEDx Talk, "Run For Your Life… at a Comfortable Pace and Not Too Far." http://www.youtube.com/watch?v=Y6U728AZnV0.*



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Disclosure

None reported.

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Can Hospital-Owned Medical Practices Survive in the Long Run?

by Arthur Gale, MD

Increasing health care costs may give private practice the upper hand



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Doctors are becoming hospital employees. Private practice which has been the dominant way physicians have practiced since the country was founded may be a thing of the past. Doctors are closing their offices for the simple reason that the hospitals give them a hefty signing bonus for the first year or two, and then the government and insurance companies reimburse them at higher levels as hospital employees than they can obtain in private practice. Hospitals buy doctors' practices in order to lock in referral sources for inpatient and outpatient services. How long can this costly state of affairs last?

The Pressure Is On

The government is under tremendous pressure to reduce Medicare costs. Over the past 30 years health care expenditures have increased from 7 to 16 percent of the GNP. The number of uninsured has increased from 30 to 50 million. For a family of four the cost of health care has increased to $20,000 annually according to a recent report from the Milliman Medical Index. And the public is asking if all these expenditures are worthwhile. The health of the U.S. population is no better than the health of citizens of many countries that spend far less on health care than does the U.S.

Hospitals comprise the nation's largest single health care expenditure at about 30 percent of the total. Both the government and employers are finding it more and more difficult to pay for skyrocketing health care costs. And they are finally beginning to scrutinize hospital costs.

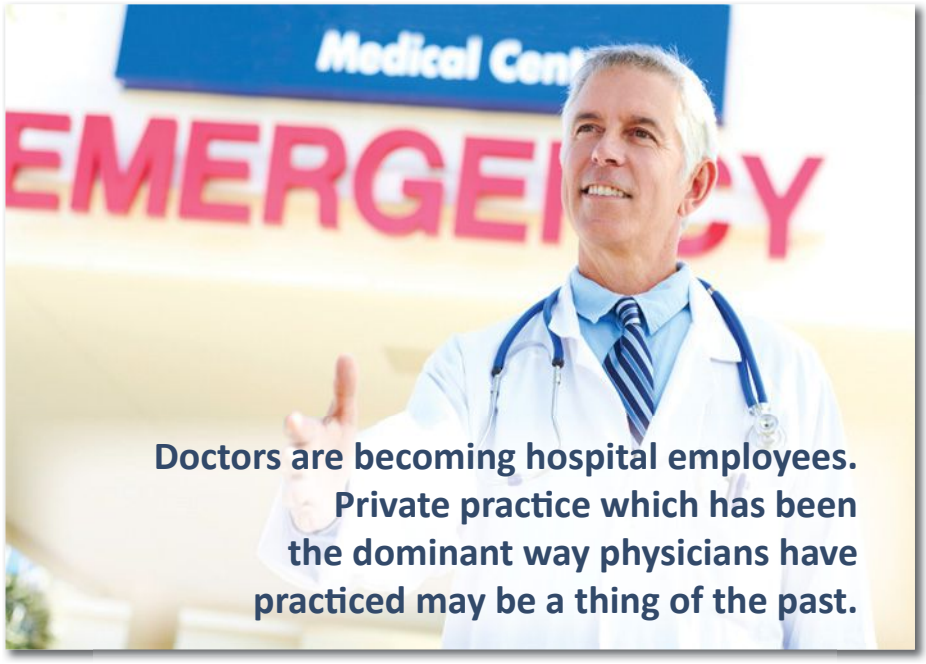
A recent article in the *St. Louis Post Dispatch* listed the costs of MRI imaging at various hospitals and outpatient imaging centers. There was at least a three-fold difference in pricing. A private for-profit hospital was the least expensive. The largest hospital system in the area refused to even reveal its prices for MRIs. Competition is supposed to be the hallmark of managed care, under which our current health system operates and which was supposed to reduce health care costs. How can there be competition when there is no price transparency? Why does this marked disparity in hospital pricing exist?

MRIs aren't the only overpriced hospital service. Hospitals strongly urge their employed physicians to refer their patients to hospital imaging centers for other types of X-rays and to high-priced hospital-owned clinical laboratories and outpatient surgical centers.

Reimbursements Vary

The influential governmental non-partisan Medicare Payment Advisory Commission (MedPAC) has





recommended cuts in hospital reimbursement. One major cut would be in primary care services. Currently a mid-level office visit for a hospital-owned doctor is $124.40. The same visit in a private physician's office is $69.97 or 44.6% less. MedPAC has recommended the elimination of this disparity. MedPAC has recommended uniform pricing for identical treatments, regardless of whether they are administered by doctors who own their own practices or doctors who work for hospital-based clinics. It is estimated that this change alone would save Medicare about $1 billion per year. If implemented it would also severely hamper hospitals' ability to attract physician employees.

How did it come about that the government and insurance companies pay doctors in private practice so little but pay hospital based doctors so generously? Both the Federal Trade Commission and corporate managed care organizations have encouraged hospitals and health plans to employ physicians. Policymakers hold as an article of faith that conflicts of interest inherent in fee-for-service private practice are the root cause of high health care costs.

The "experts" contend that cost savings can be realized when physicians practice as employees in vertically integrated systems like the Mayo Clinic, the Cleveland Clinic, Kaiser Permanente, and other hospital systems. There are no studies to support this assumption. In fact the data, some of which is cited above, support the opposite conclusion.

What percent of the GNP does health care have to consume before the policymakers start making changes in hospital reimbursement? When will hospitals be held accountable for their lavish spending on massive unnecessary building programs, huge administrative salaries, advertising, and yes, even subsidies to physicians? And when will the so-called experts in health care admit that multi-hospital mergers and the ownership of physician practices function as monopolies that raise not lower costs?

The average physician rushing to sell his or her practice to a hospital doesn't have time to think about these questions. There are bills to pay, children to send to college, mortgage payments to meet, and savings to put away for retirement.

Possibilities for Change

But sooner or later the good times for hospitals will have to end. The hospitals will of course vigorously oppose any changes in the current system. Congress is not bound to accept the recommendations of MedPAC. Hospitals constitute a very powerful lobby and will use all of their vast resources to maintain the status quo. Economic reality may nevertheless force them to cut back on non-essential expenses.

If third-party payers and the government decide to pay physicians owned by hospitals at the same rate that they pay physicians in private practice (as MedPAC recommends), physicians may find becoming a hospital employee less attractive. And hospitals might be forced to lay off many of their employed physicians. If such a scenario plays out, private practice could make a comeback.

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Pirate or Partner – Is Hospital Employment Right for You?

by Kimberly Gibbens, JD & Sarah Downs, JD

Hospitals have become interested in employing physicians in order to maintain strong primary care channels, as a reaction to pressure from the government to build accountable care organizations, and in order to be more closely aligned with physicians.





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Moving from an independent physician practice to hospital employment is a major change in a physician's practice. Whether a physician is successful in such a move depends on many factors, many of which are determined in the process of negotiating the terms of employment and acquisition. Physicians should be proactive in the process and not simply rely on the hospital to take care of every challenge and obstacle. This article briefly describes the issues a physician should consider when deciding whether to sell one's practice to a hospital and become its employee. Carefully considering these issues will increase the chances that the hospital will become the physician's partner in his or her practice instead of a pirate who steals the physician's treasures and runs the practice aground.

Ahoy, Matey: Background

The past few years have seen resurgence in hospital acquisitions of physician practices and physician employment by hospitals. After the boom of physician employment in the 1990s, and the resulting losses suffered by the hospitals, hospitals and health systems are being more cautious this time around. However, in recent years, hospitals have become interested in employing physicians in order to maintain strong primary care channels, as a reaction to pressure from the government to build accountable care organizations, and in order to be more closely aligned with physicians. Physicians have become motivated to seek hospital employment because of downward pressure on reimbursement, difficulty recruiting new physicians, and uncertainty in the industry. Before becoming aligned with a hospital or health system, physicians should carefully consider and negotiate the hospital's offer to purchase the physician's practice and employ the physician to ensure that accepting such an offer is a good business move and will provide the physician with the opportunity to have a fulfilling practice.

Batten Down the Hatches: Negotiating the Employment Agreement

In a practice acquisition, one of the most important issues to physicians is the employment agreement. Hospitals use a variety



of compensation models for employed physicians including straight salary, salary plus bonus, and productivity. In the last few years, there also has been a greater emphasis on bonuses based on quality measures. Currently, the most common approach is for the hospital to provide the physician a guaranteed salary for the first few years and then move the physician to a productivity compensation model once the physician has become more established. The productivity compensation model often resembles the compensation structure found in the private physician practice because both hospitals and physician groups often view each physician's practice as a separate profit center, and this model is structured to create an incentive for physicians to make their own practice profitable. It is important to note, however, that once employed by a hospital, the physician will be limited to only receiving credit for personally performed services for purposes of calculating any productivity bonus. Depending on how the physician's private practice is structured, this may be different from what the physician is currently allowed to receive under the Stark Law.

Regardless of the type of compensation model the hospital chooses to offer the physician, the parties should use some objective method to confirm and document that the physician's compensation will be fair market value as required by the Stark Law. Many hospitals have an established process to address fair market value issues and may have a third-party valuation consultant they routinely use to provide a fair market value opinion on the physician's compensation. It is also important to understand that the hospital must review the physician's compensation on a periodic basis to ensure that the compensation continues to remain within the range of fair market value based on the physician's productivity.

In negotiating the terms of employment, physicians often focus on the length of the contract's term to ensure the physician's employment will be guaranteed as long as possible. However, during negotiations it is also essential for the physician to pay close attention to the ability of the hospital to terminate the employment agreement for any reason (or no reason at all). This is often referred to as a "without cause" termination provision. The physician should try to negotiate a longer period of time before the hospital can terminate the agreement without cause if guaranteed employment is important. However, the physician should also understand that termination provisions are typically mutual so the physician will be held to the same limitations. In other words, if a hospital cannot terminate an employment agreement without cause, then the physician probably cannot terminate it either. As a result, one should weigh the importance of having a longer guaranteed term of employment against the ability to leave employment if, for example, the physician's relationship with the hospital is not as successful as originally hoped. An alternative to a longer guaranteed term that the physician might consider is to try to negotiate a liquidated damages provision that would require the hospital to pay the physician a set amount of compensation if the hospital terminates the employment agreement without cause. This could provide the physician some security in giving up his or her practice while providing the hospital an incentive not to terminate the employment agreement without cause.

Many hospitals require that the employment agreement include a restrictive covenant in order to protect the hospital's investment in the physician. This is often referred to as the "non-compete" provision. However, a physician may be able to negotiate less restrictive terms in the restrictive covenant such as a smaller restricted, geographic area or shorter period of time. The physician could also try to negotiate for the physician to be released from the non-compete restriction after an extended period of employment such as five years.

Becoming employed by a hospital usually results in the termination of the physician's existing malpractice insurance policy. Most malpractice policies are written on a "claims made" basis, which means that the policy covers claims that are made while the policy is still in effect. As a result, a physician needs a "tail" coverage policy to cover claims that are made after the policy has been terminated but that are based on services performed during the original policy period. Whether the hospital pays for the tail coverage policy is usually a point of negotiation, although some hospitals have a policy about paying (or not paying) tail coverage of newly employed physicians. Even though a hospital may agree to pay for the physician's tail coverage, the physician must understand that any amount the hospital pays will be considered compensation or income to



the physician for tax purposes and for purposes of the Stark Law. There are various ways to structure this type of arrangement to help reduce some of the tax consequences and to make sure that the total amount of compensation the physician receives continues to be fair market value. These issues, however, should be discussed with one's financial advisor and attorney. If the physician has to purchase tail coverage, then he or she should contact the current malpractice policy provider right away to determine what the cost will be and what steps are required to make this transition to tail coverage.

It is also useful for physicians to recognize that most physician employment agreements subject the physician to the hospital's employee policies and procedures since the physician will now be a hospital employee. These policies and procedures may or may not be provided to the physician without the physician's request and vary from hospital to hospital.

Buried Treasure: Practice Acquisition and Valuation

Hospitals typically acquire practices through asset transactions. Stock transactions are uncommon because most hospitals are unwilling to take on the additional liability related to a practice's stock, and an asset transaction enables the hospital to pick and choose which assets to purchase. It is imperative that a third party valuation be performed to determine the value of the assets, and the cost of such a valuation is typically borne by the hospital. The purchase price paid by the hospital must be within the range of fair market value to ensure that payment cannot be interpreted as payment for patient referrals, which could be a violation of the Stark Law and the Anti-Kickback Statute. In asset acquisitions, hospitals typically purchase the practice's hard assets. If the valuation provides credit for the physician's goodwill, this should be carefully scrutinized. Payments for goodwill are now uncommon because the regulatory guidance has been fairly clear that such payments are inappropriate and that the government could interpret them as payments for patient referrals.

As part of the valuation, it is also important to determine whether the hospital will purchase the practice's medical records, whether they are hard-copy or electronic. If hard-copy medical records will be included in the assets sold, the valuation company should assess the fair market value of the medical records, which will likely be limited to the cost it would take to copy the records. The purchase of electronic medical records is more complicated, with any assessed value likely being related to electronic medical record software systems and start-up costs. If the hospital does not purchase or take possession of all of the physician's medical records, it is crucial for the physician to understand his or her ongoing responsibilities related to the remaining medical records, including providing access to patients and maintaining the records according to the practice's document retention policy. If the hospital purchases some or all of the practice's medical records, the physician should ensure that the asset purchase agreement allows the physician to access the records in the event of a malpractice claim.

In most practice acquisitions, the accounts receivable are excluded from the asset purchase, and the physician must determine in advance how the physician will bill and collect the accounts receivable that are outstanding at the time of the sale including what personnel and computer systems will be used. If the physician uses the hospital for such billing and collection services, the physician must pay the hospital a fair market value rate for such services pursuant to a written agreement. This arrangement is usually structured through an agreement separate from the asset purchase agreement.

The tax implications from the physician selling the practice depend on the type of corporation that the physician used to operate the practice. Physicians should consult with a tax lawyer or accountant to plan for and navigate the tax implications. Physicians should also keep in mind that not-for-profit hospitals may have certain restrictions that must be followed when purchasing a physician's practice so that the hospital's tax-exempt status is not put at risk.

Heave Ho: Due Diligence

Due diligence is the process through which the hospital learns about the physician's practice and evaluates the financial impact of employing the physician and acquiring the practice. This is an essential part of the acquisition process so it is important to fully respond to the hospital's requests. The level of due diligence requested by the hospital



will vary depending on how familiar the hospital is with the practice and how large the practice is. Common due diligence requests include asking to see copies of the practice's contracts including equipment and real estate leases, several years of financial statements, and the physician's historical WRVUs. If the physician has any outstanding loans with respect to the practice, the physician will likely have to address how such loans will be paid prior to closing unless the hospital has agreed to assume the debt. Typically, debts are paid either before the asset transaction closes or simultaneously at closing.

Parties sometimes choose to enter into a non-binding letter of intent as part of the due diligence process before they sign the closing documents. Letters of intent spell out the parties' expectations and agreements that have been negotiated to date. The advantage of a nonbinding letter of intent is that it provides a clear understanding of the major terms of the acquisition and employment agreement, which can certainly be helpful in a complex transaction. However, because of the non-binding nature of such letters of intent, it may be simpler and less expensive to begin directly to negotiate the terms of the actual employment and asset purchase agreements instead of spending time hammering out the terms of a letter of intent.

Avast Ye: Real Estate and Equipment Leases and Other Contracts

As part of the due diligence process, the physician must determine which contracts and leases that the hospital is willing to take responsibility for and which it is not. Therefore, the physician's first step should be to determine what contracts and leases the practice has that currently are in existence. Physician practices typically have a number of contracts and leases ranging from high dollar contracts such as office space leases and software contracts to minor contracts such as those for the use of a postage machine. Physicians should pay special attention to the practice's real estate and equipment leases and review them closely to understand the term, termination, and assignment clauses. Most leases will require consent from the lessor to assign the contract to the hospital, and some contain a confidentiality clause that requires consent from the lessor before the physician can even disclose the contract to the hospital. Consequently, it is a good idea to contact the leasing company well in advance of the closing date to begin the process of obtaining the necessary consents. The hospital may be unwilling to take assignment of all of the leases, so it is also crucial to begin those negotiations with the hospital as early as possible. If the hospital is unwilling to take assignment of a lease, it is likely that the physician or the practice will continue to be responsible for lease payments until the lease is terminated or expires.

Me Hearties: Employee and Benefits Issues

Whether the hospital will employ the practice's non-physician employees is generally a point of negotiation. If the hospital agrees to offer employment to some or all of the practice's non-physician employees, the physician should consider whether it is important to have this agreement in writing. Some hospitals may only be willing to agree to it verbally or to "do their best" in providing the employees with a job.

Physicians should also evaluate the practice's benefits issues well in advance of any closing date so that no surprises arise at the last minute. Physicians should pay careful attention to any deferred payments to retirement plans and similar issues to ensure that benefit plan rules are not violated. Depending on the size of the practice and the complexity of benefits it provides, the physician may need to consult with the physician's financial advisor or lawyer to navigate these issues.

Shiver Me Timbers: Duty to Notify Patients

Physicians have a duty to notify their patients in writing that the physician's practice is being sold, who the buyer is, where they can locate the physician after the sale, and where the patient's medical records will be maintained. Providing the physician's patients this information is an exercise in good patient relations, but will also help in avoiding claims of patient abandonment.

Yo Ho Ho: Conclusion

Selling a physician practice and becoming employed by a hospital is a great option for many physicians, but making the transition to working for a hospital should not be undertaken lightly. With careful consideration of the issues described above, and with planning and diligence in the negotiation process, a physician can often find a successful partner in his or her practice. As noted, retention at the outset of appropriate legal and accounting professionals can help to avoid later legal pitfalls. MM



Guiding Principles for Physicians Entering into Employment and Contractual Arrangements

The American Medical Association (AMA) adopted new guiding principles for physicians entering into employment and contractual arrangements. The principles address the unique challenges to professionalism and the practice of medicine arising from the physician employment trend and were adopted at the AMA's semi-annual policy-making meeting.

The principles address six potentially problematic aspects of the employer-employee relationship, including: conflicts of interest, advocacy, contracting, hospital-medical staff relations, peer review and performance evaluations, and payment agreement.

The Principles are not intended to serve as a comprehensive listing of the professional and ethical obligations of employed physicians; such obligations – which are the same for all physicians, regardless of employment status – are more fully delineated in the AMA Code of Medical Ethics. Nor are the Principles a comprehensive treatment of contractual matters such as work hours, compensation models, employee benefits, and other issues typically the subject of negotiation between physicians and employers; such issues are addressed elsewhere in the body of AMA policy and in the AMA's model employment agreements. Rather, it is hoped that these Principles, in addressing select, potentially problematic aspects of the employer-employee relationship, will provide broad guidance for employed physicians and their employers as they collaborate to provide safe, high-quality, and cost-effective patient care.

For more information, visit www.ama-assn.org/go/employment.

AMA PRINCIPLES FOR PHYSICIAN EMPLOYMENT

(1) Addressing Conflicts of Interest

(a) A physician's paramount responsibility is to his or her patients. Additionally, given that an employed physician occupies a position of significant trust, he or she owes a duty of loyalty to his or her employer. This divided loyalty can create conflicts of interest, such as financial incentives to over- or under-treat patients, which employed physicians should strive to recognize and address.

(b) Employed physicians should be free to exercise their personal and professional judgment in voting, speaking, and advocating on any matter regarding patient care interests, the profession, health care in the community, and the independent exercise of medical judgment. Employed physicians should not be deemed in breach of their employment agreements, nor be retaliated against by their employers, for asserting these interests.

(c) In any situation where the economic or other interests of the employer are in conflict with patient welfare, patient welfare must take priority.

(d) Physicians should always make treatment and referral decisions based on the best interests of their patients. Employers and the physicians they employ must assure that agreements or understandings (explicit or implicit) restricting, discouraging, or encouraging particular treatment or referral options are disclosed to patients.

(e) Assuming a title or position that may remove a physician from direct patient-physician relationships – such as medical director, vice president for medical affairs, etc. – does not override professional ethical obligations. Physicians whose actions serve to override the individual patient care decisions of other physicians are themselves engaged in the practice of medicine and are subject to professional ethical obligations and may be legally responsible for such decisions. Physicians who hold administrative leadership positions should use whatever administrative and governance mechanisms exist within the organization to foster policies that enhance the quality of patient care and the patient care experience.

Refer to the AMA Code of Medical Ethics (www.ama-assn.org/go/code) for further guidance on conflicts of interest.

(2) Advocacy for Patients and the Profession

(a) Patient advocacy is a fundamental element of the patient-physician relationship that should not be altered by the health care system or setting in which physicians practice, or the methods by which they are compensated.

(b) Employed physicians should be free to engage in volunteer work outside of, and which does not interfere with, their duties as employees.



(3) Contracting

(a) Physicians should be free to enter into mutually satisfactory contractual arrangements, including employment, with hospitals, health care systems, medical groups, insurance plans, and other entities as permitted by law and in accordance with the ethical principles of the medical profession.

(b) Physicians should never be coerced into employment with hospitals, health care systems, medical groups, insurance plans, or any other entities. Employment agreements between physicians and their employers should be negotiated in good faith. Both parties are urged to obtain the advice of legal counsel experienced in physician employment matters when negotiating employment contracts.

(c) When a physician's compensation is related to the revenue he or she generates, or to similar factors, the employer should make clear to the physician the factors upon which compensation is based.

(d) Termination of an employment or contractual relationship between a physician and an entity employing the physician does not necessarily end the patient-physician relationship between the employed physician and persons under his or her care. When a physician's employment status is unilaterally terminated by an employer, the physician and his or her employer should notify the physician's patients that the physician will no longer be working with the employer and should provide them with the physician's new contact information. Patients should be given the choice to continue to be seen by the physician in his or her new practice setting or to be treated by another physician still working with the employer. Records for the physician's patients should be retained for as long as they are necessary for the care of the patients or for addressing legal issues faced by the physician; records should not be destroyed without notice to the former employee. Where physician possession of all medical records of his or her patients is not already required by state law, the employment agreement should specify that the physician is entitled to copies of patient charts and records upon a specific request in writing from any patient, or when such records are necessary for the physician's defense in malpractice actions, administrative investigations, or other proceedings against the physician.

(e) Physician employment agreements should contain provisions to protect a physician's right to due process before termination for cause. Physician employment agreements should specify whether or not termination of employment is grounds for automatic termination of hospital medical staff membership or clinical privileges.

(f) Physicians are discouraged from entering into agreements that restrict the physician's right to practice medicine for a specified period of time or in a specified area upon termination of employment.

(g) Physician employment agreements should contain dispute resolution provisions. If the parties desire an alternative to going to court, such as arbitration, the contract should specify the manner in which disputes will be resolved.

Refer to the AMA Annotated Model Physician-Hospital Employment Agreement and the AMA Annotated Model Physician-Group Practice Employment Agreement for further guidance on physician employment contract (www.ama-assn.org/go/employmentagreement).

(4) Hospital Medical Staff Relations

(a) Employed physicians should be members of the organized medical staffs of the hospitals or health systems with which they have contractual or financial arrangements, should be subject to the bylaws of those medical staffs, and should conduct their professional activities according to the bylaws, standards, rules, and regulations and policies adopted by those medical staffs.

(b) Regardless of the employment status of its individual members, the organized medical staff remains responsible for the provision of quality care and must work collectively to improve patient care and outcomes.

(c) Employed physicians who are members of the organized medical staff should be free to exercise their personal and professional judgment in voting, speaking, and advocating on any matter regarding medical staff matters and should not be deemed in breach of their employment agreements, nor be retaliated against by their employers, for asserting these interests.

(d) Employers should seek the input of the medical staff prior to the initiation, renewal, or termination of exclusive employment contracts.

Refer to the AMA Conflict of Interest Guidelines for the Organized Medical Staff (www.ama-assn.org/go/coiguidelines) for further guidance on the relationship between employed physicians and the medical staff organization.

(5) Peer Review and Performance Evaluations

(a) All physicians should promote and be subject to an effective program of peer review to monitor and evaluate the quality, appropriateness, medical necessity, and efficiency of the patient care services provided within their practice settings.



(b) Peer review should follow established procedures that are identical for all physicians practicing within a given health care organization, regardless of their employment status.

(c) Peer review of employed physicians should be conducted independently of and without interference from any human resources activities of the employer. Physicians – not lay administrators – should be ultimately responsible for all peer review of medical services provided by employed physicians.

(d) Employed physicians should be accorded due process protections, including a fair and objective hearing, in all peer review proceedings. The fundamental aspects of a fair hearing are a listing of specific charges, adequate notice of the right to a hearing, the opportunity to be present and to rebut evidence, and the opportunity to present a defense. Due process protections should extend to any disciplinary action sought by the employer that relates to the employed physician's independent exercise of medical judgment.

(e) Employers should provide employed physicians with regular performance evaluations, which should be presented in writing and accompanied by an oral discussion with the employed physician. Physicians should be informed before the beginning of the evaluation period of the general criteria to be considered in their performance evaluations, for example: quality of medical services provided, nature and frequency of patient complaints, employee productivity, employee contribution to the administrative/operational activities of the employer, etc.

(f) Unless specified otherwise in the employment agreement, upon termination of employment with or without cause, an employed physician should not be required to resign his or her hospital medical staff membership or any of the clinical privileges held during the term of employment, unless an independent action of the medical staff calls for such action, and the physician has been afforded full due process under the medical staff bylaws.

Refer to the AMA Principles for Incident-Based Peer Review and Disciplining at Health Care Organizations (http://tinyurl.com/b8ff46z) for further guidance on peer review.

(6) Payment Agreements

(a) Although they typically assign their billing privileges to their employers, employed physicians or their chosen representatives should be prospectively involved if the employer negotiates agreements for them for professional fees, capitation or global billing, or shared savings. Additionally, employed physicians should be informed about the actual payment amount allocated to the professional fee component of the total payment received by the contractual arrangement.

(b) Employed physicians have a responsibility to assure that bills issued for services they provide are accurate and should therefore retain the right to review billing claims as may be necessary to verify that such bills are correct. Employers should indemnify and defend, and save harmless, employed physicians with respect to any violation of law or regulation or breach of contract in connection with the employer's billing for physician services, which violation is not the fault of the employee. MM

Resolve Physician Agency

MSMA is proud to announce a partnership with the Resolve Physician Agency as a new MSMA member benefit. Resolve is an experienced firm that provides a wide range of excellent career services, including employment contract review and negotiation, tailor-made job placement, benefits analysis, practice evaluation, compensation analysis, and even CV and job interview coaching. As a partner with MSMA, Resolve offers their services to MSMA members at a significant discount. Learn more about Resolve at www.resolvephysicianagency.com, or call 877-758-3318.



