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Orthopedics This Week

WEEK IN REVIEW

BREAKING NEWS

For all news that is ortho, read on.

Orthopedic Power Rankings

Robin Young's Entirely Subjective Ordering of Public Orthopedic Companies

THIS WEEK: Deflation—lower prices caused by a decline in money supply—is not a global threat, it's a reality. Orthopedics has been deflating for years. Now it is global and institutionalized. Last week the Germans issued a 10-year bond with a negative yield. Why would anybody in his right mind buy a bond with a *negative* yield? Deflation. If prices decline 2% and you get a 1% negative yield, you still have a 1% positive return. It's the German central bank's concession to the reality of global deflation.

RANK	LAST WEEK	COMPANY	TTM OP MARGIN	30-DAY PRICE CHANGE	COMMENT
1	1	Stryker	22.78%	(0.45%)	There is a stampede to quality occurring in this market. As a sector, orthopedics is a very attractive place to park $$.
2	2	Smith & Nephew	20.19	(0.06)	The large, integrated ortho firms like SNN are benefitting from the global move to safe havens.
3	3	Integra LifeSciences	13.74	1.34	The one exception to the move to higher equity ground is the turnaround stories like IART and CNMD. At their core, these are cash flow stories.
4	6	Johnson & Johnson	28.44	0.62	The granddaddy safe-haven stock is JNJ with a 3.19% cash dividend yield and 56 consecutive years of rising dividend payouts. Safer than many corporate bonds.
5	5	Exactech	10.26	(8.18)	Small/micro-cap stocks are so vulnerable in these markets. Fundamentals are not driving prices at this stage.
6	9	Medtronic	27.92	(0.59)	Medtronic Spine is clearly outperforming and beginning to recover share. The game plan this management created and executed should a case study.
7	8	Zimmer Biomet	30.35	(6.26)	ZBH is so, so oversold. This is a money machine. Every $1 in sales generates 30 cents in profits. And it is the 2nd cheapest orthopedic equity.
8	7	Orthofix	2.35	(8.54)	If Brad Mason and his team can deliver on the coming quarters, OFIX will prove to have been oversold at these levels.
9	10	RTI Biologics	7.50	(9.95)	It's not a good market to be a small/microcap equity. But the traditional end of the year small cap bounce is only a few weeks away.
10	4	Xtant Medical	(16.41)	(15.07)	Given CEO Goldberg's track record of outperforming sales and earnings growth, the next 12 months should be very interesting.

Robin Young's Orthopedic Universe

TOP PERFORMERS LAST 30 DAYS

	COMPANY	SYMBOL	PRICE	MKT CAP	30-DAY CHG
1	MicroPort Scientific	853	$0.41	$583	13.21%
2	SeaSpine Holdings	SPNE	$15.65	$174	3.37%
3	CryoLife	CRY	$10.04	$298	1.83%
4	MiMedx Group	MDXG	$9.72	$1,059	1.46%
5	Integra LifeSciences	IART	$61.05	$2,226	1.34%
6	Johnson & Johnson	JNJ	$93.93	$260,102	0.62%
7	Smith & Nephew	SNN	$35.28	$15,787	-0.06%
8	Stryker	SYK	$96.46	$36,323	-0.45%
9	Medtronic	MDT	$71.13	$100,550	-0.59%
10	NuVasive	NUVA	$50.54	$2,473	-3.09%

WORST PERFORMERS LAST 30 DAYS

	COMPANY	SYMBOL	PRICE	MKT CAP	30-DAY CHG
1	Alphatec Holdings	ATEC	$0.31	$31	-45.60%
2	Xtant Medical Hld	BONE	$3.10	$36	-15.07%
3	TiGenix	TIG.BR	$1.08	$181	-14.32%
4	Aurora Spine	ASG	$0.19	$4	-11.83%
5	Wright Medical	WMGI	$21.17	$2,202	-11.39%
6	Globus Medical	GMED	$21.39	$2,033	-10.58%
7	RTI Biologics Inc	RTIX	$5.61	$323	-9.95%
8	Orthofix	OFIX	$34.05	$642	-8.54%
9	Exactech	EXAC	$17.63	$248	-8.18%
10	K2M Group Holdings	KTWO	$19.55	$808	-7.35%

LOWEST PRICE / EARNINGS RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	P/E
1	Exactech	EXAC	$17.63	$248	15.74
2	Johnson & Johnson	JNJ	$93.93	$260,102	15.95
3	Globus Medical	GMED	$21.39	$2,033	16.46
4	Zimmer Biomet	ZBH	$95.27	$19,375	17.32
5	Stryker	SYK	$96.46	$36,323	21.43

HIGHEST PRICE / EARNINGS RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	P/E
1	CryoLife	CRY	$10.04	$298	83.95
2	NuVasive	NUVA	$50.54	$2,473	80.71
3	MiMedx Group	MDXG	$9.72	$1,059	64.80
4	RTI Biologics Inc	RTIX	$5.61	$323	32.47
5	Smith & Nephew	SNN	$35.28	$15,787	31.51

LOWEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

	COMPANY	SYMBOL	PRICE	MKT CAP	PEG
1	Globus Medical	GMED	$21.39	$2,033	1.35
2	Zimmer Biomet	ZBH	$95.27	$19,375	1.55
3	Exactech	EXAC	$17.63	$248	1.77
4	ConMed	CNMD	$48.70	$1,349	1.94
5	Smith & Nephew	SNN	$35.28	$15,787	2.05

HIGHEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

	COMPANY	SYMBOL	PRICE	MKT CAP	PEG
1	NuVasive	NUVA	$50.54	$2,473	5.43
2	MiMedx Group	MDXG	$9.72	$1,059	4.32
3	Medtronic	MDT	$71.13	$100,550	3.52
4	Johnson & Johnson	JNJ	$93.93	$260,102	3.22
5	CryoLife	CRY	$10.04	$298	2.80

LOWEST PRICE TO SALES RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	PSR
1	Alphatec Holdings	ATEC	$0.31	$31	0.15
2	Exactech	EXAC	$17.63	$248	1.00
3	Xtant Medical Hld	BONE	$3.10	$36	1.03
4	RTI Biologics Inc	RTIX	$5.61	$323	1.23
5	SeaSpine Holdings	SPNE	$15.65	$174	1.25

HIGHEST PRICE TO SALES RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	PSR
1	TiGenix	TIG.BR	$1.08	$181	28.85
2	MiMedx Group	MDXG	$9.72	$1,059	8.95
3	LDR Holding Corp.	LDRH	$35.79	$1,037	6.95
4	Wright Medical	WMGI	$21.17	$2,202	6.38
5	Medtronic	MDT	$71.13	$100,550	4.96

PSR: Aggregate current market capitalization divided by aggregate sales and the calculation excluded the companies for which sales figures are not available.

16 of the Top Foot and Ankle Surgeons in North America

BY ELIZABETH HOFHEINZ, M.P.H., M.ED.

Whether treating a calcaneal fracture or exploring it in the lab, these orthopedic foot and ankle surgeons are at the forefront of efforts to keep North America mobile and active. The 16 physicians here represent standout orthopedic surgeons dedicated to improving the daily lives of their patients. Those in the know about foot and ankle surgery gave us their thoughts on these top orthopedic specialty surgeons.

Here is that list. We don't have "the market" on lists…this isn't the be-all and end-all list—but it is ***a*** *list of the most impressive orthopedic foot and ankle surgeons in the country. The information in quotation marks is what the peers of these top doctors said about them.*

This information was obtained via a telephone survey of thought leaders in the field. No one at OTW names anyone to the list.

In alphabetical order, here are 16 of the top orthopedic foot and ankle surgeons in North America.

U.S. Navy photo by Journalist Seaman Erica Mater

Judith F. Baumhauer, M.D., M.P.H. is a professor in the department of Orthopaedic Surgery at the University of Rochester. She is a past president of the American Orthopaedic Foot and Ankle Society (AOFAS) and the American Board of Orthopaedic Surgery (ABOS). "Judy is a caring, skilled orthopaedic surgeon who is always on the leading edge of how innovations may be applied to daily care of patients. She has recently served as the primary investigator for an international multicenter study that has proven the efficacy and safety of a new hemi arthroplasty implant for treatment of metatarsal phalangeal arthritis."

Christopher P. Chiodo, M.D. is chief of the Foot and Ankle Surgery Service at Brigham and Women's Hospital. "He is a leading figure in researching foot and ankle disorders; he pursues this work with extreme care and thoughtfulness. He is also serving our field via his position on the editorial board of *Foot and Ankle International*."

