VOLUME 21, ISSUE 1 | JANUARY 7, 2025

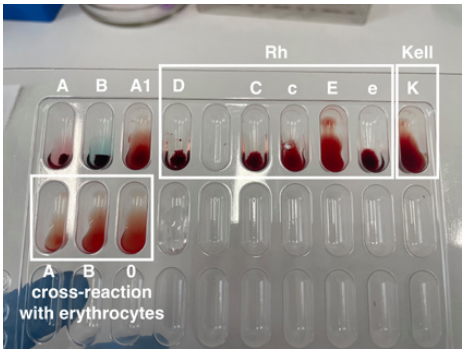
# Orthopedics This Week

## WEEK IN REVIEW


**4 Twenty Emerging Leaders in U.S. Spine Surgery >>** Who are tomorrow's leaders in the practice, study, and development of spine surgery? NASS's SpineLine has selected this year's class of future spine surgery leaders. Bottom line: spine surgery is in good hands.

**9 2025 ORS Annual Meeting to Celebrate Power of Science >>** In just a couple months, February 7-11, 2025, The Orthopaedic Research Society (ORS) will hold its Annual Meeting in warm and welcoming Phoenix, Arizona. Orthopedics This Week has everything you need to know to make the most of this essential orthopedic annual meeting.

**12 Blood Type Elevates Spondy or ASD Risk?! >>** According to a just published study, patients with B+ blood type, not A, not O, not any other blood type, have a 300% greater likelihood of developing spondylolisthesis. Which begs a number of questions, most notably, why?


**20 SPINE SURGERY LEADERS UNDER 40**



## BREAKING NEWS


14 **Bioventus Grows Sales Significantly** in Q3, 2024

17 **Globus Medical: Strong Q3 Sales** and Product Intros

19 **Alphatec Beats** Wall Street's **Sales Forecasts,** But Not EPS

20 **SI-BONE Grows Q3 19%,** Despite Hurricane Helene

23 Data From 1,626 Cervical **TDR Revision Cases Released**

25 **More Precise Pain Measurement** Drives Outcomes?


**For all news that is ortho, read on.**

**CLICK HERE TO DOWNLOAD A PDF VERSION OF THIS WEEK'S NEWSLETTER**

# Orthopedic Power Rankings

## Robin Young's Entirely Subjective Ordering of Public Orthopedic Companies

**THIS WEEK:** Ortho stocks, with just a handful of exceptions, sold off in December on fears of more cost pressures—rising raw material prices, higher logistics costs, recalcitrant reimbursers. But The Washington Post had a little good news, writing that Trump's team is scaling back their tariff plans. Still, inflation is lurking as both government spending keeps rising and tariff's seem destined to increase. How much that affects ortho and spine remains to be seen.

| RANK | LAST WEEK | COMPANY | TTM OP MARGIN | 30-DAY PRICE CHANGE | COMMENT |
|---|---|---|---|---|---|
| 1 | 1 | Pacira Biosciences | 13.02% | (3.61%) | Still the least expensive stock—based on P/E, PEG and PSR—in our ortho and spine universe. One big shareholder, DOMA, is pressuring management to increase value. |
| 2 | 2 | Integra LifeSciences | 6.60 | (3.90) | Management is still working through the 483's they received in 2024. IART dropped from $44/share to $19/share, losing 57% of its value, because of those warning letters. Way overreaction. |
| 3 | 3 | Globus Medical | 17.67 | (1.92) | GMED management is obessed with getting operating margins back to where they were pre-NUVA. Never bet against these guys. GMED is too cheap at these prices. |
| 4 | 5 | Bioventus | 4.78 | (5.43) | BVS wrapped up its divestiture of Advanced Rehab business. Margins on the way up. Investors are not paying attention, although analysts are bullish. |
| 5 | 7 | ConMed | 12.22 | (7.66) | 3rd cheapest stock in our universe. Key points: $0.20 per share quarterly dividend and above average sales and earnings growth rates. |
| 6 | 8 | Medtronic | 19.17 | (4.30) | Over the past 5 years, investors in MDT have lost 18.72%. Over the last 12 months, MDT is off 1.79%. The saving grace? 3.20% dividend yield and a cheap stock price. |
| 7 | 6 | Zimmer Biomet | 20.70 | (5.35) | I can't get the image of CEO Ivan Tornos in burnt orange lederhosen, with Brooks Brothers socks, standing next to cigar smoking Ahhnold out of my mind. Uff DA! |
| 8 | NR | Xtant | (12.29) | 31.23 | Pre-announced that 2024 year-to-date sales were up 36%, which got buyers excited. At $0.44 per share, it's a penny stock. Sales, however, at $116-120 million are not chump change. |
| 9 | 9 | Axogen | (0.65) | 8.63 | Nice increase in Axogen as investors cheered the BLA submission and 18% sales growth to a $200 million annual run rate. |
| 10 | NR | Smith & Nephew | 11.60 | (3.48) | Back on the Power Rankings on the basis of valuation...aka: cheap. Two announcements, the CORIOGRAPH™ modeling service for total hip arthroplasty and the AETOS™ shoulder system. |

# Robin Young's Orthopedic Universe

## TOP PERFORMERS LAST 30 DAYS

| | COMPANY | SYMBOL | PRICE | MKT CAP | 30-DAY CHG |
|---|---|---|---|---|---|
| 1 | Aclarion | ACON | $0.30 | $3 | 66.05% |
| 2 | Xtant Medical Hldgs | XTNT | $0.53 | $73 | 31.23% |
| 3 | Dynatronics Corp | DYNT | $0.13 | $1 | 21.86% |
| 4 | Paragon 28 | FNA | $10.93 | $915 | 10.29% |
| 5 | AxoGen | AXGN | $16.11 | $709 | 8.63% |
| 6 | SINTX Technologies | SINT | $3.69 | $5 | 6.34% |
| 7 | SI-BONE, Inc | SIBN | $14.27 | $598 | 3.48% |
| 8 | Globus Medical | GMED | $82.79 | $11,273 | -1.92% |
| 9 | Aurora Spine | ASG.V | $0.28 | $22 | -2.70% |
| 10 | Medacta | MOVE | $121.19 | $2,424 | -2.89% |

## WORST PERFORMERS LAST 30 DAYS

| | COMPANY | SYMBOL | PRICE | MKT CAP | 30-DAY CHG |
|---|---|---|---|---|---|
| 1 | Nevro Corp | NVRO | $3.71 | $139 | -10.39% |
| 2 | Anika Therapeutics | ANIK | $16.19 | $237 | -7.80% |
| 3 | ConMed | CNMD | $67.95 | $2,099 | -7.66% |
| 4 | Orthofix | OFIX | $17.35 | $663 | -7.37% |
| 5 | Stryker | SYK | $361.52 | $137,817 | -7.03% |
| 6 | Alphatec Holdings | ATEC | $9.37 | $1,328 | -6.77% |
| 7 | Bioventus | BVS | $10.44 | $847 | -5.43% |
| 8 | Zimmer Biomet | ZBH | $104.47 | $20,797 | -5.35% |
| 9 | Medtronic | MDT | $80.95 | $103,801 | -4.30% |
| 10 | OrthoPediatrics Corp | KIDS | $23.35 | $565 | -4.26% |

## LOWEST PRICE / EARNINGS RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | P/E |
|---|---|---|---|---|---|
| 1 | Pacira Biosciences | PCRX | $18.40 | $850 | 13.25 |
| 2 | Johnson & Johnson | JNJ | $144.19 | $347,155 | 18.82 |
| 3 | Medtronic | MDT | $80.95 | $103,801 | 19.40 |
| 4 | ConMed | CNMD | $67.95 | $2,099 | 23.01 |
| 5 | Zimmer Biomet | ZBH | $104.47 | $20,797 | 26.21 |

## HIGHEST PRICE / EARNINGS RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | P/E |
|---|---|---|---|---|---|
| 1 | Xtant Medical Hldgs | XTNT | $0.53 | $73 | 111.00 |
| 2 | Globus Medical | GMED | $82.79 | $11,273 | 56.66 |
| 3 | Smith & Nephew | SNN | $24.42 | $10,676 | 40.59 |
| 4 | Medacta | MOVE | $121.19 | $2,424 | 39.72 |
| 5 | Stryker | SYK | $361.52 | $137,817 | 34.98 |

## LOWEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

| | COMPANY | SYMBOL | PRICE | MKT CAP | PEG |
|---|---|---|---|---|---|
| 1 | Integra LifeSciences | IART | $23.17 | $1,788 | -7.33 |
| 2 | ConMed | CNMD | $67.95 | $2,099 | 1.20 |
| 3 | Pacira Biosciences | PCRX | $18.40 | $850 | 1.23 |
| 4 | Medacta | MOVE | $121.19 | $2,424 | 1.42 |
| 5 | Stryker | SYK | $361.52 | $137,817 | 3.02 |

## HIGHEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

| | COMPANY | SYMBOL | PRICE | MKT CAP | PEG |
|---|---|---|---|---|---|
| 1 | Johnson & Johnson | JNJ | $144.19 | $347,155 | 6.27 |
| 2 | Xtant Medical Hldgs | XTNT | $0.53 | $73 | 5.55 |
| 3 | Zimmer Biomet | ZBH | $104.47 | $20,797 | 3.82 |
| 4 | Smith & Nephew | SNN | $24.42 | $10,676 | 3.59 |
| 5 | Medtronic | MDT | $80.95 | $103,801 | 3.52 |

## LOWEST PRICE TO SALES RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | PSR |
|---|---|---|---|---|---|
| 1 | Dynatronics Corp | DYNT | $0.13 | $1 | 0.03 |
| 2 | Nevro Corp | NVRO | $3.71 | $139 | 0.33 |
| 3 | Xtant Medical Hldgs | XTNT | $0.53 | $73 | 0.80 |
| 4 | Orthofix | OFIX | $17.35 | $663 | 0.89 |
| 5 | Aurora Spine | ASG.V | $0.28 | $22 | 1.11 |

## HIGHEST PRICE TO SALES RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | PSR |
|---|---|---|---|---|---|
| 1 | Aclarion | ACON | $0.30 | $3 | 41.28 |
| 2 | Globus Medical | GMED | $82.79 | $11,273 | 7.19 |
| 3 | Stryker | SYK | $361.52 | $137,817 | 6.72 |
| 4 | Medacta | MOVE | $121.19 | $2,424 | 4.75 |
| 5 | AxoGen | AXGN | $16.11 | $709 | 4.46 |

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

# Twenty Emerging Leaders in U.S. Spine Surgery

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


*Source: RRY Publications LLC and SpineLine*

The North American Spine Society's *SpineLine* journal has selected this year's class of young—under 40 years of age—emerging leaders in the practice, study, and development of spine surgery. In selecting individuals for the list, the members of *SpineLine's* selection committee considered each candidates' surgical accomplishments to date, community service, and philosophy of care.

The 20 Under 40 program began in 2018 as an effort to honor exceptional young spine care professionals. This initiative highlights those under 40 who have demonstrated notable achievements in their field, community service, and a commitment to advancing spine care. Members of previous classes have gone on to serve on the NASS Board of Directors, Committees, and Editorial Boards. This year's class will be invited to serve as *NASSJ* reviewers.

"It would be safe to say the number of impressive candidates has evolved more than the award itself," *SpineLine* editor in chief, F. Todd. Wetzel, M.D., told *OTW*. Naturally, the award was something of an unknown at first, but now seven years later the young physicians see winning this as a real feather in their caps. They put a ton of thought into the application and are truly excited about winning the honor. You can see evidence of it with the numerous social media posts from honorees."

"In an era when doctors are expected to see more patients than ever, these brilliant young minds understand that treating each individual is still the most important thing. That has been heartening to witness."

Here are the physicians, surgeons and researchers featured on this year's list,

some of whom contributed specifics on their research and thoughts on the field.

**Theresa Williamson, M.D. Harvard Medical School (Boston, Massachusetts).** Dr. Williamson is a neurosurgeon and surgical ethics researcher, renowned for her expertise in treating a wide spectrum of spine disorders, brain, and spinal trauma using minimally invasive techniques tailored to each patient.

**Eren Kuris, M.D., Lifespan Orthopedics Institute (Providence, Rhode Island).** Dr. Kuris is a spine surgeon specializing in complex orthopedic spine surgery. As an assistant professor of orthopedics at The Warren Alpert Medical School of Brown University, he leads as the director of spine trauma, tumor, and infection within the department of orthopedic surgery.

**Micheal Raad, D.O., Silver Pine Medical Group (Sterling Heights, Michigan).** Dr. Raad, a dedicated internal medicine specialist, brings over 15 years of teaching experience from Henry Ford Hospital's prestigious training program, transitioning to private practice in 2003. He holds clinical professorships at Michigan State University and Oakland/William Beaumont School of Medicine.

"This is all a big passion project to me. I simply love what I do. I love spine surgery and being able to use my hands to make people's lives better. I also love scratching my head and approaching important research questions with curiosity. Perhaps, the most exciting thing about research is its potential to improve the way we do things. Whether its advancements in risk stratification or improved surgical techniques, at the end of the day patients' quality of lives is the bottom line. Lastly and most importantly, this is not only my work but the work of my mentors, the work of every person I have ever collaborated with (and they are in the 100s) as well my loving and supporting family."

**Omar Ramos, M.D., Twin Cities Spine Center (Minneapolis, Minnesota).** Dr. Ramos is an orthopedic spine surgeon specializing in cervical, thoracic, and lumbar spine surgery, with expertise in minimally invasive, robotic, and navigation-assisted techniques.

"I am dedicated to advancing surgical spine care through both open and minimally invasive techniques that prioritize patient recovery and quality of life. My journey, from witnessing healthcare disparities in the Dominican Republic to being a staff surgeon at Twin Cities Spine Center has instilled in me a strong commitment to reducing barriers to high-quality care. I am also passionate about mentoring and believe that by nurturing the next generation of spine surgeons, we can collectively raise the standard of spine care and continue to make meaningful improvements in the field of spine surgery."

**Vivek Babaria, D.O., DISC Sports & Spine (Los Angeles, California).** Dr. Babaria is a pioneering osteopathic physician specializing in interventional spine and sports medicine. Utilizing advanced ultrasound technology, he provides real-time diagnostics and personalized treatment plans encompassing minimally invasive procedures, neuromodulation, and orthobiologic therapies.

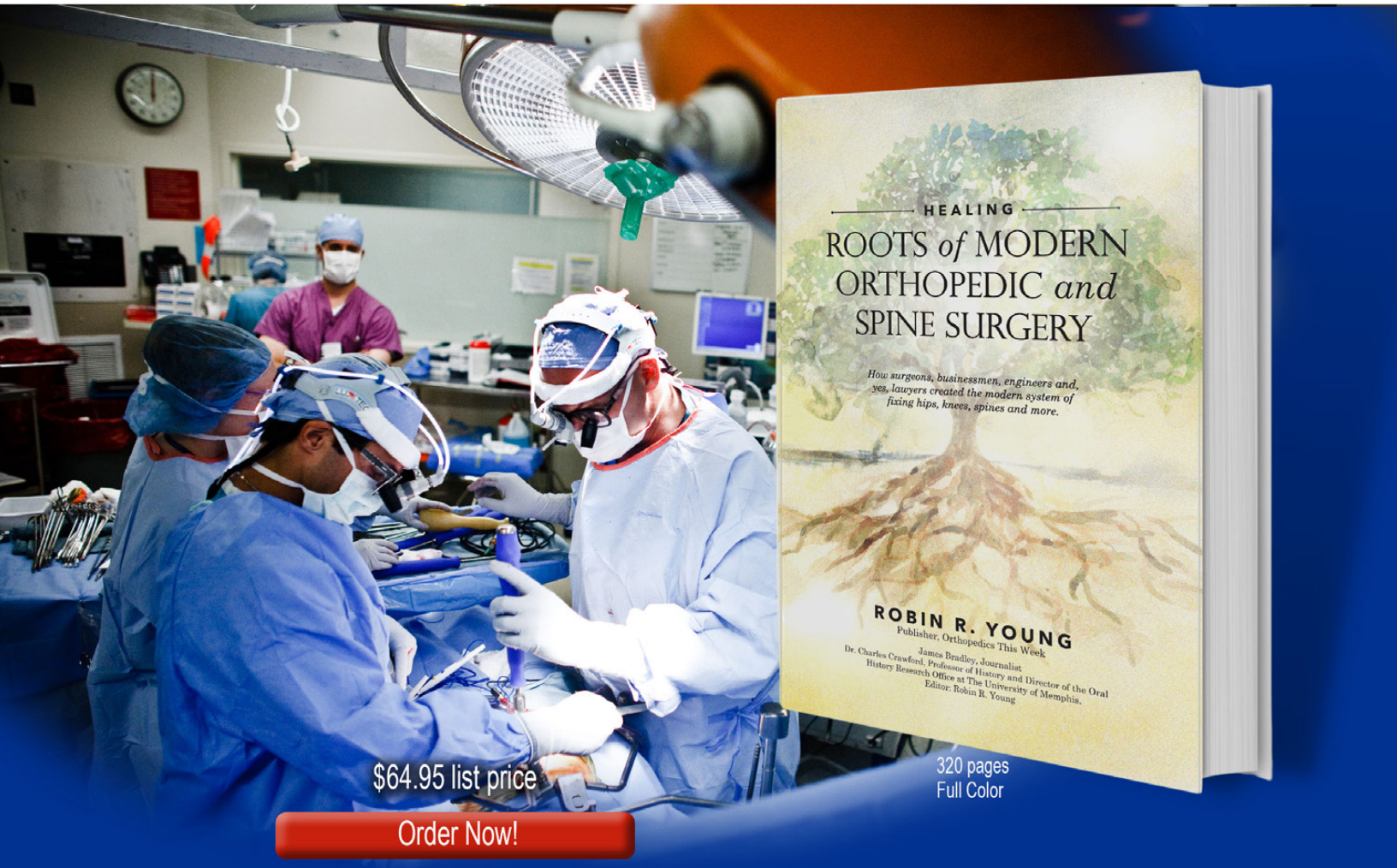
"I want people to know that my work goes beyond just treating pain. It is also about restoring quality of life and empowering people to live without limitations. As an interventional spine physician, I see firsthand how pain can steal joy and alter activity. I'm committed to pushing the boundaries of medicine, using the latest regenerative techniques like PRP to not only manage pain but also help keep the body functional. My goal is to shift the focus from merely masking symptoms to increasing longevity, one patient at a time."