Drivers of Health Care Costs

A Physicians Foundation White Paper - First of a Three-Part Series

For many years and in countless articles, physicians have been the scapegoat for rising health care costs in the United States. In fact, they have been blamed by many critics for the United States leading the world in health care expenditures.

A close examination of the data indicates that this blame is misplaced – that delving into key components in health care spending reveals something else. While there is general disagreement among the so-called experts as to the degree of impact of each component, almost everyone seems to agree that new technology – not physicians – is number one on the list of contributors to rising health care costs.

We have examined data on the leading key components and found that chronic disease conditions, life style – including obesity and addictions, administrative expenses, hospitals, pharmaceuticals, mandated insurance benefits, aging, end-of-life care, defensive medicine and health disparities have all had anywhere from a moderate to significant impact on rising overall health care costs.

In the final section, entitled "Interesting Statistics about U.S. Health Care System", we examine why infant mortality rates can be a poor indicator of the success or failure of a health care system. The same applies for life expectancy statistics. Issues such as medical innovation need also to be considered in the general discussion of a health care system's success or failure.

THE PHYSICIANS FOUNDATION
Empowering Physicians
Improving Healthcare

Following a settlement of a class action lawsuit brought by physicians against the managed care industry, The Physicians Foundation (PF) was created in late 2003. It is a nonprofit 501(c)(3) organization that seeks to advance the work of practicing physicians and help facilitate the delivery of quality health care to all Americans. It pursues its mission through a variety of activities, including grant-making, white papers, research, and policy impact studies. The PF focuses on the following core areas: health system reform, physician leadership programs, workforce needs and pilot projects. As the health care system in America continues to evolve, The Physicians Foundation is steadfast in its determination to foster the physician/ patient relationship and assist physicians in sustaining their practices during these challenging and turbulent times.

To this end, The PF commissioned comprehensive national physician surveys in 2008, 2010 and 2012 which revealed a deep sense of frustration, stress and anxiety. Navigating an increasingly hostile practice environment was causing widespread dissatisfaction and low morale. In the wake of burgeoning insurance and regulatory red tape, little or no negotiating power with insurers, increasing office operating costs with low margins, declining reimbursements and the ever present threat of a malpractice action--physicians were having serious problems in sustaining their medical practices.

And then along came The Affordable Care Act (ACA), passed by Congress on March 23, 2010. With its myriad of provisions affecting physician practices--not to mention its length and sheer comprehensiveness--physician angst only multiplied. And it doesn't appear that the recent action of the U.S. Supreme Court on June 28, 2012, has lessened that anguish.

Among the publications appearing on The PF website (www.physiciansfoundation.org) are several "Roadmaps" examining the provisions of the ACA and how they will impact physician practices. One of the goals of The Physicians Foundation is to bring these issues to the attention of the public, business, state legislators, members of Congress and policy-makers so they can better understand how these practice impediments are adversely affecting physicians in their efforts to deliver the best possible care to all Americans. The PF intends to continue its mission to remain in the forefront of those activities and projects to help physicians to better navigate through all of the practice uncertainties ahead.



Timothy B. Norbeck is the Chief Executive Officer of The Physicians Foundation and has over 45 years of experience in the health care field.
Contact: www.physiciansfoundation.org
Part one of a three-part series. Reprinted with permission from The Physicians Foundation.



In light of the string of federal budget deficits, combined with a U.S. national debt approaching $17 trillion, the largest in the world – it is understandable that observers are scrutinizing health care costs which accounted for 17.9 percent of the nation's GDP in 2010, or almost $2.6 trillion. As the second highest component in national health expenditures at 20% (hospital care is 31 percent), physician/clinical services have captured everyone's attention.[1] Physician/Clinical services include health care services within the Department of Defense (higher costs in times of war), Indian Health Services, laboratory services, outpatient care centers and the portion of medical laboratory services and physician services in hospitals that are billed independently. Some critics have suggested that physicians' incomes and the fact that physicians direct most health care spending (80% is a frequently used number) are the real culprits in rising health care costs. But let us look at all of the relevant components that contribute to health care costs.

Physician / Clinical Services

Years ago the iconic Mike Royko, a Pulitzer Prize winning journalist who penned columns for the *Chicago Daily News*, the *Chicago Sun-Times* and the *Chicago Tribune*, received a poll about "doctors' earnings" which laid at their feet considerable responsibility for rising health care costs.[2] Royko, it should be noted, was revered for his style of not suffering fools or tolerating sacred cows. Considered so straight-forward and honest, he even criticized the new owner of the newspaper where he was employed – "No self-respecting fish would want to be wrapped in a ------ newspaper." In short, he told it like it is.

Here is how Royko responded in his column to the poll critical of physicians' incomes and their role in rising health care costs.

"*The poll tells us that the majority of Americans believe that doctors make too much money. The pollsters also asked what a fair income would be for physicians. Those polled said, 'oh, about $80,000 would be OK.'*

How generous. How sporting. How stupid.

You could conduct the same kind of poll about any group that earns $100,000 plus and get the same results. Since the majority of Americans don't make those bucks, they assume that those who do are stealing it from them.

It is also stupid because it didn't ask key questions, such as: 'Do you know how much education and training it takes to become a physician?'

If those polled said, no, they didn't know, then they should have been disqualified. If they gave the wrong answers, they should have been dropped. What good are their views on how much a doctor should earn if they don't know what it takes to become a doctor?

Or maybe a question should have been phrased this way: 'How much should a person earn if he or she must (a) get excellent grades and a fine educational foundation in high school in order to (b) be accepted by a good college and spend four years taking courses heavy in math, physics, chemistry and other lab work and maintain a 3.5 average or better, and (c) spend four more years of grinding study in medical school, with the 3rd and 4th years in clinical training, working 80-100 hours a week, and (d) spend another year as a low-pay, hard-work intern, and (e) put in another 3 to 10 years of post-graduate training, depending on your specialty and (f) maybe wind up $100,000 in debt after medical school and (g) then work an average of 60 hours a week, with many family doctors putting in 70 hours or more until they retire or fall over?'

As Mr. Royko went on to say, *"Based on what doctors contribute to society, they are far more useful than the power-happy, ego-tripping, program-spewing, social tinkerers.*

But propaganda works. And, as the stupid poll indicates, many Americans wrongly believe that profiteering doctors are the major cause of high medical costs.

Of course doctors are well-compensated. They should be. Americans now live longer than ever. But who is responsible for our longevity – lawyers, Congress, or the guy flipping burgers in a McDonald's?

Let us talk about medical care and one of the biggest problems we have. That problem is you, my fellow Americans.

Yes, you, eating too much and eating the wrong foods; many of you guzzling too much hooch; still puffing away at $2.50 a pack; getting your daily exercise by lumbering to the fridge to the microwave to the couch; doing dope and bringing crack babies into the world; filling the big-city emergency rooms with gunshot victims; engaging in unsafe sex and catching a deadly disease while blaming the world for not finding an instant cure. You and your habits, not the doctors, are the single biggest health problem in this country. If anything, it is amazing that the docs keep you alive as long as they do."

The fact that this all came from Mike Royko gives it extra credence, and makes his comments especially prescient.

Writing about the physicians' role in health care costs, in an article that recently appeared in *Health Affairs*, Mark Smith referred to the 80% of health care costs directed by physicians. He noted that: Physicians decide (that) "you're going to be hospitalized; you need an MRI; you're going to get a stent; you need a knee replacement." But despite the fact that they direct this spending, they are not necessarily the principal beneficiaries of it (especially now).



In addition, Smith noted, "Consider the economics of joint replacement. Medicare pays, on average in California, $18,000 for a total hip replacement ($16,336 to the hospital and $1,446 to the surgeon). A recent study asked 1,200 members of the public, 'How much do you think Medicare pays an orthopedic surgeon for a total hip replacement?' On average, patients thought that Medicare paid surgeons $11,000 for the procedure. (Interestingly, patients reported they thought that Medicare *should* pay $18,000 to the surgeon.) Cutting the surgeon's fee by 27 percent saves Medicare $390. While the numbers are higher in the commercial market, approximately the same ratio of payments exists; the bulk of the money goes to hospitals and device manufacturers."[3]

We can only imagine that some elected lawmakers (or their staffs) have the same misunderstanding of physicians' income as the general public. Or, as cognitive psychologist Amos Tversky famously said, "Whenever there is a simple error that most laymen fall for, there is always a slightly more sophisticated version of the same problem that experts fall for."

Smith also worries about physician burnout and a looming, if not already present, serious physician shortage. When writing about physician compensation, well-known Princeton medical writer and economist Uwe Reinhardt wrote: "One can think of several reasons why physician compensation in the United States is relatively more generous than elsewhere. First, physicians in most other nations face a powerful single buyer (monopsony) for health services. As the McKinsey Global Institute and Mark Pauly have shown, market power (or regulation) translates into relatively lower prices for health services, including the services of physicians. Second, U.S. physicians must make a larger financial investment in their education than their counterparts in many other countries do. They must recover the debt they incur as part of the educational process. Third, the incomes of highly skilled health care workers – notably physicians – are determined partly with reference to the incomes that equally able and skilled professionals can earn elsewhere in the economy. Because the U.S. distribution of earned income for all occupations is wider than it is in most other OECD countries, the relatively high incomes offered skilled professionals in the United States may well have served to pull up the incomes of American physicians relative to the incomes of their peers abroad."

With respect to physician training, Dr. Reinhardt weighs in on the subject this way: "Suppose that in country A physicians get free training through a taxpayer-financed educational system, while in country B physicians finance their own education and then, once trained, are paid higher fees. If country A classifies these training expenses as education rather than health care spending, which country would report higher health care costs? Is that difference in health care costs real or an artifact of labeling?"

Journalist Christopher Beam, who writes for *Slate*, had this to say about "American doctor salaries."

"They are high for several reasons. The first is the cost of education. In France and Great Britain, students go directly to medical school after high school, and their entire educations are free. In the United States, students must first get a bachelor's degree before attending medical school, and the average medical students' debt is $155,000 (editors' note: closer now to $200,000). Then come at least three years of residency, which usually pays less than $50,000 a year.[4] *Finally, there is the notion of opportunity costs.*

Presumably, many doctors could have opted for jobs on Wall Street or in management consulting instead of choosing to go to medical school. 'They sit in the Princeton eating clubs,' says health care economist Uwe Reinhardt, 'and one guy just got a starting job at Goldman for $150,000. Another guy says, 'I'm going to medical school to take on $35,000 a year in debt.'

But none of this really matters because doctors' salaries aren't a large enough chunk of health care spending in the United States to make a difference. According to Reinhardt, "doctors' net take-home pay (that is income minus expenses) amounts to only about 10% of overall health care spending. So if you cut that by 10 percent in the name of cost savings, you'd only save about $24 billion. That's a drop in the ocean compared with overhead for insurance companies, billing expenses for doctors' offices, and advertising for drug companies. The real savings in health care will come from these expenses."[5]

Complicating the entire issue for physicians (and certainly adding to practice costs, at least initially), particularly those in smaller private practices, is that there are 551 certified medical information software companies in the United States selling 1,137 software programs. According to Business Week (June 21, 2012), "Their products have one thing in common: They don't communicate with one another, and this is by design. EHR vendors which charge as much as $25,000 (and much more) per doctor for a system and



a monthly subscription fee on top of that, want to lock out competitors while locking in customers for life."6 This is just another reason why David Bronson, MD, President of the American College of Physicians, said that, "The burdens are worsening as physicians must contend with the costs and hassles of implementing new quality reporting standards and electronic health records. This is one of the reasons many of physicians are becoming employed; they just can't sustain their practices." He went on to say that high burnout rates are driving many physicians to move away from clinical practices and could deter some from entering the profession. For more on this important issue of burnout and morale, see The Physicians Foundation website at www.physiciansfoundation.org which includes our recent (September 2012) comprehensive survey of 630,000 physicians in the United States.

Earlier this year, a Colorado physician discussed the issue of medical practice sustainability with the *Wall Street Journal*. "His family practice uses electronic health records, calls up patients at home to check on their progress, and coordinates with other specialists and hospitals – all the things that policy makers and insurers say should improve patient care. But many of these enhancements aren't reimbursed under traditional insurance contracts that pay mostly for face-to-face visits with patients." It is not sustainable under the current payment system," he says. "There simply is just not enough money to go around to provide the services that we provide."[7] The upshot: Doctors fear a squeeze as they try to ramp up changes in tandem with evolving reimbursement schemes. "You're asking a practice that may be only marginally viable as a business to invest in significant infrastructure," says Glen Stream, President of the American Academy of Family Physicians, in the *Wall Street Journal* article.

Hospitals

Hospital costs during 2010 in the U.S. constituted $814 billion or 31.4% of all health care expenditures.

As mentioned in *Health Care News* in September 2012, *"At the heart of President Obama's signature health care law is a simple idea: bigger is better. His law incentivizes massive mergers of systems and providers into big players in the marketplace, binding them together to share costs. These new health care behemoths will be managed from Washington, with regulators wielding control from on high.*

That's just one problem. When it comes to health care, "bigger is better" isn't true. And consumers will pay a huge price for this mistake. The president's health care law contains rafts of new regulations, benchmarks, and taxes for providers to deal with. Since these limit profit margins and create new administrative costs, they make it very appealing for health care providers to merge into gigantic, sprawling systems of care.[8] A recent report in *The Washington Post* notes, '*The health care industry is increasingly turning to consolidation as a way to cope with smaller profit margins and higher compliance costs that many anticipate when the federal government's health care reforms under (Obama's law) take effect.*' *Across the health care industry, we're seeing the merger trend continue to rise.*[9]

These larger mergers don't actually translate to better care or to savings for patients. The Wall Street Journal recently reported on a patient from Nevada whose echocardiogram bill came to $373 before a merger and then $1,605 after a merger.[10]

The same treatment, in the same office, by the same cardiologist, separated by just six months – but with a price point far higher because the physicians had been purchased by a hospital system, allowing for a much higher price to be charged.

The larger a hospital system gets, the more monopolistic control it can exercise over a market, putting insurers at a disadvantage when it comes to negotiating rates. Obama's law accelerates the process, giving these large entities even more incentive to merge through the creation of accountable care organizations (ACOs). These large health care entities will destroy any hope for competition in a marketplace, driving out or buying out independent doctors and extracting as much money as possible from taxpayer-funded entitlements and the privately insured."

We have written previously about our strong belief that bigger is not better, and it appears that new studies confirm that assertion.

An August 2012 article in *The Wall Street Journal (WSJ)* discussed the overall issue. *"Major health insurers say a growing number of rate increases are tied to physician-practice acquisitions. The elevated prices also affect employers, many of which pay for their workers' coverage. A federal watchdog agency said doctor tie-ups* (Note: physician practices/hospital consolidations) m*ore likely resulting in higher Medicare spending as well, because the program pays more for some services performed in a hospital facility.*[11]

This year, nearly one-quarter of all specialty physicians who see patients at hospitals are actually employed by the hospitals, according to an estimate from the Advisory Board Co. That is more than four times as many as the 5% in 2000. The equivalent share of primary-care physicians has



doubled to about 40% in the same time frame. Traditionally, most doctors who see patients at hospitals are in independent practice.

The structural shift is being driven partly by declining reimbursements for physicians, particularly in certain specialties like cardiology. Doctors are also being pressed to make new investments, such as introducing electronic medical records, and some are attracted to the idea of more regular hours with fewer administrative headaches.

Medicare pays substantially more for certain services if they are performed at hospital facilities. A 15-minute doctor visit, for instance, cost the program about $70 last year at a free-standing practice, but the same visit ran about $124 if it was billed as hospital-outpatient, according to the Medicare Payment Advisory Commission. That difference can bump up reimbursements after an acquisition if a hospital system upgrades a clinic to become an outpatient facility, or moves services into a hospital site.

With private insurers, hospital systems with strong market heft can often negotiate higher rates for physician services than independent doctors get. The differential varies widely, anywhere from 5% or less to between 30% and 40%, industry officials say.

Other industry officials suggest the costs often mushroom even more. In a letter sent to some doctors in Nevada, Wellpoint, Inc. said the cost for a spine MRI, or magnetic resonance imaging, done at a free-standing center in the area ranged from $319 to $742, while the same test done by a hospital would run between $1,591 and $2,226."[12]

A letter to the editor of the *WSJ* on September 4, 2012 is instructional: *"It would behoove Medicare and all other insurance carriers to provide private-practice physicians with incentives to stay independent. Increasing fees to these physicians will still be less costly than paying for the same services performed in a hospital out-patient setting."(Editors' note: Agree!)*[13]

A September 14, 2012 article, also in the *WSJ*, described the concern over consolidation felt in California. *"California's attorney general has launched a broad investigation into whether growing consolidation among hospitals and doctor groups is pushing up the price of medical care, reflecting increasing scrutiny by antitrust regulators of medical-provider deals.*

The probe, which has been under way for several months, is examining hospital systems' reimbursement from the insurers, according to people with knowledge of the matter. The regulator appears to be focusing on whether the systems' tie-ups with physicians, as well as ownership of hospitals, have given them the market power to boost prices in a way that violates antitrust law, these people said."[14]

As physicians find it increasingly difficult to sustain their practices during times of declining reimbursements, increased regulation, little negotiating power with insurers, growing practice costs, new EHR requirements, and combined with the always constant threat of a malpractice suit, who can blame physicians for looking to hospital systems for employment? But overall costs will continue to escalate.

One final footnote on the subject: It is interesting to note, as reported in the August 2012 media release of the Ambulatory Surgery Center Association, that, *"when asked whether they would prefer a doctor who is employed by a hospital or who owns his own office, 55 percent (of Americans /poll respondents) say they want a physician who owns and supervises his own practice."*[15]

Medical Malpractice / Defensive Medicine

One of the difficulties in recognizing the overall importance of the medical malpractice / defensive medicine issue as it relates to health care costs is that the physicians' cost of insurance premiums represents "only" about 1-2 percent of overall health care spending. But that 1-2% represents $27 - $54 billion dollars. Further complicating the issue is the Congressional Budget Office (CBO) estimate (mentioned in the Social Security Advisory Board Report in 2009) that "imposing limits on malpractice awards would only lower malpractice premiums by about 6 percent nationwide, resulting in a modest savings on total health care expenditures of less than 0.2 percent."[16]

The Robert Wood Johnson Foundation (RWJF) Report of 2008 gives short shrift to the premium cost issue, pointing out an article in Science and Technology by Sloan and Chepke, where it was estimated "that over a 30-year period (1970-2000), medical malpractice premiums increased from 5.5 percent to 7.5 percent of total physician practice expenses, so premiums cannot be an important cost driver. Research on whether defensive medicine affects spending is challenging because liability risk pushes physicians in the same direction as fee-for-service payment incentives – providing more services."[17] It should be noted, however, in reference to fee-for-service medicine (FFS), that the traditional FFS payment system doesn't really exist anymore. Medicare price controls, which insurers emulated, took care of that mechanism. As a physician



pointed out in the *Wall Street Journal* (*October 19, 2012*), "The only FFS practices remaining are cosmetic surgery and those physicians who accept cash only."[18]

But others point to the considerable cost of defensive medicine – ordering extra tests because of a fear of a lawsuit – which Phillip K. Howard (Chairman of Common Good) estimates at over $200 billion a year.[19]

Another problem with the malpractice lawsuit system is that 54 cents of the malpractice dollar goes to lawyers and administrative costs, according to a 2006 study in the *New England Journal of Medicine*.[20] Some critics of the current system also point to former Senator John Edwards, who, for example "made a fortune bringing in cases against hospitals for babies born with cerebral palsy. Each of those tragic cases was worth millions in settlement. But according to a 2008 study at the National Institutes of Health, in nine out of ten cases of cerebral palsy, nothing done by a doctor could have caused the condition."[21]

The U.S. Department of Health and Human Services reports that "Americans spend more per person on the cost of litigation than any other country." No surprise there. The report goes on to say that the U.S. had 50% more malpractice claims filed per 1000 population than the United Kingdom and Australia, and 350% more than Canada.[22] The fact that two-thirds were dropped, dismissed, or found in favor of the defendant certainly confirms that the present system simply is inefficient and does not work.

And, *American Medical News* (*September 2010*) adds that physicians prevail 90% of the time when a malpractice case does go to trial.[23]

According to the American College of Obstetricians and Gynecologists (ACOG), one in 10 obstetricians have stopped delivering babies, unable to pay malpractice premiums on the order of $1,000 per baby (probably a low estimate for today).

Those who like to lowball the costs of defensive medicine claim that it is difficult to separate it from the effects of other factors that lead to more intensive use of resources including the diffusion of new technology, the incentives of the fee-for-service form of reimbursement and the factors accounting for regional variation in spending. This is the rationale given in the Social Security Report previously mentioned for lower estimates of the costs of defensive medicine. An article on the subject in *Health Affairs* (*September 2010*) concludes that "defensive medicine practices exist and are widespread, but their impact on medical care costs is small."[24]

But Richard A. Epstein, a professor of law at the University of Chicago and a senior fellow at the Hoover Institute – while he estimates malpractice premiums constituting less than 1% of the total U.S. health care bill (*WSJ*, *June 30, 2009*) – does believe that defensive medicine adds as much as 10 percent to health care costs.[25] At a total health care cost of $2.7 trillion estimated in 2011 – the 10% estimate figures to be $270 billion! Author Marc Siegel, MD, puts it simply: "Fear of malpractice suits compel doctors to over treat when confronted with sick patients."

As mentioned in a recent *NEJM* article (*August 1, 2012*), its authors mention that "more than 75% of physicians – and virtually all physicians in high-risk specialties – face a malpractice claim over the course of their career. Regardless of whether a claim results in liability, the risk of being sued may cause physicians to practice a type of defensive medicine that increases costs without improving the quality of care."[26]

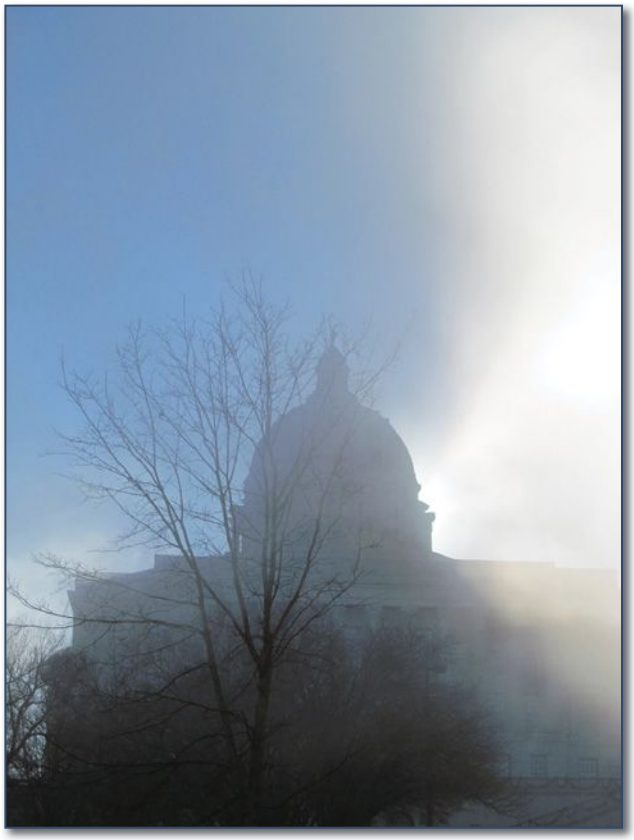
But lost in almost all of the discussions of the impact of medical malpractice premiums and defensive medicine is the considerable agony and trauma suffered by those more than 75% of physicians and their families because of liability suits (or the threat of them).

The biennial surveys by The Physicians Foundation in 2008, 2010 and 2012 demonstrate how important the issue is to practicing physicians which impacts greatly on their sense of morale and optimism. This considerable (human) cost must be considered in examining efforts to change the present system, even if experts cannot agree on the financial costs.

As an article in *Health Affairs* (*September 2010*) points out, "Physicians can insure against malpractice awards, but they cannot insure against the psychological costs of being involved in litigation, including the stress and emotional toll."[27]

Parts two and three of this white paper will appear in future issues of *Missouri Medicine*. References can be found at www.physiciansfoundation.com.

MM



Another Legislative Session begins here in Jefferson City, as winter vapor from the Missouri River bottoms floats up and envelops the 96-year old Capitol.

PRESIDENT'S

Be Careful What You Wish For

by Stephen Slocum, MD

Here we go again, another January and another opening of the Missouri legislative session. MSMA is once again preparing for battle, formulating strategy both offensive and defensive. Our legislative team is helping to write bills, identify sponsors, and determine allies as well as foes. We are discussing legislation which is being introduced, and deciding our official response to legislation pertinent to health care.

Last year's session had its share of success and disappointment, but overall it was a good year in Jefferson City.

SB 682, which reserves the right of administration of certain spinal injections to physicians, passed, although the law sunsets in 2016. MSMA supported this bill.

MSMA opposed SB 679 and HB 1371, which would have allowed advanced practice nurses to practice independently. This applies primarily to nurse practitioners and nurse anesthetists. Neither bill passed out of committee. MSMA also helped to defect HB 1533, which would have allowed chiropractor reimbursement by MoHealth Net for any procedure done within their scope of practice. No new funding was provided for this reimbursement, and if the bill had passed, all other payments would have been reduced.

SB 641 and HB1339 were defeated. These bills would have extended the sunset on vision legislation passed in 2007. That legislation mandated full eye exams for children entering kindergarten or first grade. It was the position of organized medicine that pediatricians, family physicians and school nurses are qualified to screen children for vision problems, and that the original legislation was an unnecessary unfunded mandate.

MSMA also opposed failed bills which would have equalized physical therapists' co-pays to that of primary care physicians, and would have repealed the motorcycle helmet requirement for riders 21 years of age and older.

On the negative side, MSMA was unsuccessful at helping pass bills which would have increased tanning bed regulations, prohibited texting while driving for adults, eliminated economic credentialing by hospitals, and increased the state's tobacco tax.

More significantly, MSMA was unsuccessful at the passage of prompt credentialing legislation which would have put a 90-day limit on the credentialing of new physicians by insurance companies. There was also failure to pass legislation establishing a statewide drug registry which was to track controlled substance prescriptions.