Thomas O. Clanton, M.D. is director for Foot and Ankle Sports Medicine at the Steadman Clinic in Vail, Colorado, and is a past president of the AOFAS. "As an expert in foot and ankle and sports medicine, Tom maintains a thoughtful and effective approach to

the management of sports foot and ankle injuries. Tom's talents and clinical acumen continue to distinguish him as a respected authority and educator for treating athletes with foot and ankle injuries."

J. Chris Coetzee, M.D., Mb., ChB. is an orthopedic surgeon with Twin Cities Orthopedics in Minneapolis and clinical associate professor at the University of Minnesota Department of Orthopaedic Surgery. "He is considered one of the most talented surgeons in foot and ankle. His excellence in teaching from the podium and in the operating room have brought him international recognition. He is a critical thinker who brings efficiency and practicality into his roles as a leader, clinician and product designer."

Michael Coughlin, M.D. is an orthopedic surgeon with the Coughlin Foot and Ankle Clinic at St. Alphonsus Hospital in Boise, Idaho, and a clinical professor of orthopedic surgery at the University of California San Francisco. Dr. Coughlin is a past president of the AOFAS and the International Federation of Foot & Ankle Societies. "He is one of the acknowledged experts in the field of foot and ankle surgery. He is an adept clinician who has many years of experience supporting his wealth of knowledge, and he has been one of the principal editors of the most widely used textbooks on foot and ankle surgery. These characteristics along with his affable nature and creative abilities (having designed several widely used surgical techniques) make him one of the top foot and ankle surgeons in the country."

Timothy R. Daniels, M.D. is an associate professor of Surgery at the University of Toronto and head of orthopedic surgery at St. Michael's Hospital. He is also an associate scientist in the Keenan Research Centre of the Li Ka Shing Knowledge Institute of St. Michael's Hospital. "Tim is one of the best thinkers in our profession. Every time he stands up and presents a paper, one has to stop and listen. There will be pearls of wisdom that one can use every day. As such, he is one of the most respected teachers in our time."

Mark E. Easley, M.D. is an associate professor of Orthopaedic Surgery at Duke University Medical Center. He serves as one of the directors of the Duke Foot and Ankle Fellowship Program. He is the current president of the AOFAS. "He is a thoughtful, skilled orthopedic surgeon, teacher and leader in the orthopedic foot and ankle community. Mark has presented at numerous local national and international meetings where he has shared his clini-

cal skills with colleagues from all over the world."

Mark A. Glazebrook, M.D., FRCS(C), M.Sc., Ph.D. is an assistant professor of surgery in the division of orthopedics at Dalhousie University in Nova Scotia; he holds a cross appointment to the School of Biomedical Engineering. "Dr. Glazebrook has proven over the past few years to be the most innovative researcher in Canada. As part of the larger Canadian Orthopedic Foot and Ankle Society he and his co-workers throughout Canada created the most extensive database on ankle arthritis and the management of that in the world."

Jeffrey E. Johnson, M.D. is a professor of orthopedic surgery at Washington University School of Medicine in St. Louis. "He is adept with complicated cases, and knows how to break complex deformities into parts and address each part so that it is simplified. He has done innovative research on fusions and deformity correction."

Anish R. Kadakia, M.D. is an associate professor in the Department of Orthopaedic Surgery at Northwestern University Feinberg School of Medicine. "He has been the leader in research in ankle fractures. He has top notch knowledge and the highest dedication to resident education."

Florian Nickisch, M.D. is an associate professor in the Department of Orthopaedics at the University of Utah. "He has been the leader in forefoot surgeries. He is a great educator and compassionate doctor with high patient satisfaction. He always gives clear bulleted teaching points with case examples."

Salene G. Parekh, M.D., M.B.A. is an orthopedic surgeon with the North Carolina Orthopaedic Clinic and an associate professor of Surgery in the Department of Orthopaedic Surgery at Duke University. "Salene is a very busy and talented orthopedic surgeon who has the ability to use his clinical skills and ideas towards innovations in clinical care. Salene collaborates with surgeons and other colleagues to improve orthopedic care for patients through the development of surgical procedures and devices."

Phinit Phisitkul, M.D. is a clinical associate professor in the Department of Orthopedics and Rehabilitation. "He is rapidly developing into an academic leader in foot and ankle surgery publishing numerous articles in well-respected high impact orthopaedic journals. In a short time, he has made substantial contributions to the science and clinical knowledge of foot and ankle care in North America. He is active in the

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Marc R. Viscogliosi
marcv@vbllc.com

Anthony G. Viscogliosi
aviscogliosi@vbllc.com

John J. Viscogliosi
john@vbllc.com

505 Park Avenue
14th floor
New York, NY 10022
Telephone: (212) 583-9700
www.vbllc.com

AOFAS and has strong leadership potential at both the national and international levels."

Charles L. Saltzman, M.D. is chair of the Department of Orthopaedics at the University of Utah where he serves as the LS Peery Presidential Endowed Professor. He is a former president of the AOFAS and the International Federation of Foot and Ankle Societies and president of the Association of Bone and Joint Surgeons. "He is one of the most well rounded academic foot and ankle surgeons in leadership, science and technology. He has been an international leader in establishing methods and systems for performing outcomes research in foot and ankle. His publications have established the standard of excellence in clinical and basic science lower extremity studies. Among his many innovations are innovative methods, technologies and devices to perform joint replacement, fusions and reconstructions."

Lew C. Schon, M.D. is director of foot and ankle services at MedStar Union Memorial Hospital in Baltimore. He is also founder and director of the Orthobiologic Laboratory at that facility. Dr. Schon is a past president of the AOFAS. He is an associate professor of Orthopaedic Surgery and Biomedical Engineering at Johns Hopkins University School of Medicine and a clinical associate professor of Orthopaedic Surgery at Georgetown University School of Medicine. "Lew is very innovative with regard to surgical procedures, and approaches his cases with planning and precision. He has done impressive work with biologics as well, including pioneering basic science research that will contribute to advances in our field."

Bruce Sangeorzan, M.D. is a professor of Orthopaedics and Sports Medicine at the University of Washington in Seattle and director of the VA Center of Excellence in Limb Loss Prevention and Prosthetic Engineering. He is the immediate past president of the AOFAS. "He is an expert in foot and ankle, as well as trauma surgery. Bruce maintains a thoughtful and carefully structured approach to orthopaedic foot and ankle care that distinguishes him as a role model among his peers." ♦

Contrition and the "BMP Issue": NASS's Bono Speaks

BY WALTER EISNER

The long dark night of the Ethics Inquisition at the North American Spine Society (NASS) may be coming to an end.

In a remarkable admission by Chris Bono, M.D., the incoming president of the society, Bono says that "polarizing" events, like the "BMP issue" created a "noticeable rift" between NASS and other societies and some of its members.

Bono made the comment in an article written in the July/August edition of *SpineLine*.

Internecine Warfare

The reference to the BMP issue relates to the June 2011 *Spine Journal* Infuse article written by its Editor-in-Chief Eugene Carragee, M.D. Carragee alleged that some researchers were biased because of payments from Medtronic, plc, maker of the product.

Eugene Carragee, M.D. Editor-in-Chief, The Spine Journal

An independent Yale study funded by the company eventually determined that we were back where we were before *The Spine Journal's* assault on Infuse. Infuse works in certain patients and certain indications and not in others. And it is comparable to iliac crest bone graft (ICBG)—(the gold standard)—in its ability to stimulate bone growth.

Courtesy of Brigham and Women's Hospital and North American Spine Society

A review of payments to surgeons by the company showed that many of the payments were for unrelated patents and many took place after the research was conducted.

But the damage was done. Support from industry waned and a purge of surgeons with strong industry ties left the NASS board isolated and captive to a Groupthink mentality that sent the pendulum swinging hard to assuming collaborations between surgeons and industry were inherently suspect. The society added an "ethicist" to its board of directors.

Collaboration Damage

Medtronic received the message and sent back one of their own. At the 2013 annual society meeting there was no Medtronic sales booth. The company only had an open space with chairs, tables and sofas. There was no sales staff, but only personnel from the company's Office of Medical Affairs.

The ethics Inquisition didn't just stop with an article in *The Spine Journal* and an internal membership rift. With the assistance of NASS public relations staff, the information found its way into the national press and ultimately a U.S. Senate hearing led by Iowa Senator Chuck Grassley.