**Ashraf N. El Naga, M.D., UCSF Health (San Francisco, California).** Dr. El Naga is a distinguished orthopedic surgeon renowned for his specialization in traumatic injuries and spinal conditions, including fractures of the spine, pelvis, arms, and legs. He is director of the orthopedic spine service at Zuckerberg San Francisco General Hospital.

**Michael Suer, M.D., UWHealth (Madison, Wisconsin).** Dr. Suer serves as a spine medicine specialist at UWHealth and holds an assistant professorship at the University of Wisconsin School of Medicine and Public Health's Department of Orthopedics and Rehabilitation Medicine.

"Much of my work has been focused on education. Within this framework, I have worked in several capacities in both increasing Physical Medicine and Rehabilitation exposure within the medical school and improving educational models for our trainees. In working with the biomedical engineering students at UW-Madison, we developed a 3D printed spine model to improve procedural technique. I also designed a diagnostic ultrasound curriculum and a board review curriculum for our residents and fellows which culminated in the publication of a book containing 900 board-prep questions titled, *Questions and Answers in Pain Medicine: A Guide to Board Exams* and earning the 2022 Physical Medicine and Rehabilitation Clinical Teacher of the Year Award. I have

# First of a Series on the History of Modern Orthopedics and Spine Surgery




## FROM OUR READERS

*"Robin Young has so meticulously and thoroughly crafted the incredible and true story of the spine and orthopedic industry - I felt as though I was reliving every moment. Fascinating recollection. A real page turner. Kudos!"* **– Alex Lukianov, Founder and past chairman & CEO of NuVasive**

*"Spectacular book. Loved it!"* **– Alexander R. Vaccaro, M.D., Ph.D., M.B.A., President Rothman Orthopedic Institute, Philadelphia, PA.**

*"Robin Young has taken us on a splendid journey from the origins of orthopedic surgery as a specialty through it's early development to the important and essential collaboration between orthopedic surgeons, engineers and industry that has produced a compendium of treatments that have enriched the lives of millions of patients. For those of us who love orthopedic surgery, the best part is that this is only volume 1 with more to come!!"* **– Joseph D. Zuckerman, M.D., Walter A.L. Thompson Professor of Orthopedic Surgery and Chair, Department of Orthopedic Surgery, NYU School of Medicine, New York, NY**

*"Robin Young describes the early development of orthopedic medical devices and the intersection of surgeons, corporate, and engineering leaders. The manuscript is an easy read. Dr. Charnley who is most responsible for bringing innovation to orthopedic surgery, like Thomas Edison, failed at many techniques and materials before finding success. Ron Pickard built Danek into the industry leader Sofamor-Danek but more importantly withstood the attacks by plaintiff attorneys in their pedicle screw ligation. In both cases and as demonstrated in many other examples in the book, holding to what is best for patients and to basic core principles will result in the best outcomes. Robin shows convincingly how anyone who has the idea, commitment, can assemble a team and overcome the many hurdles and failures can produce dramatic results that can help patients and revolutionize an industry."* **– Paul A. Anderson MD, Former Professor of Orthopedic Surgery, Neurologic Surgery and Biomedical Engineering, University of Wisconsin, Madison.**

*"Anyone not knowing the history might think the currently available orthopedic devices either always existed or formed on their own, but each product needed the right people at the right place at the right time working with a company to develop, produce, and introduce to surgeons the new advance. This book chronicles the roots of today's orthopedic/spine industry and tells the untold story of often unknown people who by their actions ended up helping millions of orthopedic surgery patients around the world. "The book Robin Young wrote is is Orthopedics This Last Century. I recommend all the OTW readers order a copy."* **– Richard Treharne, Ph.D., Vice President Orthopedic Research, Active Implants, Inc., Memphis, TN**

also served as the course director for 2 courses for the medical school and as the associate Physical Medicine and Rehabilitation residency director. I am also serving as the interim division chair of Physical Medicine and Rehabilitation at UW Health in Madison, Wisconsin."

**Rachel Bratescu, M.D., NYU Langone (New York City).** Dr. Bratescu is a fellow at NYU Langone. She completed her orthopedic surgery residency at Houston Methodist and attended Georgetown University School of Medicine.

**Mohamed A.R. Soliman, M.D., M.Sc., Ph.D., NewYork-Presbyterian Hospital (New York City).** Dr. Soliman is an interventional radiology resident at NewYork-Presbyterian Hospital, part of Weill Cornell Medicine.

"I want people to know that my work is deeply rooted in improving patient outcomes in spinal surgery. My journey through neurosurgery has been driven by a commitment to integrating clinical excellence with innovative research. I strive to translate complex scientific insights into practical applications that enhance surgical techniques and patient care. Additionally, my involvement in education and mentorship reflects my dedication to fostering the next generation of spine surgeons, ensuring they are well-equipped to tackle the challenges of our field."

**David B. Anderson, Ph.D., University of Sydney (Australia).** Dr. Anderson is a lecturer in the school of health sciences and is focused on cervical myelopathy, spinal stenosis, and placebo methodology.

"What I would like people to know is that there is a lot of work to be done. For the two conditions that I am engaged most in [cervical myelopathy and lumbar spinal stenosis]—targeted approaches are needed. For cervical myelopathy—a lot of work is needed to increase awareness of the condition. Groups such as Myelopathy.org that I work with are leading the way on this and undertaking various initiatives to increase the community's awareness of the condition and working towards increasing evidence on what best practice looks like. For lumbar spinal stenosis—the condition is well known amongst most clinicians, and the focus is more around implementing best practice; referring to the high-quality guidelines such as those produced by the North American Spine Society."

**K. Aaron Shaw, D.O., Children's Mercy Kansas City (Missouri).** Dr. Shaw is a clinical assistant professor of orthopedic surgery at the University of Missouri-Kansas City School of Medicine. His spine surgery practice at Children's Mercy Kansas City focuses on scoliosis and kyphosis.

"I have the privilege of working in an incredible team of skilled physicians and surgeons to care for the children of the Greater Kansas City area. I enjoy caring for all types of spinal deformity in children, adolescents, and young adults where we provide the full complement of non-surgical and surgical treatment options. I have a special interest in the care of children with early onset scoliosis who present with such a large spectrum of deformities, and each requires personal consideration in how best to care for that specific child, not only from a surgical perspective but also taking into account the unique aspects of each child and family."

**Edward S. Yoon, M.D. Hospital for Special Surgery (New York City).** Dr. Yoon is chief of the Division of Interventional Radiology at the Hospital for Special Surgery. Specializing in minimally invasive treatments of joints and spine, he is dual fellowship trained, and dual board certified in Diagnostic Radiology and Interventional Pain Management.

**Nishank Mehta, M.S., M.B.B.S., Stony Brook Medicine (New York).** Dr. Mehta is a resident in orthopedic surgery at Stony Brook Medicine and assistant professor in the Department of Orthopaedics at All India Institute of Medical Sciences, New Delhi.

"I want my work to stand out as an inspiration for my colleagues and the fraternity of spine surgeons in developing countries—and a testament that impactful and innovative research is very much possible even in healthcare settings which might be significantly limited in resources by Western standards. It is imperative that future research in spine surgery is carried out with a more pragmatic approach that is mindful of the costs at which it comes, to what extent it is relevant to healthcare settings outside of where it was envisioned and carried out and whether it would increase or bridge the gap in healthcare services between diverse patient populations. 'Equitability' and 'sustainability'—in my mind—are the scales on which future research in my area of interest should be weighed."

**Syed I. Khalid, M.D., University of Illinois College of Medicine (Chicago).** Dr. Khalid is a resident in the department of neurosurgery at the University of Illinois College of Medicine.

"Our goal in spine surgery is to personalize care to improve patient outcomes. Achieving this requires a deep understanding of the individuals we treat—their unique health profiles, lifestyle factors, and overall context. Advanced analytics and technologies

greatly enhance our ability to gain these insights. By integrating data-driven information such as body composition, bone density, and social determinants of health, we can make better decisions and develop highly individualized treatment plans that optimize outcomes in the short term and throughout a patient's recovery journey. I believe the future of spine surgery research lies in precision medicine—developing more sophisticated models that integrate a broad range of patient data to predict outcomes, reduce complications, and tailor treatments. Harnessing artificial intelligence to refine risk stratification models holds immense potential. These models can incorporate clinical data, radiographic information, and social factors to provide a comprehensive picture of patient recovery."

**Kelsey Corcoran, D.C., Yale School of Medicine (New Haven, Connecticut).** Dr. Corcoran is an associate research scientist of biomedical informatics and data science at Yale. She has an interest in interdisciplinary musculoskeletal care and Veterans healthcare.