So what is in store for us this coming year? Certainly the recent Missouri Supreme Court ruling that our cap on noneconomic damages in malpractice lawsuits will be getting attention in the state legislature. This is a critical issue, and we will all be asked to pitch in and help in the effort to re-establish the cap. More specific



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information on upcoming legislation will be forwarded to you.

Usually, reviewing the previous year's legislative activity gives clues as to what may lie ahead. We know that scope-of-practice expansion attempts which failed will be back. Expect the nurses to introduce legislation again this year.

We will again be dealing with prompt credentialing, and hope this is the year we will get this legislation passed. We also believe that the prescription drug monitoring issue will be back, and this is an issue I believe deserves a bit more scrutiny.

We do need to help protect our patients' privacy, and we need to prevent the imposition of more complex regulations on our practice of medicine.

I have been asked on my travels around the state about the fact that Missouri is the only state without a drug registry. Abuse of prescription medication is certainly a major issue. Physicians are frequently used by drug-seekers and addicts to satisfy their needs. Shouldn't there be a way that Missouri physicians can determine whether or not that patient in the exam room, who appears to be in considerable discomfort, has seen another physician and been prescribed a controlled substance?

None of us desire to be a tool for the addicted. In fact, last year MSMA supported the above mentioned bill to establish a drug registry, but the bill proved to be very controversial. The issue of patient privacy, which is a very significant consideration, was a major factor in the bill's failure. But there are other factors which need to be reviewed.

I was a guest at the Kentucky Medical Association's annual convention last September in Louisville. The theme of the convention was the unanticipated review of Kentucky House Bill Number 1, which was legislation passed in a special session of the Kentucky legislature. The bill serves to establish regulations to the state's drug registry, the Kentucky All Schedule Prescription Electronic Reporting (KASPER). The Kentucky Board of Medical Licensure has added regulations for HB1 which are more comprehensive than the requirements of the bill itself. In short, the new requirements for drug reporting in Kentucky are considered by physicians to be a total disaster.

During the legislative consideration of this bill, the Kentucky Medical Association voiced its strong opposition, due to the oppressive nature to physicians of the various components. The media turned on the KMA, and vilified its president, Dr. Shawn Jones, for being in favor of facilitating drug abuse in the state. Leadership of the KMA was, to say the least, dismayed at this bill's passage.

In Kentucky, the definition of a pain-management clinic is quite broad, and may include private physician practices. Pain management clinics must register with the state board, and are subject to strict regulations.

All physicians who prescribe controlled substances must register with KASPER, and make a KASPER inquiry each time a controlled substance is prescribed. There are standards for initial prescribing, prescribing for more than three months, and long-term prescribing. There are documentation requirements as well as patient education requirements. Failure to comply with these standards and requirements result in strict penalties.

Many physicians I met in Kentucky were considering referring their patients in need of narcotics to pain management clinics. Those in surgical specialties were very concerned about their ability to manage pain in their post-op patients without spending an inordinate amount of personal time querying KASPER and submitting absurd amounts of documentation.

So what do we really want in Missouri? I think we all agree that it would be extremely helpful to know whether or not that patient in our office is in true need of a narcotic medication, or is likely a drug seeker. The ability to look up a name on a registry certainly sounds attractive. But would the state collecting names be an undue invasion of patient privacy? Should patients be concerned that the information collected by the state be inadvertently made public through the observation by medical office personnel?

Even more importantly, should physicians be concerned that the establishment of a drug registry lead to regulations such as now exist in Kentucky, whereby vast amounts of time would be wasted by physicians doing mandated queries of the registry, and even more time wasted in completing the documentation requirements for actually prescribing a controlled substance?

MSMA will undoubtedly be grappling with these issues once again. I believe that if we again endorse in the legislature the concept of a drug registry, we must keep in mind the potential pitfalls inherent in such legislation. We do need to help protect our patients' privacy, and we need to prevent the imposition of more complex regulations on our practice of medicine.

Maybe there is a reason Missouri is the only state without a drug registry. We need to be careful what we ask for.

MM

Be Alert and Engaged in the Legislative Process

by Sen. Robert Schaaf, MD

Consider all aspects affecting your practice of putting so many more people on Medicaid. How will it affect your cash flow?

The legislative session started January 9 and it's shaping up to be a busy year for the House of Medicine. Every physician and patient will be affected by what happens in Jefferson City before May 17. Doctors simply must get involved; the stakes are too high not to.

The Accountable Care Act (ACA) upheld by the U.S. Supreme Court, will have a dramatic impact on medical practice. Already the tax on medical devices is kicking in, and all of us will be paying more for medical supplies without additional reimbursement to cover the cost. But other ACA impacts will also affect us at the state level. Legislators need to hear from doctors themselves as to the nuances of those effects.

Medicaid expansion has already been proposed by Governor Nixon. It would extend coverage to able-bodied adults up to 138 percent of the federal poverty level (FPL), or about 255,000 to 400,000 people, depending on whom you ask. Currently only adults with children are covered up to 19 percent FPL. The cost for the first three years would be paid for by the federal government, but then the state would have to pick up five percent, then ten percent, but after 2020, the law is silent on payment. The total cost is not yet known.



Robert Schaaf, MD, MSMA member since 1980, chats with a reporter after Gov. Blunt signed the Tort Reform Bill in 2005. He now represents State Senate District 34 in St. Joseph, and is an MSMA First District Councilor.
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Consider all aspects affecting your practice of putting so many more people on Medicaid. How will it affect your cash flow? How do you feel about the Medicaid population you have now? What about the reimbursement, which averages 60% or so of Medicare rates? What do you believe government's role should be? Should able-bodied adults be covered, or should we focus on people who are unable to help themselves? Do you feel that Medicaid patients receive good care and have adequate access now? Will there be enough providers to care for so many more Medicaid patients?

Next up will be talk about creation of a health-insurance exchange, and whether it should be a state-based or federal exchange. The new law says that every state must have an exchange and that it must meet the criteria set by the federal government; but we don't know all those criteria yet. We may not have much flexibility to make something better. If the

state runs it, the state must pay for it, and it is said that running it will cost a lot; but exactly how much is unknown.

More importantly, the new law allows personal tax credits to be given to people between 100% and 400% FPL, to be used to subsidize their purchase of health insurance, but only when purchased through the new exchange. However, the law specifically made credits available only through a state-based exchange. Realizing the problem, the Internal Revenue Service just went ahead and drafted rules that would allow people to take the credits through a federal exchange, too, in spite of how the law reads. Now the state of Oklahoma has sued to stop the IRS. If the courts respect the simple meanings of words, Oklahoma should win. But courts are unpredictable and unreliable.

This tax credit business is important because the law also allows for big fines to be levied against larger employers that have employees who get the tax credits. $2,000 per employee can add up pretty quickly, and the fines could hurt Missouri's economy. But the state law passed by voters in 2010, called the Healthcare Freedom Act, or Proposition C, prohibits Missouri from participating in a federal government system that directly or indirectly fines employers. I know this is complicated, but the bottom line is that the state law prevents us from forming a state-based exchange because it would bring fines upon employers indirectly—and if we were to form one, we would have to roll back the language the voters passed two years ago. I seriously doubt we will form a state-based exchange.

If Oklahoma loses its lawsuit, and the tax credits are made available through a federal exchange, it could lead to one of those crazy results of government (like requiring riverboat casinos to be in ponds filled with river water). Should Missouri not expand Medicaid, able bodied adults greater than the poverty level would have subsidized health insurance, but those below the poverty level would not. That's just crazy, although it would be an incentive for able-bodied people to work harder and earn more money, so they could get help buying health insurance. The current system has too many incentives for people not to work, and federal law stops us from eliminating them.

Medicaid already covers 14% of all Missourians. It pays for half the children and half the births. Its growth usually eats up most of any increase in revenue coming into the state treasury. To pay for Medicaid, we have had to slash other programs, including education, and the state is already facing severe problems taking care of the roads, bridges and buildings we already have. There is severe underfunding of our second injury fund, our prison costs, and our public defender system, as well as many other important government functions. Medicaid underpays physicians and has pitiful access for those it covers. My opinion is that we need to take better care of those who are most vulnerable rather than dilute our efforts by covering more able-bodied adults.

Missouri will also be affected by the spending cuts that are certain to result from the coming debt ceiling debate in Congress, but of course we will have no idea what that effect will be for months. Meanwhile, amid all this uncertainty, we will have to craft together a budget based upon what we think will happen. It won't be easy.

All of these things will affect physicians as will hundreds of bills affecting medical practice yet to be filed. Luckily, we have the MSMA lobbyists carefully watching the countless health-related issues the legislature considers every year. But that is not enough. You can help by being alert and engaging in the political process. You are needed now more than ever. MM



PRO/CON



Should **Ophthalmologists** Test Hearing & Sell Hearing Aids?

Are **Ophthalmologists** qualified to provide these services?

Is this a valuable service to patients?

Is hearing testing only done to enhance practice revenue?

by Steven M. Silverstein, MD, Martin E. Anderson, MD, Anthony A. Mikulec, MD & Charles M. Lederer, MD



Say What? Integrating Hearing into an Ophthalmology Practice

by Steven M. Silverstein, MD

"Blindness separates us from things, but deafness separates us from people."
--Helen Keller



Steven M. Silverstein, MD, MSMA member since 1992, is an Ophthalmologist at Silverstein Eye Centers in Kansas City and an Assistant Professor in Ophthalmology at the University of Missouri - Kansas City. His practice does hearing testing and sells hearing aids.
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Introduction

At first glance, it may appear that adding hearing services to an ophthalmic practice is a move primarily motivated by economics. In truth, I never thought of it. Several patients over the years asked why we did not provide hearing services. It just seemed like a natural fit, and after all, they trusted us with their eyes, why wouldn't they want to have us care for their hearing as well? And so it was that following appropriate due diligence, we opened our hearing department five years ago. We were one of the first six such centers in the country and have learned much since our hearing service inception.

Let's look in more detail why are we doing this? Nationwide, there is a strong trend toward incorporating more clinical services into practices. Our patients trust us for comprehensive eye care; the alternatives are typically a non-physician supervised, high pressure retail store or kiosks in a shopping mall. In our practices, we are able to provide a service without Medicare oversight and without taking severe Medicare or insurance-based discounts.

There is an Unmet Need for Testing Hearing

There is tremendous and growing patient need for hearing services. Arthritis, hypertension, and hearing loss are the most common chronic medical problems in America. The incidence of hearing loss naturally rises in step with increasing age: 40% of all patients ages 60-65 have significant hearing loss, and this figure skyrockets to 80% by age 80. Johns Hopkins now estimates that 55 million U.S. citizens have notable hearing loss. Hearing deficit is the most common undiagnosed and untreated problem within our patient population. Only 13% of primary care physicians screen for hearing loss, and it is not a part of most routine physical exams. 90% of patients with hearing loss can be treated with hearing aids.

"An untreated hearing loss is more noticeable than hearing aids." -Dr. Sergei Kochkin

There are several diseases associated with hearing loss: glaucoma (especially narrow angle), diabetes (about 40% have hearing loss), ear infections, arthritis,



hypertension, head injury, hereditary diseases (some with ocular manifestations) and acoustic neuroma.

There are two primary types of hearing loss: conductive and sensorineural. Sometimes these underlying etiologies may be mixed. Though hearing deficit may have either a central or a functional component, the majority are conductive in which hearing aids may be highly beneficial. Sensorineural hearing loss may be benefitted by ENT consultation and possible surgery. Over 80% of people with hearing loss have never been tested and 90% of these patients have irreversible loss. Currently there are six to seven million hearing aid wearers in this country. This number will continue to grow rapidly as the baby boomers move into old age.

The concept of integrating hearing testing and hearing aid dispensing is simple: vision and hearing are our two most important senses. Both are fundamental to a patient's ability to remain active, engaged, and functional. Loss of vision or hearing negatively effects quality of life. These precious senses are vital to effectively connect with people and surroundings. Integrating hearing services into an ophthalmic practice is a natural fit. Vision and hearing loss occur in the same demographic group. Our ophthalmology practice typically sees 50 to 150 patients every day. Most ophthalmology practices have incorporated optical dispensing in their list of services, providing experience with retail operations. Therefore, our message is that vision and hearing work synergistically, and we address both.

Why Don't People Wear Hearing Aids?

Denial is very common, especially with men. I frequently am told by women, "I can hear a pin drop, but my husband…" Or by men, "I hear everything I want to hear, if you know what I mean." Other reasons include: no physician involvement or recommendation, poor fit and function often bought from high pressure sales kiosks and stores, bad experience of friends or family, fear and perception of looking old, dissatisfaction with style, fashion, appearance, size or comfort. Technologically the hearing aid may fail to assist hearing due to background noise, feedback, and distortion.

A Business Opportunity

For every 100 patients who sit in our waiting room about 50 have some demonstrable hearing loss and 40 have never been tested largely because it has not been suggested by a physician. This is a summary of our startup costs:

- Legal and accounting: $5,500
- Recruiting a hearing specialist: $5,000
- Build out: $18,500. [I would urge that you start in an existing space in your office since "sound booths" are no longer necessary]
- Testing equipment" $27,000
- Inventory: $9,500. [No need to stock many devices. Turn around for ordered products is very fast. Keeping demo products for patients to try in their own environment is important.]
- Software: $1,100
- Printing, supplies, brochures, licenses: $2,000.
- Our total capital outlay: $90,000 (build out cost can be greatly reduced from this figure).

How to Get Started in Hearing Testing

There are two successful models to choose from when integrating hearing services in your practice: "build it and they will come" that is going solo. In this model, you and your staff do all of the due diligence, shopping for suppliers, inventory, equipment, hire out the legal work, design and oversee the build, produce and execute the marketing and perform the recruitment search for a licensed hearing specialist. The learning curve can be steep, but ultimately, there is more retained earnings for the ophthalmology practice.

The second model is a turnkey operation with a business arrangement with a specialty enterprise. This organization assists with the entire set up of the audiology operation including equipment and inventory purchasing, recruitment, and business legalities and contracts. These companies succeed based upon your sales volume and there may be opportunities for negotiated volume discounts. This benefit typically does not filter down to the end user (usually ophthalmologists). They perform the functions of

Figure 1
Projected Expenditures

Unit Sales	18
Returned units (patient returns/refund is common)	1
Average sales price	$1,600
Net Sales	$27,200
Cost of Goods	$10,600
Gross Margin	16,600

a middleman and receive a negotiated payment for every device sold. This is certainly the easiest method to get set up and trained but is less profitable than going it alone. Designing a hybrid where the ophthalmologist partners for a period of time with such a company and then takes over operations may be the best fit for many practices.

What Has Changed with Hearing Aid Technology?

We are now in the era of digital (rather than analogue) multi-channel signal processing with microchip technology. There has been tremendous improvement in size, color, shape, comfort, and sound quality compared to units just five years ago. Software capabilities provide many great features such as blue tooth linking to a cell phone, water resistance, and rechargeable batteries. Prices range from $900 to $6,000 per hearing aid with an average sales price of $1,500. An example of a pro forma is shown in Figure 1.

Keys to Success

The most important step is to hire the right person to oversee the hearing testing endeavor. A hearing specialist or audiologist usually draws an annual salary ranging from $30,000 to $75,000 plus 4 to 7% of net collections.

This depends upon their experience and pre-established performance benchmarks. In general, the higher their salary the lower is their productivity incentive.

Next, physician involvement and staff training and engagement are all critical to the success of the hearing aid business. Each physician and staff member must accept and promote the concept of vision and hearing as integrated and complimentary services. Our ophthalmology practice also provide patients the opportunity to improve the quality of their life through better hearing.

Marketing and Promotion of Hearing Services

These might include any or all of these: internal referral from practice physicians and staff; "paper promotion"



such as posters, signage, brochures, statement stuffers; inclusion on practice website; Health Fairs and nursing home screenings; external marketing such as newspaper, radio, message specific mailings. Remember that the sale is only successful if the patient is satisfied. Selling directed to the spouse or a third party usually leads to a hearing aid living in the drawer and an unhappy patient who was not receptive to the concept.

Though we are allowed to bill Medicare, Medicaid, and all third party payers for hearing exams (with the provision that they are ordered and interpreted by the physician), I strongly urge that the hearing exam be incorporated as a 'loss leader' with the hope that it establishes credibility with the patient. We have never charged for a hearing exam and that has proven to be a good thing. This show patients that their best interest is primary. Remember that most people especially men are in complete denial to begin with. Moreover this good act will often lead to the sale, when appropriate, of a hearing product.

The most important priority is to get the patient in front of the hearing specialist. Focus on maximizing the number of patients referred for hearing evaluation. Patients respond best to the relationship between certain systemic and ophthalmic diseases (diabetes, glaucoma, etc.) and hearing deficit-especially if the hearing exam is complimentary.

Summary and Conclusion

More people experience hearing loss than any other undiagnosed medical problem.

Vision and hearing are our two most important senses. Your patients must see and hear sufficiently to maximize their quality of life; it makes sense to treat them together. This hearing testing program is part of your ophthalmology practice; effectively administering the program and delivering the message is what works. The patients are already in your office, i.e., same age demographic as for hearing loss. They and their family wish their ophthalmologist had a program to address their hearing related needs. They trust their ophthalmic physician. They know that they receive quality care. MM



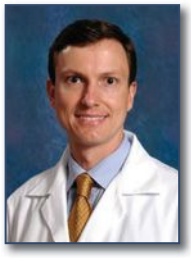
CON

Hearing Tests in Ophthalmology Offices? I Don't Like the Sound of That!

by Martin E. Anderson, Jr., MD & Anthony A. Mikulec, MD

While dispensing of hearing aids by a physician other than an ENT in Missouri is legal; we will demonstrate that such practice is not in the best interest of the patient nor of the untrained physician dispenser.





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It Use To Be: Eyes-Ears-Nose & Throat (EENT)

The fields of otolaryngology and ophthalmology have a long and illustrious history together. In 1896, Dr. Hal Foster organized a meeting in Kansas City, Missouri, for practicing ophthalmologists and otolaryngologists. This two-day meeting led to the formation of the Western Ophthalmological, Otological, Laryngological, and Rhinological Society which soon thereafter would become the more familiar American Academy of Ophthalmology and Otolaryngology. This society would pioneer the establishment of the first two American specialty boards: the American Board of Ophthalmology in 1917 and the American Board of Otolaryngology in 1924.

The Academies remained unified until 1977, when it was determined that the growing and diverse needs of Ophthalmology and Otolaryngology would be better served by separate Academies. The American Academy of Ophthalmology and the American Academy of Otolaryngology-Head and Neck Surgery have since been separate.[1,2] Otolaryngologists undergo at least five years of residency training, a significant portion of which is devoted to examination and care of the ear.

Missouri Law on Hearing Testing

In Missouri, hearing aids are sold by physicians' offices, independent audiologists and hearing aid dispensers in free-standing clinics (see Figure 1). In Missouri, "only a Missouri Hearing Instrument Specialist licensee is allowed to recommend a particular device or assist with the selection of a hearing instrument for a patient," as set forth by the Board of Examiners for Hearing Instrument Specialists of the Missouri Division of Professional Registration.[3] As of January 1st, 2013 to obtain a Missouri Hearing Instrument license in the state of Missouri, one will be required to have associate degree or higher in hearing instrument science or a masters or doctoral degree in audiology.[4]

Physicians are exempt from this regulation, and therefore any physician, irrespective of training, is permitted to fit and dispense hearing aids in the state of Missouri without licensure.[3] Physician offices which sell hearing aids in Missouri are predominantly otolaryngology practices, in conjunction with licensed Hearing Instrument Specialists. A study by Consumer Reports in 2009 examined and evaluated multiple models of identifying, evaluating and treating hearing loss and determined that the best value for patients from a cost and quality standpoint was provided by a combined practice of an audiologist and an Otolaryngologist.[5]

Marketing of Hearing Services to Ophthalmologists & Primary Care

Recently, medical specialties other than otolaryngology (mainly ophthalmology and secondarily primary care practices) have begun performing audiometric testing and fitting hearing aids.[6,7,8] Several such ophthalmology practices are currently advertising the sale of hearing aids.[6,7,8,9] To facilitate the sale of hearing instruments by practices that have previously not offered hearing services, corporations such as Physician Hearing Services, Inc., have become more prominent.[7,8,10] This corporation offers a "turnkey" hearing services program designed to take advantage of an alternative revenue stream that is not dependent on third party insurance.[8,10]

Why are practitioners willing to sell hearing aids given the significant potential for medicolegal risk and extended patient follow up? The answer is simple: hearing aids can be a lucrative source of income.[7] Unlike most advanced economies, private insurance and Medicare do not provide hearing aid benefits. Therefore, in the United States hearing aids are generally a cash business. Because the pricing rates for hearing aids are outside of the regulation by private insurance and Medicare, they can be subject to significant markups.

Figure 1

Who Can Dispense Hearing Aids in Missouri?

Highest Level of Education Required

Physician	Doctorate of Medicine	No licensure required
Audiologist	Doctorate of Audiology or Masters Degree in Audiology	Requires Missouri Hearing Instrument License
Hearing Instrument Dispenser	Associate's Degree in Hearing Sciences	Requires Missouri Hearing Instrument License

This development has garnered the attention of both the American Academy of Ophthalmology and the American Academy of Otolaryngology in recent years. Dr. Zacks, Chair of the American Academy of Ophthalmology's Ethics Committee in 2009, stated that, "*Ophthalmologists, by reason of their education, training and experience, are best qualified to treat diseases of the eye and the ocular adnexa. We can't have ophthalmologists representing that the medical services they provide are identical to those of someone who, by training and experience, practices otolaryngology.*"[6]

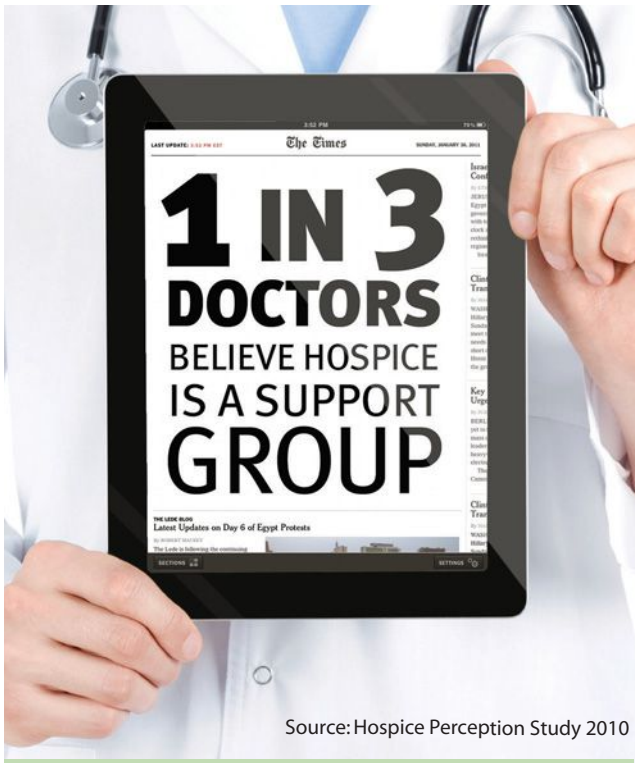
David Nielsen, MD, Executive Vice President and CEO of the American Academy of Otolaryngology-Head and Neck Surgery, raised the question of optimal quality of care for patients during an interview when he offered that "*Selling hearing aids as a revenue generator, without the clinical experience, training and equipment to examine the ear, hearing and balance function, and oversee the medical aspects of diagnosing hearing loss, is less than optimal care.*"[6]



When hearing aids are sold and dispensed in conjunction with an otolaryngology practice, the patient first receives audiometric evaluation followed by otologic evaluation. Most otolaryngologists have a microscope in the clinic which greatly facilitates cerumenectomy and thorough ear examination. Many cholesteatomas are quite difficult to see with the hand held otocscope, making diagnosis by non-otolaryngologists difficult. Audiometric evaluation allows the office to determine the type and severity of hearing loss, while the otologic evaluation, in conjunction with the data obtained from audiometry, allows the otolaryngologist to determine if the patient is an appropriate candidate for a hearing aid.

This initial otologic exam serves to exclude more serious underlying pathologies, such as cholesteatoma, vestibular schwannoma or cerebrovascular disease, as the causes of hearing loss. Missing any of these serious diagnoses can not only put the patient at medical risk, but may also place the hearing aid dispenser at medicolegal risk. These are major risks as failure to diagnose an acoustic neuroma in a timely fashion can limit a patient's treatments options and cause undue morbidity. Such a case of delayed diagnosis, *Ebin v. Kimmelman* returned a verdict of $2 million for the plaintiff in 2002. A Google search with key words "ophthalmology hearing aid" returns with a link for a personal injury firm as the first search result. Missouri non-otolaryngologist dispensers may be a particular target of interest for trial attorneys with the lifting of the $350,000 non-economic damages cap by the Missouri Supreme Court in August of 2012.

When hearing aids are dispensed in the office of an otolaryngologist, device selection, hearing aid fitting and follow up are performed by the hearing aid dispenser or audiologist only after this initial otologic assessment. Unlike most eye glasses, hearing aid devices require a substantial amount of follow up. At first, follow-up appointments primarily focus on mechanical and physical alterations to



Source: Hospice Perception Study 2010

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the hearing aid device itself. However, prolonged care is also required. Patients who wear hearing aids experience cerumen impaction and otitis externa at a significantly higher rate than the general public due to stimulation of the cerumen glands and mechanical obstruction by the hearing aid.[11,12] Cerumen removal is easily accomplished in the otolaryngology office under binocular microscopy.[11] Cerumen itself can greatly reduce the effectiveness of the hearing aid. Cerumen impaction can limit hearing aid performance by up to 40 dB.[12] Hearing aid manufacturers indicate that 60-70% of hearing aids sent for maintenance are done so because of the effects of cerumen.[11] The requirement for initial and maintenance otologic care are not adequately satisfied by those specialties outside of otolaryngology.

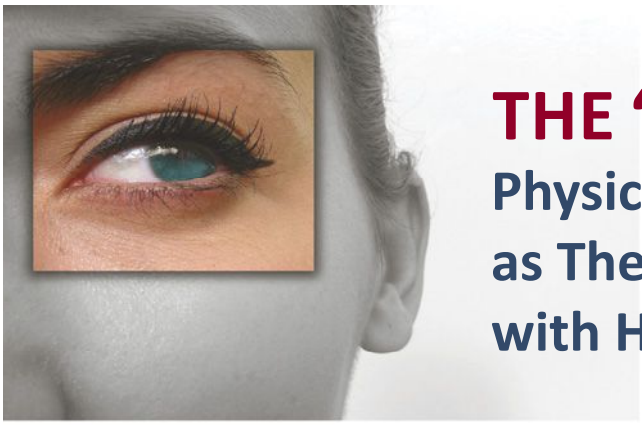
Conclusion: Not in the Patient's Best Interests

While dispensing of hearing aids by a physician other than an ENT in Missouri is legal; we have demonstrated that such practice is not in the best interest of the patient nor of the untrained physician dispenser.