Grassley used *The Spine Journal's* words to paint a picture of unethical companies hiding evidence from regulators and paying surgeons to cook research evidence.

Gone Too Far

Slowly society leaders began to get the message. At an annual spine technology meeting held in Cabo, Mexico, in June 2015, NASS Executive Director Eric Muehlbauer told attendees that perhaps the society had gone too far in establishing and enforcing ethical standards. "Our ethics rules are con-

stantly evolving, so we take great care to assess whether or not the rules go too far in establishing and enforcing ethics standards."

Now the incoming president goes further.

In his *SpineLine* article, Bono says, "Let's get everything out in the open. NASS, as a society has some real work to do."

"Whether justified or not, past events have created a noticeable rift between NASS and other societies and some of its members. There has been a perception of uninhibited and full endorsement of polarizing events, like the 'BMP issue.' There have been allegations that NASS has actively blocked the approval or coding of new technologies. There has been a general sense that NASS is no longer a 'spine surgeon's society.' I have lived through all of these events. In fact, I can take some responsibility via involvement in some of these events. Taking the next (and most difficult) step, I can tell you that I can understand the reasoning behind each of these complaints."

Acknowledgment is the first step to recovery. Bono was Carragee's deputy at *The Spine Journal* when the charges were made.

"In the past, we have perhaps gone too far in keeping distance between our industry partners and society leadership. This has sent the wrong message." He said that by nature of NASS's pioneering disclosure and divestment policy, "an apparent wall had been placed between those 'with industry ties' and the inner workings of the society for fear of biased decisions."

That "apparent wall," was built by NASS leaders who publicly praised Carragee's courage and work. In his outgoing presidential address in 2012, NASS President Greg Przybylski, M.D. devoted a significant portion of his speech to address the controversies surrounding *The Spine Journal*.

NASS President Greg Przybylski, M.D. / Courtesy of jfkmc.org

Przybylski told attendees that there had been "a lot of controversy raised lately despite the fantastic accomplishments of *The Spine Journal*."

While acknowledging that the pendulum had swung too far, Bono stuck firm to the notion that the importance on Level 1 compliance (i.e., divestment) for board members and certain committee chairs is critical. This will not go away.

Time to Change

"As the first Coverage Committee Chair, what legs do I have to stand on when I am asking for reimbursement (or not) of a new technology on behalf of members? They are quite simple: evidence and unbiased impartiality. At the same time, should I not speak to industry representatives or surgeon innovators? Should I close my ears and eyes to the information they have to provide? Am I so insecure in my ability to discern information, whatever the source, that I should be exclusionary? My answer is, succinctly, no."

Bono wrote that he hears comments from, "NASS no longer supports surgeons," to "NASS is just a surgical society." That NASS is "so pro-industry it's disgusting," to "NASS has turned its back on industry."

Each of the, statements, according to Bono, "represents an extreme opinion founded in at least some reality. While here is not the place to discuss events in detail, I acknowledge this."

It's not only about surgeons, said Bono. "As much as our 'multidisciplinary' society boasts equal treatment of nonsurgical and surgical issues, there is a tendency (I hope unintentional) to address nonsurgical issues with less fervor. As the membership growth has been more from nonoperative practitioners, greater attention must be paid to making sure things are as equitable as possible."

Bono's Promise

But the society can move beyond the tumult by believing in NASS. He promises there will be no hidden agenda on his watch. He said the society won't support everything that "comes down the pike," but will also not be "wishy-washy, noncommittal" and only support something that has five high-quality randomized controlled trials.

Bono says the society has not "cowered away" from difficult issues (e.g.

percutaneous sacroiliac joint fusion.) "Instead we have confronted them, albeit not with a unilateral rubber stamp of approval but rather with a balanced approach to enable reasonable access to treatments."

He said a few years ago someone close to him and unhappy with NASS asked him why he stayed involved in NASS. "If you're not involved, you have NO influence. It means you're giving up." Bono didn't want to give up.

"It's easy for NASS to be perceived as all for the 'surgeons' or all for the 'non-operative' guys. Or as 'anti-industry' or an impedance to innovations. I am committed to listening to voices that have been inadvertently muted in years past."

"NASS," continued Bono, has become a "machine in many ways—for health policy, guideline development and advocacy. Our roots, however, have grown from the development of the science of health care. We need researchers within our leadership ranks, both physician and nonphysician, to help guide us along the road of true advancement of spine care."

Bono concluded that NASS can be considered guilty of making some decisions in a vacuum. "It's time to equalize to atmospheric pressure to make the best possible choices."

Chris Bono is a very smart guy. He was accepted into medical school in his senior year in high school and currently serves as chief of the Orthopedic Spine Service at Brigham and Women's Hospital in Boston.

He's got a lot of bridges to senior surgeons, industry and others to rebuild, and he's taken the first step. ♦

RBC's 5th Annual Extremities Survey Released

BY ROBIN YOUNG

The Royal Bank of Canada (RBC), the 5th largest investment bank in North America and one of the most respected research houses on Wall Street, issued its 5th annual survey of the extremities market last week. This survey of 57 U.S. surgeons focused primarily on upper extremities (shoulders).The survey, aimed at the Wall Street crowd, pulled in some interesting insights for both surgeons and companies who supply them. Here are five excerpts from that report that caught our attention.

Wikimedia Commons and Denkhenk

1. 65% of surveyed surgeons plan to increase their use of pre-operative planning software and patient specific cutting guides for shoulder replacement

Several manufacturers offer pre-operative planning software for shoulder replacement surgeries. And a growing number of manufacturers including Stryker Corporation and Blue Belt Technologies are offering smart, robotic tools which actually help guide the surgeon's movements for knee and hip surgery.

Can these smarter, more software driven tools—whether with motors attached or not—improve the quality of musculoskeletal procedures while reducing complication rates? Apparently the vast majority of extremity surgeons believe so.

The RBC survey found that nearly two-thirds of surveyed surgeons (approximately 65%) said they will be using pre-operative or intro-operative planning software for patient specific cutting guides in the coming year. As many as 11% of the surgeons said that they would use it on more than 40 procedures in the coming year. *(See graph on page 13.)*

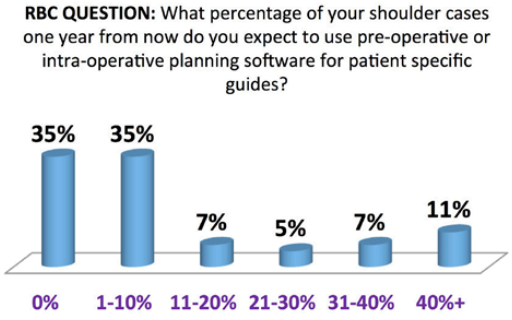
2. U.S. Surgeons remain undecided about pyrocarbon bearing surfaces for shoulder implants

Pyrolytic carbon surfaces promise better wear than other bearing surface materials in articulating implants. But U.S. surgeons remain undecided. Several journals have stepped into this knowledge gap and have accelerated their efforts to publish studies on these materials.

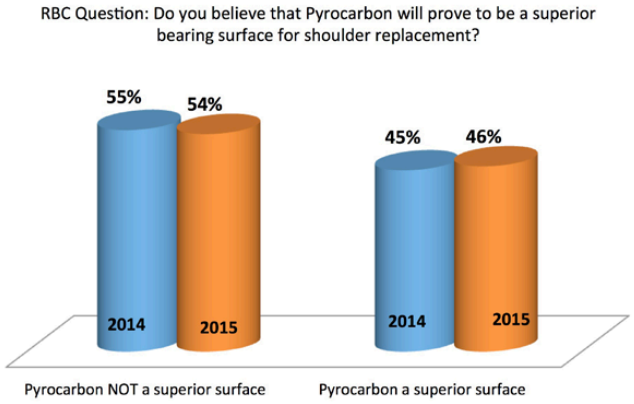
A retrospective review of 51 implants in 36 patients was undertaken by a group of researchers from Wrightington Hospital in the UK led by David R. Dickson, BSc, MBBS. They collected demographics, complications, further surgery, and implant revision data. The objective measures they employed were grip strength, range of motion, and radiological assessment of alignment, loosening, and subsidence. They also collected a subjective outcome measure—the Patient Evaluation Measure, Quick Disabilities of the Arm, Shoulder and Hand score, and visual analog scores (0, best; 10, worst) for appearance, satisfaction, and pain.