**Sonal Sodha, M.D., Cedars-Sinai (Los Angeles, California).** Dr. Sodha earned her medical degree at Johns Hopkins University School of Medicine in Baltimore and completed her orthopedic surgery residency at the University of North Carolina at Chapel Hill. She also completed a fellowship in spine surgery at Mayo Clinic.

"As a spine surgeon, most importantly I strive to treat my patients with thoughtful consideration of numerous elements: correlation of symptoms to imaging, solid indications, an array of surgical options, and multidisciplinary tools. These elements, combined with care and compassion, often lead to excellent surgical results for the patient. This is always my foremost priority. Drawing on my extensive background in biomedical engineering, I have integrated robotic spine surgery as an important adjunct in my clinical practice. I believe this technology is very useful to increase accuracy, patient safety, and efficiency in many cases, particularly those of challenging revisions, long-segment constructs, and complex or atypical anatomy. I look forward to continuing to collaborate with surgeons and the industry on innovative technology and evidence-based data to continue improving the quality of care for spine patients."

**Morgan Price, D.C., Puget Sound Health Care System (Seattle, Washington).** Dr. Price is a chiropractor at VA Puget Sound Health Care System and serves on the healthcare provider organization stakeholder advisory council for the National Quality Forum. She is also a health policy fellow at the American Chiropractic Association.

"I am passionate about implementation and promotion of high-quality conservative care efforts for patients with spine pain that are centered around self-efficacy, quality of life functional goal setting, and patient activation/motivation. This shines through in my clinic with patient care, trainee education, health policy advocacy, and in my research pursuits."

**Houssam Bouloussa, M.D., University Health Orthopaedics (Kansas City, Missouri).** Dr. Bouloussa earned his medical degree in France before completing spine and pediatric orthopedic fellowships at Yale, UPMC, Oakland (California) Medical Center and University of Alberta, Edmonton, in Canada.

**Chester J. Donnally III, M.D., Texas Spine Consultants (Dallas).** Dr. Donnally is a spine surgeon with extensive experience in spine trauma, having trained with leading experts in the field. He completed his spine surgery fellowship at Rothman Institute in Philadelphia and his orthopedic surgery training at University of Miami Hospital/Jackson Memorial Hospital.

"I use social media purely from a patient education standpoint—no dancing, no jokes, no personal aspects, just education. There is so much misinformation about spine surgery, outcomes, ands risks—I use these (free) platforms to provide information about various spine conditions and treatment options. The aspect I'm most proud of is that I do not outsource any of my work. I film all my own content, edit it, and post it—all from my cell phone! I think this adds a bit of authenticity to my work. I am not trying to market a brand or pay for views. Instead, I am trying to provide free educational resources to anyone who needs it!"

**Zachary NaPier, M.D., Indiana Spine Group (Indianapolis).** Dr. NaPier is a board-certified, fellowship-trained orthopedic spine surgeon with advanced expertise in minimally invasive and motion-preserving surgical techniques. He has a particular expertise in prone transpsoas lateral interbody fusion, which he has presented, published, and taught to other surgeons.

For more information about each of these remarkable individuals, check out SpineLine's story. ♦

# 2025 ORS Annual Meeting to Celebrate Power of Science

**BY TRACEY ROMERO**


*2023 ORS Annual Meeting / Source: ORS Facebook Page*

In just a couple months, February 7-11, 2025, The Orthopaedic Research Society (ORS) will hold its Annual Meeting in warm and welcoming Phoenix, Arizona. *Orthopedics This Week* has everything you need to know to make the most of this essential orthopedic annual meeting.

This year's program is designed to celebrate the power of science, and will include five days of scientific education, workshops, exhibits, and plenty of time for networking.

The meeting, which is focused on the latest innovations in orthopedics, is open to all career levels and different disciplines.

Tim Mix, director of Marketing, Communications, and Membership at ORS, recently talked with *OTW* about what meeting attendees can expect this year.

"The Orthopaedic Research Society 2025 Annual Meeting will bring the international musculoskeletal research community together for five days of scientific education, workshops, networking, exhibits, poster sessions, and much more," Mix said.

"'Science is Our Core' is this year's theme. That will be reflected through all content and events at the Annual Meeting," he added.

The ORS 2025 Guest Clinical Society will be the Pediatric Orthopaedic Society of North America and the Guest Nation will be Sweden.

Mix offers these tips for getting the most out of this year's meeting:

> Check the ORS site at https://www.ors.org/2025annualmeeting/ to set up your schedule, as best as possible, ahead of time. There are a

lot of things going on throughout each of the five days—much of it happening simultaneously. Planning ahead can help to keep you on track. Download the app, which will be made available closer to the event via that same link. The app will provide the latest updates while on site at the event. Also, do take the time to take a break from the presentations to network, meet colleagues, establish new connections, visit the poster, and exhibit hall, and be open to new topics, people, and experiences.

**When:** February 7-11, 2025.

**Where:** Phoenix Convention Center in Phoenix, Arizona.

## Spotlight Speakers

David Bennett, M.D. of Phoenix Children's Hospital on "Pre-operative Visualization for Better Outcomes"

Hannah Dailey, Ph.D. of Lehigh University on "Mechanical Biomarkers in Bone: In Vivo Insights from Digital Twins"

Kharma Foucher, Ph.D. of University of Illinois, Chicago on "Osteoarthritis as a Disease of the Whole Person: Using Biomechanics to Improve Outcomes Beyond the Joint"

Matthew Greenblatt, M.D., Ph.D. of Cornell University on "New Skeletal Stem Cells in the Spine and Beyond"

Lin Han, Ph.D. of Drexel University on "Decorin: A Central Player of Cartilage Extracellular Matrix in Health and Disease"

Chuan-ju Liu, Ph.D. of Yale University on "Ion Channels in Osteoarthritis: Emerging Roles and Potential Targets"

## Meet Dr. David Bennett

David Bennett, M.D., is a pediatric orthopaedic and spine surgeon at Phoenix Children's Hospital. He is an assistant professor at the University of Arizona, Mayo Clinic, Barrow Neurological Institute, and Creighton College of Medicine.

His upcoming talk, "Pre-operative Visualization for Better Outcomes," is based on a book he and his colleagues recently published called "The 5-minute pre-op plan," which captures the spirit of surgical planning as a visualization-driven process.

He explained to *OTW*, "The presentation tries to capture the concept of visualization as a pre-requisite to good outcomes, and it doesn't mean 5 hours of meditation or 18 hours of 3D printing, but it certainly can for some. We get into how advanced imaging, mental rehearsal, AI, structured frameworks, and 3D-printing can be selected on a case-by-case basis to transform the planning phase (often discarded by modern surgeons as superfluous) into an indispensable tool for optimizing surgical precision and outcomes; the things that matter most but can never really be fully captured directly by performance metrics and research.

"Grounded in principles articulated within my book *The Five-Minute Pre-Op Plan*, the talk emphasizes that the capacity to rapidly generate a comprehensive surgical strategy is not the result of haste but of disciplined, deliberate mastery to train oneself to be able to internalize the planning process."

He added, "At its core, the discussion explores the importance of preoperative visualization: mentally navigating the anatomy, surgical steps, and potential challenges long before the first incision. By investing just a few minutes in this level of preparedness, surgeons can anticipate complexities, align their team, and achieve greater parity between plan and execution."

## This Year's Exhibitors

Osteometrics, Inc. | Scanco Medical | Mayo Clinic | Cleveland Clinic | BioRobotics Lab – simVITRO

Micro Photonics | KUBTEC Scientific Biomomentum Inc. | Dejavi Innovation MILabs | Pediatric Orthopaedic Society of North America (POSNA) | XSENSOR Technology Corporation | Scintica | CompagOs | Neoscan Americas | Bruker BioSpin | EXAKT Technologies, Inc. | ATI Industrial Automation, a Novanta Company

## Symposia

**Unmet Clinical Needs Symposium** – Addressing the POSNA Consensus-Based Research Agenda through Discovery Science

**TENET -** Regenerative Treatments to Promote Tendon Regeneration and Restoring Tendon Functionality

## Workshops

- **In Memory of Terrie Cowley:** Bridging the Gaps in Temporomandibular Joint (TMJ) Research
- **Are We Really Studying Aging Associated OA in Our Animal Models?**
- **Advancing Clinical Impact of Movement Analysis** and Patient Activity Monitoring Combining Wearables, AI, Computer Vision, and Data-Driven Approaches

- **Advancing Regenerative Rehabilitation** for Muscle Trauma
- **Use of Artificial Intelligence and Machine Learning** in Orthopaedics: Trends and Future Perspectives
- **The Physical Impact of Psychological Stress** in the Musculoskeletal System
- **Leveraging Computational Modeling** and Simulation Within and Beyond an Episode of Clinical Care: What Will It Take?