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MM



THE 'MIDDLE HEAR'

Physicians Must Always Serve as Their Patients' Fiduciary with Honesty & Good Faith

by Charles M. Lederer, MD





Charles Lederer, MD, MSMA member since 1982, is a glaucoma specialist in Kansas City, Missouri, and the *Missouri Medicine* Editorial Board member in ophthalmology. He does not test hearing or sell hearing aids in his practice.
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The provision of hearing aid sales and service, while intended to be a benefit to our elderly patients, has the profit motive as the underlying basis.

Let the Hearing Begin

Should hearing aids be dispensed from ophthalmology practices? This question can be answered by adherence to an overriding principle: determining what is best for our patients and our profession, while acknowledging that there are often unavoidable factors that compromise the ultimate achievement of this goal.

There are compelling arguments in favor of providing hearing aid services to our elderly ophthalmology patients. Vision care and hearing care can be thought of as complementary services. Ophthalmologists have a concentration of elderly patients. A significant percentage could benefit from a hearing aid, resulting in an improved quality of life (See Figure 1). Patients who already use hearing aids require maintenance services and periodic replacement. Since many of our patients rely on family members or friends for transportation, obtaining both eye and ear care in one trip can be a significant convenience.

The provision of hearing aid sales and service, while intended to be a benefit to our elderly patients, has the profit motive as the underlying basis. Medical practices struggle with decreasing reimbursement and increasing overhead. It is not unreasonable to consider ethical alternative sources of income to help maintain our ability to provide quality patient care.

Are we able to maintain our paramount role as medical fiduciary if we profit from products or services that are tangential to our essential areas of expertise? It is not optimal medical care if physicians of various medical specialties function as ersatz ENT specialists and assume diagnostic and therapeutic roles in areas in which they have little expertise. Ultimate care for the hearing impaired patient is afforded by a skillful and conscientious hearing aid specialist or audiologist functioning collaboratively in an ENT practice. This arrangement is not easily available or practical for many patients.

Otolaryngologists are understandably reluctant to condone the dispensing of hearing aids by practitioners with less knowledge and experience. The ongoing issue of "turf battles" between ophthalmologists and optometrists is somewhat analogous, although the main concern of ophthalmologists is the granting of ever-expanding optometric scope of practice measures by legislative fiat. Nonetheless, an ophthalmology practice would not



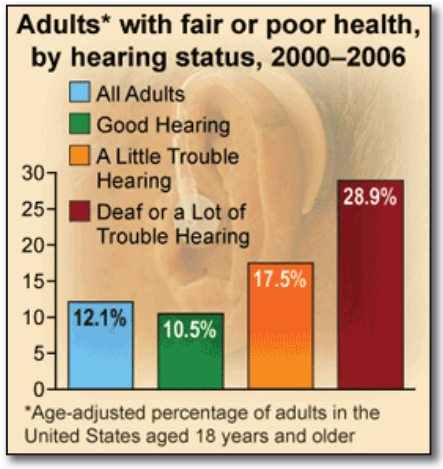


necessarily be overjoyed to discover that an optometric practice had opened next to their office, offering many of their same services. However, if the optometric practice performed ethically and in accordance with legal guidelines, there would be limited grounds for serious protest.

What would be the proper ethical interpretation of the situation whereby the tables were turned and ENT specialists (or other non-ophthalmic medical specialty groups) prescribed and sold eyeglasses from their offices?

Presenting a hypothetical, suppose an ENT office hired an accomplished ophthalmic technician to perform limited eye exams and prescribe glasses. A savvy technician could perform intraocular pressure testing and take digital photos of the anterior and posterior segments of the eyes for later physician review. The technician could use an auto refractor to determine refractive error and write the prescription for glasses, although for purposes of legality a licensed physician would need to sign the prescription either manually or electronically. To achieve the economic benefit of this model the patient would then need to be guided to the practice's optical shop to fill the glasses prescription. Even with care to stay within the boundaries of legal medical practice and billing, analysis suggests that this arrangement crosses an ethical red line.

Figure 1



Companies that offer adjunctive hearing aid services to medical practices rented floor space at the recent annual meeting in Chicago of the American Academy of Ophthalmology. Although visual and hearing services are a natural fit, some companies do not solely target ophthalmology practices but instead promote this concept to a variety of primary care specialties. The business models of these companies vary widely.

At one end of the spectrum, space in a primary care practice is converted to a hearing aid center. A technician employed by the primary care practice is taught to perform and interpret basic audiology tests and recommend and fit a hearing aid. The technician is not a hearing aid specialist or audiologist and is therefore unable to legally prescribe the hearing device. Thus, a licensed physician from the practice is required to sign off on the encounter and prescribe the hearing aid. The main selling point of one company that promotes this model is the claim that the cost of their hearing aids is approximately one-half the cost of obtaining hearing aids through more usual channels. It is safe to say that this arrangement is not within the ethical boundaries that most physicians would be comfortable with.

If hearing services are offered, the preferable arrangement is an "arm's length" business model where the physicians of a practice establish the hearing aid business entity, not necessarily within the physical confines of the physicians' office. The practice employs a state-licensed hearing aid specialist or audiologist who functions autonomously. The physicians are not involved with hearing-related diagnosis, treatment, or the dispensing of hearing aids. Unless a physician has had dedicated training in otology, he or she will best serve the patient by a standard protocol of referring any patients with medical issues that may be suspected or diagnosed during the hearing evaluation to an ENT specialist, assuming the availability of such services. Even seemingly minor issues such as otitis externa or cerumen impaction are best evaluated and treated by a practitioner with expertise in this area. Although these guidelines tend to decrease the profitability of the hearing services entity, they maintain the goal of prioritizing the patients' best interests.

With the above arrangement, it should not be considered a breach of ethics to inform patients that hearing aid services are available on site. Care should be taken to avoid placing pressure on patients who are only seeking eye care to partake of such services, lest a patient sense that he or she is primarily considered a profit center for the practice. It should not be suggested that the physicians in the practice have expertise in diagnosis and treatment of impaired hearing.

Conclusion: Let It Not Fall On Deaf Ears

Ours is a privileged profession. We earn this privilege by accepting the obligation to function as our patients' fiduciary in medical issues, acting solely in their best interests with honesty and good faith. Our standing is eroded if we are perceived to manipulate this relationship. MM

The Eye Handbook: A Mobile App in Ophthalmic Medicine

by Ken Lord, MD, Vinay A. Shah MD & Rohit Krishna, MD

Mobile smartphone technology has revolutionized how we practice medicine.



Ken Lord, MD, (above top), MSMA member since 2010, is a vitreoretinal specialist at Retina Associates of Southern Utah. Vinay A. Shah, MD, (left), is a Vitreoretinal specialist at the Dean McGee Eye Institute and a Clinical Associate Professor in the Department of Ophthalmology at the University of Oklahoma in Oklahoma City. Rohit Krishna, MD, (right), MSMA member since 2000, is Director of the Glaucoma service and Associate Professor of Ophthalmology at UMKC and is Medical Director/CEO at Epic Surgery Centers in Kansas City.
Contact: dr.kenlord@gmail.com

The Eye Handbook is the most popular and successful application available in eye care. What began as a resident research project three years ago at the University of Missouri Kansas City Department of Ophthalmology has evolved into the number one source for mobile eye care information in the world, with over half a million downloads and over 25 thousand active users.

Mobile smartphone technology has revolutionized how we practice medicine. It is estimated that over 70-80% of physicians own a smartphone.[1] Ophthalmology is a tech heavy field with many different devices utilized in the normal process of patient care. The Eye Handbook, a diagnostic and treatment reference app has a myriad of functions that enhance the ability of ophthalmologists and other health care providers to deliver timely and quality eye care.[2]

The app is a portal of ophthalmic information giving users the ability to treat and diagnose eye conditions in virtually any setting. While there are about 80+ mobile smartphone applications at the present time available in the field of eye care, no single app offers more features and applicability then Eye Handbook. An abbreviated list of Eye Handbook's features are listed below:

- Patient Education Videos/Material
- Eye Atlas
- Testing Tools/Calculators
- Practice Efficiency tools
- Revenue/Coding tools
- Physician References
- Board Review Material
- Lectures/Videos
- Meetings/Journals Portals
- Selected American Academy of Ophthalmology (AAO) Content
- Treatment Reference Manual
- Forum Discussion boards
- Eye Care Professional Directory

One of the most useful Eye Handbook features is the ability to perform diagnostic testing in various forms on the application. Whether doing a consult in a hospital or seeing a patient in the emergency room, having the ability to perform basic vision tests on a mobile device is very useful. (See Figures 1A and 1B.) These tests don't replace standardized office exams, but they can certainly give the clinician an idea of the patients overall visual status.

Another popular feature is the calculators section. (See Figures 2A and 2B.) Every field in medicine is benefited by the use of calculators in one form or another. The Eye Handbook has formulas allowing a user to perform intraocular lens

calculations, lens power transpositions, glaucoma risk calculations, and many others. More calculators are planned for implementation in future upgrades.

The Eye Handbook also has a digital Eye Atlas with pictures of common ophthalmic conditions. (See Figures 3A, 3B and 3C.) Eye care professionals across the globe have submitted their own images for inclusion in the atlas. The atlas can be used to educate patients on a disease process, discuss a contemplated surgery, or even to refresh the memory of physicians treating a particular disease. There is also the ability to perform small quizzes within the atlas.

Users of the Eye Handbook also commonly use the coding section where popular ophthalmic ICD-9 codes are listed and easily indexed. The coding section contains CPT codes, modifiers, and global periods for easy accessibility. Many physicians report the great utility in having a quick reference of common ophthalmic ICD-9 codes on the go.

Eye Handbook was built to include important information valuable not only to medical students and residents, but to busy practicing ophthalmologists, optometrists, and ancillary personnel like technicians. As the app has evolved, the app has been tailored to meet the needs of anyone involved in eye care.

The latest addition to the Eye Handbook is a user profile & directory and an eye care forum portal. Now users can list themselves in a global directory of eye care professionals. And as well, answer and post questions about eye conditions or questions about eyecare in general. This is the only forum of its type available on a mobile platform. (See Figures 4A, 4B, and 4C.)

A graph is shown of the most common Eye Handbook features accessed in an average month. The numbers represent the amount these items were accessed in the month of October 2012. As you can see, the Eye Handbook has a large user base. (See Figure 5.)

The idea for Eye Handbook began three years ago at the University of Missouri-Kansas City (UMKC). With the support of residents and faculty at UMKC, content

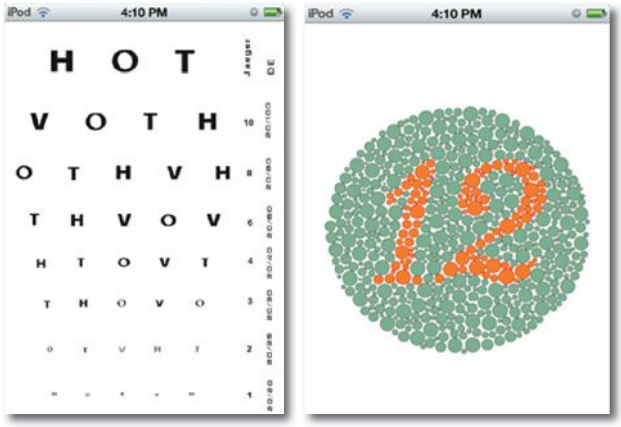
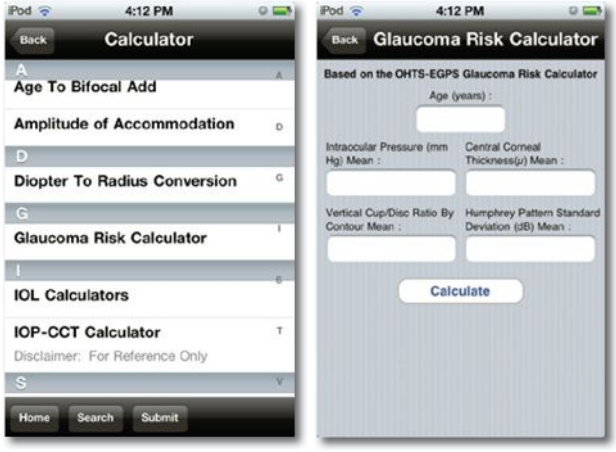
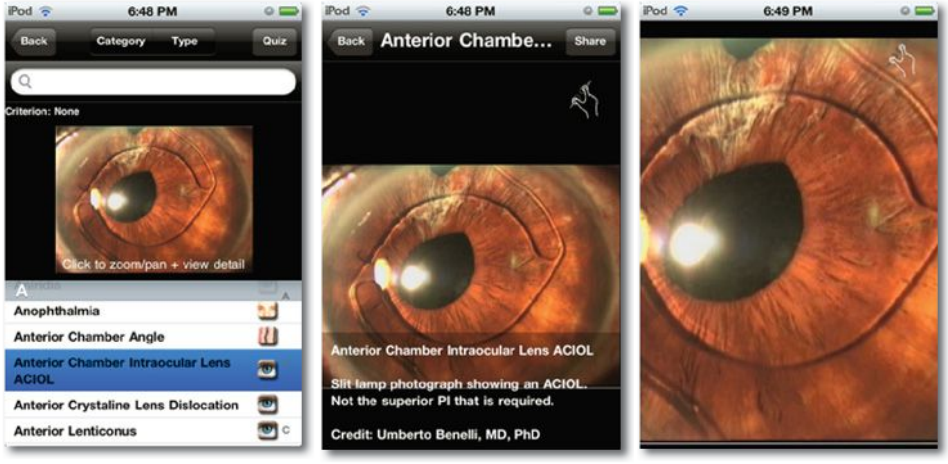


Figure 1A & 1B
A) Near Vision Card B) Ishihara Color Plate



Figures 2A & 2B
A) List of common ophthalmic calculators
B) Glaucoma Risk Calculator



Figures 3A, 3B & 3C
A) index list of ophthalmic conditions
B) metadata associated with each image
C) representation of the image pan & zoom feature

was generated and the very first version of the Eye Handbook was published to the iTunes App store in October of 2009.

The Eye Handbook application was initially released at the American Academy of Ophthalmology's (AAO) annual meeting in October 2009 and was an instant success. Because the application is free, users have had little inhibition to download the app onto their phone. Within days of the release at AAO, Eye Handbook had over ten thousand downloads. And Eye Handbook has had a persistence with users, or in other words, most users who downloaded the app have kept it on their phone. This is in direct contrast to 99% of other apps downloaded, where users try the app for a brief time and then delete.

At present, Eye Handbook development continues on both the Android and iPhone platforms, (See Figure 6A, 6B, 6C, 6D, and 6E) with updates scheduled for release in the very near future. The Eye Handbook has evolved through user feedback and we are indebted to our loyal users for their continued patronage.

The Eye Handbook is a great of example of an App that began small and filled a niche. Using a freemium model and broad credibility it has established itself as a standard in mobile ophthalmic medicine.



Figures 4A, 4B, 4C
A) Eye Handbook Profile screen shot
B) Eye Handbook eye care professional directory
C) Eye Handbook Forums

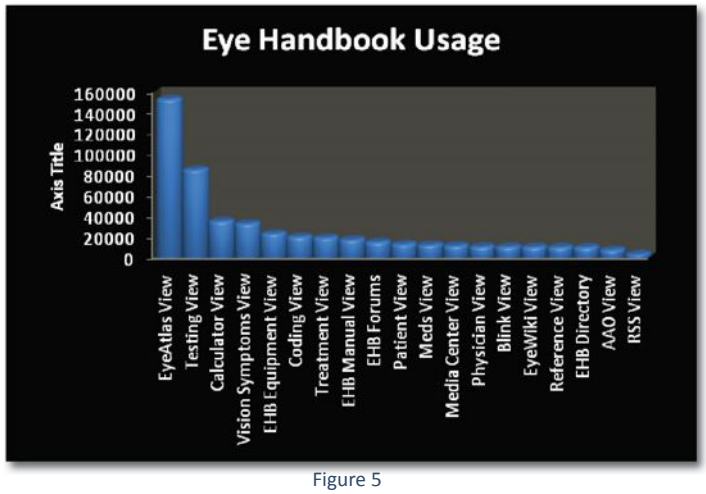


Figure 5
Most common items access on the Eye Handbook in October 2012.



Figures 6A, 6B, 6C, 6D, 6E
A) First version of the Eye Handbook published on the Apple iPhone app store October 2009
B) Version 2.3 Published June 2010
C) Version 4.0 Published June 2011
D) Version 4.3 Published September 2012
E) Version 4.4 set to be published December 2012

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MM

Improving Compliance with Eye Drop Medications

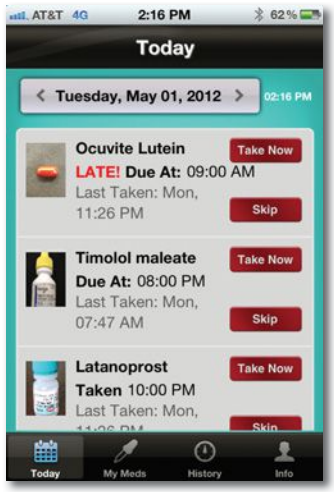
by Scott Pastor, MD & Tom Harbin MD

Numerous studies show frequent poor compliance to use of glaucoma eye drops. Since both of us, Drs. Pastor and Harbin, specialize in glaucome, we developed an app for eye drop users.

EyeDROPS is the first mobile app to remind patients when to take their eye medications, and will enhance compliance and adherence in those with glaucoma or any other chronic condition requiring the use of drops.

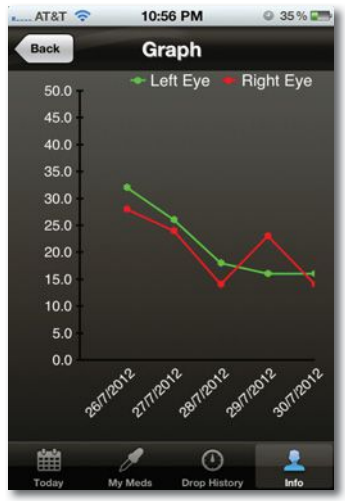
Utilizing pull-down menus, drop regimens are easily entered, and reminders will pop up whenever a drop is due (See Figure 1). Once a drop is taken, the exact time is recorded, and the app will automatically schedule the next time for that drop. Multiple drops and other eye medications can be entered and tracked (See Figure 2). The app demonstrates the correct way to administer a drop and reminds the patient of the need for eyelid closure and proper interval between drops (See Figures 3 & 4).





Figures 1 & 2





Figures 3 & 4

A premium version will be released, and for a nominal charge will offer a significantly enriched and more robust experience for patients. In addition to the basic app, it will include:

1. The ability to enter drop regimens for any family member.
2. The ability to track compliance for weeks/months, as well as the opportunity to email this information to the treating doctor.
3. A database to enter a patient's prior laser and surgical interventions.
4. A catalog of all previously-used drops, and the reason for they were discontinued.
5. A record of Intraocular pressures, with the ability to view the IOP history as a continuous graph.
6. Text messages and emails to congratulate the patient for good adherence and encourage better adherence when necessary. These messages can be configured with participating ophthalmologist's signatures.

The app is available on both Apple and Android devices and soon will be on the Windows and Blackberry platforms as well.

Tom Harbin, MD, is Co-developer EyeDROPS, the eye drop reminder app/Eye Consultants of Atlanta. Contact: tomharbin@harbinbooks.com

Good News from MSMA Members

Missouri Medicine announces a new Editorial Board member, selected on the basis of exceptional professional accomplishments, and eminence in their fields of expertise.

Jerry D. Kennett, MD, MSMA member since 1980, has accepted the position of Cardiology Board Member. He is the Vice President and Chief Medical Officer for Boone Hospital Center and a member of the BJC System Leadership Committee in addition to his active cardiovascular practice. He serves on the AMA Council on Legislation and is a Past President of the MSMA.



Dr. Kennett replaces **Douglas Bogart, MD**, MSMA member since 1978, who formerly served in this position prior to his retiring his medical practice in 2012. Dr. Bogart was Associate Professor of Medicine and Section Chief of Cardiology at Truman Medical Center and contributed numerous articles to *Missouri Medicine.*



Missouri Medicine announces the **The Arthur Gale Freedom of Expression Award** to be presented annually to the author of the best commentary article published in *Missouri Medicine*, in honor of **Arthur Gale, MD**, one of the Journal's Contributing Editors and MSMA member since 1976. This prestigious and monetary award will be offered to encourage MSMA physicians to submit personal perspective essays on issues that are topical and provocative. The subject matter is wide open, but suggested topics range from medical-legal issues such as medical ethics, professional liability, and anti-trust, to such socio-economic issues as practice management, physician/hospital relations, and insurance industry practices, to political and legislative issues, in both Missouri and Washington, DC. All MSMA members shall be eligible to submit articles, and a special, independent MSMA committee shall be appointed in December of every year to judge the submissions published during that calendar year. Visit www.msma.org/missourimedicine for more information.



Edward H. Andres, III, MD, MSMA member since 1976, was honored by Heartland Health in St. Joseph for more than four decades of service he has given to the St. Joseph Community.

Charles Bentlage, MD, MSMA member since 1971, was honored by ACCESS Family Care in Cassville, which was founded in 1996 as a Federally Qualified Health Center for the purpose of increasing access to primary health care for those who lack medical insurance coverage.

Sally Bomar, MD, MSMA member since 2010, Maryville, was named the recipient of the 2012 St. Luke Physician Recognition Award at St. Francis Hospital and Health Services. It is sponsored by the hospital's Mission Awareness Team, and initiated to honor physicians who best exemplify the mission and core values of SSM Health Care and St. Francis.

William Dailey, MD, MSMA member since 2010, of Golden Valley Medical-Windsor out of Clinton, was named the Ringside Physician for the Olympic hopefuls in the USA Boxing Junior World Team Open. He has trained at the Olympic Training Center in Colorado Springs, and is board certified to provide care as a Ringside Physician.

Pierre Gilles, MD, MSMA member since 2011, and **Pervez Alvi, MD**, MSMA member since 2008, were named to the Hannibal Regional Medical Group Board of Directors in Hannibal.

Patrick B. Harr, MD, MSMA member since 1976, has been named to the Northwest Missouri State University Board of Regents by Governor Jay Nixon. Dr. Harr spent 38 years practicing medicine in Marville, and served as a volunteer physician for Northwest athletics' teams before retiring in 2012.

David Kuhlmann, MD, MSMA member since 2007, was named to the Bothwell Regional Health Center Board of Trustees in Sedalia. Dr. Kuhlmann is a board certified neurologist and sleep specialist.

Mark Laney, MD, MSMA member since 2009, President and CEO of Heartland Health in St. Joseph, will serve as the 2013 Chair of the Missouri Hospital Association Board of Trustees.

William Marshall, MD, MSMA member since 1977, was chosen as the Glasgow Citizen of the Year for 2012 by the Glasgow Board of Aldermen, and honored during the Glasgow Chamber of Commerce Christmas dinner last year.

P. Kumar Rao, MD, MSMA members since 2003, St. Louis, was selected by the American Academy of Ophthalmology for the 2013 Academy's Leadership Development Program. Dr. Rao is on the board of the Missouri Society of Eye Physicians and Surgeons.

Perry L. Schoenecker, MD, MSMA member since 1977, St. Louis, was recently presented with the Distinguished Service Award in the section of orthopaedics by the American Academy of Pediatrics. He is professor of orthopaedic surgery at the Washington University School of Medicine and chief of staff at Shriners Hospital for Children in St. Louis. MM

Endurance Runner Named in Article is Kentucky Medical Association Member

I am interested in getting copies of the article and editorial on marathon runners which appeared in your July/August 2012 issue. I thought it was an excellent overview of this new information about possible cardiotoxicity of 'over-exercising.' As a matter of introduction, I am a physician, and also an AMA and Kentucky Medical Association member. More importantly, I am one of the endurance runners described in the article/editorial. Thank you for your help and this important research.

Robert M. Haugh, MD
Paducah, Kentucky

[Editor's Note: There have been many requests for the above articles. The material featured in the "Cardiovascular Damage from Chronic Excess Endurance Exercise" (July/August 2012) by Drs. Harshal Patil, James O'Keefe, Carl Lavie, et al. has received worldwide attention in both the medical and public press. This includes an editorial in the international journal *Heart* 'Run for your life....at a comfortable speed and not too fast" (November 29, 2012); a *Wall Street Journal* article by Pulitzer Prize-winning writer Kevin Helliker, a former Kansas City native, "One Running Shoe in the Grave" (November 27, 2012); and a TED/YouTube presentation by Dr. O'Keefe http://www.youtube.com/watch?v=Y6U728AZnV0. Their collective research papers in *Mayo Clinic Proceedings*, *Missouri Medicine*, *Heart,* and numerous medical and public presentations were chosen as one of the Top 10 Cardiology topics for 2012 by www.theheart.org.]

Ozark Mountain Ridge Runners Be Aware!

Just read your very interesting editorial and articles (July/August 2012) on distance running. As a fellow runner I concur completely. I've taken the liberty of passing the articles out at our local running club, The Ozark Mountain Ridge Runners.

Micheal S. Clarke, MD
Orthopaedic Surgeon
Springfield MO
MSMA member since 1976

I'm Sorry, But I Must Object

A recent "Viewpoint" editorial in JAMA[1] caught my eye. It outlines a provision of the Affordable Care Act with results that will affect us all and our patients. It requires the Pharmaceutical/Device industry to report to the federal government all payments to physicians and teaching hospitals (large or small including CME, food, and gifts) so they can be placed on a public website for our patients to see. These reports would even be specific as to the drug or device being promoted. Also being reported would be physician ownership or interest in manufacturers and group purchasing organizations.

All of this is being done because: "Close relationships between manufacturers and prescribing providers can lead to conflicts of interest that may alter clinical decision making. Increased transparency of these relationships tries to discourage inappropriate relationships, while maintaining the beneficial relationships."[2]

Now all of us agree that payments resulting in outright "bribery" of physicians or researchers are bad for all of us. BUT…I would maintain that this is the rare exception and that by far the vast majority of us are intellectually honest in doing our research and caring for our patients. I would also venture that virtually all of us benefit from these interactions and that the quality and size of the lunch that is brought for ourselves and our staff is inconsequential. And how are the manufacturers going to get clinical research done without providing some incentive for the clinician? Fear of misreading of the reported income by patients may cause some clinical researchers to stop doing such research.