Their results were published in the August 2015 edition of the *Journal of Hand Surgery*. Average follow-up was 103 months (range, 60–172 months). The mean arc of motion was 54° (range, 20° to 80°).

Conclusions: No difference in grip strength between operated and nonsurgical side. Six implants were



RBC 2015 Extremity Surgeon Survey



RBC 2015 Extremity Surgeon Survey

revised, and three of these required additional surgery. The degree of loosening or subsidence did not correlate with outcome. Implant survival as assessed by Kaplan–Meier was 88% at 10 years. And the patients reported good pain relief, a functional range of motion, and high satisfaction.

So, at this stage in the commercialization of pyrocarbon implants for extremity surgery, the RBC survey found that 54% of the surgeons surveyed did not believe that this new bearing material would prove to be superior to other materials for shoulder replacements.

3. Stemless shoulders will grab 10-20% of shoulder procedures in five years

Earlier this year, Minnesota-based Tornier (soon to be acquired by Wright Medical Group, Inc.) introduced the first stemless shoulder implant in the U.S. Stemless shoulder systems have been available in Europe for years.

Since the original Neer humeral replacement in the 1950s, the standard primary anatomic total shoulder arthroplasty design has evolved slowly. Recently that evolution has been to shorten stems progressively in order to reduce the risk of stem-related complications. Several companies have developed and now market a stemless humeral arthroplasty component in Europe.

Of the stemless shoulder arthroplasty systems heading to U.S. surgeons, three are currently undergoing clinical trials in the U.S., of which, as we noted earlier, Tornier's Simpliciti, received FDA clearance earlier this year following the successful conclusion of its 2011 clinical trial.

Naples, Florida-based Arthrex, Inc.'s Eclipse clinical trial started in January 2013 and the company has stated that it hopes to complete the study in 2017.

The Biomet Nano clinical trial began in October 2013 and also has a tentative completion date of 2017. Results for stemless shoulder arthroplasty indicate clinical outcomes are similar to standard stemmed shoulder arthroplasty. Radiographic analysis indicates implant stability without migration or subsidence at two- to three-year minimum follow-up.

According to the RBC survey, surgeons are looking forward to this new Tornier implant. With more than 2,700 Simpliciti cases performed outside the U.S., there is good reason for excitement about stemless implants. So far 16% of the U.S. surgeons have been trained on the Simpliciti implant. And feedback is positive.

When surgeons were asked for what percentage of their patients would they consider using a stemless implant, the average answer was 20% within five years.

Expected Penetration of Stemless Shoulders as a Percent of All My Shoulder Procedures			
	One year from now	Two years from now	Five years from now
AVERAGE	10%	14%	20%
MEDIAN	5%	10%	15%

RBC 2015 Extremity Surgeon Survey

4. Patient specific instruments, planning software, new poly and stemless shoulders are technologies most likely to change practices in the next few years

To a large extent innovation in orthopedics is migrating toward reducing clinical errors, improving patient outcomes by lowering complication rates and, in effect, standardizing excellence even in the face of patient anatomical diversity.

Probably the predominant method that manufacturers are using to develop this avenue of innovation is a combination of new instrumentation, planning software, 3-D visualization software, and implant customization.

When RBC asked surgeons about their reaction to specific product lines, these trends in innovation were apparent in the rankings. Extremity surgeons are clearly excited about the innovations coming their way.

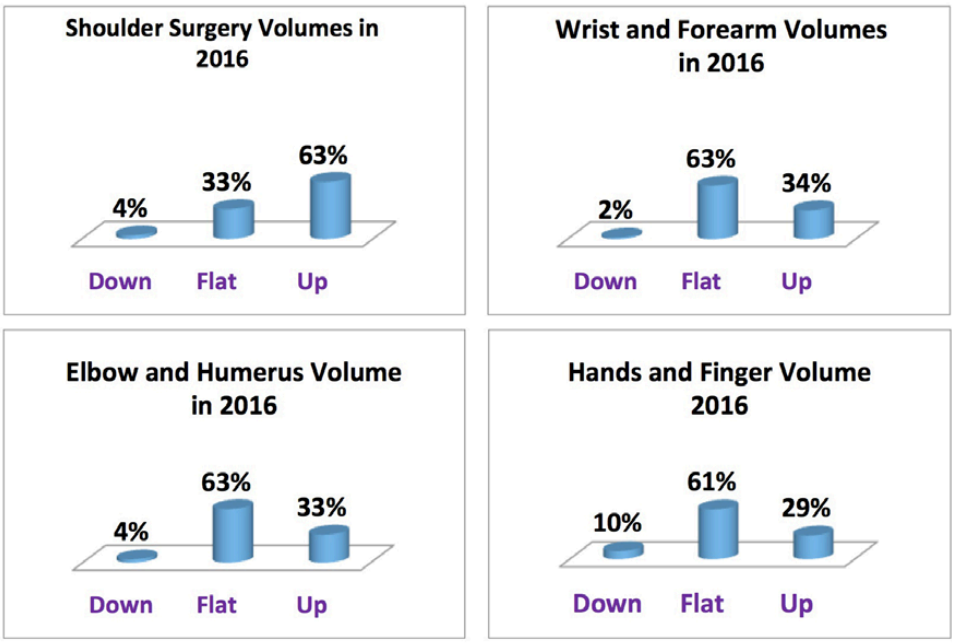
In what was probably the most interesting question in the survey, RBC asked surgeons about specific company products. Here, courtesy of RBC, is the result.

RBC 2015 Surgeon Extremity Survey

5. Surgery backlogs are growing in the U.S. and upper extremity surgeries should grow at high-single-digit year-over-year rates in 2015 and 2016

RBC's analysts, relying on data from Dalton Consulting in Warsaw, Indiana, are forecasting continued strong growth in sales of extremity products in the U.S. due to improved health care utilization; more surgeons trained on extremity procedures; innovative, new products which can expand the total market; and mix changes which can mitigate the effects of pricing pressure. As a result, RBC's analysts are modeling approximately 9% year-over-year sales growth in 2016. Forming the basis for such a strong forecast is the message from the surgeons themselves that backlogs are strong and likely to grow in 2016.

Thanks to RBC Capital Markets and specifically Glenn Novarro, Brandon Henry, CFA and George Santo for allowing *OTW* to use portions of the Fifth Annual RBC Extremity Surgeon Survey for this article. ♦



RBC 2015 Surgeon Extremity Survey

Massive Hopkins Study: Yoga Great for Arthritis // UVA Researchers Offer New Insights for Proper Tibial Tunnel Placement // Jonathan Mathers, M.D. Joins OrthoAtlanta

BY ELIZABETH HOFHEINZ, M.P.H., M.ED.

Largest-Ever Study Says: Yoga Eases Pain, Improves QOL for Arthritis Patients In the largest-ever randomized trial of yoga in sedentary adults with arthritis, researchers at Johns Hopkins have found that eight weeks of yoga modified for people with arthritis resulted in significant improvements in pain, energy, mood and mobility. This study was led by psychologist Susan J. Bartlett Ph.D., an associate professor at Johns Hopkins (now at McGill University). Co-investigators included Clifton Bingham III, M.D., a rheumatologist, associate professor at Hopkins and director of the Arthritis Center, and Steffany Haaz Moonaz Ph.D., a yoga therapist now at Maryland University of Integrative Health.

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Dr. Bingham told *OTW*, "Many of my patients had asked whether yoga could help them, and until this study, I did not know for sure. We weren't sure if yoga was realistic for people with arthritis, and whether we could develop a yoga program that was respectful of individual limitations. We began by identifying concerns for specific joints that were injured or weakened by arthritis. We essentially deconstructed common poses and looked at how they impacted shoulders, hands and wrist, knees, ankles and feet. Next, we reviewed modifications that might be required. These patients were not in a typical yoga class at the local gym; each person received an individualized assessment and modifications developed with the research team, which included rheumatologists."

Dr. Bartlett reported, "Our first concern was safety. None of the patients experienced yoga-related events during the study, including arthritis flares."

Dr. Bingham added, "As a rheumatologist, I was concerned some patients might try to push too hard. Instead, they told me that with yoga, they were much more comfortable with their bodies and aware of their limitations."

Said Bartlett, "Our second interest was impact. We looked at how yoga affected physical function, fitness, mood, and quality of life. We found doing yoga was associated with about a 20% improvement in physical health—much less difficulty with physical aspects of work, home, other activities, with similar improvements in pain, energy, and mood."