## Session Highlights

- **Saturday, February 8:**
  - Standing on the Shoulders of Giants: A Mentor-Mentee Luncheon
  - Evidence-Based Advocacy to Inform Science Policy Decisions: An Orthopaedics Case Study
  - *ORS Public Outreach Committee*
  - Rigor and Reproducibility for Sex Differences and Women's Health Research
- **Sunday, February 9:** MSK Infection-Antibiotic Resistance and its Impact on Orthopaedic-Related Infections
- **Monday, February 10:** Digital Twins to Transform Orthopaedic Research

## ORS Open Door 2025

Since 2018, ORS has held the Open Door Program to engage students and teachers in discussions about careers in different scientific disciplines.

This year it will be held on Friday, February 7 from 9:00 am to 2:00 p.m. at the University of Arizona, Biomedical Sciences Partnership Building, 475 N. 5t St. Phoenix, Arizona 85004.

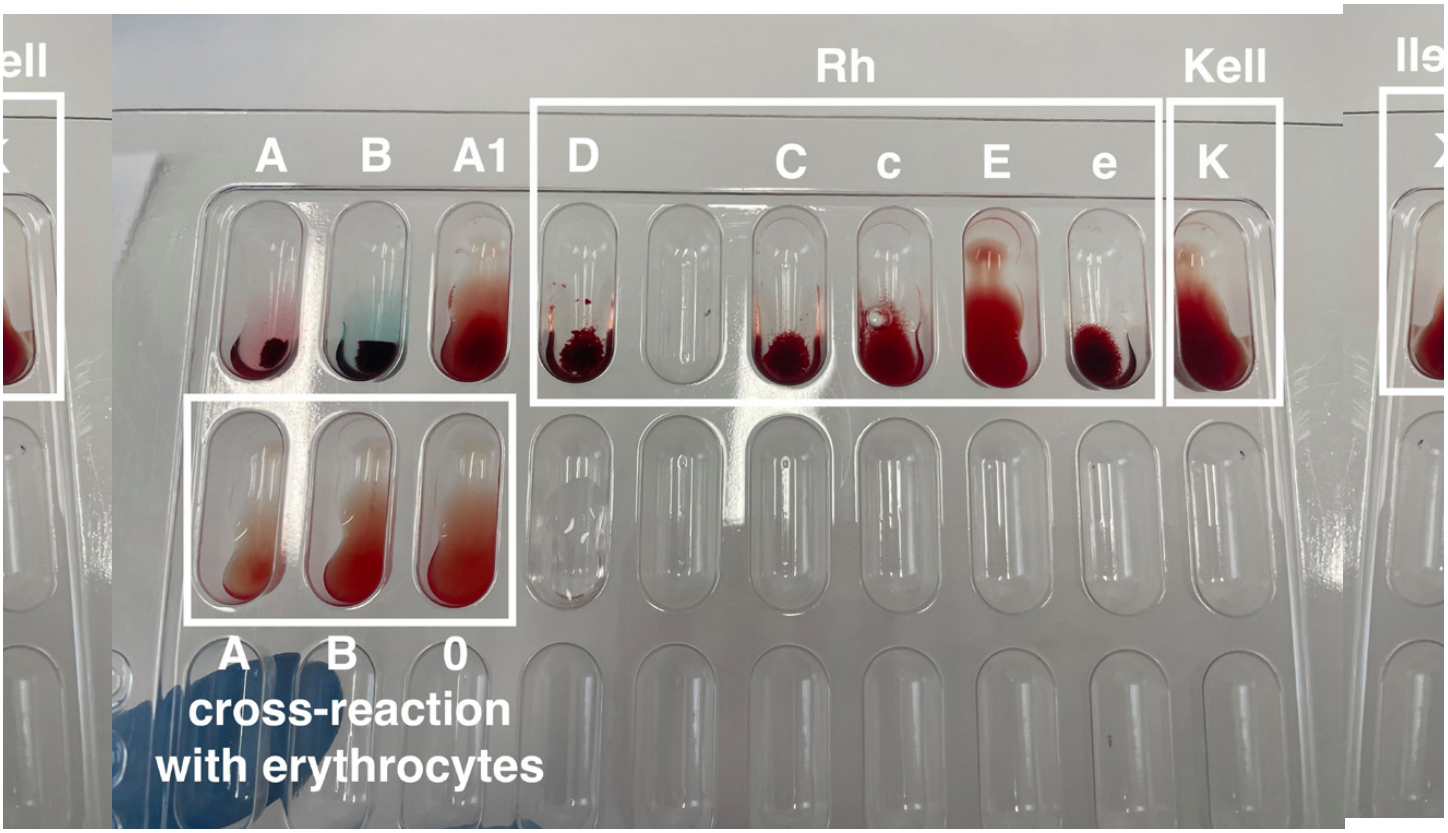
This year's partner and audience are Arizona Association for Middle Level Education and Rogers Ranch STEM Academy.

To register for this essential Orthopaedic meeting: https://www.ors.org/register2025/ ♦

*Advertisement*

# Blood Type Elevates Spondy or ASD Risk?!

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




*Source: Wikimedia Commons and Bondarev.gal*

According to a just published study, patients with B+ blood type, not A, not O, not any other blood type, have a 300% greater likelihood of developing spondylolisthesis.

Which begs a number of questions, most notably, why?

The resulting paper, "Is ABO blood type a risk factor for adjacent segment degeneration after lumbar spine fusion?" was published in the October 14, 2024, edition of the *European Spine Journal*.

The researchers who designed, performed, and then wrote up the study were from Rush University Medical Center, Louisiana State University Health, The Hong Kong Polytechnic University, McGill University, and Virginia Mason Neuroscience Institute.

The team enrolled 445 posterolateral or posterior lumbar interbody fusion patients. They analyzed pre- and postoperative radiographic imaging and collected alignment parameter data looking for signs of adjacent level disease. And, of course, they noted the blood types. Here's the distribution:

- O+ (36.0%),
- O- (5.2%),
- A+ (36.2%),
- A- (6.3%),
- B+ (12.1%),
- B- (1.6%), and
- AB+ (2.7%).

A majority of the patients were female (59.1%), mean age was 60.3 years and average BMI was 31.1 kg/m$^2$.

## Blood Type as an Indicator for Adjacent Segment Disease and More

"We were aiming to gain a better understanding of adjacent segment

degeneration and to look at it from a perspective that had never before been addressed," explained co-author Dino Samartzis, D.Sc., professor in the Department of Orthopaedic Surgery at Rush University Medical Center. "The concept of blood type as a potential biomarker for adjacent segment degeneration came into discussion, in part, because studies started emerging during COVID that found that individuals with a specific blood type were predisposed to having more severe forms of COVID."

"We looked into the matter and noted that blood type was associated with other conditions. We thought it could play a role of health and disease/disorders of the spine. To test this concept, we decided to investigate a very clinically relevant condition, adjacent segment degeneration, in relation to blood type."

"Our work has led to the discovery of the molecular biology and genetic mechanisms as well as epidemiological risk profiles of disc degeneration and discogenic pain. We are sensitive that spine degeneration can be very multifactorial, yet much remains to be answered. Adjacent segment degeneration/disease following a lumbar fusion is a serious concern for spine surgeons worldwide. Despite so much research on the topic, its occurrence remains a mystery."

## The Results

The multi-center research teams found that the blood type did not correlate with changes in hospital or intensive care duration, discharge disposition, reoperation rate, or in-hospital complication rate.

However, the team did find that patients with an A+ blood type were most susceptible to postoperative epidural hematoma. Average patient follow-up was 11.0 months. All patients in the study had similar Patient-Reported Outcomes Measures, specifically:

- 132 (29.7%) study patients developed radiographic evidence of adjacent segment degeneration.
- Patients with a B+ blood type were significantly more likely than A+ and O+ blood type patients to develop spondylolisthesis and adjacent segment degeneration.
- There were no significant differences in sagittal alignment parameters and number of levels of fusion were found.

Sam Rudisill, M.D. first author of the study and medical student at Rush (now an orthopedic resident at Mayo Clinic), told *OTW*, "Interestingly, our study showed that risk for adjacent segment degeneration varied according to ABO blood type, with patients having B+ blood type found to be more than three times as likely as those with A+ blood type and nearly four times as likely as those with O+ blood type to develop spondylolisthesis at the intervertebral segment just above the fused lumbar spinal level."

"Similar relative rates of adjacent segment degeneration were also observed at the level below the fusion construct. Patients with A blood type also demonstrated higher rates of upper-level spondylolisthesis compared to those with O blood type."

"While the mechanisms by which ABO blood type influences risk for adjacent segment degeneration remain to be elucidated," continued Dr. Rudisell, "the discovery of these associations supports the notion that the pathogenesis of adjacent segment degeneration is complex and multifactorial, not entirely explained by altered spinal kinematics following lumbar spine fusion."

"Biologic factors such as ABO blood type therefore warrant the consideration of researchers seeking to investigate the potential mechanisms of degenerative spine conditions."