How about the effect on CME? According to the article, commercial support declined 31% from 2007 to 2010 with the current regulations. It will take significant effort to prorate these expenses to each individual attendee, keep track, and then report to the government. They could simply decide to save money by not donating.. Our CME expenses would increase 37% in order for the providers to break even. In addition, our needy patients would have no free samples.

Furthermore these regulations may not affect large contractual payments to physicians who have consulting and management agreements with manufacturers. Instead, the regulators are mainly concerned about lunch money and CME spending.

These regulations, in my opinion, result in the following, all of which will add to health care costs:

- The creation of expensive bureaucracies within the 1000 or so companies that make drugs and devices.
- Another governmental bureaucracy to accept, collate, and publish the results.
- And record-keeping for each doctor's office and hospital.

Most critically, when a patient sees that his or her doctor has received "payments" in the past year, what is he

or she to think? Is the doctor being bribed? Can they trust the doctor? This builds distrust between the patient and her physician. Will the government/patient relationship become more important than the physician/patient relationship? Hmm…perhaps that's the idea.

As a recently retired physician, one-time General Practitioner, and long-time Interventional Radiologist, I have always welcomed visits from manufacturers' representatives. When I was in General Practice in the early 60s in rural Minnesota I welcomed visits by pharmaceutical representatives. They informed me of new medications, and I learned a lot from them. They didn't bring much in the way of snacks back then, but they provided me with samples of medicines for me give to my patients. I recall that insurance for medications was virtually non existent. More recently, as an Interventional Radiologist, visits from the device manufacturers representatives not only informed me of new products but more importantly they helped me learn how and where to use them. From my standpoint, these reps were informative and helpful. Mostly, I felt from these individuals an earnest desire to inform and teach.

If the government is intent on easing concern over these interactions I would suggest a different approach. I would suggest instead that they support conferences in Medical Schools and teaching hospitals regarding drugs and devices. These conferences would be attended by both reps and faculty. This would encourage the representatives to be honest and complete, and critiques by faculty could teach the students how to better assess and critically interact with the rep, which will better prepare them for their future careers.

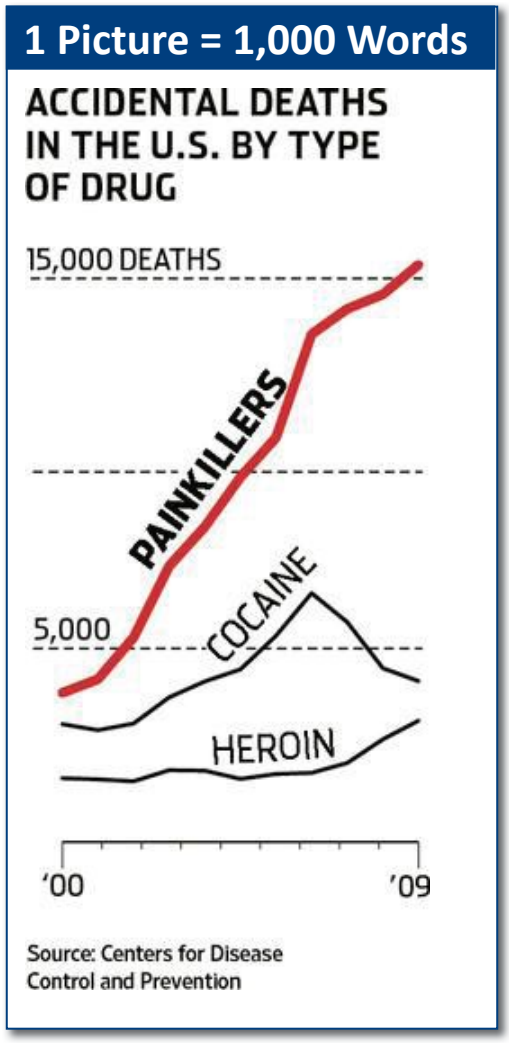
We need to promote honesty, trust, and critical thinking in the profession of medicine. Not distrust.

G. David Dixon, MD, FACR, FSIR
MSMA member since 1977
Retired Interventional Radiologist
Saint Luke's Hospital
Former Clinical Professor of Radiology
UMKC School of Medicine

References

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[Editor's Note: This letter was also submitted to the Editor of the *Greater Kansas City Medical Bulletin* and published in their Fall 2012 issue. Dr. Dixon was accidentally not given credit for being the author.]



Letters to the Editor or General Comments

Send an email to jhagan@bizkc.rr.com and copy lfleenor@msma.org. Letters to the Editor for publication should be 300 words in length or shorter, and should include your full name, specialty, and association. Letters are edited for length and clarity.

Errata

Missouri Medicine regrets that the author's academic degrees were inadvertently omitted from the byline of the following article in the November/December 2012 issue, "Study of Secondhand Smoke Exposure in St. Louis City and County Suggests Need for Comprehensive Smoke-free Missouri Law Adoption." While the section "About the Authors" listed the degrees correctly, the byline should have read: Sarah Moreland-Russell, PhD, Julianne Cyr, MPH, Peter Benson, PhD, Graham Colditz, MD, DrPH, Deren Pulley, & Joaquin Barnoya, MD. MM

MSMA Welcomes New Members [as of January 31, 2013]

MSMA Direct

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Bantrup, Gregory W., MD	AN
Brown, Richard P., MD	CD
Bruening, Cristie L., DO	AN
Chalasani, Ajay, MD	AN
Chamberlin, Willard, DO	AN
Choe, Sung H., MD	AN
Christian, Michael R., MD	EM
Elsenraat, Abram J., MD	AN
Etzenhouser, Angela D., MD	PD
Ferguson, Joshua A., DO	AN
Finch, LaDonna T., MD	FP
Fontana, John L., MD	AN
Gillbanks, Marjon M., MD	IM
Gisi, John, DO	AN
Gupta, Sanjaya K., MD	CD
Hahn, Steven L., MD	AN
Hamlin, Christopher W., MD	AN
Horton, Peter J., MD	GS
Hull, Steven G., MD	SM
Ivancic, Michael G., MD	AN
Jordan-Childs, Sabrina D., MD	FP
Keyrouz, Salah G., MD	N
Kodwani, Nand, MD	AN
Linwong, Meth, MD	OPH
Lowry, Jennifer A., MD	PD
Maxfield, Daniel M., MD	GS
Miller, Barry L., DO	AN
Miller, Melissa K., MD	PEM
Rader, Valerie J., MD	CD
Reddy, Srinivas, MD	AN
Ross, Gregory P., DO	AN
Schroll, John T., MD	OBG
Shultz, William, MD	AN
Tuttle-Newhall, Janet E., MD	CCS
Vats, Hemender S., MD	NEP
Vaughn, Trevor M., DO	AN
Vidal, Claudia I., MD	ACP
Wheeler, Wells C., MD	AN

Boone

Davis, Ryan M., MD	VIR
Denneny, III, James C., MD	OTO
Diaz-Arias, Alberto A., MD	ACP
Fairlamb, James E., MD	CD
Fernandez, Joss D., MD	TS
Janzen, Mark L., MD	VS
Koch, Robert H., MD	FP
Martin, Kari L., MD	D
Newton, J. Camp, MD	APM
Norregaard, Thorkild V., MD	NS
Richards, Michael E., MD	DR
Sherman, Seth L., MD	ORS
Tanaka, Tomoko, MD	NS
Watson, Charles R., MD	APM

Boone County RFS

Puricelli, Michael D., MD	OTO

Buchanan

Biria, Mazda, MD	CCE
Edds, Eric M., MD	DR
Maalouf, Roger E., MD	ID
Seevers, Brooke R., DO	OBG
Zink, Robert F., MD	CDS

Cape Girardeau

Allcock, Darren M., DO	END
Dwyer, Joseph C., MD	CD
McCearley, Sandra S., MD	CD
McWilliams, Grant D.E., DO	OBG
Meyer, Sara A., MD	OBG
Moore, Satheavy L., MD	DR
Roos, Kimberly Kay, MD	OBG

C-M-M-R

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LaMonda, Justin G., MD	IM

Cole

Flood, Daivd L., MD	SMO
Snyder, Michael J., MD	ORS

D-H-P-D

Mazal, Benjamin B., MD	FP

Dunklin

Chintalapalli, Poornima, MD	PD

Grand River

Rights, Theodore H., MD	GP

Greene

Allam, Bala S., MD	IM
Banoth, Prameela, MD	IM
Boehm, Jason A., MD	AN
Buvat, David R., MD	IM
Conduff, Lester L., MD	FP
Krinochkin, Olexandr S., MD	CCM
Leonardo, Jr., Albert R., MD	PLM
Leonardo, Rachelle M., MD	IM
Mantala, Marcelo J., MD	IM
Mensah, Felix A., MD	IMP
Obi, Chizoba C., MD	IM
OuldEthmaneAbouElMaa, C., MD	FP
Scale, Lloyd C., MD	ON
Thomas, Ann, MD	IM
Thomas, Jacob K., MD	OPH
Tippor, Shamant, MD	IM
Ugbarugba, Emmanuel E., MD	GE
Ulloa, Eduardo R., MD	P
Voraganti Ramamurthy, R. MD	IM
Wood, Mary Pereira, MD	CCM
Woods, Shannon L., MD	FP
Woodward, Thomas D., MD	IM
Yamoah, Johnny C., MD	IM

Southwest Medical Society

Allison, Jana L., MD	OBG
Jones, Kristie E., MD	NEP

Jefferson

Alam, Tariq J., MD	N
Silver, Leah C., DO	FP

Johnson

Anderson, Douglas W., MD	FP

Lafayette-Ray

Sundberg, Elizabeth E., MD	NEP

Lake of the Ozarks

Barnum, Grant M., DO	IM
Mataverde, Philip A., DO	N
Nagy, Virginia A., MD	FP
Russell, Trent K., MD	PD

Metro Med of GKC

Bajracharya, Himal B., MD	ID
Beary, William M., MD	PCC
Bequette, Jennifer S., MD	IM
Brune, Paul R., MD	ID
Dandache, Patricia R., MD	ID
Day, Brandon S., MD	IM
Divadeenam, Krishna M., MD	P
Ellison, Stefanie R., MD	EM
Gaume, Michael, MD	AN
Hahn, Marc B., DO	AN
Harlan, Cody S., MD	ORS
Jewell, Nathaniel R., MD	DR
Jones, Kevin C., DO	CD
Kapur, Rahul, MD	FP
Kozinn, Jonathan B., MD	CCA
Levine, Meredith C., MD	FP
Lewis, Corey Blaine, MD	IM
Lingenfelter, Erich J., MD	ORS
McBride, Jennifer M., MD	IMP
Pollak, Arnold J., MD	CD
Raman, Sripriya, MD	PDE
Shah, Hamid M., MD	AN
Tisma-Dupanovic, S., MD	PDC
Vestal, Lauren E., MD	OBG
Watts, Catherine O., MD	PD
Weed, Jr., John C., MD	GO
Wentz, Brock T., MD	ORS
Colanese, Jessica S., MD	FP
Cummins, Jennifer D., MD	FP
Daharsh, Eric D., DO	FP
Dulin, Regan M., DO	FP
Hooker, Garrett W., MD	FP
Jabara, Cory N., DO	FP
Jackson, Dawn M., MD	FP
Luong, Tu Anh, MD	FP
McGonigle, Erin M., DO	FP
Stefanovic, Maja, MD	FP
Valenta, Emily C., DO	FP
Westhues, Eileen N., DO	FP

Mid-Missouri

Hopkins, Karen B., MD	IMP
Masterson, Emily K., MD	FP

Mineral Area

Clauss, Karin L., MD	PD

North Central

Schrant, Benjamin L., DO	AN
Wilson, Margaret A., DO	FP

Northeast

Mitchell, Laura J., MD	EM

Northwest

Singh, Amrit P., MD	FP

Ozarks

Butler, Jennifer L., MD	PD
Duff, Brian J., MD	FP
Luthy, Siu Ping, MD	FP
Schauer, Lora L., MD	PD

Perry-Ste. Genevieve

Lam, Tony C., MD	OBG

Pettis

Deeths, Christine M., MD	FP
Mook, David G., MD	IM

Quad

Komatireddy, Geetha R., MD	RHU

St. Charles-Lincoln

Gottimukkula, Rajashree, MD	ID
Kadyk, Deana L., MD	D
Keller, Alyssa L., MD	FP
Leibold, Thomas M., MD	GS
Patri, Manokiran, MD	ID
Qualley, Rachel M., MD	D
Stengel, Robyn M., MD	D
Yong, Lee K., MD	ID

St. Louis Metro

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Bhorade, Anjali M., MD	OPH
Chishti, Mohammad I., MD	P
Cole, F. Sessions, MD	NPM
Culican, Susan M., MD	OPH
Doerr, Thomas D., MD	IM
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Fowler, Kathryn J., MD	DR
Gordon, Joe E., MD	PO
Hagemann, Andrea R., MD	OBG
Hicks, IV, Robb R., MD	EM
Hruska, Lindy A., MD	GS
Kastelic, Keith A., MD	DR
Keeler, Kathryn A., MD	PO
Kraus, Jacqueline J., MD	N
Lin, Alexander Y., MD	PS
Marusic, Gina M., MD	PD
Mormol, Jeffrey S., MD	OBG
Mueth, Steven R., MD	PD
Osei, Daniel A., MD	HS
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Porshinsky, Brian S., MD	CCS
Robertson, Theresa E., MD	GS
Schnapp, Anita R., MD	OBG
Seematter, Colleen E., MD	PD
Senciboy, Donna N., DO	OBG
Shah, Rajesh S., MD	GE
Siegfried, Carla J., MD	OPH
Sindecuse, Mark A., MD	IM
Sunje, Mensur O., MD	IM
Thomas, Anish J., MD	IC
Thompson, Robert W., MD	VS
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Wall, Lindley B., MD	ORS
Watkins, Cami L., MD	IM

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Maddukuri, Geetha S., MD	NEP

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Ryther, Robin C., MD	PDN
Shaw, Hillary L., MD	DR
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SEMO

Henderson, Mark S., MD	GS
Sanders, Cary T., MD	ORS

South Central

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Frescoln, Hilary A., MD	FP

Tri-County

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Murdock, Christopher P., DO	R

Tri-Lakes

Myers, Michael A., MD	FP

West Central

Holden, Shaun B., MD	FP

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Acar, Selin
Ahn, Haejun
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Anderson, Eric R.
Ansari, Mohammad S.
Arcilla, John L.
Baqui, Zeeshan M.
Behera, Anit K.
Burns, John P.
Carey, Tamala C.
Coney, Talia S.
Cousins, Stephanie A.
Curtis, Kurt A.
Delaney, Dana M.
DeSouza, Thiago Q.
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Evans, Neil R.
Gogineni, Swetha
Goodrich, Brittany E.
Goodwill, Vanessa S.
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Gorton, Lauren
Guzovsky, Olga
Hieger, Robert J.
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Howard, Michael H.
Huang, Ronald
Janssen, Matthew
Kao, Monica L.
Klein, Ashley E.
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Marcu, Ioana
Marin, Eric L.
Marrocco, Michael T.
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Nguyen, Long V.
Oh, Ann S.
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Peddada, Krishi V.
Petry, William
Qiu, Qiong
Roesler, Elizabeth C.
Rojanasthien, Siripong
Saeed, Hashir
Sampson, Keishondra A.
Schuler, Anna I.
Shah, Ravi S.
Shaikh, Imran
Soulsby, William D..
Strand, John D.
Sun, Brian H.
Taylor, Christine A.
Thouvenot, Chelsea M.
Valencia, Clarisse
Viehl, Luke T.
Voss, Vanessa B.
Walker, Jacquae M.
Westrich, Jr., David J.
Wiley, Evan R.
Winn, Wesley W.
Young, Daniel N.
Yu, Justin
Zahrli, Tyler A.

UM

Abdul-kafi, Owais S.
Alqhalitz, Yaza N.
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Breite, Matthew D.
Crawford, Lauren Glyn
Deisher, Heather N.
Diaz, Jenna N.
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Hopkins, Amanda N.
Hopkins, Nicholas H.
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Long, Theresa M.
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Luecke, Kyle G.
Mazi, Patrick B.
McCormick, Chad M.
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Panfili, Zachary E.
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Swarz, Jeffrey A.
Tran, Andrew Van
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White, Ryan D.
Williams, Nicole M.
Windham, Samuel L.
Yu, Yajie

UMKC

Anand, Gaurav M.
Asmar, Julia M.
Bland, Tiffany G.
Creeden, Race A.
Cunningham, Danielle A.
Eswaran, Sanju P.
Gupta, Mrigank
Jarmon, Natalie
Kapp, Kelly A.
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Kent, Forrest L.
Kimmis, Brooks D.
Kumar, Gayathri K.
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Oakley, Carlee I.
Raskas, Jasmine L.
Reddy, Shivarama L.
Samuel, Ankhita R.
Sandhu, Jeena K.
Solano, Mitchell A.
Tomassian, Christopher A.
Vaidyanathan, Vaishnavi L.
VonEnde, Jennifer B.
Wardrip, Haley M.
Warren, Morgan M.
Weidling, Robert W.
Zhang, Lawrence X.

WU

Abraamyan, Torgom
Abreu, Damien
Agenor, Aooon
Akhirome, Ehiole O.
Asel, Mackenzie C.
Bansal, Anchal
Benzoni, Nicole
Bern, Michael D.
Bichanich, Miles J.
Bollinger, Lucy B.
Chen, Ishita
Chen, Simon B.
Cheng, Tiffany L.
Chou, Chris
Chu, Cheryl S.
Dang, Na L.
Fischer, Caroline R.
Fram, Brianna R.
Frisse, Annie C.
Garber, Charise J.
Gefen, Ashley M.
Huverserian, Ari R.
Kaufman, Johana R.
Kleckner, Vanessa L.
Lee, Dong Y.
Lindburg, Miranda R.
Min, Jasper
Mishra, Shruti
Mohapatra, Arand
Moon, Kelsey A.
Morris, Marie T.
Moses, Lindsey E.
Oetjen, Landon K.
Ott, Katherine C.
Patel, Aalok P.
Qi, Owen
Russler, Emilie V.
Scheel, III, Paul J.
Shankar, Vikram A.
Siller, Alejandro F.
Skillington, S. Andrew
Swor, Erin C.
Vachharajani, Punit A.
Wang, Pengcheng
Witt, Jacob S.
Xu, Amy Z.
Yu, Jenny L.
Zhou, Daisy
Zubovic, Ema

KCUMB

Adjamian, Norair (Noro)
Afshar, Dustan
Aitken, James S.
Allard, Corey T.
Boxberger, Jacob E.
Braunlich, Phillip
Briggs, Holley
Bryan, Aria T.
Carlson, Megan
Carr, Stephanie C.
Clithero, Andrew D.
Cooper, Elizabeth S.
Dason, Patrice G.
Decker, Rebecca Ann
Diskin, Gerald J.
Evans, Christopher G.
Fazel, Natasha E.
Fee, Kristin N.
Ferguson, Austin D.
Fortini, Mary B.
Freeman, Emily A.
Furomoto, Brent
Gayer, Corinn L.
Girgis, Mark M.
Hurng, Gina
Jeranko, Mark C.
Kahl, Rachel M.
Kalra, Preeti
Kaup, Nicholas A.
Knoy, Christiana M.
Kwass, William K.
Langdon, Jamie R.
Larson, Jordan D.
Lien, Ming
Maxwell, Jordan
McAlister, Matt K.
Mehrhoff, Casey J.
Miller, John M.
Mitchell, Mary McGinley
Mohiuddin, Hafsa
Morrison, Hillary C.
Mueller, Scott
Murphy, Sara
Nakashima-Moran, Patrick
Nelson, Rebecca S.
Nielsen, Rachel
Pankow, Christopher M.
Parsel, Sean M.
Patel, Pratiksha
Patel, Shivani
Perry, Thomas R.
Phamduy, Timothy
Prebeck, Joshua M.
Putman, Julie N.
Radzevich, Joe
Rashid, Katherine M.
Reddy, Priyanka P.
Reid, David
Sahe, Arnab
Schlotterback, Katie S.
Sitler, Collin
Sivakumar, Divya
Skotnicki, Meghan A.
Soloman, Danielle L.
Steenson, Sarah
Tooley, Jacob
Traum, Daniel J.
Troiano, Isaac A.
Vora, Roma R.
Waranch, Christopher A.
Weaver, Luke J.
Weber, Katherine
Wojcicki, Katherine M.

ATSU

Amin, Neel H.
Dahle, Michael D.
Gonzalez, Jaime S.
Hayes, Ryan T.
Jaramillo, Carmen G.
Kalthoff, Andrew M.
Maduli, Chauntelle L.
McDonald, Kathleen Anne
McDonough, Thomas P.
Mohan, Olivia R.
Noonan, Tim P.
Pinney, Adam J.
Pulito, Joseph D.
Reichel, Stacy G.
Roberts, Kallie S.
Severns, Caleb M.
Stewart, Daniel R.

In Memoriam

- John L. Bircher, MD, 86, St. Loius, Radiology, Jan. 13, 2013
- Irvin J. Cramp, DO, 56, Montgomery City, Family Practice, Nov. 27, 2012
- John R. Loughead, MD, 90, Poplar Bluff, Otolaryngology, Jan. 10, 2013
- Corinne Walentik, MD, 63, St. Louis, Pediatrics, Dec. 6, 2012

ANNUAL CONVENTION GUEST SPEAKERS

What Missouri Physicians Need to Know: The Supreme Court Decision and Beyond

Friday, April 5 ◆ 1:30 pm

Cynthia Brown, Vice President for Governmental Affairs for the American Medical Association, will describe the effects of the U.S. Supreme Court's recent ruling on the Affordable Care Act and its ramifications for Missouri physicians.

The Future of Medicine: Accountable, Transparent, and Focused on Quality



Friday, April 5 ◆ 3:30 pm

Jerry Kennett, MD, Vice President, Chief Medical Officer, Boone Hospital Center in Columbia, Mo., and a member of the American Medical Association Council on Legislation, will discuss physician quality measurement and the benefits of measuring processes and outcomes.

The Realities of the Patient-Centered Medical Home

Saturday, April 6 ◆ 8:00 am

A.J. DeLaney, MD, is a family physician at the Clay Platte Family Medicine Clinic, a Physician Practice Connections Patient-Centered Medical Home as recognized by the National Committee on Quality Assurance, and will speak on the Patient-Centered Medical Home, and how it emphasizes the importance of the physician-patient partnership.

Accountable Care Organizations, Shared Savings & Care Transformation: Are We Ready?



Saturday, April 6 ◆ 10:00 am

James Rogers, MD, is the Clinical Vice President for Adult Primary Care and the Medical Director for the Physician Group Practice transition demonstration project with Centers for Medicare and Medicaid Services with Mercy Health System in Springfield, Mo. He was Board Chair for Primaris, the Quality Improvement Organization for Missouri, and will discuss ACOs, shared savings, and care transformation.

Why We Need an Alzheimer's Plan for Missouri



Saturday, April 6 ◆ 1:30 pm

John C. Morris, MD, is the Director of the Charles F. and Joanne Knight Alzheimer's Disease Research Center, Memory and Aging Project at Washington University School of Medicine. He will discuss targeting early diagnosis and treatment of Alzheimer's Disease, and the Missouri Alzheimer's State Plan Task Force recommendations, as commissioned by the 95th Missouri General Assembly.

Hospital and Physician Alignment Post-ACA



Saturday, April 6 ◆ 1:30 pm

With over 25 years of health care industry experience, Ron Present is a Principal and the Health Care Advisory Services practice leader for Brown Smith Wallace LLC in St. Louis. He will discuss the pros and cons, the logistics, and the pitfalls of physician-hospital alignment.