The team has also created a checklist of considerations for doctors for their patients interested in trying yoga. Dr. Bingham noted, "It's important to talk about possible modifications and hazards of certain poses. For instance, with hip replacement, the surgical approach (anterior or posterior) has implications for the poses they should avoid. We recommend gentle, integral, prenatal yoga, chair, and other programs for people with limitations."

Dr. Moonaz commented to *OTW*, "Yoga is best learned under the guidance and supervision of an experienced yoga teacher or therapist familiar with arthritis. Videos can facilitate home practice between classes once an individual learns safe and appropriate modifications. People with arthritis should arrive before the class to talk with the teacher about their condition, any movement

limitations, doctor recommendations, and concerns they have."

Bartlett concluded, "Arthritis patients need to remain active to live a full life and manage their disease. Now we have good evidence that suggests yoga—modified to fit individual needs and limitations—can be a safe, effective way to improve pain, mood, and quality of life."

For additional information concerning the yoga program and modified poses please see: http://www.hopkinsarthritis.org/patient-corner/disease-management/yoga-for-arthritis/

UV Research Offers Tibial Tunnel Placement Suggestions Where should that pesky anterior cruciate ligament (ACL) tibial tunnel go? "The issue of anatomic femoral tunnel placement has largely been settled," said Mark Miller, M.D., the S. Ward Casscells Professor of Orthopaedic Surgery at the University of Virginia, to *OTW*. "Now, researchers are turning their attention to establishing the same degree of certainty for placement of the tibial tunnel. Since 1994, most of us have used the posterior border of the anterior horn of the lateral meniscus as a landmark for tibial tunnel guide pin placement. Newer studies indicate that it is biomechanically, and perhaps clinically superior to have the graft more anterior. There are those, however, who advocate for posterior placement because of the risk of roof impingement."

"We undertook a matched pair cadaveric study with six specimens in each group (anatomic and trans-tibial). None of the grafts impinged when using an anatomic (independently drilled) femoral tunnel; however four of the six grafts impinged with trans-tibial femoral tunnel positioning. When I presented the findings at the Herodicus and the ISAKOS (International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine) meetings, they were well received. People did ask, 'So where do we put the tibial tunnel?' We don't have the answer yet, but we are now on to the next phase of our work, which will hopefully shed light on this."

"Our new study—a randomized controlled trial—is underway, and compares anterior versus a more posterior tibial tunnel placement. We have enrolled six patients and are aiming for a total of 100 in each group. We are taking intraoperative fluoroscopic images at the time of pin placement; we put two guide pins in place, take a lateral image; and then measure the anterior-

posterior distance. After placement of both pins, we open the randomized envelope to determine which location to over drill."

"The bottom line is that most people have been using an artificial landmark for the tibial tunnel, and this does not yield a consistent A-P [anterior-posterior] distance on lateral radiographs. At this point, we know that we can safely move the tunnel more anteriorly, but we don't know if that will yield the best results."

Jonathan Mathers, M.D. Joins OrthoAtlanta M. Jonathan Mathers, M.D. has joined the team at OrthoAtlanta, bringing with him 10 years of experience in orthopedic surgery and sports medicine. Dr. Mathers holds a special interest in advanced arthroscopic surgery for rotator cuff and ACL tears. He also has expertise in fracture care and work related injuries.

Dr. Mathers earned his medical degree at Georgetown University School of Medicine, during which time he was a fellow at the National Institutes of Health. Dr. Mathers completed his orthopedic surgery residency at Greenville Hospital System University Medical Center and Shriners' Hospital in Greenville, South Carolina. He completed his sports medicine fellowship training at Baylor University School of Medicine in Houston Texas, including advanced training in arthroscopic shoulder and knee surgery. Dr. Mathers also holds an undergraduate degree in Biomedical Engineering from Duke University. Dr. Mathers gained experience in the treatment of collegiate and professional athletes as an assistant team physician for the Houston Astros, Houston Texans and University of Houston Cougars.

Dr. Mathers told *OTW*, "My first priority is to become an integral part of the OrthoAtlanta team of great physicians and staff. I not only look forward to bringing my own relationships with other providers and the community into the practice but also forging new connections. Ultimately, I will strive to earn the trust and privilege of taking care of patients in this community by helping them make well informed decisions regarding their care." ♦

COMPANY

FTC Clears Wright Medical and Tornier Merger

Wright Medical Group, Inc. and Tornier NV's $3.3 billion merger announced a year ago will cost them an ankle and toe.

The companies announced on September 30, 2015 that the Federal Trade Commission (FTC) approved the deal on condition that Tornier's U.S. right and assets related to total ankle replacements and total silastic toe joint replacements used to treat arthritis, are sold. The assets will be sold to Integra LifeSciences Holding Corporation.

In an 8-K filing on October 1, 2015, Wright Medical disclosed that is has asked the SEC to delist its common stock from the *NASDAQ Global Select Market*.

Reverse Merger

As a result of the merger, a change in control of Wright occurred and the surviving entity of the merger, Wright, became an indirect, wholly owned subsidiary of Tornier, which was renamed "Wright Medical Group, N.V."

Former Wright stockholders own approximately 52% of Wright N.V. on a fully diluted basis and former Tornier shareholders own approximately 48% of Wright N.V. on a fully diluted basis.

All of the current directors of the Wright board of directors resigned from their directorships of Wright Medical. Gary Blackford, John Miclot, Robert Palmisano, Amy Paul and David Stevens will continue as directors of Wright Medical Group N.V.

Girin and Senner Agreements

Wright entered into letter agreements with Pascal Girin and Jason Senner, executive officers of Wright, in connection with their previously disclosed planned departure from the combined company. Under the agreements Girin and Senner will remain employed by Wright until December 1, 2015 and December 31, 2015, respectively. In the meantime, each will continue to receive his base salary and will continue to be eligible to participate in the employee benefit plans.

Wright agreed to provide Girin and Senner with certain severance payments.

Girin's agreement says that if he has not accepted full-time employment or a full-time engagement as an independent contractor for a company other than Wright, or has not otherwise engaged his own business on a full-time basis, Wright agrees to enter into a consulting agreement with him.

The consulting agreement provides that Girin will provide services for Wright, until June 1, 2016. Girin will be entitled to receive a monthly consulting fee equal to the monthly base salary he received immediately prior to the effective date of the consulting agreement.

Leading Extremities Company

BMO Capital Market analyst, Joanne Wuensch, said the deal creates a "leading extremities company, doubling the revenue base, with management commentary for revenue growth in the mid-teens and a pathway to positive EBITDA (having targeted $40-45 million in cost-cutting opportunities), while leveraging the two franchises and headquartered in the Netherlands. It also does not preclude the combined asset from being acquired at another date in the future, given that it now has critical mass."

Long live Wright N.V. — *WE*

Courtesy of Wright Medical Group, Inc.

BIOLOGICS

New Biofilm Has Antimicrobial, Antifungal, Anti-Inflammatory Properties

Researchers from Inserm/Strasbourg University in France have a new way of tackling infections. The team, housed at Unit 1121 "Biomaterials and Bio-engineering," has created a nearly invisible biofilm with antimicrobial, antifungal and anti-inflammatory properties. It may be used to cover titanium implants, and to prevent or control post-operative infections.

According to the September 21, 2015 news release, "…researchers have used a combination of two substances: polyarginine (PAR) and hyaluronic acid (HA), to develop and create a film that is made of several layers. As arginine is metabolised by immune cells to fight pathogens, it has been used to communicate with the immune system to obtain the desired anti-inflammatory effect. Hyaluronic acid, a natural component of the body, was also chosen for its biocompatibility and inhibiting effect on bacterial growth."