*OTW* asked Dr. Rudisell, given the study data, how can surgeons work around such a non-modifiable risk factor as blood type. "Our work is proof-of-principle that raises awareness that blood type may be a potential risk factor for adjacent segment degeneration and in fact for other spine conditions," explained Dr. Rudisell. "Larger, more prospective studies are needed to validate and expand on this concept. However, if what we noted holds true, such easily attainable information as blood type can add tremendous value to any clinician and scientist in their understanding of spine degeneration and pain and be added to the list of risk factors to aid in improving patient management and outcomes as well as managing patient expectations."

Finally, noted Dr. Rudisell, "With data analytics becoming more and more sophisticated day-by-day and with artificial intelligence solutions becoming more prominent, such new information can in time be easily incorporated into algorithms or software programs that can provide immediate insight to any clinician in managing patients. Ultimately, this 'personalized spine care' approach can vastly improve patient outcomes and decrease associated healthcare costs, ultimately leading towards a more productive society." ◆

COMPANY

# Bioventus Grows Sales Significantly in Q3, 2024


*Source: Bioventus Inc. and AdobeStock*

Bioventus Inc. reported $138.964 million in sales and $4.074 million in operating profit for the quarter ending September 30, 2024, which met both Wall Street's expectations and management's guidance.

Robert Claypoole, Bioventus' president and chief executive officer and Mark Singleton, senior vice president and chief financial officer, reported during their quarterly earnings call continued growth in the third quarter as the business grows.

Claypoole said, "As a result of strong execution by our Bioventus team across all functions and geographies, we delivered another strong quarter, and we look forward to completing a successful and transformational 2024."

He explained, "We believe our diverse portfolio, growth strategy and improved execution position us to sustain our momentum and deliver above market revenue growth, margin expansion and cash flow acceleration in the years ahead."

He said that they continue to focus on the three priorities he laid out at the start of the year: accelerating revenue growth and improving profitability and liquidity. In the third quarter, the rev-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enue grew 15%, making it the fourth straight quarter for double-digit growth.

Areas of significant growth included Pain Treatment and Surgical Solutions, particularly with the investments in Nexus and BoneScalpel, and their single-injection Hyaluronic acid therapy DUROLANE.

"To this end, we are making strategic investments to build awareness about the benefits of ultrasonic surgery versus current practices, increased medical education and commercial effectiveness and enhance our portfolio with line extensions. Longer term, we plan to augment our growth by penetrating neurosurgery and general surgery, while also expanding internationally. We're excited about our potential to drive sustained double-digit Ultrasonics growth in the years ahead," Clapoole continued.

Claypoole also gave an update on Exogen which is expected to grow annually by low- to mid-single-digits as they continue to focus on medical education and product enhancements.

In the third quarter they reported an adjusted EBITDA of $24 million, $2 million more than the previous year. Claypoole said that for the year they have improved their adjusted EBITDA margin by almost 150 basis points.

Singleton acknowledged that they expect a temporary slowdown in their Bone Graft Substitute (BGS) business because of shortages in supply chain and delays in adding new larger distributors.

Despite this though, he said they now expect net sales to be in the range of $562 million to $567 million instead of in the range of $557 million to $567 million and the adjusted earnings per share to be between $0.40 and $0.42.

### Analysts Concerned About the Seasonality of the Business

Chase Knickerbocker from Craig Hallum asked for further clarification on any seasonality of the business that could impact the end of year numbers.

Claypoole said, "We'll see lower growth in Q4, driven mainly by 2 factors. First are unfavorable comps from a year ago, especially with Exogen where we had some onetime favorability in Q4 with significant collections for that business."

The second, he said, is slower BGS growth which he had already explained.

"But that said, we feel very good about our continued momentum across the business in Q4 and in line with our guidance. We're looking forward to driving approximately 13% top line growth for the year."

Robbie Marcus from JPMorgan wanted to know if these issues in the fourth quarter will bleed into 2025 and cause any growth disparity in the first and second half of the upcoming year?

Claypoole reassured, "So we feel really good about our momentum into Q4 and into 2025 as well. In terms of any of the factors that I mentioned for Q4 that could carry into 2025. Really, the only one is from a BGS standpoint, making sure that we—as I mentioned—have a temporary lag effect and need to ramp that back up as we go into next year. So the start may be a little bit softer. But besides that, feel very good across the business about our momentum heading into next year."

Marcus also asked if the BGS issues will be resolved by second quarter of 2025 and Claypoole said no.

**Bioventus Inc.**
**Quarterly Report ($ in 000s): 3 and 9 Months Ended 9/30/24**

| 3 Month Sales | | | 9 Month Sales | | |
|---|---|---|---|---|---|
| 2023 | 2024 | % Change | 2023 | 2024 | % Change |
| $120,794 | $138,964 | 15.04% | $376,922 | $419,638 | 11.33% |
| **Op Profit** | | | **Op Profit** | | |
| 2023 | 2024 | % Change | 2023 | 2024 | % Change |
| $2,418 | $4,074 | 68.49% | ($82,890) | ($19,967) | -75.91% |
| 2% | 3% | | -22% | -5% | |
| | | | | | |
| **EPS** | | | **EPS** | | |
| 2023 | 2024 | % Change | 2023 | 2024 | % Change |
| ($0.12) | ($0.07) | -41.7% | ($1.45) | ($0.52) | -64.14% |
| **2024 Sales Estimate** | | | **2025 Sales Estimates** | | |
| Consensus | Change | | Consensus | Change | |
| $564,910 | 10.30% | | $587,620 | 4.02% | |

*Source: RRY Publications LLC*

Caitlin Cronin from Canaccord pushed for more information on the performance for pain treatments and any concerns about competition.

Claypoole emphasized that their business is uniquely differentiated from their competitors.

"We have dedicated the largest dedicated sales force with strong payor contracts, and that is a very strong combination. And we're also focused on and seeing traction with improving our commercial execution with larger accounts."

He added, "And as a result of that combination, we've been driving significant volume gains and we always expected that the pressure from competitors will increase in the coming years, that's what happens when you're leading."

"So even though the comps get harder, we feel good about our ability to continue to grow above market given our strength and our momentum."

Cronin also asked about how their ultrasound bone cutting tools compare to others on the market.

Claypoole said, "Overall in that category, we're early in the going here, and that's what's so exciting about it. We have the world-class technology and tremendous momentum with the business, but we're just scratching the surface and plenty of opportunity for us to expand organically and that includes through additional innovation in the space."

He put emphasis on their heavy research and development department. — *TR*

## $185M Investment and New CEO for Orthopedic Care Partners

Orthopedic Care Partners (OCP), an orthopedic practice management platform, has completed significant financing milestones and named Timothy Corvino, M.D., MBA chief executive officer.

*Timothy Corvino, M.D., MBA / Source: Orthopedic Care Partners*


*Advertisement*

Global alternative asset manager Brookfield Asset Management, through Brookfield Special Investments (BSI), provided a $185 million hybrid capital raise. The hybrid capital investment will support Orthopedic Care Partners in its next stage of growth. The investment provides both a new strategic partnership and capital structure flexibility.

Orthopedic Care Partners also successfully completed a $358 million senior credit facility refinancing, led by TPG Twin Brook Capital Partners. TPG Twin Brook Capital Partners is a direct lending finance company. According to the press release, the debt refinancing "extends and reprices the Company's [Orthopedic Care Partners] existing credit facility to a lower rate." The debt refinancing will also provide Orthopedic Care Partners with "an expanded revolving credit facility and delayed draw term loan." All of this will contribute to its continued growth.

Dr. Corvino commented, "Today's senior debt refinancing and partnership with BSI positions OCP for accelerated future growth; we look forward as an organization to growing OCP's presence in current and new markets, continuing to invest in enhancing our patient care and experience at every OCP location and executing on our robust pipeline of high impact growth opportunities."

Dr. Corvino is an experienced healthcare executive with more than 20 years of clinical experience and 15 years of strategic and operational leadership experience. He has served as an executive leader for a number of healthcare companies.

Most recently Dr. Corvino was CEO of Spire Orthopedic Partners. According to his biography on the Orthopedic Care Partners website, while at Spire Dr. Corvino "transformed a single surgical practice into a nationally recognized musculoskeletal platform." Dr. Corvino also previously served in executive roles at Covenant Physician Partners and U.S. Acute Care Solutions. — *KD*

Source: Globus Medical and I don't know where he got this one

## Globus Medical: Strong Q3 Sales and Product Intros

Globus reported $626 million in sales and $48 million in operating profit for the quarter ending September 30, 2024, which was above both Wall Street's expectations and management's guidance.

Globus Marks Progress Since Merger

During the third quarter earnings report, Dan Scavilla, company president and chief executive officer, reported on the company's progress as it marked the one-year anniversary of the Globus NuVasive (NUVA) merger. Scavilla said, "September 1st marked the 1-year anniversary of the Globus NuVasive merger, making this quarter the fourth consecutive combined earnings release with sales growth, strong financial performance and best-in-class innovative product launches."

He reported that third quarter sales reached $626 million, an increase of $242 million—primarily from the NUVA purchase. Non-GAAP Earnings per Share was $0.83, an increase of 45%—again, due primarily to the merger. Globus also recorded a free cash flow of $162 million in the third quarter.