American Medical Association Board of Trustees



Friday, April 5 ◆ 8:00 am

Joseph P. Annis, MD, an anesthesiologist from Austin, Tx., AMA Board of Trustees Member, will be MSMA's guest throughout the Convention, and addressing the House of Delegates on Friday.

www.msma.org/annualconvention

- **REGISTRATION**
- **HOTEL RESERVATIONS**
- **PROGRAMS & EVENTS**
- **ALLIANCE PROGRAMS & EVENTS**
- **RESOLUTIONS**

MSMA
Missouri State Medical Association

Missouri State Medical Association

155th Annual Convention

April 5-7, 2013 - Westin Crown Center - Kansas City

Make hotel reservations prior to February 22, 2013 to take advantage of MSMA's Convention room rate. Call the Westin Crown Center directly at 888-627-8538 and ask for MSMA's Convention room block or go to www.msma.org/annualconvention

Pre-Convention Meetings

Thursday, April 4

2:15 pm	MSMA Insurance Agency Board Meeting
3:30 pm	MSMA Executive Committee
3:30-6:30 pm	Convention Registration
4:00-6:30 pm	Exhibitor Setup & Registration
5:00 pm	**MSMA Council Meeting**
6:30 pm	Alliance Dutch Treat Dinner [Offsite]
6:30 pm	University of Missouri Awards Reception & Dinner [Offsite @ Kansas City Club]
7:00 pm	**MSMA Council Reception & Dinner**

Convention Meetings

Friday, April 5

6:30 am-4:00 pm	Convention Registration
6:30 am	University of Missouri Breakfast
6:45 am	Moneta Breakfast
7:00 am	**Exhibit Hall Opens/Continental Breakfast for all Conferees**
8:00 am	**Opening Session MSMA House of Delegates**
8:30 am	Alliance Board Meeting
10:00 am	Alliance General Assembly - Session I
10:00-11:30 am	**Reference Committee A**
10:30 am-Noon	**Reference Committee B**
11:00 am	Physicians Health Committee Meeting & Luncheon
Noon	SLMMS Caucus & Luncheon
Noon	MMSGKC Caucus & Luncheon
12:30 pm	"Spirit of the Alliance" Awards Luncheon
1:30 pm	**MSMA General Session**
2:30 pm	Alliance General Assembly - Session II
2:30 pm	Medical Student Section Business Meeting
3:30 pm	**MSMA General Session**
3:30 pm	Alliance Past President's Reception
5:00 pm	OMSS Business Meeting
5:30 pm	Medical School Alumni Receptions
7:00 pm	Alliance Foundation Fundraiser & Dinner

Saturday, April 6

6:30 am-4:00 pm	Convention Registration
7:00 am	**Exhibit Hall Opens/Continental Breakfast for all Conferees**
All Day	CME Programs, Lectures & Meal Functions
8:00 am	**MSMA General Session**
8:30 am	Alliance General Assembly - Session III
10:00 am	**MSMA General Session**
10:00 am	MMPAC Meeting
12:30 pm	Alliance Installation Luncheon
12:30 pm	AMA Issues
1:00 pm	Resident/Fellow Section Meeting
1:30 pm	**MSMA General Session**
1:30 pm	OMSS Educational Session
2:00 pm	Missouri State Medical Foundation Meeting
2:30 pm	Alliance Board Meeting
3:00 pm	Component/Specialty Society Leaders Meeting
5:15 pm	Reception: 50-Year Pin Recipients & MSMA Past Presidents
6:30 pm	**MSMA Presidential Inauguration**
7:30 pm	**MSMA Presidential Reception**
	Entertainment, Hearty Hors d'oeuvres & Cash Bar

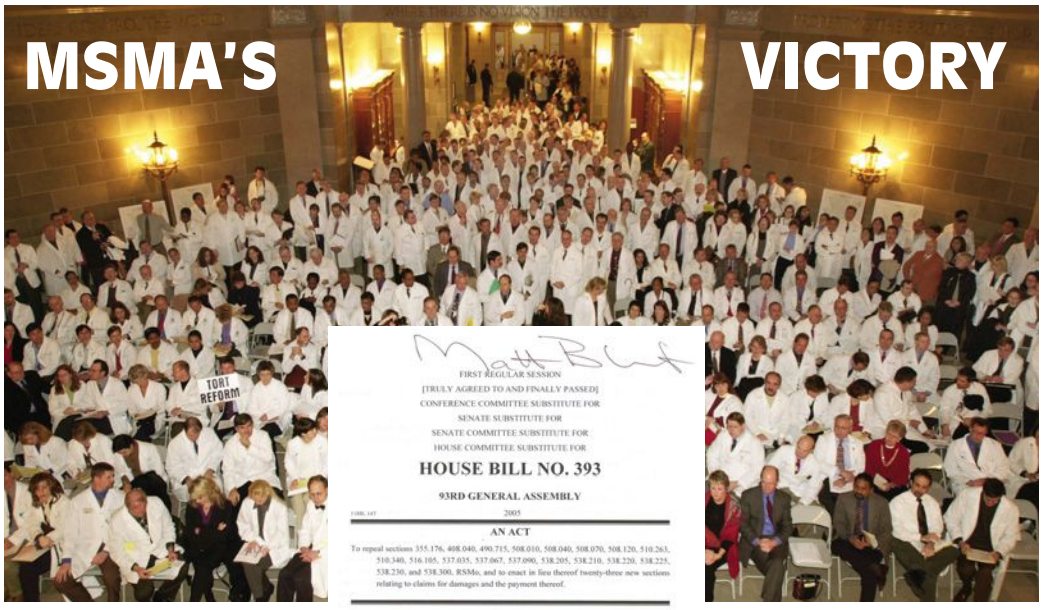
Sunday, April 7

7:00 am	District Breakfasts & Caucuses
8:15 am	**Second MSMA House of Delegates**
Immediately Following Closure of the HOD	MSMA Council Meeting

Complete Program at www.msma.org/annualconvention

Subject to Change. Refer to Convention Official Program for times and meeting locations. All meetings held at the Westin Crown Center Hotel unless noted. Watch for updates on CME Program, Lectures & Meal Functions at www.msma.org/annualconvention. For more information, contact MSMA's Benita Stennis, at 800-869-6762 or bstennis@msma.org.

Physicians: Make This Happen Again!



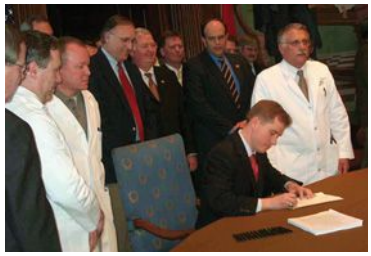
TORT REFORM

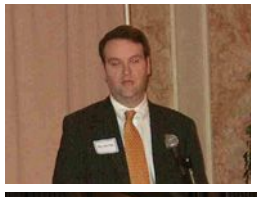
Physicians from all over the state celebrated MSMA's Tort Reform Victory when Gov. Matt Blunt signed House Bill 393 into law.

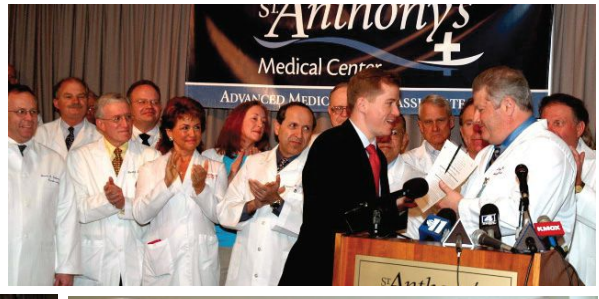
















A summary of MSMA's efforts, clockwise, from top: The second MSMA White Coat Rally drew 800 doctors, while leaders in Farmington, Lake of the Ozarks, Jefferson City, and St. Louis held their own White Coat Rallies. Gov. Blunt signed HB 393 in front of MSMA physicians at St. Anthony's Hospital in St. Louis, and Rep. Rob Schaaf, MD, talked to reporters after Gov. Blunt signed HB 393 into law at the Capitol. Physicians hold onto the signed bill with sponsor Rep. Richard Byrd.

Assessment of Dangerousness in Clinical Practice

by Angeline Stanislaus, MD

Often the single most important predictor of future violence is the history of past violence



Angeline Stanislaus, MD, is in private practice in forensic psychiatry in St. Louis and a Clinical Assistant Professor in Psychiatry at Saint Louis University.
Contact: angelinestanislaus@gmail.com

Abstract

Physicians, especially psychiatrists, face the daunting task of assessing the risk of dangerousness in clinical settings. This article reviews the research on mental illness and violence and identifies the specific psychiatric symptoms that have been associated with an increased risk of violence.

Introduction

Horrific Incidents such as the Sandy Hook Elementary School killings, the Fort Hood and Virginia Tech massacres, the shooting of U.S. Representative Gabrielle Giffords, and 18 others come to mind when we consider the inextricable association of mental illness and dangerousness. Even though such incidents are relatively rare, the traumatic impact such an incident has on a community is severe and persistent. Often the mental state of the perpetrator(s) is called into question after such an violent incident, along with the analysis of missed precursors of such violence (See Figure 1).

Physicians, especially psychiatrists, face the daunting task of assessing the risk of dangerousness of individual patients on a regular basis. The commonly encountered clinical situations where the risk of dangerousness is taken into consideration are: need for involuntary commitment to a psychiatric facility, need for enforcing involuntary psychotropic medications for treatment refusal, discharge planning for hospitalized psychiatric patients and need for closely monitored psychiatric follow up in the community.

Research Examining the Relationship Between Violence & Serious Mental Illness

The Epidemiological Catchment Area Study

The National Institute of Mental Health's (NIMH) Epidemiological Catchment Area (ECA) study was the first community based study that examined this issue.[1] The ECA study sampled 17,803 subjects from five communities in the United States and examined rates of various psychiatric disorders. Data on violence was collected on 7,000 individuals. Violence was defined as use of a gun or weapon in a fight or involvement in more than one fight that came to blows with a person other than a partner or spouse.

The ECA study found that persons with serious mental illness namely schizophrenia, bipolar disorder and major depressive disorder were two to three times more assaultive than persons without such illnesses. Lifetime violence among individuals with serious mental illness was 16% compared with 7% among individuals without mental illness. The risk of violence in the seriously mentally ill increased to 43% with co-morbid substance abuse.



Figure 1
Seung-Hui Cho, a mentally ill South Korean student, killed 32 people and wounded 17 more on the Virginia Tech campus April 16, 2007. He had stalked fellow students and been ordered to receive treatment for severe anxiety disorder.

The MacArthur Violence Risk Assessment Study

The purpose of this study was to ascertain the prevalence of community violence in a sample of people discharged from acute psychiatric facilities. For this study 951 patients who were interviewed prior to discharge from hospital were compared to a community sample. The patients and the community sample were re-interviewed every 10 weeks for a year. Acute psychiatric symptoms were reviewed and incidents of violence were documented.[2]

The MacArthur Violence Risk Assessment Study found that individuals who scored high in the Anger Scale were twice as likely to have engaged in violent behavior. Discharged psychiatric patients who did not have substance abuse were not more violent than residents of the same community. Monahan, the author of the MacArthur Violence Risk Assessment Study, noted in his report of the study, "Does this mean that we claim that mental disorder has nothing to do with violence? No. Mental disorder has a significant effect on violence by increasing people's susceptibility to substance use."[2]

The CATIE Study

The data from the CATIE (Clinical Antipsychotic Trials of Intervention Effectiveness) study, which was designed to assess the treatment response of individuals with schizophrenia to various antipsychotic medications, was analyzed by Swanson. He examined the prevalence and correlates of violence among patients with schizophrenia who lived in the community and assessed the net effects of psychotic symptoms and other risk factors for minor and serious violence among individuals with schizophrenia.[3]

In the CATIE study 1,410 patients diagnosed with schizophrenia were enrolled in 56 sites in the United States. The patients were clinically assessed and interviewed about violent behaviors in the past six months. Both positive and negative symptoms of schizophrenia were assessed using Positive and Negative Syndrome Scale (PANSS). The positive psychotic symptoms assessed were delusions, conceptual disorganization, hallucinations, excitement, grandiosity, suspiciousness, persecution and hostility. The negative symptoms assessed were blunted affect, emotional withdrawal, poor rapport, apathetic, socially withdrawn, difficulty in abstract thinking, lack of spontaneity in flow of conversation and stereotyped thinking.

The CATIE study showed that the six month prevalence of violence in individuals with schizophrenia was 19.1% of which 15.5% was minor violence and 3.6 % was serious violence. 80.9% of individuals with schizophrenia in this study had no violence. Minor violent behavior was more likely among females, those with limited or no vocational activity, those residing with family or relatives, those not feeling "listened to" by family members and those with recent history of police contact. The correlates of serious violence were younger age, childhood conduct problems, arrests history, above median PANSS positive scores and below median PANSS negative scores.

The CATIE study also examined the correlation between specific psychotic symptoms and serious violence. It found that hostility, both verbal and non-verbal expression of anger and resentment was correlated with violence. The presence of suspiciousness and persecutory thoughts or delusions which varied from guardedness to a network of systemized persecutory delusions that dominated the patient's thinking or behavior increased risk for serious violence. The presence of auditory hallucinations with associated rigid delusional interpretation of the hallucination, and hallucinations that provoke verbal or behavioral responses such as obedience to a command hallucination are correlated with increased risk of serious violence. Grandiosity with unrealistic conviction of superiority including delusion of extraordinary abilities was correlated with increased violence. The presence of excitement characterized by hyperactivity, agitation, heightened

Figure 2

"Going Postal": Work Place Violence

'Going postal', in American English slang, means becoming extremely and uncontrollably angry, often to the point of violence, usually in a post office or other workplace environment. The expression derives from a series of incidents from 1983 onward in which United States Postal Service workers shot and killed managers, fellow workers, and members of the police or general public in acts of mass murder. United States Postal Service shootings have occurred in Edmond, Oklahoma 1986, Ridgewood, New Jersey 1991, Royal Oak, Michigan 1991, double events 1993, Goleta, California 2006, Baker City, Oregon 2006.

Source: Wikipedia



responsivity to stimuli, hypervigilance and excessive mood lability was also correlated with increased violence.[3]

Specific Psychiatric Symptoms Associated with Violence

Acute psychotic symptoms, such as delusions and hallucinations, are associated with increased risk of violence. There is usually a substantial delay between the onset of psychosis and serious violence.[4]

Delusions

Patients with persecutory delusions are at increased risk of aggression.[5] Threat/Control-Override symptoms are associated with increased aggression.[6] Examples of Threat Control-Override symptoms are delusions where the patient feels that their mind is dominated by forces beyond his/her control, or feels that thoughts are being inserted into his/ her head. Persecutory delusional preoccupation is also part of the Threat Control–Override symptom complex as described by Link et al.

Patients who have a well systemized persecutory delusional system which is associated with fear, anger, or anxiety are more likely to act on their persecutory delusion and become violent.[7] Other types of delusional beliefs are also associated with increased risk of violence. In Capgras Syndrome the patient believes that a loved one is being replaced by an imposter. The violence by the patient is with the intent to get rid of the imposter but this may result in serious harm to the loved one. In eroto-manic delusions, the patient holds the belief that another person, usually a stranger, someone holding a high-status, or famous person, is in love with him or her. Based on this belief the patient may engage in stalking behaviors. Erotomanic delusions are observed in 10% of stalkers.[8] Many celebrities have been stalked including David Letterman, Halle Berry, Jody Foster, Madonna, and Stephen Spielberg. Rebecca Schaeffer, star of the television show My Sister Sam, was shot and killed by an obsessed stalker John Bardo.

Hallucinations

Patients with command hallucinations to harm others are twice as likely to be violent than patients without such commands.[9] In these patients the command hallucinations give very specific instructions to harm. Patients are more likely to harm themselves or engage in non-violent acts than to engage in specific acts of violence against another individual. Patients who obeyed the command to act violently were also preoccupied with a hallucination-related delusion. The other factors that increase patient's compliance with the command hallucination are familiarity of the voice, feelings of personal superiority, and personal benefits from the act.[10]

Hostility

Patients may exhibit hostility as part of an underlying psychotic disorder, affective disorder, personality disorder, substance induced disorder or a combination of these disorders. Presence of hostility is highly correlated with increased risk of imminent violence. In the MacArthur Study patients who were violent scored high in the anger scale. Also in the CATIE study the presence of verbal and non-verbal expression of anger and resentment highly correlated with serious violence.[3]

Presence of chronic hostility that stems from distrust of one's employer and other employees is often encountered in individuals who commit mass workplace related violence. These individuals often have paranoid personality disorder and present as being detached and socially isolated with the inability to work with others (See Figure 2.)

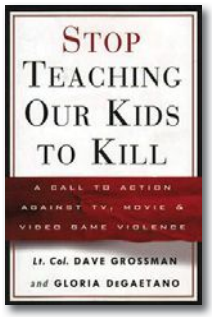
Excitement

The presence of hyperactivity, agitation, and accelerated motor activity are associated with impending aggression.

Book Review

Stop Teaching Our Kids To Kill

by Lt. Col. Dave Grossman and Gloria DeGaetano
1999 Crown Publishers New York
185 pages



"The goal of this book is to make people aware of what the prolific use of violence in television, movies, and video games is doing to our children. Teaching Our Kids to Kill calls to the table the makers of this violence to address the myriad scientific research on the subject--research that couldn't make it clearer how solid and deadly the link is between this kind of graphic imagery and the escalating incidences of youth violence--and understand and change what they are doing and the dangerous effects their products are having on our children."
Source: Amazon.com

Often these may be the only visibly noticeable signs in a patient who is imminently dangerous. Patients with acute potential for aggression may also appear hypervigilant with heightened responsivity to stimuli. The presence of associated mood lability further increases the risk for aggression.

Role of Substance Abuse in Mental Illness and Violence

Substance abuse and dependence are highly co-morbid in individuals with mental illness. Lifetime prevalence of violence among individuals with substance abuse and dependence is 35% and this increases to 43% among those with co-morbid mental illness. Schizophrenic patients who abuse substances are 17 times more likely to be violent than the general population.[11] Substances that are commonly associated with increased risk of aggression are alcohol, cocaine, methamphetamine and PCP.

Summary

While assessing risk of dangerousness in clinical practice it is important to obtain as much information as possible with regards to the patient's psychiatric history. Often the single most important predictor of future violence is the history of past violence (See book review above). Therefore, it is important to review the patient's past history of aggression and its relationship to his mental illness. If a patient has a history of becoming assaultive in an acutely psychotic mental state, then it is likely that the patient will become assaultive again when acutely psychotic.

Acutely psychotic patients preoccupied with persecutory delusions may respond with fear, anger or anxiety. These emotions increase the risk of violence, typically towards individuals incorporated in their delusional system. This risk is further intensified by the presence of command auditory hallucinations. The patient is more likely to comply with the command auditory hallucinations if the voice giving the command is familiar to the patient and the command to commit acts is consistent with the delusional system incorporated by the patient. The patient who responds to the persecutory delusional system and command hallucinations with extreme hostility, agitation and excitement is at imminent risk of harming another person.

The presence of a co-morbid substance abuse may enhance the development of this acute psychotic process, may alter the emotional response to the delusions and hallucinations and may disinhibit the patient's ability to control his aggressive urges and precipitate acute aggression.

Conclusion

The above described risk factors for violence need to be considered while making clinical decisions regarding need for psychiatric hospitalizations, need for involuntary administration of medications, discharge planning, and while formulating outpatient follow-up care in the community.

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Disclosure

None reported.

MM



Matters of the Heart: Cardiovascular Disease in U.S. Women

by Kevin A. Bybee, MD & Tracy L. Stevens, MD

Cardiovascular Disease is responsible for one death every minute in U.S. women—roughly equivalent to the total number of deaths in females due to cancer, diabetes mellitus, Alzheimer's disease, accidents and chronic lower respiratory disease combined.





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Abstract

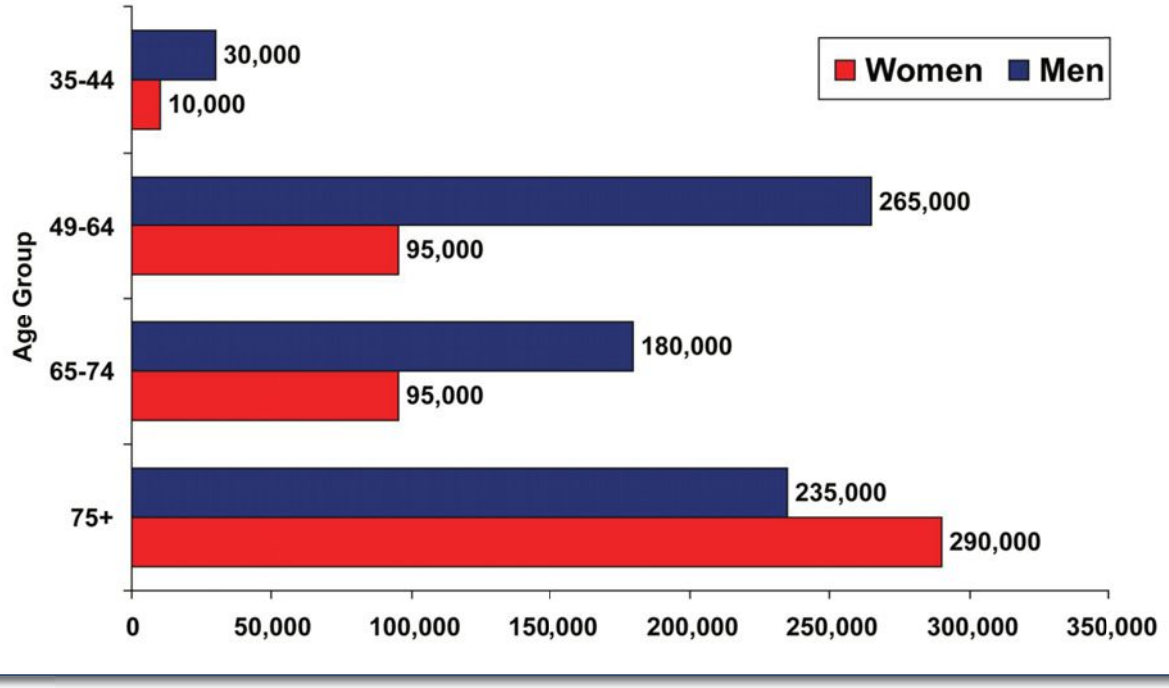
Cardiovascular disease is the leading cause of death in United States women and accounts for approximately 500,000 deaths annually. Over half of cardiovascular disease-related deaths in women result from coronary artery disease including acute coronary syndromes. This paper reviews gender specific issues in women as they relate to current cardiovascular disease epidemiology, trends in cardiovascular disease epidemiology, coronary artery disease detection, risk factor modification, and prevention of cardiovascular disease-related events.

Epidemiology of Cardiovascular Disease in Women

Cardiovascular disease (CVD) is the leading cause of death in women and men in the United States (U.S.) and in other developed countries. Cardiovascular disease, which includes hypertension, coronary artery disease, heart failure and stroke accounts for nearly 500,000 deaths in U.S. women every year. More than half of these CVD-related deaths are due to coronary artery disease. In 2005, death rates for CVD in the U.S. were 237.1 per 100,000 for all women, 230.4 for white women and 319.7 for black women.[1]

The leading causes of death in U.S. women are diseases of the heart, cancer, stroke, and chronic lower respiratory disease.[2-5] CVD is responsible for one death every minute in U.S. women—roughly equivalent to the total number of deaths in females due to cancer, diabetes mellitus, Alzheimer's disease, accidents, and chronic lower respiratory disease combined. It is estimated that 3,200,000 U.S. women suffer a myocardial infarction every year, with 213,572 U.S. women dying from coronary artery disease each year. For the first time, U.S. death rates due to cardiovascular disease in women have now surpassed that of men.[4] Death rates from coronary artery disease in those <55 years of age are still significantly higher in men than women. However death rates for coronary artery disease and acute coronary syndromes after the age of 65 are higher in women than in men (See Figure 1).

Figure 1
Number of myocardial infarctions (new and recurrent) or fatal coronary artery disease events per year in the U.S. by age and gender.
Source: National Heart, Lung and Blood Institute



Trends in Cardiovascular Disease Mortality and Outcomes in Women

Coronary heart disease-related mortality rates have decreased in the U.S. over the past three decades. From 1980 to 2002, overall the death rate due to heart disease decreased 49% in women over the age of 65. Similarly, death rates due to heart disease in men over the age of 65 decreased by 52%.[4] Disturbingly the rates of heart disease-related mortality appear to be increasing in women ages 35 to 54. Several factors may increase rates of CVD-related morbidity and mortality in the near future. These include the rising average female lifespan, the aging baby-boomer population and increasing prevalence of cardiovascular risk factors. This trend will likely affect women to a greater extent than men given the greater likelihood of heart disease-related mortality in older women.

Prevalence of Subclinical Atherosclerosis

Coronary atherosclerosis is a disease process that begins well before the clinical presentation of angina, an ischemic coronary event or death. Fatty streaks and aortic atheroma have been detected in children. We can now detect subclinical coronary atherosclerosis through measurement of calcification within the coronary arteries using ECG-gated cardiac computed tomography technology. The Coronary Artery Risk Development in Young Adults (CARDIA) study evaluated the prevalence of subclinical coronary atherosclerosis in younger adults.[6] This study found that 5.1% of women between the ages of 33 and 45 and 15.0% of men between these ages had subclinical coronary atherosclerosis identified by the presence of coronary artery calcification. This finding emphasizes the importance of identifying and treating modifiable risk factors as early in life as possible.

Detection of CAD

Early initial detection of coronary artery disease (CAD) in women at risk is critical for optimal prognosis and management. Several modalities exist for the non-invasive assessment of CAD. Non-invasive detection of CAD in women presents gender-specific issues that make the diagnosis more challenging than in men. Women commonly present with CAD at an older age than men and often have limited exercise capacity due to co-morbid conditions. The sensitivity and specificity test characteristics for non-invasive functional testing are less robust in women compared to men.

Risk Stratification of Women at Risk for Coronary Artery Disease

The initial assessment of possible CAD in women begins with risk stratification based on cardiovascular risk factors and symptom status. Testing modalities for detecting CAD in women can be divided into two categories: 1) coronary anatomic assessment using coronary artery calcium scoring, coronary CT angiography, invasive coronary angiography; 2) functional testing using exercise electrocardiography, stress echocardiography, stress radionuclide myocardial perfusion imaging including single photon emission computed tomography (SPECT), positron emission tomography (PET) and stress cardiac magnetic resonance imaging (MRI).

Evaluation for Coronary Artery Disease in Asymptomatic Women

Coronary Artery Calcium Scoring

Coronary artery plaques are complex structures and are composed of multiple components including heterotopic calcium deposits. Coronary artery calcification is pathopneumonic of coronary artery plaque/CAD. ECG-gated computed tomography (CT) imaging of the coronary arteries can be performed without the use of intravascular contrast and provides for accurate detection and quantification of coronary artery calcium. The amount of coronary artery calcification is most commonly quantified utilizing the Agatston scoring technique. The coronary calcium score correlates with risk of cardiac events and independently predicts cardiac risk beyond that of the Framingham Risk Score (FRS). Current data support the use of CAD screening procedures such as coronary calcium scoring in women with an intermediate risk FRS. Current guidelines do not advocate CAD screening in woman at low risk for CAD events. Women with high CAD risk should be treated with proven, aggressive secondary prevention measures to reduce the risk of subsequent ischemic cardiovascular events.

Evaluation for Coronary Artery Disease in Symptomatic Women

Women presenting with symptoms suggesting angina/CAD are commonly referred for functional stress testing for obstructive CAD and for prognostication. Functional testing for CAD is extremely valuable for diagnosis and management including identifying patients that would benefit from coronary revascularization.

Exercise Electrocardiography

Exercise electrocardiography (ECG) is one of the most studied and utilized stress testing modalities. Numerous studies have demonstrated the ability of the exercise ECG to diagnose and prognosticate suspected CAD. The current ACC/AHA guidelines recommend exercise ECG in symptomatic women with an intermediate pre-test likelihood of CAD based on cardiovascular risk factors, a normal resting ECG and the capacity to perform maximal exercise testing. Exercise ECG testing in women has several limitations. ST-segment depression during treadmill testing is a less specific marker of ischemia in women due to hormonal effects on cardiac repolarization. The menstrual cycle can influence the ischemic threshold in premenopausal women. Estradiol and progesterone levels are lower during the early follicular phase and as a result myocardial ischemia can be provoked with lesser levels of exercise. Inducible ischemia develops at higher levels of exercise later in the menstrual cycle when estrogen levels are higher. A large meta-analysis of previously published exercise ECG studies found that the overall sensitivity and specificity of detecting obstructive CAD by exercise ECG in women was 61% and 70%, respectively. These test characteristics are significantly less robust compared to exercise ECC performance in men in whom the sensitivity and specificity are 72% and 77%, respectively. Prognostication of CAD can be improved by utilizing the Duke Treadmill Score using data such as exercise duration, presence of anginal symptoms provoked during the stress test, heart rate recovery and magnitude of ST-segment deviation with exercise.