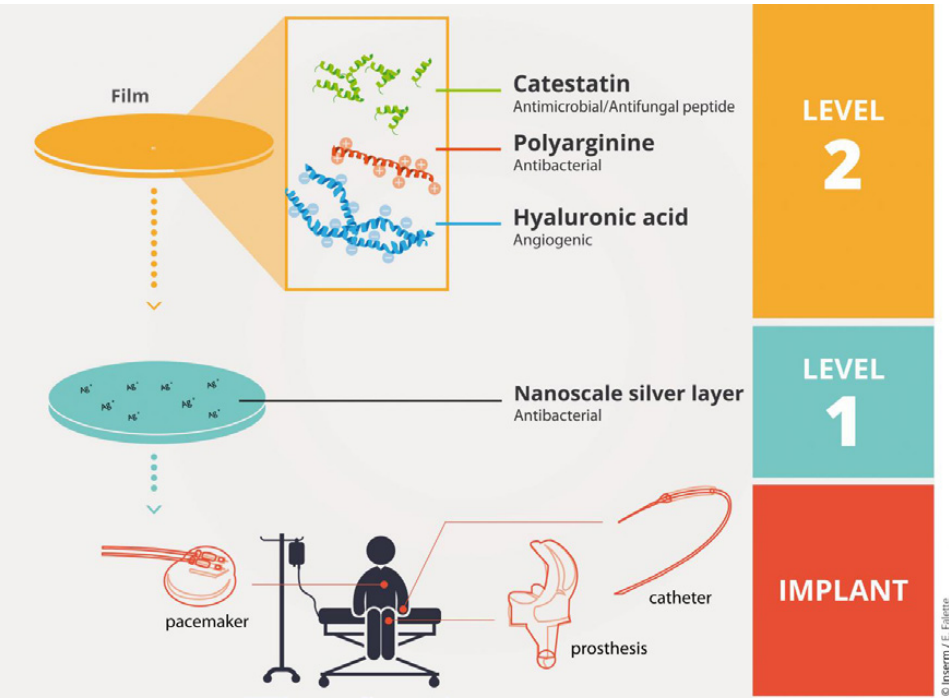
"The film is also unique due to the fact that it embeds natural antimicrobial peptides, in particular catestatin, to prevent possible infection around the implant…. As well as having a significant antimicrobial role, these peptides are not toxic to the body that they are secreted into. They are capable of killing bacteria by creating holes in their cellular wall and preventing any counter-attack on their side."

"On the one hand, researchers demonstrate, through contact with human blood, that the presence of the film on the implant suppresses the activation of inflammatory markers normally produced by immune cells in response to the implant. Moreover, the film inhibits the growth and long-term proliferation of staphylococcal bacteria (Staphylococcus aureus), yeast strains (Candida albicans) or fungi (Aspegillus fumigatus) that frequently cause implant-related infection."

Philippe Lavalle, Ph.D., research director at Inserm, told *OTW,* "Our lab has worked on surface coatings for several years. During discussions with surgeons from Strasbourg Hospital (in particular from the intensive care unit), it appears that nosocomial infections related to catheters, cardiac valves…are increasing and lead most of the time to dramatic issues for patients who are in intensive care units. So, we decided to focus a large part of our studies on the design of new coatings for medical devices with antimicrobial properties against the most common pathogens related to nosocomial infections. We decided to use polyarginine as one component of the reservoir used for antimicrobial agents, like catestatin, an antimicrobial peptide. The good surprise was that Polyarginine by itself appeared to act strongly as an antimicrobial against the bacteria S. aureus."

"We can easily play with the components to increase the doses of antimicrobial agents, the delay of efficiency or the release profile. Moreover, our coating acts as a platform and we can also include some growth factors to obtain for example a reservoir of bone morphogenic proteins on the surface of the implant to promote bone regeneration."

"We demonstrated the proof of concept and now we need to check its efficiency on animal models. Moreover, we believe we can again improve the system, as our very recent studies led to an upgraded version of the coating. Finally, although we would like to get a final product to market soon, because all of the components are natural or FDA approved, this will take some time." — *EH*



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LARGE JOINTS

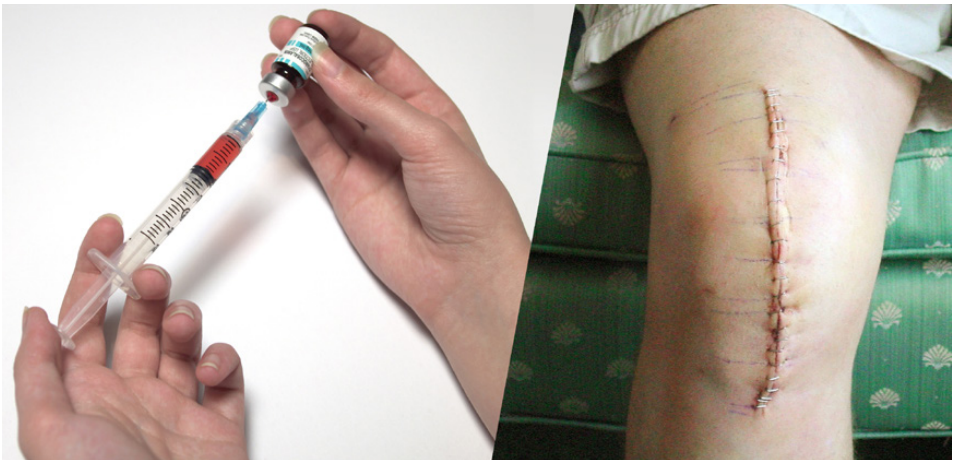
Continuous Bupivacaine Drastically Reduces Opioid Consumption

A literature review conducted by Alan Dine, senior director of Global Clinical Strategy and Government Affairs at Halyard Health, has found that a continuous infusion of local bupivacaine reduced the need for opioids more than injections of liposomal bupivacaine (EXPAREL, manufactured by Pacira Pharmaceuticals) following total knee arthroplasty (TKA). The continuous infusion came via Halyard's ON-Q Pain Relief System, a non-narcotic elastomeric pump.

Taking into account the four studies available for review, use of the continuous infusion of bupivacaine lowered opioid consumption by 55% in the first 48 hours, and 71% in the first 48-72 hours postoperative—compared to either a single injection of local anesthetic, or liposomal bupivacaine.

Roger Massengale, general manager of Acute Pain at Halyard Health, told *OTW*, "The results of the study confirm the hypothesis that continuous infusions of local anesthetics would perform better than single injections of standard local or EXPAREL."

"Research is also warranted to investigate whether continuous infusions for acute post-operative pain may also reduce the incidence of chronic pain resulting from surgery." — *EH*



(Left) Pixabay and PhotoLizM / (Right) Flickr and F Delventha

Blood Loss Less in Obese Surgery Patients

Here is a puzzler. Blood transfusion rates in patients having hip and knee replacement surgery are dramatically lower in overweight and obese patients than they are in patients of normal weight. That is the result of a study of 2,399 patients at the Henry Ford Hospital in Detroit, Michigan. Of the 2,399 patients evaluated, 1,503 underwent knee replacement and 896 underwent hip surgery between January 1, 2011 and November 1, 2013.

In addition, researchers found no correlation between the heavier patients and post-surgical complications such as blood clots and heart attacks. The patients were divided into three body mass index (BMI) groups: normal which was less than 25 BMI, overweight—25-29.9 BMI, and obese—more than 30 BMI.

The blood transfusion rate for patients with a normal BMI was 34.8% compared to 21.9% for obese BMI patients for hip replacement. For knee replacements, there was a 17.3% blood transfusion rate for normal BMI patients compared to 8.3% for obese BMI patients.

"The results were surprising to us. It goes against the normal thought process," said Craig Silverton, D.O., a Henry Ford joint replacement surgeon and the study's lead author. "It's hard to explain but one theory could be that heavier patients have larger blood volume than patients of normal weight."

An estimated 78.6 million adult Americans are obese, and their weight problems are closely linked with an increased demand for hip and knee replacement surgery, according to government and research figures. — *BY*

GOOD NEWS

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Psoriatic Arthritis No Bar to Joint Replacement

Patients with psoriatic arthritis undergoing total hip arthroplasty will find encouragement in a study that found they face no greater risk of poor outcomes than do patients who have the surgery because of osteoarthritis.

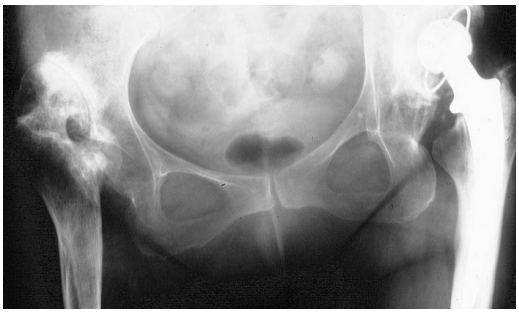
Andrew Smith, writing in the publication *MD*, reported on what was a complicated study. Researchers began by comparing results for 63 psoriatic arthritis patients with 153 who had cutaneous psoriasis and osteoarthritis and a large cohort of patients who suffered from osteoarthritis alone.

They found that the patients with psoriatic arthritis suffered significantly more co-morbidities than did patients with osteoarthritis alone. In addition, they were more likely to be obese, more likely to be current or former smokers and slightly more likely to be male. In terms of race, education level and other factors the groups were similar.