GMED's U.S. spine sales, with NUVA, grew 55% in Q3. Highlights were expandable implants, MIS screws, biologics, lateral and cervical products. OUS sales also reached record levels (for GMED) in Q3 soaring 86% on a


*Source: Globus Medical and AdobeStock*

**Globus Medical, Inc.**
**Quarterly Report ($000s): 3 and 9 Months Ended 9/30/24**

| 3 Month SALES | | |
|---|---|---|
| 2023 | 2024 | % Change |
| $383,639 | $625,705 | 63.10% |
| **Op Profit** | | |
| 2023 | 2024 | % Change |
| $404 | $48,098 | 11805.45% |
| 0% | 8% | |
| **EPS** | | |
| 2023 | 2024 | % Change |
| $0 | $0 | 4122.2% |
| **2024 Sales Estimate** | | |
| Consensus | | Change |
| $2,500,000 | | 37.60% |

| 9 Month Sales | | |
|---|---|---|
| 2023 | 2024 | % Change |
| $951,942 | $1,862,062 | 95.61% |
| **Op Profit** | | |
| 2023 | 2024 | % Change |
| $123,019 | $105,717 | -14.06% |
| 13% | 6% | |
| **EPS** | | |
| 2023 | 2024 | % Change |
| $1.03 | $0.56 | -45.63% |
| **2025 Sales Estimates** | | |
| Consensus | | Change |
| $2,660,000 | | 6.01% |

*Source: RRY Publications LLC*

constant currency basis compared to Q3, 2023. Big winners were Japan, Germany, the U.K., Italy, Brazil, and Colombia.

Scavilla acknowledged that the Q3 GAAP gross profit was lower than the 2023 Q3, 53% vs. 62%. He explained that this decline was the result of stepped-up amortization from the NuVasive merger. He expects it to end in Q4.

"Based on our results so far, I would like to compliment the entire Globus team for their speed and effort in completing the most successful spine merger in history. There's still a great deal of work ahead of us, but I look forward to building from this base and accelerating growth as we move into the future."

Scavilla said that Globus also launched four new products in Q3 and expects to launch more before the end of the year. Among the new products were the Excelsius Navigation hub with three imaging workflows: 3D imaging with automatic registration, preoperative CT fluoroscopy emerging and interoperative 2D fluoroscopy.

"We have yet to fully harness the power of the combined Globus NuVasive product offerings internationally and feel this will be a significant tailwind moving forward in 2025 and beyond," he added.

Globus has increased its guidance to now expect a 2024 net sales between $2.49 billion to $2.5 billion.

**Wall Street Pressed Management About the FDA's Warning Letter**

Analysts also asked for an update on the recent FDA warning letter.

Scavilla emphasized that the warning letter was about their internal process of handling complaints and not anything to do with a robot or patient safety.

"And it was really about the array of criteria we selected when we're analyzing plates. The FDA would like us to do more, in which case we did. We went back to the very first complaint and went through every single one of them, realized that our outcome would not change with all the additional criteria. We've agreed to put that going forward."

Now they are working on proving it is an effective approach and waiting for the FDA to come in for reinspection. He admitted there was some impact on sales from concerned customers but not anything significant.

Matt Miksic, an analyst from Barclays asked for clarification on what led to the growth in the third quarter.

Keith Pfeil, chief operating officer and chief financial officer explained, "Really, when you look back on the year, we aggressively went after eliminating cost redundancies as well as facility consolidation like I commented on in the quarter."

"As we got into the year, we identified more and more places where we felt that there was opportunity for savings and really as we really looked at the year come together, the key focus for us is driving cash savings."

Miksic also asked about the progress in expanding the sales field force since the merger with NuVasive.

Scavilla said, "It's really been several folds. The first one is we have been training our representatives on the system itself. So, we've been bringing our team in, making them experts, getting them comfortable with that so that they understand how to perform this. And I've seen dozens and dozens of teams from the former NuVasive team in our labs running through that. At the same time, our product development team has been working to take the great NuVasive products like Reline or Modulus and get those on to the software that's been done."

Caitlin Cronin from Canaccord asked what makes their ortho robot stand out compared to competitor systems.

Scavilla said, "I would say that footprint is certainly one of them to be considered, especially as you work in Ambulatory Surgery Centers. We've looked at this, and we're really pleased with how we've designed it to go in there."

"One of the things Caitlin, I had mentioned earlier is I think that just the fact that it's a newer robot that we've really built within the last year or two using some of the newest componentry, the ability to have smooth and articulating movements that I think are really good. The fact that you can do a registration with or without CT, how you want to operate this. We don't need preplanning to be sent away. It's something that a surgeon can decide to do either the day before or right in the OR."

Cronin also asked about the early customers of the free hand navigation and where the technology will most likely be used over time.

Scavilla said it will be used in hospitals, outpatient, and ASCs.

"The procedures that have occurred have really been strong. There's a lot of excitement out in the field and also with our surgeon and with these given that it is currently the largest section of navigation entering into that actually opens a brand-new field for us."

"While we think the long-term play will be robotics, we obviously recognize there's always going to be multiple avenues for surgeons to treat patients." — *TR*

## Alphatec Beats Wall Street's Sales Forecasts, But Not EPS

Alphatec Holdings, Inc. reported $151 million in sales and a $33.7 million operating loss for the quarter ending September 2024. Sales were well above both Wall Street's expectations and management's guidance. EPS, however, missed analysts' expectations.

### Alphatec Explains Its Industry Leading Sales Growth Strategy

Patrick Miles, chairman and chief executive officer of Alphatec Holdings, Inc., reported that Alphatec generated $151 million in total revenue, which beat Wall Street's expectations and led the spine industry at 30% surgical product sales growth.

"So super excited about what's going on here. We've outgrown everyone in the spine business again by at least 2x. I'm expecting more. And our focus is on perpetuating profitable growth," Miles said.

He added, "EOS Insight is launched, and we have a record number of orders year-to-date. The profitability is good at $7.4 million in adjusted Earnings Before Interest, Taxes, Depreciation and Amortization [EBITDA], greater than 50% sequential reduction in cash burn.

He explained that Alphatec is on track to generate cash in the fourth quarter and that they increased their term loan capacity by $50 million.

"Our value creation and cash generation are really the focus of what we're doing. So as a spine-focused company, creating value clearly is our intention."

He said they will do this by leading in revenue generation and increasing profitability. He also pointed to their recent streamlining of their organizational structure.

"So we have an infrastructure in place with all of our facilities to ultimately scale this business, and that was the intention from the beginning. We are positioned with sets and inventory to fuel expansive growth."

J. Todd Koning, chief financial officer, added the $151 million in revenue was made up of $135 million in surgical revenue and $15 million of EOS revenue.

"We saw strong contributions across the portfolio, particularly in our lateral and expandable implant technologies, which contributed to the 9% growth in average revenue per procedure," he said.

"Third quarter results grew $5 million sequentially as we benefited from the increased product availability and new territory additions. Third quarter non-GAAP gross margin was 69%, down 60 basis points compared to the prior year due to the impact of product mix."

### Analysts Worried that Alphatec Spending Too Much

Brooks O'Neill, an analyst with Lake Street Capital Markets, raised doubts that Alphatec won't outspend their resources.


*Source: Alphatec Holdings, Inc. and AdobeStock*

**Alphatec Holdings, Inc.**
**Quarterly Report ($000s): 3 and 9 Months Ended 9/30/24**

| 3 Month SALES | | |
|---|---|---|
| 2023 | **2024** | **% Change** |
| $118,262 | $150,719 | **27.44%** |
| **Op Profit** | | |
| 2023 | **2024** | **% Change** |
| ($37,359) | ($33,703) | **-9.79%** |
| **-32%** | **-22%** | |
| **EPS** | | |
| 2023 | **2024** | **% Change** |
| ($0.35) | ($0.28) | **-20.0%** |
| **2024 Sales Estimate** | | |
| Consensus | | Change |
| $605,120 | | 27.50% |

| 9 Month Sales | | |
|---|---|---|
| 2023 | **2024** | **% Change** |
| $344,292 | $434,769 | **26.28%** |
| **Op Profit** | | |
| 2023 | **2024** | **% Change** |
| ($128,565) | ($112,351) | **-12.61%** |
| **-37%** | **-26%** | |
| **EPS** | | |
| 2023 | **2024** | **% Change** |
| ($1.18) | ($0.90) | **-23.73%** |
| **2025 Sales Estimates** | | |
| Consensus | | Change |
| $729,770 | | 20.60% |

*Source: RRY Publications LLC*

Miles said, "And so the one thing that I will tell you is we are committed to building a self-funding growth company." He went on to explain that they are taking the necessary internal moves to streamline the organization so they can demonstrate consecutive flat operating expenses and an adjusted EBITDA above expectations.

Koning added, "I think clearly, this is a business of growth. That growth is generating incremental profitability through adjusted EBITDA. And as we think about the actions recently taken to ultimately narrow the organization, we also have done a significant deep dive in the operation to really root out discretionary spending and to really ultimately reduce our overall spend in that area as well. And so I think we're being very thoughtful and very diligent about where we're placing our resources and overall reducing that resource consumption today."