Stress Echocardiography

It is recommended that stress echocardiography be reserved for the evaluation of CAD in symptomatic women who are at least intermediate risk and do not qualify for exercise ECG. The test can be performed utilizing exercise stress or pharmacologic stress in those unable to exercise. Stress echocardiography is more accurate than exercise ECG in detecting obstructive CAD in both men and women. The sensitivity of stress echocardiography in detecting single vessel CAD in women is approximately 81% with a specificity of 86%. Women with an abnormal stress echocardiogram have higher cardiac event rates compared to women with a normal study. Stress echocardiography provides a more robust risk stratification compared to exercise ECG.

Radionuclide Stress Myocardial Perfusion Imaging

It is currently recommended that stress radionuclide myocardial perfusion imaging (MPI) be reserved for

the evaluation and prognostication of suspected CAD in symptomatic women who are at intermediate or high risk for CAD. Stress single positron emission computed tomography (SPECT) MPI is the most commonly employed imaging stress modality in the U.S. in both men and women. Smaller left ventricular volumes in women, a lesser likelihood of multi-vessel disease and the relatively poor spatial resolution of Tl-201 reduce the accuracy of Tl-201 SPECT imaging in women. The reported sensitivity and specificity of Tl-201 SPECT in women is approximately 78% and 64%, respectively. Contemporary analyses have shown a sensitivity and specificity of 99m-technitium based SPECT studies to be approximately 84% to 87% and 91% to 94% respectively.

Stress MPI results have been shown to provide prognostic information in women beyond that of standard clinical and exercise ECG variables. A normal SPECT MPI study is associated with a very low risk of short-term cardiac events (<1%). The risk of cardiac events increases when ischemia is present. There is a continuum of risk based on the size and severity of perfusion defects. Women undergoing pharmacologic stress MPI have higher mortality and cardiac event rates compared to those undergoing exercise MPI for any given perfusion result including those with non-ischemic studies. The annual rate of CAD-related mortality is double in diabetic women with normal MPI studies compared to non-diabetic women with normal MPI studies (0.8% vs. 1.6%).

Cardiac stress MPI utilizing positron emission tomography (PET) is becoming a more widely available modality for assessment of coronary artery disease. PET MPI is much more accurate than SPECT in detecting flow-limiting CAD, especially in women. Reported sensitivity and specificity for detecting obstructive CAD with PET is 98% to 95%, respectively.

Traditional and Nontraditional Risk Factors for Cardiovascular Disease in Women

Although women's awareness about their number one health threat has increased over the past ten years, the percentage remains low. Even "aware" women often feel exempt and personally not at risk. It is imperative to educate all women on their personal responsibility to know and manage their individual risk factors. These include traditional risk factors and those that are gender specific. Finally all women must understand that all women are at risk.[7]

Hypertension

The overall prevalence of hypertension is greater in women than men, especially those with a history of hypertension during pregnancy. Black and Hispanic women are twice as likely to have hypertension. Diastolic elevation is more common in younger women and favorably responds to exercise. Oral contraceptives and hormone replacement therapy may increase blood pressure. Reno-vascular hypertension from fibromuscular dysplasia and autoimmune disorders such as systemic lupus erythematosus are contributing factors.[8,9]

Angiotensin converting enzyme inhibitors or angiotensin receptor blockers are first to be considered in patients with diabetes and may be preferred in post-menopausal women with hypertension.[7] This is supported by the theory of menopause being associated with a fall in nitric oxide from lack of estrogen receptor stimulation with resultant rise in aldosterone. Studies suggest this mechanism may account in part for diastolic dysfunction observed in post menopausal women. Interestingly, women are more likely to experience the ACE inhibitor cough than men as well as develop edema from the vasodilatory effects of calcium channel blockers.

Diabetes

Diabetes is a more powerful risk factor in women than men.[7] Abnormal lipid profiles are more likely to be present in diabetic women than diabetic men. Women with a history of gestational diabetes are at greater risk for developing diabetes later in life. Metabolic syndrome risk factors, including polycystic ovary syndrome, increases the likelihood of developing diabetes and warrants aggressive screening. As women transition through menopause, a common occurrence is weight gain and increase in abdominal girth compromising the ability of insulin receptors to govern blood glucose.

Dyslipidemia

While studies have reported statin therapy to be effective in women, dyslipidemia is less likely to be treated in women than men. Changes in cholesterol are associated with menopausal status. Total and LDL cholesterol levels are lower in premenopausal women than in age matched men; following menopause they exceed that of men. A common false assumption is that women can ignore elevated total and LDL cholesterol if their HDL cholesterol and total cholesterol to HDL ratio are ideal.[7] As with anti-hypertension medication prescriptions, women are less likely to fill and use a prescription for cholesterol lowering therapy.

Nicotine Abuse

Women who smoke are more likely than men to suffer a myocardial infarction and this occurs twenty years

earlier than in women who do not smoke. The most common reason women won't stop smoking is related to their fear of gaining weight. Nicotine and supplemental hormones, either in the form of contraception or hormone replacement, are a deadly combination and the leading cause of myocardial infarction in young women.

Obesity

Obesity is an independent risk factor for cardiovascular disease, most prevalent in black women, followed by Hispanic and white women. Those with abdominal obesity and increased waist to hip ratio carry an even greater risk of cardiovascular disease even among women of normal weight. This suggests that maintaining a normal waist size may be as or even more important as weight control. Excess adipose tissue results in overproduction of adipokines which are potent mediators of inflammatory factors that are associated with increased cardiovascular risks.

Family History

History of myocardial infarction in primary family members is an independent risk factor for cardiovascular disease. There is evidence to suggest a history of maternal myocardial infarction, regardless of age, carries an increased risk for cardiovascular events.

Oral Hygiene

Evidence correlates periodontal disease with atherosclerosis. Gingivitis becomes more prevalent in the post-menopausal woman and should be aggressively treated.

Depression

The Nurses Health Study reported that physically healthy women with symptoms of depression had an increased risk of future cardiovascular events.[10] Young women, less than sixty years of age, have the highest prevalence of depression following myocardial infarction and may account for the lowest attendance in cardiac rehabilitation and poorer outcomes. C-reactive protein is increased in patients with depression and down regulates endothelial nitric oxide production. Associated abnormal serotonin levels may lead to platelet aggregation and prescription of selective serotonin reuptake inhibitors has been shown to reduce cardiovascular mortality.

Immune System Disorders

Autoimmune disorders, including rheumatoid arthritis and systemic lupus erythematosus, carry an increased risk of premature coronary artery disease. Young women with lupus have a fifty time greater risk of myocardial infarction compared to healthy women in the same age group. These inflammatory states are associated with spontaneous plaque rupture and therapies that reduce inflammation reduce cardiac risk. Considering lupus as a coronary artery disease equivalent has recently been proposed, placing these women in the high risk category.

Cancer Therapies

Doxorubicin (Adriamycin) and trastuzumab (Herceptin), chemotherapy agents administered for treatment of breast cancer, have potential cardiotoxic effects which can result in cardiomyopathy and congestive heart failure. Radiation to the chest can cause myocardial restriction and pericardial constriction. Radiation-induced coronary artery and valvular disease may require surgical intervention. Cardiac complications manifest clinically ten or more years following radiation therapy and may be more likely to occur in those receiving therapy for left sided breast cancer.

Hormonal status

Menopause, whether it is natural or surgical, is a risk factor all women share and is associated with accelerating risk for cardiovascular disease.[7] Estrogen receptors are present throughout the cardiovascular system. As estrogen circulates and binds to these receptors, vasodilation via nitric oxide occurs. This relationship creates a healthy vasculature, promoting relaxation with antioxidant properties. As circulating hormonal levels fluctuate, whether related to hormone therapy, menstrual cycle, pregnancy, perimenopause, natural or surgical menopause, variable physiologic responses occur. This can result in a multitude of symptoms including palpitations, chest discomfort and account for potential increased risk of cardiovascular events. Fluctuations in circulating reproductive hormones can trigger endothelial dysfunction. Women with vasomotor disorders such as migraine headaches and Raynaud's Disease may note exacerbation of their symptoms depending on the stage of menstrual cycle. Chest discomfort just prior to menses may be related to coronary artery spasm. Spontaneous dissection and acute coronary syndromes are more likely to occur in this phase of the menstrual cycle.

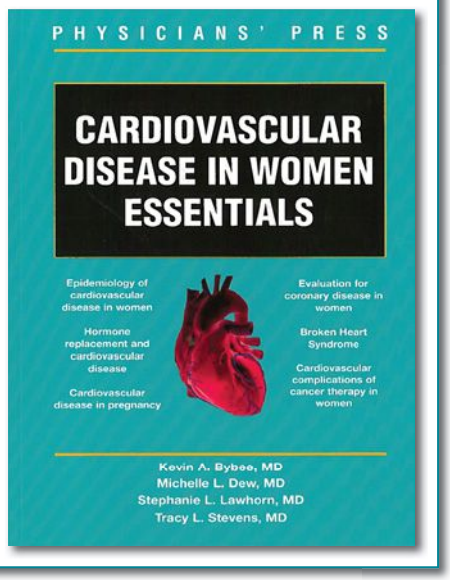
The post-menopausal woman with hypertension and diabetes is most likely to experience symptomatic diastolic dysfunction. Shortness of breath, especially with quick acceleration and climbing stairs is commonly

Book Review

Cardiovascular Disease in Women Essentials

by Kevin A. Bybee, MD, Michelle L. Dew, MD,
Stephanie L. Lawhorn, MD & Tracy L. Stevens, MD
Saint Luke's Mid America Heart Institute, Kansas City, Missouri
Publisher: 2012 Jones & Bartlett Learning
133 pages

Cardiovascular disease (CVD) is the largest single cause of death among women, accounting for one third of all deaths. In the United States, more women than men die every year of CVD. In the United States, 38.2 million women (34%) are living with CVD, and the population at risk is even larger. Cardiovascular Disease in Women Essentials is a current, concise, and authoritative guide to the diagnosis, treatment and management of cardiovascular disease in women. This pocket-size, quick reference is an ideal resource for primary care physicians, cardiologists, internal medicine physicians, and physicians in training.



reported. Women may experience microvascular angina with abnormal coronary flow reserve. Diastolic dysfunction is a trigger for atrial fibrillation. Strict risk factor control and exercise have favorable effects on diastolic function. Congestive heart failure is the most common diagnosis for adult hospitalization and diastolic rather than systolic congestive heart failure is more common in women.

Recent studies suggest hormone replacement therapy should not be used with the expectation of cardiovascular protection. Rather, women should consider hormone therapy for relief of menopausal symptoms and to use the lowest dose for the shortest duration.[11-14]

Summary

Cardiovascular disease is the number one health threat to women. (See book review above.) Women of all ages and ethnic cultures need to proactive about their own heart health and take responsibility to reduce their risk factors. In addition to traditional risk factors, women need to be aware of other clinical conditions that can impact their cardiovascular health.

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Disclosure

None reported.

MM

Preventive Cardiology

A Retrospective Single Center Experience

Utilization of Phase II Cardiac Rehabilitation in Veterans Administration Patients

by Manish Jhawar, MD, Albert Chan, MD, Leif Christianson, MD, Ankit Mehra, MD, Kul Aggarwal, MD, Kevin Dellsperger, MD & Anand Chockalingam, MD

Our survey showed that phase II cardiac rehabilitation attendance led to better adherence to exercise amongst veterans in the long run, underscoring the importance of rehab programs.



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Abstract

Cardiac rehabilitation (CR) is underutilized across the United States. Reported national average varies from 14-35% after acute myocardial infraction and 31% after coronary artery bypass grafting surgery. No study to date has examined the utilization of CR in eligible veteran population. In this retrospective study, computerized veteran medical records at a single Veterans Administration (VA) hospital were screened between January 1, 2006 and December 31, 2009. Patients who met the inclusion and exclusion criteria were surveyed telephonically and asked a series of questions relating to delivery and utilization of phase II CR. Data was collected using a pre-printed questionnaire and patient responses were number coded.

Utilization rate of phase II CR in veterans was noted to be 21%. Common reasons reported for underutilization of CR included time and distance problems, orthopedic- and stroke-related muscle weakness and lack of motivation. Participation in Phase II CR led to better adherence to exercise long term. Also, 65-70% of the veterans expressed interest in a tailored home based CR program. CR is underutilized in eligible veterans. Compliance could possibly be improved if the veterans were offered a tailored CR program.

Introduction

Coronary artery disease (CAD) patients with recent acute myocardial infarction (AMI) and patients who undergo coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI) are ideal candidates for cardiac rehabilitation (CR). Several studies have shown the benefit of CR in improving mortality, morbidity and CAD risk factor control.[1] Despite its proven benefit, CR programs are underutilized across United States, with only 14 to 30% of eligible patients participating. Elderly, non whites, females and

patients with medical co-morbidities receive much less CR.[2,3] Also, cost, time and accessibility issues are other impediments for the utilization of CR in United States.[4] Various home-based CR programs may improve CR utilization and have shown to be as effective as center-based programs. No study till date has examined the utilization of CR in the veteran population. In this study we examine the utilization rates of phase II CR in eligible veterans at a single VA center and evaluate factors affecting CR participation.

Methods

Harry S. Truman Memorial Veterans' Hospital (HSTMVH) computerized patient records were queried from January 1, 2006 to December 31, 2009 to derive a list of 682 potential participants meeting the inclusion criteria of one of the following diagnosis: 1) Stable angina; 2) AMI (ST elevation or non-ST elevation) followed by CABG; 3) AMI (ST elevation or non-ST elevation MI) followed by PCI or (4) AMI followed by medical therapy.

After eliminating readmissions and patients without recent coronary event or revascularization, 313 veterans were identified during the 2007-2008 time period. After distributing these into four groups, 132 veterans were mailed recruitment letters for study participation of which 47 agreed to participate in the study. The study survey included a series of questions relating to delivery and utilization of phase II CR programs. Data was collected by four surveyors using a pre-printed questionnaire and patient responses were number coded in this institutional IRB approved study. Data analysis involved simple percentage calculation and was done using Microsoft Excel 2007.

Results

We surveyed a total of 47 veterans in whom phase II CR was indicated. Of the 47 veterans, three had stable CAD, 12 presented with AMI and underwent CABG, 27 presented with AMI and underwent PCI and five presented with AMI and were managed medically. In this survey, 27 (57.4%) admitted to or remembered being offered CR while the remaining 20 (42.6%) claimed to have not been offered phase II CR. Of those who remembered being offered CR, only 10 (21% of the total surveyed) chose to participate and the remaining 17 did not. Thus, we analyzed the study data based on the three groups:

Group 1: Those offered and chose to participate

(n=10) Out of 10 in this group seven completed phase II of CR and continue to exercise at the time of the survey (70%). First reason cited by people who couldn't complete or did not continue to exercise were orthopedic problems and/or stroke related muscle weakness. Median annual household income of veterans in this group was 20 - 40K and the common education level was high school or GED.

Group 2: Those offered and chose not to participate

(n=17) Out of 17 in this group, only three (~18%) reported to continue some form of exercise at the time of the survey. The common first reasons cited for not participating in CR in this group were: a) already exercising (n=5); b) lack of time (n=3) and c) lack of motivation (n=4). Median annual household income of veterans in this group and common education level was 20 - 40K and high school or GED respectively, same as group 1. If offered, 12 out of 17 (~71%) in this group said that they would be interested in some form of home based tailored CR.

Group 3: Those that did not remember being offered

(n=20) Of the 20 veterans in this group only two (10%) reported indulging in some form of exercise related activity at the time of survey. When asked what would prevent them from participating in a center based CR program if it was offered, the common first reasons cited were: a) orthopedic/bone issues; b) lack of motivation and c) a combination of time distance problems and stroke related muscle weakness. Median household income in this group of veterans was 20 - 40K as well and the common education level was some form of college attendance with/without degree. Again, 13 (65%) expressed interest in home based CR if it was offered.

Discussion

In 2001, 19 states and the District of Columbia included questions in the state-based Behavioral Risk

Factor Surveillance System (BRFSS) survey regarding receipt of cardiac rehabilitation services following a heart attack. The findings indicated that less than a third of heart disease patients had participated in phase II CR.[3] Suaya et al reported underutilization of cardiac rehab in Medicare beneficiaries (those > 65 years of age) to be as low as 14% in AMI and 31% in CABG patients.[2] However, to our knowledge no study has looked at phase II CR utilization in veterans in particular. In our survey the utilization rate of phase II CR in veterans was 21%, much lower than the above reported national average of around 30%. This is despite HSTMVH being a referral VA for cardiac interventions and surgery as well as having dedicated staff and CR program with automated referral of eligible patients to CR.

In our survey, the common reasons for underutilization of CR in veterans appeared to be time and distance issues, orthopedic and stroke-related muscle weakness and lack of motivation, which in turn could be the result of the two aforementioned issues. The current practice of center based cardiac rehab with its associated hassles of limited availability in small remote areas, travel to bigger centers, parking etc., further adds to the problem and decreased compliance. Several other factors have been reported responsible for underutilization of CR in the elderly.[2] We studied socioeconomic status and education level and did not find any significant difference between the groups in this regard.

To circumvent the problems associated with center based CR programs and improve utilization several alternative home-based programs have been developed and used around the globe. A recent meta-analysis looked at 12 such studies and concluded that, in stable CAD patients home based CR programs were as effective as center based programs in improving the health and quality of life-related outcomes.[5]

Conclusion

Our survey showed that phase II CR attendance led to better adherence to exercise amongst veterans in the long run, underscoring the importance of rehab programs. Underutilization is therefore a concern and raises the need to develop ways and means to improve compliance among veterans. Home based programs are as effective as center based programs and individually tailored CR programs could potentially improve this situation. As over 65% of the veterans in our survey expressed interest in a rehab program if it was home based, these novel solutions may improve CR use, functionality and survival for our veterans.

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Pain Management Mini-Series Part I

A Review of Management of Acute Pain

by Quinn Johnson, MD, Robert R. Borsheski, DO & Joseph L. Reeves-Viets, MD

Despite numerous studies, there is no consensus regarding a single treatment protocol for acute or chronic pain.



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Abstract

Acute pain is a complex process involving activation of nociceptors, chemical mediators and inflammation. Medications can be used to target each of the key elements within the pain pathway and eliminate or reduce the sensation of pain. Pain management begins, when possible, prior to the tissue trauma and continues throughout the perioperative period. When acute pain is appropriately managed, patient's clinical outcomes and satisfaction are improved.

Introduction

Beginning in 1999, TJC (The Joint Commission) initiated a new focus mandating improvement in the treatment and evaluation of pain for patients. As a result, physicians of all specialties and hospitals began to implement processes to improve pain management through a variety of modalities. Key junctures of the pain cycle were targeted with the ultimate goal to interrupt or minimize factors within the pain pathway. Many advocated preemptive anesthesia, with the goal of preventing the pain message before it enters the central nervous system.[1] Despite numerous studies, there is no consensus regarding a single treatment protocol for acute or chronic pain. This article provides a broad basic background for understanding options regarding acute pain management for physicians outside of anesthesiology.

Anatomy and Physiology of Pain

Pain is initiated when specialized nerves, called nociceptors, are activated in response to adverse chemical, thermal or mechanical stimulus.[2] Activation can be direct due to trauma or indirect via biochemical mediators released from damaged tissues and circulation. These mediators can further augment the pain process by up-regulating pain receptors[3] and recruiting additional surrounding nociceptors into activity. Mediators include, but are not limited to, prostaglandins, bradykinins, histamine, serotonin and arachidonic acid. The severity of the pain sensed is dependent on the number of receptors stimulated, the duration of the stimulus and the amount of mediators released locally.[2] Once the nociceptor is depolarized, a signal is sent from the periphery into the dorsal horn of the spinal cord, where pain signals are integrated to elicit spinal reflexes such as withdrawal of the affected area, muscle spasms, and to release additional mediators within adjacent spinal segments and relay information to higher cortical areas.[2,3]



Figure 1
Pain can be classified as acute or chronic, or in broad categories based on the origin of the injury or pain fibers.

Nociceptors are divided into two major nerve groups based on presence or absence of myelination. Myelinated A-delta fibers transmit the signal rapidly and are responsible for the initial sharp pain changing later to burning or soreness. Unmyelinated C fibers are relatively slower in speed and are associated with deep aching or throbbing types of pain that follows the initial sharp pain. Both types of pain fibers then cross the midline and stimulate the ascending pain fibers in the spinothalamic tract. Substance P is one of the key neurotranmitters relaying the pain signal from the periphery and the spinothalamic tract. Fibers in the spinothalamic tract terminate in the thalamus, limbus and brain stem.[2] Further information is transmitted to multiple cortical areas of the brain responsible for localization and pain perception. Descending pain fibers are in turn activated from the cerebral cortex via efferent pathway to the spinal cord and periphery[4] and act to decrease the intensity of the pain signal via encephalin, serotonin and gamma aminobutyric acid (GABA) neurotransmitters.[3]

In addition to pain perception, activation of the pain pathway causes the release of hormones and vasoactive substances such as cortisol, vasopressin, and catecholamines.[2] The release of these factors, referred to as the surgical stress response, peaks in the initial hours of the post-operative period. The stress response can cause hyperglycemia and impairment of immunological functions, as well as breakdown of fat and muscle.[2] Tissue trauma also causes release of vasoactive mediators which play a role in pain. Mast cells, platelets and plasma components contribute histamine, leukotrienes, and bradykinins.[5] Independently, the mediators further sensitize nociceptors, and activate additional cytokines that augment inflammation already present.

The autonomic nervous system can also be activated by pain. This occurs in large measure in the dorsal horn, and is responsible for the associated symptoms seen with pain such as nausea, sweating, alteration of heart rate and blood pressure.[6] An excellent example of autonomic activation associated with pain is angina, where myocardial pain is expressed with symptoms of nausea, sweating, in addition to chest pressure.

Classification of Pain

Pain can be classified as acute or chronic, or in broad categories based on the origin of the injury or pain fibers (See Figure 1). Somatic pain has nociceptors that originate in the peripheral tissues such as skin and muscle and allow more specific ability to localize the source.[7] Visceral pain originates in internal organs. These nociceptors are activated by actual tissue damage, or in the absence of damage, pressure and stretch of the organ. Visceral pain is not well localized and frequently the pain is referred to another area of the body.[4] This is due to somatic fibers in a separate anatomic location intermingling with visceral fibers within the dorsal column and stimulating the somatic fibers, thus causing pain to be felt in the undamaged somatic region. Neuropathic pain occurs with damage to a peripheral nerve, dorsal root, or anywhere in the central nervous system.[8] If pain is present it is described as a sharp or shooting pain found along the distribution of that nerve. Because the nerve itself is injured, it can continue to be abnormally activated, creating a hyper-excitable state within the central nervous system. Patients may have persistent or paroxysmal pain even in the absence of a painful stimulus.[8]

Quality /Outcomes

Management of pain has been linked to improved patient satisfaction, improved clinical outcomes, reduced number of clinical complications and an overall reduction in costs.[8] The acute pain process can be targeted at several critical junctures with different modalities. Traditionally, pain modification has been viewed mostly as a post-operative function in which opioids played the major role. The paradigm is shifting to an emphasis of pre-emptive pain control where the goal is to minimize or eliminate pain even before it begins and aggressive intervention after the initiation of pain. Pre-operative administration of anti-inflammatory medications, nerve blocks, and opioids are blended together to help reduce the perceived pain, degree of surgical stress, and decrease the release of biochemical mediators. By decreasing the overall intensity of pain perceived by the patient, less overall pain medications are used[11] resulting in an overall reduction in undesirable side effects and length of stay. Quality of care and patient outcomes are directly tied the ability to effectively treat pain.[12]

Opioids

Stemming from an unclear origin in ancient times, opioids have long been the gold standard for acute pain control. They act by binding presynaptic opioid receptors, which prevents release of substance P via membrane hyperpolarization, thereby preventing impulse propagation. The majority of opioid receptors are located in the central nervous system including the spinal cord; some are found peripherally.[3]

Three subtypes of opioid receptors are found in varying locations: μ,κ and δ. Stimulation of differing receptors accounts for the varying clinical effects of opioids. Opioids useful in the treatment of acute pain are almost exclusively μ receptor agonists. There are two subspecies, μ_1 and μ_2. Stimulation of the μ_1 receptor produces spinal and supraspinal analgesia, euphoria, miosis, bradycardia, hypothermia and urinary retention. Stimulation of μ_2 produces spinal analgesia, respiratory depression, physical dependence and constipation. Mu receptors are also the primary receptors for the endogenous opioid agonists, endorphins. The κ and δ receptors also cause both spinal and supraspinal analgesia and a mixture of the unwanted effects listed above, plus dysphoria, sedation and diuresis. They are also stimulated by endogenous dynorphins and enkephalins, respectively. The vast majority of opioid receptors are located in the CNS and agonists must therefore cross the blood brain barrier. Generally speaking, greater lipid solubility hastens onset and enhances potency. Opioids do not have a ceiling effect like acetaminophen and NSAIDS.[3] Thus, if enough agonist is administered, analgesia will occur, though untoward effects may occur first and prevent further administration. The individual response to any given dose is highly variable and must be carefully tailored, particularly in the elderly and opioid naïve. Through receptor up-regulation, tolerance to opioids develops after repeated doses. This occurs for both analgesic properties as well as most adverse effects save two: miosis and constipation.

In the postoperative period, opioids are administered commonly through intravenous patient controlled analgesia, or PCA. Although initially thought to reduce the overall opioid delivered in the immediate postoperative period, patients have been found to require equal amounts whether administered by a nurse or by PCA. The major advantages have been overall patient satisfaction, decreased sedation scores and a lesser impact on the nursing staff.[13] Successful use of PCA requires diligence in patient monitoring and pain assessment and a willingness of the house staff to tailor the settings to each patient's needs through the postoperative course.

Neuraxial analgesia

Although opioid analgesia is well established and effective, there are significant advantages to achieving analgesia without sedation and respiratory depression. Termination of nociception at the level of the spinal cord is one such technique. This may be achieved in either the subarachnoid or epidural spaces. Though continuous spinal catheters have a role in some obstetrical and surgical cases, the use of epidural analgesia is far more common in the United States.[19]

Continuous epidural infusion of local anesthetic and opioid provides superior analgesia when compared to most other techniques. Since opioid receptors are found in the substantia gelatinosa in the posterior spinal cord and these areas are anesthetized by an epidural infusion, far smaller anesthetic doses are required than when administered systemically thereby limiting unwanted effects. The solution infused into the epidural space spreads both rostrally and caudally, allowing exposure to spinal nerve roots at multiple spinal levels simultaneously. Most institutions offer a continuous infusion pump with the added

function of a patient controlled bolus, which can limit the basal infusion rate.