Patients from all three groups scored about the same before their procedures on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) of pain and function, and they posted similar WOMAC scores when they were measured again after their procedures. They found that patients with psoriatic arthritis and psoriasis/osteoarthritis scored worse than those with osteoarthritis alone.

However, Smith reported that "after regression analysis that controlled for potential confounders, these apparent discrepancies disappeared and patients from all three groups enjoyed similar outcomes after their hip replacements." Members of all three groups expressed similar levels of satisfaction with the results of their operations.

The study authors wrote in the journal *Arthritis & Rheumatology* that: "Neither psoriatic arthritis nor cutaneous psoriasis in conjunction with osteoarthritis are risk factors for poor outcomes after total hip arthroplasty. This is important information to convey to psoriatic arthritis and psoriasis patients contemplating total hip arthroplasty." — *BY*



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Missouri Governor Poster Child for Bilateral Knee Replacement

Approximately a year and a half after his last knee surgery in early 2014 the Democratic governor of Missouri and Missouri politics fixture, 59-year-old Jay Nixon, has had both knees replaced.

Gov. Nixon, a second-term governor who had served four terms as attorney general, is an avid basketball player and at one time played against former Portland Trail Blazer player and current Mizzou (University of Missouri—Gov. Nixon's alma mater) basketball coach Kim Anderson.

"I know Kim from college. I went to Missouri and got a chance to see him there. I was a student at the same time. I have the odd sports anecdote of, right after he was cut by the Portland Trail Blazers, the next place he showed up was a city-league game in Columbia, and I had to guard him. I was not at NBA level—let's put it that way—and it became relatively obvious." – Gov. Nixon to Joe Walljasper, *Columbia Daily Tribune*.

Gov. Nixon's office did not disclose more details about his two-for-one surgery—such as location, surgeon or prognosis.

Although a recent study has found that patients with inflammatory arthritis who underwent same-day bilateral knee replacements had the same outcomes as patients with osteoarthritis (OA). Which should be good news for the Governor.

Mark Figgie, M.D. of the Hospital for Special Surgery in New York described his recent study of bilateral knee replacements to *OTW*, "Since inflammatory arthritis is a systemic disease, patients

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have historically had poorer outcomes, including higher complication rates. We wanted to see if our results with bilaterals in carefully selected patients were comparable to patients with OA; I was pleasantly surprised at results showing that the outcomes were no different in patients with OA. I expected those with inflammatory arthritis to have higher complication rates, more prolonged hospital stays, and more transfers to a rehab facility."

"The inflammatory patients are in many ways in better shape when they come to us. What we see with OA is patients who are sicker and more obese; in inflammatory arthritis, because the disease is treated more aggressively, they are often in better condition. However, those with inflammatory arthritis tend to have more severe contractures and joint deformity. If both knees have bad contractures, you should do both knees the same day because if one knee is straight and the other is contracted then the patient won't rehab properly. This study shows that orthopedic surgeons can take on these patients with difficult deformities and get good results."

The press reports that Gov. Nixon is in contact with his staff and is continuing to serve in his administrative role while he recovers. His staff has indicated that the surgeries were not done because of any recent injury.

This wear and tear is clearly patient generated and in the service of the great sport of basketball. — *BY*

EXTREMITIES

Cartiva Implants First Thumb Study Patient

Cartiva, Inc., a firm in Alpharetta, Georgia, has treated its first patient in a study of the safety and effectiveness of Cartiva's Synthetic Cartilage Implant (SCI). It is used in the treatment of first carpometacarpal (CMC) joint osteoarthritis at the base of the thumb. The surgery was part of a study, led by principal investigator Erin Brown, M.D., Ph.D., F.R.C.S.(C), who performed the surgery in Vancouver at the University of British Columbia (UBC) Hospital.

Courtesy of Cartiva, Inc.

According to the news release, this procedure was also the first to utilize this Cartiva implant design, using implants and tools optimized for the specific curvatures of the CMC joint. Cartiva SCI is a proprietary hydrogel polymer device designed to mimic natural cartilage. The implant is used in the treatment of osteoarthritis in patients with diseased or damaged articular surface in the first CMC joint. Cartiva SCI is implanted in the metacarpal base, where its placement provides replacement for damaged cartilage without requiring the destruction or removal of a patient's healthy tissue.

Osteoarthritis of the thumb CMC joint (also known as thumb basal joint arthritis), is a common and frequently

debilitating condition that affects 8% to 12% of the general population, according to company officials, and as many as 33% of postmenopausal women.. The problem causes joint pain, swelling, instability, deformity, loss of motion and weakness, making it difficult to turn doorknobs or open jars. Surgical options for later-stage patients include joint fusion, total or partial trapeziectomy or arthroplasty.

"We are excited to be the first hospital to enroll a patient in this study," said Brown, clinical professor and director of Research, Division of Plastic Surgery at UBC. "The Cartiva device is implanted in a quick and straightforward procedure, and has the potential to restore grip and pinch strength following debilitating osteoarthritis of the CMC joint. I look forward to enrolling additional patients and following them on a longer-term basis, which will help examine the potential of this promising technology." — *BY*

REIMBURSEMENT

Insurer Pays Clients for Shopping Around

Priority Health of Grand Rapids, Michigan, a health insurer, is giving its patrons a cash incentive to shop around for medical procedures. Awards range from $50 to $200 for choosing a less expensive option on 300 common health procedures. According to Karen Bauffard of the *Detroit News*, selecting a less-costly knee replacement surgery, hysterectomy or rotator cuff repair can result in a gift to the patient of a $200 Visa gift card from the health insurer—while also saving on deductibles.

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Bauffard writes that the program is an attempt to make consumers more conscious of health care costs and provide incentives to health providers to make their procedures more cost transparent. Insurers are finding that employers and individuals are shifting to high-deductible insurance plans in order to reduce their monthly premiums.

Bauffard reports that other state insurers, including Blue Cross Blue Shield of Michigan, which does not have a program like Priority's, is watching to see if there is more demand for this approach. Priority has paid out more than $40,000 in rewards since launching the Priority Rewards program two months ago, writes Bauffard who says that members earn $5 just for viewing the prices with a cost comparison tool at priorityhealth.com. — *BY*

Huge Geographic Variations in Cost of Spinal Fusion

If you're decision to have spinal fusion is driven by cost, you may want to drive to the Midwest. According to a new study from the University of Utah, the price of such an operation varies by region, with costs being lowest in the Midwest and highest in the Northeast. The research, published in the September 1, 2015 issue of *Spine*, was conducted by W. Ryan Spiker, M.D. and his colleagues.

RRY Publications/Wikimedia Commons and Bruce Blausen

The researchers analyzed 2012 Medicare data as it pertains to anterior cervical discectomy and fusion (ACDF) and posterior lumbar fusion (PLF). As a comparison procedure, the researchers examined the cost of total knee arthroplasty (TKA).

"Each procedure had a significant range in cost across the country," Dr. Spiker and co-authors noted in the article. Costs for ACDF ranged from about $11,000 to $25,000, while PLF costs ranged from $20,000 to $37,000. For TKA patients without major medical conditions, the range was from about $11,000 to $19,000.

Co-author Vadim Goz told *OTW*, "We were surprised by two findings in the study, the first being the degree of variation in costs. The average cost of a single level ACDF ranged from $10,879 in Alabama to $24,923 in Maryland. This is a fairly astounding difference. What is even more interesting is that the varia-

tion in costs was not explained by a state's total population and was only partially explained by a state's cost of living."

Goz added, "The next step will focus on identifying geographic areas and providers that are able to provide high quality care at a lower cost. We hope to identify cost drivers, and factors that allow for delivery of care for less, and understand what factors result in higher costs for similar procedures in similar patient populations."

Dr. Spiker commented to *OTW*, "As the world of healthcare continues to evolve, it is important for orthopaedic surgeons to take a leading role in understanding and controlling the cost of care. It is critical that we understand the issues that impact the cost surgical treatments in order to provide appropriate and cost effective care." — *EH*

SPINE

Paralyzed Man Walks Again…Using Brain Control

A man who was paralyzed for five years due to a spinal cord injury is now able to walk. Using the power of his own brain, the man achieved this without use of manually controlled robotic limbs. The research, published in the open access *Journal of NeuroEngineering and Rehabilitation*, involved an electroencephalogram (EEG) based system. The system employs electrical signals from the participant's brain, which then travel down to electrodes placed around his knees to create movement.

According to the September 23, 2015 news release, "Mental training was initially needed to reactivate the brain's walking ability. Seated and wearing an

Courtesy of Dr. Zoran Nenadic

EEG cap to read his brainwaves, the participant trained to control an avatar in a virtual reality environment. He also required physical training to recondition and strengthen his leg muscles. The participant later practiced walking while suspended 5cm above ground, so he could freely move his legs without having to support himself. On his 20th visit, he translated these skills to walk on the ground and wore a body-weight support system for aid and to prevent falls. Over the 19 week testing period, he gained more control and performed more tests per visit."

Zoran Nenadic, D.Sc., the senior lead researcher of the study, from University of California, Irvine, said, "Once we've confirmed the usability of this noninvasive system, we can look into invasive means, such as brain implants. We hope that an implant could achieve an even greater level of prosthesis control because brain waves are recorded with higher quality. In addition, such an implant could deliver sensation back to the brain, enabling the user to feel their legs."

Dr. Nenadic told *OTW*, "The most surprising finding about the study was that the brain networks responsible for the initiation or cessation of walking are still functional years after paralysis."

"The current system is noninvasive and does not involve any surgical procedures. It is conceivable that future BCIs (brain-computer interfaces) will increasingly employ implantable devices for both brain signal recording and muscle stimulation. This will require involvement of neurosurgeons and perhaps orthopedic surgeons."

"Our plans are to streamline and simplify the current system, so that it can be one day taken outside the laboratory. A prototype is being developed that will be tested in multiple subjects with paraplegia due to spinal cord injury. At the same time, we are pursuing the development of a fully implantable invasive BCI system for the restoration of walking. This is a long-term project and its testing in humans will require FDA clearance." — *EH*

FDA Clears Conventus' Third Cage

The U.S. Food and Drug Administration has granted 510(k) clearance to Conventus Orthopaedics, Inc. for its Conventus Orthopaedics Cage PR (Proximal Radius) System—number three in the series. According to the press release, the system is designed to be a means of addressing fractures of the head and neck.

As explained in the press release, the system takes advantage of the shape memory properties of nitinol and expands within the bone creating stable fixation and preventing the collapse of the fracture repair.

The new Conventus Cage, according to company officials, is similar to the first two products. This third Conventus Cage PR creates a rigid substrate designed to self-expand within the bone to avoid interference with soft tissues and ultimately improve upon pronation and supination.

"The implant is designed to address important limitations of conventional approaches to radial head and neck repairs while allowing for preservation of the bony anatomy and preserving future treatment options," company officials explained.

Paul Buckman, Conventus President and CEO said, "The approval of this additional indication reflects our commitment to provide more innovative solutions and options for surgeons working to repair orthopedic fractures throughout the body. Our overall goal is to provide a complete platform technology enabling surgeons to treat all trauma and fracture repairs from a 3-dimensional approach." — *BY*

CONVENTUS CAGE™

Courtesy of Conventus Orthopaedics, Inc.

Courtesy of Conventus Orthopaedics, Inc.

PEOPLE

Three Surgeons Join Aria 3B Orthopaedic Institute

Todd M. McGrath, M.D., Douglas C. Sutton, M.D., and Daniel E. Bronsnick, M.D., have all joined the Aria 3B Orthopaedic Institute, a large provider in Philadelphia and the surrounding communities.

As indicate in the September 28, 2015 news release, "After recently completing a fellowship in sports medicine at the Moses Cone Health System in Greensboro, North Carolina, Todd M. McGrath, M.D., has joined the Aria 3B Orthopaedic Institute as a non-operative sports medicine physician. Dr. McGrath has more than 14 years of experience in the field, and brings with him expansive knowledge in diagnostic and interventional musculoskeletal ultrasounds and invasive ultrasound techniques."

"Douglas C. Sutton, M.D., is fellowship trained in adult spine surgery, and treats congenital, developmental and post-traumatic conditions of the spine. His extensive surgical practice includes decompression procedures of the spine, micro/minimally invasive procedures, anterior and posterior fusion techniques, motion preservation technology and spinal instrumentation."

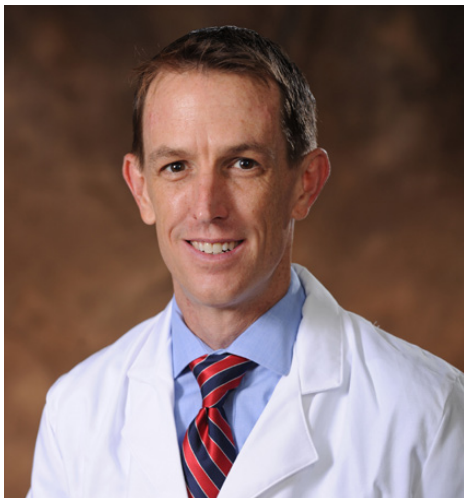
Shoulder surgeon Daniel E. Bronsnick, M.D. completed his fellowship training in shoulder and elbow surgery at Brown University. Prior to joining the Aria 3B Orthopaedic Institute, Dr. Bronsnick was a staff surgeon at the Veteran's Administration Medical Center, Miriam Hospital and Rhode Island Hospital."

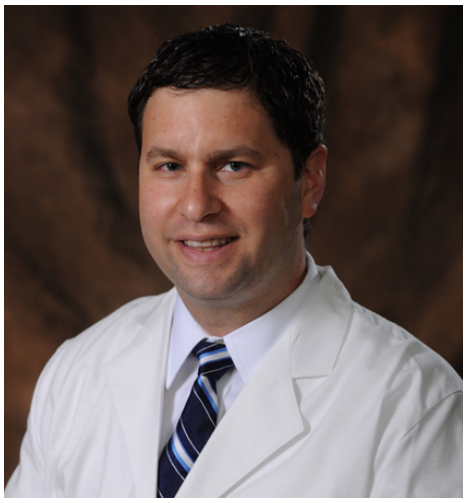
Dr. McGrath told *OTW*, "As a new physician with the Aria 3B Orthopaedic Institute, I am looking forward to adding to and building on the sports medicine presence and our practice within the communities we serve. The legacy and reputation of orthopaedic sports care is well established with the 3Bs. I hope to add to the non-operative care of our elite athletes, weekend warriors, adolescent athletes and patients simply trying to maintain or regain an active, healthy lifestyle. Newer modalities and therapies are allowing us to expand our use of diagnostic ultrasound, minimally invasive interventional ultrasound procedures and nonsurgical treatment of chronic tendinopathies within the office setting. I look to expand on our ability to treat acute injuries both on the field and in the office, drawing on my experiences in emergency medicine as well as sports medicine, from acute fracture management to concussions to medical emergencies as they may arise. In addition, I look to build on my experience with endurance athletes of all levels, whether that be runners, cyclists or multisport athletes through treatment of chronic overuse injuries, biomechanical analysis for injury treatment and prevention as well as therapies to maximize performance."

Dr. Sutton commented to *OTW*, "I have had the privilege of providing spine care to our community for over 20 years, and it is my goal to help develop a full service spine program integrated with an orthopaedic specialty hospital so that we may continue to reach more patients in need of specialized spine and orthopaedic care."

Dr. Bronsnick noted, "My focus over the next 3-6 months is to treat the entire spectrum of shoulder and elbow injuries and problems. I use the most up to date technologies and surgical techniques to provide a high level of care. I emphasize patient centered care with a goal to improve quality of life and increase the functional status of each patient that walks through my door." — *EH*


Douglas C. Sutton, M.D.


Todd M. McGrath, M.D.


Daniel E. Bronsnick, M.D.

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Robin R. Young, CFA
Editor and Publisher
robin@ryortho.com

WRITERS

Elizabeth Hofheinz, M.P.H., M.Ed.
Senior Writer
elizabeth@ryortho.com

Walter Eisner
Senior Writer
walter@ryortho.com

Biloine W. Young
Senior Writer
bgwy@msn.com

ADVERTISING

Tom Bishow
Vice President of Sales
tom@ryortho.com

PRODUCTION

Suzanne Kirchner
Production Manager
suzanne@ryortho.com

Jayme Johnson
Email, Web, & Conference Coordinator
jayme@ryortho.com

Dana Bader
Graphic Designer
dana@ryortho.com

---

116 Ivywood Lane • Wayne, PA 19087
TOLL FREE: 1-888-749-2153
www.ryortho.com