In addition to blocking sensory fibers of the dorsal spinal nerve roots, the paraspinal sympathetic chain is inevitably blocked. With loss of sympathetic tone to the vascular smooth muscle of the corresponding spinal levels blocked, hypotension may occur. This effect will be more pronounced with the degree of sympathectomy as well as with concomitant hypovolemia or cardiovascular disease.

Although some early studies showed decreases in major morbidity and even mortality with neuraxial techniques, more recent data do not support such advantages.[18] An epidural should still be considered for patients specifically at risk of respiratory depression or prolonged ventilation, or for surgical incisions that may prevent deep breathing such as sub-xiphoid and thoracotomy, or blunt trauma such as rib fractures. This approach may facilitate incentive spirometry thereby limiting respiratory complications.

Risks of placing an epidural catheter range from minor perturbation to devastating.[14] From most common to least common, they are hypotension, inadequate analgesia, post dural puncture headache, unintentional subarachnoid injection (total spinal), epidural hematoma and epidural abscess. Fortunately, severe complications are rare. To minimize risk, scrupulous sterile technique must be used, as well as attention to coagulopathy whether pathologic or iatrogenic. The abundance of anticoagulants presents an added challenge. The American Society of Regional Anesthesia has published guidelines with regard to the use of epidural procedures in the setting of anticoagulants (www.asra.com).

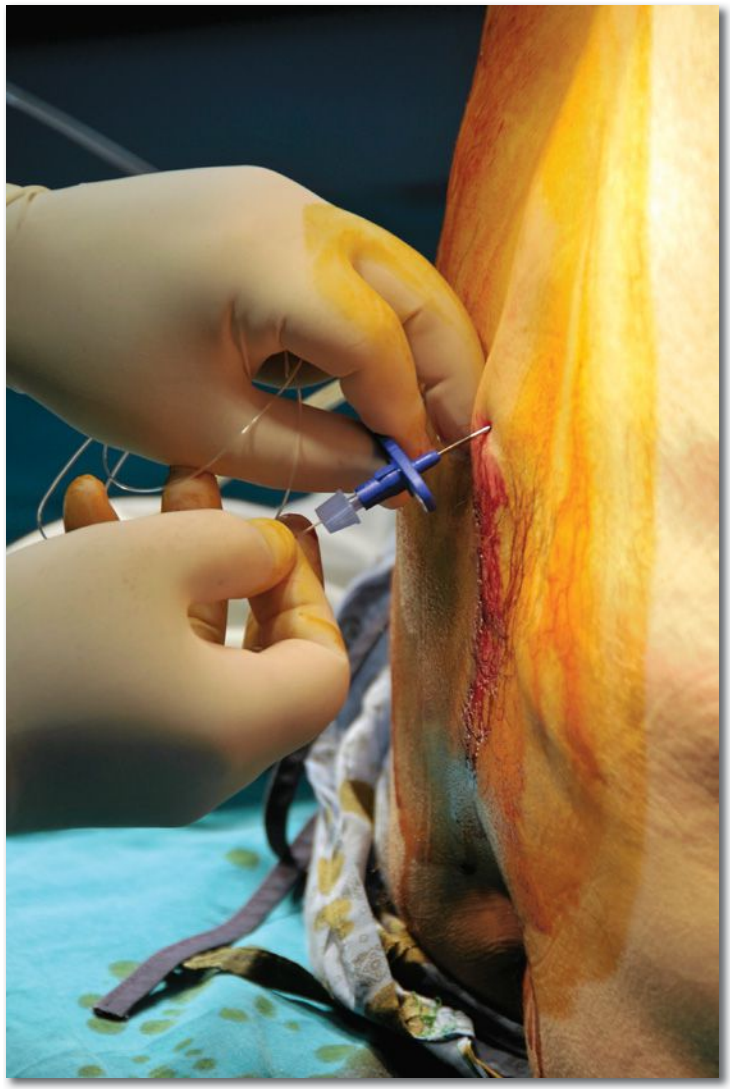


Figure 2:
Spinal anestesia epidural being administered.

Non-Opioid Adjuncts

Since inflammation plays an important role in the nociceptive pathway, non-steroidal anti-inflammatory drugs (NSAIDS) are an important part of the multimodal approach to analgesia. In addition, non-pharmaceutical therapies such as heat and ice can also be effective. Pain itself can also reciprocally fuel the inflammatory state, so-called neurogenic inflammation.[17] Neurogenic inflammation can itself produce the same physiologic effects as direct tissue injury. When tissues are disrupted, some of the phospholipid bilayer of the membrane is converted to arachadonic acid. The cyclooxygenase enzyme then converts arachadonic acid into prostaglandin, necessary for transduction of noxious stimuli to the nociceptor as well as neurosensitization of painful stimuli and subsequent hyperalgesia.[3]

The cyclooxygenase enzyme has two isoforms, COX-1 and COX-2, with very different physiologic effects.

Products of COX-1 sustain both platelet function and the gastric mucosal barrier whereas COX-2 affects the inflammatory cascade and pain.[15] Aspirin and most NSAIDS nonselectively blocks both isoforms, producing analgesia as well as potential adverse effects including coagulopathy, gastric ulceration and nephropathy. The hope that selective COX-2 inhibitors would produce analgesia alone has not been supported by clinical data, and several of these compounds have been removed from use due to increased incidence of myocardial infarcts and cerebrovascular accidents. However, NSAIDS remain a valuable adjunct to opioids and local anesthetics in the treatment of acute pain and can reduce perioperative opioid requirements by up to 50%.[16]

Ketamine is a powerful analgesic with established opioid-sparing properties.[20] Its mechanism of action is complex but acts mainly as an antagonist of the N-methyl-D-aspartic acid (NMDA) receptor. Since it has no action at opioid receptors, it is devoid of respiratory depression at analgesic doses. There is also markedly less nausea and vomiting when compared to opioids. It's initial use as a general anesthetic was limited by psychotropic side effects such as hallucinations. Fortunately, these are rare at analgesic doses. Nystagmus is more likely but may not be bothersome to a patient in pain.

Peripheral Nerve blocks

One modality for the intervention of acute pain occurs in the periphery, at the level of the nociceptor. Local anesthetics can be used to prevent the depolarization of the nerve by blocking the sodium channel, thus preventing the pain signal's propagation from the periphery into the CNS[21] (See Figure 2). While all local anesthetics act via similar mechanisms, they vary in onset time, duration of action and potency. These medications have the benefit of completely eliminating or greatly reducing the amount of acute pain experienced. In experienced hands, these medications can be safely and reliably placed to maximize their benefits. Toxic side effects, while uncommon, are possible and depend mainly on location of injection and total dose of local anesthetic entering the circulatory system. Local anesthetics enter the circulation either via inadvertent intravascular injection or via absorption of local anesthetic injected into surrounding tissue. Intravascular complications affecting the central nervous and/or cardiovascular systems include life-threatening seizures and cardiovascular collapse with complete electrical conduction blockade of the heart.[22] The rate of absorption is site specific and may be decreased by adding vasoconstrictive agents such as epinephrine. Needle trauma, causing mechanical disruption or ischemia of the nerve resulting in temporary or permanent nerve damage, is theorized to expose the nerve to high concentrations of local anesthetic resulting in nerve damage due to ischemia or chemical exposure.[23]

Past and current surgical practice included blocking initial pain signals by infiltration with local anesthetics. Infiltrated local anesthetic has both anti-inflammatory effect as well as ability to block nerve transmission.[23] To achieve sensory blockade, nerves innervating an area proximal to the trauma site are targeted to interrupt the pain pathway prior to the central nervous system. Nerve blocks have become more common, including "single-shot" and catheter techniques. Both involve injecting local anesthetic adjacent to the nerve. In the latter, a small catheter is placed through which additional local anesthetic can be delivered over an extended period of time. Nerve blocks can be performed proximal and adjacent to the spinal cord in nerve plexus or extend out to the distal terminal nerve. While specific blocks are beyond the scope of this review, each nerve block has unique risks and benefits, and even appropriately performed nerve blocks will have effects beyond blocking pain fibers. For instance, brachial plexus blocks can affect the nearby phrenic nerve, leading to a temporary elevated hemi-diaphragm and subjective shortness of breath until the local anesthetic affects resolve. Local anesthetics can also spread, causing deficits in motor, proprioception or temperature fibers, thus complicating early physical therapy.

Although orthopedic surgery is often associated with nerve blocks, general surgery and obstetrics utilize more nerve blocks for pain management. In some institutions, paravertebral blocks are being used in breast cancer surgery for post-operative pain control, with opioid use reduced by up to 40% when paravertebral blocks were utilized.[10] One study has shown pre-operative use of nerve blocks decreased the chances of developing chronic pain at the surgical site.[11] A randomized, controlled, double blinded study of patients undergoing major abdominal surgery who had transversus adbdominus plane blocks demonstrated improved recovery times, facilitated rehabilitation, decreased opioid requirements, and reduced overall postoperative morbidity.[12]

Ultrasound has facilitated the increased number and types of nerve blocks. With appropriate training, ultrasound allows rapid recognition of and placement of a needle adjacent to nerve tissues. Equally important is the visualization of the local anesthetic as it is injected to ensure it is being deposited in the appropriate location. While many practitioners can have success without utilizing the ultrasound for nerve blocks, its use is becoming commonplace. A meta-analysis of randomized controlled studies comparing the use of ultrasound to traditional methods demonstrated that ultrasound guidance reduces the time performing the block, shortens block onset time, and decreases the amount of time in performing the block.[24] Ultrasound blocks are less painful for patients because a nerve stimulator is not needed to confirm position in most instances[25], and fewer needle passes are needed when using ultrasound. However, most studies show no difference in complication rates when using ultrasound to perform blocks. Barriers most frequently cited against using the ultrasound include the cost of the equipment and the lack of training in using the technology.[25]

Summary

Acute pain derives from combined effects of stimulated nociceptors, local inflammation, systemic stress response mediators, and psychological factors. No one single treatment will intervene to treat each factor; rather, a combination of modalities should be utilized to reduce pain perception. Because of individual variation, acute pain management plans should be tailored for the needs of each patient. Follow-up and adaptation of the plan is necessary as different etiological factors will dominate at different stages of the acute pain process. The use of temporary interventions such as nerve blocks will need to be continued with other modalities that were initiated at the same time (opioids) or added later (anti-inflammatory agents) in order to optimize pain relief. Ultimately, the patient with improved acute pain management yields increased satisfaction, reduced costs, decreased risk of chronic pain, and decreased overall morbidity.

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Disclosure

None reported.

MM

Infectious Spondylodiscitis: Diagnosis and Treatment

by Michael H. Amini, MD & Gary A. Salzman, MD

MRI is highly sensitive and much more specific than other imaging modalities and provides much better visualization of soft tissues.



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Abstract

Infectious spondylodiscitis presents a diagnostic conundrum, and establishing the diagnosis often requires expensive testing and workup. But because of the potentially irreversible neurologic consequences and the great expense and time required to adequately treat this rare infection, establishing a diagnosis is paramount. Below, we present a representative case from clinical practice and examine the prevalence of certain signs and symptoms and the utility of various diagnostic modalities health care providers can use to accurately diagnose afflicted patients and avoid disastrous complications.

Representative Case

VS is a 52-year-old male who presented to the Internal Medicine service for a two-week history of gradually increasing axial low back pain that was worse with standing and physical activity. He described the pain as sharp in nature, and stated that his activities of daily living (ADLs) were impaired by pain. He denied any fevers or weight loss, bladder or bowel incontinence, urinary symptoms, radicular pain in his buttocks or legs, or weakness in his lower extremities. He had a past medical history significant for poorly controlled diabetes mellitus (as well as hypertension and chronic renal insufficiency not requiring dialysis). Of significant interest, he had undergone lumbar puncture for unrelated issues approximately six months prior.

On admission he was afebrile, with normal vital signs. Palpation and percussion of his back revealed point tenderness over his mid-lumbar spine. Neurological examination of his bilateral lower extremities revealed 5/5 strength and normal sensation, no clonus, downgoing Babinski, and 2+ patellar and achilles reflexes. His CBC did not show leukocytosis, left shift, or increase in any particular leukocyte cell lines, but his ESR was elevated at 122. His CT scan on presentation showed a destructive lesion in the L3-L4 disc space and both adjacent vertebrae.

The patient was subsequently admitted for spondylodiscitis, and blood cultures were drawn at that time. An MRI was then done to further image adjacent soft tissue and evaluate for the possibility of

an epidural abscess but did not reveal anything further than the results of the CT. Antibiotics were held for his first hospital day until we could obtain a CT-guided needle aspiration of the lesion to yield a microorganism. He was then started on IV Vancomycin for empiric coverage. Unfortunately, neither cultures of the lesion nor his blood grew any organisms.

After he showed clinical and improvement, the patient was subsequently discharged home with a six-week course of IV Vancomycin for empiric coverage of MRSA, as staphylococcal species represent the largest percentage of identified organisms in patients with spondylodiscitis and because 75% of *s. aureus* isolates in our institution are methicillin resistant.

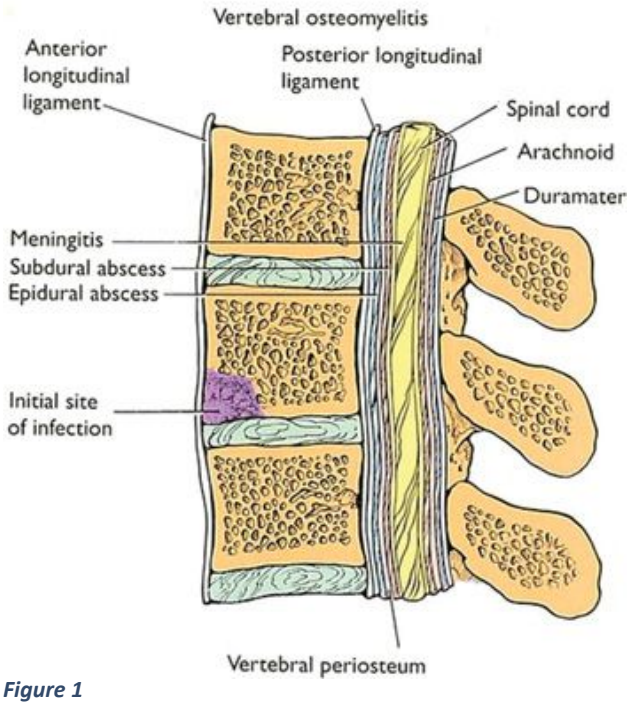


Figure 1

Spondylodiscitis- an infection of both the intervertebral disc and the adjacent vertebrae.

Pathogenesis

It is important to note that truly isolated "discitis" and "spinal osteomyelitis" most likely represent different stages and levels of progression of spondylodiscitis- an infection of both the intervertebral disc and the adjacent vertebrae[1] (See Figure 1). The disease begins after inoculation of the spinal column by three distinct routes: a) Direct contamination by penetrating trauma or spinal surgery b) Contiguous spread from adjacent soft tissue infection or c) Hematogenous spread from a distant source of infection.[2-4]

Careful elicitation of the patients history will reveal any recent sources of direct contamination such as lumbar puncture, discography, corticosteroid injection, epidural injection or catheterization, vertebroplasty/ kyphoplasty, and of course recent spinal surgery.[4]

Patients who manifest disease from contiguous spread will often have clinically or radiographically evident nearby infections such as cellulitis, soft tissue infection, recent rectal surgery, or adjacent upper urinary tract infection.[1,2,4,5]

Because it is both the most common and arguably the least evident cause, a more in-depth search is needed to reveal a distant source of hematogenous spread of microorganisms, such as distant cellulitis, genitourinary tract infection, infected intravenous catheters, bacteremia, endocarditis of both native and mechanical prosthetic heart valves, diverticulitis, or even from normal oral flora after dental procedures or tooth brushing. In fact any true, or even transient, bacteremia may provide the nidus for infection.[1-4, 6]

In cases of hematogenous spread, the sludging of blood flow that occurs in the metaphyses of the vertebral bodies near the end plates provide a great opportunity for bacteria to seed and subsequently develop infection.[1,4,6,7]

Patient Demographics and Predisposing Factors

Though the reported rates of certain predisposing factors are often limited by the relatively small sample size of many of the trials, certain reproducible general principles are important to keep in mind in the clinical setting. Men are more likely to develop spondylodiscitis, with some authors citing a 1.5-3:1 preponderance of males.[1, 2, 5, 7-10] Age is another important predisposing factor, as it is for many infections. Some authors report that 75% of patients with hematogenous spondylodiscitis are older than 50-65 years of age.[1-3, 5, 7-11] Diabetes mellitus and its resultant immunosuppression are present in 18-66% of afflicted patients.[1-5, 10] Other immuno-suppressed conditions are common as well; some reports cite coexisting cancer in 25% of patients. One should look for chronic steroid use, anti-rheumatic medications,

or other potential causes of immunosuppression. Intravenous drug abusers are more predisposed to developing spondylodiscitis because of frequent transient bacteremia.[1-4]

Two additional predisposing factors must be sought out by the physician: a) A history of recent injury or trauma (even non-penetrating). The theoretical explanation is that any vertebral injury causes an increase in local vascularity and fosters hematogenous spread to vertebral bodies. b) A history of a recent invasive procedure. Any GU or oral manipulation, IV injection or insertion of peripheral or central lines, non-spinal surgery, etc. may cause a transient bacteremia that may seed the vertebrae.[1-4, 11]

Symptoms: Fever, Back Pain, Spinal Cord or Nerve Compression

Fever

Like many other slowly progressive infections, fever is poorly sensitive for spondylodiscitis. Many studies have verified that fever is present in only 52-68%, though the latter number comes from a study that considered "fever" as greater than 37.5 degrees celcius, rather than 38.0 (Hopkinson). The absence of fever should not dissuade the healthcare provider from considering and appropriately working up spondylodiscitis.[2,11,12]

Back Pain

Focal back pain, especially in the lumbar region, is the *single* most common physical exam finding in patients with spondylodiscitis, present in >90% of patients.[2,3,11] Often they exhibit point tenderness or pain upon percussion of affected vertebral bodies. The length of symptoms is often very important in this disease because most patients present with a subacute or chronic length of duration. Though this disease does represent a true osteomyelitis, its progression is often slower than osteomyelitis found elsewhere. One study found that the mean duration of symptoms at the time of diagnosis in 64 patients was 48 days with a large range of $\pm$ 40 days.[2]

Spinal cord or Nerve Compression

Studies report an incidence of neurological compression in 33-59% of patients. This most commonly is apparent as radicular compression with consequent uni- or bi-lateral weakness, parasthesias, or paralysis. Neurological symptoms should raise the clinician's suspicion of mass effect from an abscess in the epidural space. The prevalence of abscess formation is varying, but cited in the literature as 35-74%.[2,5,11] A study from a neurosurgical unit reported abscess formation in 74% of patients, but obtained a CT or MRI in less than 80% of the total patients, but did so routinely in all patients with neurological symptoms.

Though likely not representative of patients in a primary care setting, one study from a neurosurgical unit demonstrates the seriousness of neurological sequellae with abscess formation: 63% of patients (17 of 27) had significant neurological findings on admission (13 with paraparesis, 1 hemiparesis, 2 tetraparesis); all of these had abscess formation with spinal cord compression.[5] Another study by Kapeller[11] et al. showed that 59% presented with signs of radicular compression, and 29% with cord compression.

Laboratory: Leukocytosis, Erythrocyte Sedimentation Rate (ESR), Blood Cultures

Leukocytosis

The same principle holds true here as it does for the presence of fever. Often times, far too much stake is placed in the presence or absence of an elevated white blood cell count, despite that only 36-61% of patients with spondylodiscitis present with Leukocytosis.[2, 5, 11] It is worth noting that leukocytosis is more common in patients with MRI confirmed abscess formation.

Erythrocyte Sedimentation Rate

Many studies have shown that an elevated ESR is present in 76->80% of patients with spondylodiscitis.[2,4,5,11] Although its sensitivity is not optimal and its specificity is certainly questionable, this does confer a good negative predictive value for normal results. For this reason, it is often used as a low-cost screening tool for spondylodiscitis.

Ninety-one percent of patients have an ESR >50 and 63% of patients had an ESR >100. And like the finding of leukocytosis, an elevated ESR is far more common in patients with epidural abscess formation (35 of 35 patients, in one study).[3] It's use also extends beyond that of diagnosis: it can be followed serially to evaluate response to antibiotics and improvement, particularly in those patients with no isolated organism who were given empiric antimicrobial therapy.[13-15]

Blood Cultures

Though hematogenous dissemination is the most common source of infection, blood cultures are frequently negative. It is important to remember that a transient

bacteremia, not overt bacteremia, is often the culprit in seeding the vertebrae. Most sources report the prevalence of positive blood cultures to be 55-75%.[1-3] Though not ideal for establishing the diagnosis, it should be performed routinely as it may guide antibiotic therapy.

Imaging: X-Ray, CT Scan, Radionuclide Imaging, MRI

X-Ray

Radiographs, though helpful, have limited utility in this clinical disease because of the delay in appearance of characteristic findings. When present, a destructive lesion involving two adjacent vertebrae with collapse of the vertebral bodies and the intervening disc is highly suggestive of spondylodiscitis. Other findings include end plate irregularity, defects of the subchondral portion of the end plate, and hypertrophic/sclerotic bone formation. And since it may clinically be evident as isolated osteomyelitis, involvement of an isolated vertebra is possible; this may falsely appear merely as a vertebral compression fracture. Initial findings are not present for the first two to three weeks of symptoms and will thus provide false negative results.[4,17,18] Suggestive radiographs are only present in only one-third of patients.[3]

CT Scan

Most authors agree that CT provides little benefit over other imaging modalities (MRI or bone scintigraphy) in this disease process, and is primarily used in guidance for biopsy.[4] CT is suggestive of the diagnosis in two-thirds to three-fourths of the time. In chronically afflicted patients, CT scans are nearly as sensitive as MRI scans, but are much less so in acute diseases.[3, 7, 18, 19]

Additionally, because of the widely accepted inferiority of CT scans in identifying soft tissue abnormalities, they have a poorer sensitivity in detecting epidural abscess formation.[19] In patients with neurological symptoms, MRI is necessary.

Radionuclide Imaging

Bone scans are one of the most sensitive tests in detecting patients with spondylodiscitis. Multiple reports cite sensitivity of 90-95%. Despite the excellent sensitivity, the downfall to this approach is the poor specificity of this imaging modality. Bone scans are positive for multiple other reasons, many of which can mimic spondylodiscitis radiographically and clinically: compression fracture, neoplasm, advanced degenerative disk disease, etc. In addition, they are unable to detect abscesses. Bone scans are largely reserved for patients who are unable to undergo MRI because of pacemakers or metal artifact from adjacent hardware.[3,5]

MRI

MRI has largely become the imaging modality of choice in patients who are able to undergo the procedure. Characteristic findings include decreased signal intensity and loss of height in vertebral bodies and intervertebral discs on T1 images, and increased signal intensity in the discs on T2 images, though increase signaling in the vertebrae is common as well. With contrast enhancement, the involved vertebrae and the disc both enhance; if ring enhancement is seen in the epidural or paraspinal space, this indicates abscess formation.

MRI has supplanted other imaging modalities for a multitude of reasons. First of all, its sensitivity is superior to most other imaging modalities and at least equivalent to bone scans. One of the largest case series, of 103 patients, reported a sensitivity of 91% in patients with symptoms less than two weeks, and a sensitivity of 96% in those with symptoms longer than two weeks.[14] Additionally, multiple sources[3,4,9,14,19,20,25] have pointed out that MRI is greatly superior to other imaging techniques in providing detail of the soft tissues, allowing detection of epidural abscesses, which is principally important in those with neurological symptoms. Though CT scans may provide some soft tissue detail, particularly if performed with contrast, they are poorly sensitive in the acute phase. And though they may be the most sensitive technique, bone scans cannot provide information on the status of soft tissues nor can they differentiate from other differential diagnoses.

Direct Isolation of Organisms:

CT-Guided Biopsy/Aspiration

Though this technique may be fruitless from a microbiological standpoint, it is still of critical importance. The utility of obtaining a tissue specimen is two-fold: culture and histology:

Culture

The cited rate of isolating an organism from culture varies according to source, with most authors reporting 50% to 75%.[1,4,5,7,8,21-23] Even in experimentally inoculated sheep, all of which developed clinical infection, the yield rate of culture was only 37.5%, with most positive cultures coming from weak growth in broth medium only.[24] Multiple studies confirm that biopsies performed before initiation

of antibiotics yield a causative organism near 75-80% of the time, while biopsies performed after initiation of antibiotics yield a causative microorganism near 50% of the time.[22]

Histology

This modality is highly sensitive in detecting the presence or absence of spondylodiscitis but fails in addressing the causative organism and may also be suggestive of spondylodiscitis in patients who do not truly have the disease. Classic histologic findings include bone marrow fibrosis, plasma cell and lymphocyte infiltration, and vascular proliferation. Multiple studies report the sensitivity of histology between 81% and 90% and the specificity between 75% and 100%.[7,8,21]

Using both pathologic examination and culture of the biopsy greatly improves the yield in establishing the diagnosis. Either histology or culture is positive in 95% of patients with spondylodiscitis, and histology and culture are positive in 78% of patients.[7, 8, 21]

Summary

Establishing the diagnosis of spondylodiscitis is often difficult to do and is frequently done on presumptive evidence. In patients with suspected spondylodiscitis, one should of course begin with a thorough history and physical exam, specifically seeking out the course of illness, predisposing conditions, and any history of "invasive" procedures that may have led to transient bacteremia. A careful neurologic examination is paramount, as compression from an abscess may lead to irreversible damage. It is important to remember that the absence of fever, leukocytosis, and positive blood cultures does not rule out the diagnosis. An elevated ESR is one of the most sensitive indicators of an infectious process, but can be elevated for other reasons as well.

When considering imaging, plain films may suggest the diagnosis, and bone scans and CT scans are very sensitive. Unfortunately bone scans are highly non-specific and CT scans do not show adequate soft tissue detail. MRI is highly sensitive and much more specific than other imaging modalities and moreover provides much better visualization of soft tissues; as such, all patients with neurological symptoms should undergo an MRI.

Patients should undergo CT-guided biopsy of suspicious spinal lesions. Histological examination of specimens is a sensitive measure, and though the yield of culture is suboptimal, attempting to isolate a causal organism is a necessity in guiding antimicrobial therapy.

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None reported.

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