Miles add that they have plenty of inventory for new representatives and new distributors, and that they are starting to see the investments they have made in the last year to 18 months pay off as they build the sales force they have always envisioned.

Mathew Blackman of Stifel said, "No. I appreciate that. But I guess the point is that we're ramping up that productivity curve, and we still have ways to go.

Miles and Koning agreed.

Miles added, "Yes. We're a nominal player in this business. There's 95% to go…we're a 5% market shareholder. But clearly, we're growing aggressively. And I got to tell you, we're the belle of the ball."

"You look at what we're doing procedurally with regard to lateral, what's going on with regard to EOS. And it's not a secret to the industry that there's a lot going on here with regard to evolving care and people want to be associated with," Miles added.

Matt Miksic from Barclays asked why competing with a robot today isn't more of a challenge.

Miles replied that their goal is "to have a profound influence on spine care" and that the purpose of the EOS is to drive better decision-making, to be able to provide surgeons with data on the likelihood of a patient to have good outcomes from a specific intervention.

"And so all of our work has been how do we architect a procedure that's reflective of a step-by-step execution where we can provide interoperative information to drive predictable outcomes. That is our strategy," he said.

Matthew O'Brien from Piper Sandler questioned considering all the investments they are making why their top line in 2025 isn't higher.

Koning agreed saying, "Our asset base does support a level of revenue growth that is higher than what's implied. Ultimately, we'll look at where we are, and we'll talk about guidance in 2025. And—but I think your observation that we have invested, and we have the asset base to continue to grow at meaningful rates. And we've grown about, call it, over $100 million a year for the last three years or so." — *TR*

## SI-BONE Grows Q3 19%, Despite Hurricane Helene

SI-BONE, Inc. reported $40.3 million in sales and a $7.6 million operating loss for the quarter ending September 30, 2024, which was below both Wall Street's expectations and management's guidance.

**Despite Hurricane Helene, Growth Momentum Intact**

Despite some Hurricane bad news, SI-BONE reported stellar sales growth for the quarter ending September 30, 2024.

Saquib Iqbal, SI-BONE's senior director of investor relations reported during the third quarter earnings call that SI-BONE generated worldwide revenues of $40.3 million, up 19% from the prior year's Q3.

Laura Francis, chief executive officer said the successful quarter was driven by the performance of iFuse TORQ and iFuse Bedrock Granite 10.5 and 9.5. SI-BONE has also received Federal Drug Administration 510(k) clearance for iFuse TORQ TNT.

TNT is SI-BONE's next-generation pelvic implant system designed to fit the anatomical and bone density characteristics of the sacrum and ilium. Francis explained that what makes it unique is


*Source: SI-BONE, Inc. and and AdobeStock*

that it extends across the entire pelvis and offers different fusion structures for the different areas of the pelvis to improve bone integration.

"TNT is our second breakthrough device to launch in the last two years. This solution, designed with leading trauma surgeons to treat patients with sacral insufficiency fractures, expands our presence in the trauma market with an anatomy-specific implant system that complements the surgeon workflow."

"We pride ourselves on disrupting traditional orthopedic and neurosurgical industry norms, which are often burdened by low margins and undifferentiated products as well as large capital investments. With each new product launch, we are distinguishing SI-BONE as an asset-light platform of anatomy-specific products that are supported by clinical evidence and favorable health economics," Francis said.

"Starting with sales infrastructure, our surgeons are not only drawn to our comprehensive solutions, but also value the exceptional support provided by our highly experienced sales team, which remains unmatched in the industry."

"The combination of our direct sales team consisting of 82 territory managers and an increasing number of third-party agents has accelerated market penetration and translated into significant operating leverage."

Francis said that SI-BONE's trailing 12-month *per-territory* revenue increased 21% to $1.8 million, and they expect the overall revenue *per territory* to exceed their $2 million target.

Anshul Maheshwari, chief financial officer, acknowledged that Hurricane Helene had an impact at the end of the quarter on case scheduling and cancellations. So did an IV solution supply issue.

Despite this though, he said, "We also expect to be fourth quarter adjusted Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) to be positive. The strong start to the fourth quarter reaffirms our confidence in the underlying demand momentum."

SI-BONE lowered their 2024 worldwide revenue guidance to a range of $165 million to $166 million.

**SI-BONE, Inc.**
**Quarterly Report ($000s): 3 and 9 Months Ended 9/30/24**

| 3 Month SALES | | |
|---|---|---|
| 2023 | 2024 | % Change |
| $34,014 | $40,340 | 18.60% |
| **Op Profit** | | |
| 2023 | 2024 | % Change |
| ($11,169.00) | ($7,633.00) | -31.66% |
| -33% | -19% | |
| **EPS** | | |
| 2023 | 2024 | % Change |
| ($0.25) | ($0.16) | -36.0% |
| **2024 Sales Estimate** | | |
| Consensus | | Change |
| $165,090 | | 17.60% |

| 9 Month Sales | | |
|---|---|---|
| 2023 | 2024 | % Change |
| $100,027 | $118,176 | 18.14% |
| **Op Profit** | | |
| 2023 | 2024 | % Change |
| $34,425 | $29,754 | -13.57% |
| 34% | 25% | |
| **EPS** | | |
| 2023 | 2024 | % Change |
| ($0.86) | ($0.64) | -25.58% |
| **2025 Sales Estimates** | | |
| Consensus | | Change |
| $193,820 | | 14.80% |

*Source: RRY Publications LLC*

### Analysts Dig for Further Details on Effects of Case Deferment

Craig Bijou with Bank of America Securities asked if the hurricanes and IV shortage were the reason the guidance came down.

Francis explained, "We did see some temporary disruption to case scheduling as well as cancellations in the markets that were impacted by Helene. And also, we did experience a little higher summer seasonality, mainly due to surgeon vacations. So, that did impact the revenue potential for the quarter."

"But overall, coming into the fourth quarter, physician engagement and demand has been quite strong, and that translates into strong top-line and bottom-line performance."

Maheshwari added that as they were thinking about their guidance, they looked for feedback from the field about how these things would affect the four quarter and adjusted the guidance for the possibility of deferred cases not being able to be rescheduled in the fourth quarter.

He explained, "Now, assuming that is not the case, and the procedures do go back on the books sooner, that could put us on the top end of the range. And, as Laura said, the momentum in the business is strong. But as always, we want to take a thoughtful approach based on some of the indications we have from the field and have reflected that in our guidance. But if things play out better, that could provide potential upside and play better than we expect."

Xuyang Li with Jefferies specifically asked about the SI joint fusion market.

Francis called SI-BONE the "undisputed market leader in SI joint fusion," pointing to high demand from surgeons for their iFuse-3D, TORQ and INTRA

products and the educational approach their sales force takes as big drivers.

"As I said, we have the most comprehensive portfolio out there and the best commercial education and patient advocacy infrastructure in the industry," she added.

Analysts also asked about the transitional pass-through payment for the Bedrock Granite which will start on January 1, 2025.

"It's a really important milestone for Granite and its clinical significance in sacropelvic stabilization fusion. When they finalized their decision on the TPT award, CMS [Centers for Medicare and Medicaid Services] actually provided a unique code for hospitals to use when reporting the use of Granite implants. Additionally, what's really important is that CMS granted a $0 device offset," Francis shared.

She explained that this allows for hospitals to fully pass through 100% of the Granite technology costs that they report when they're actually using the product.

Caitlin Cronin with Canaccord asked specifically about the inventory set built out of Granite 10.5 and 9.5 which Maheshwari said were doing well.

"We're feeling really good about the Granite family usage trends that we're seeing. So, that's number one. The beauty of Granite 9.5 is it actually uses the same instrument sets that go with the 10.5.

"We are putting out more capacity each month, each week, almost each day to be able to support the demand that we're seeing in Granite, especially as we continue to penetrate the degenerative spine opportunity. But we've got the supply chain framework in place to be able to meet those demands." — *TR*

**LARGE JOINTS**

## Does Robotic Assist Reduce TKA Revision Rates? NO?!

Research being a patience game, those interested in performing a population-level comparison of revision rates between robotic-assisted and non-robotic assist total knee arthroplasty (TKA) had to wait. But patience paid off with the February 2024 release of "Robotic-assisted TKA is Not Associated With Decreased Odds of Early Revision: An Analysis of the American Joint Replacement Registry," which appears in the journal: *Clinical Orthopaedics and Related Research.*

"Robotic-assisted total knee arthroplasty was first approved for use in the U.S. in 2017," co-author Lucas Nikkel, M.D. of Johns Hopkins Medicine, told *OTW*. "It takes some time to get enough patients who have had procedures with the technology and have two-year outcomes."

"TKA is one of the most common surgical procedures in patients over 50 years of age, and there are over 600,000 done every year in the United States. There is increasing interest in both robotic-assistance and potentially more durable implant fixation techniques (cementless designs) in total knee arthroplasty, and these are often marketed as a way to improve accuracy, outcomes, and implant longevity."

"However, prior technological innovations such as navigation or customized cutting guides have not been shown to improve outcomes, and robotic assistance is associated with higher surgical costs."

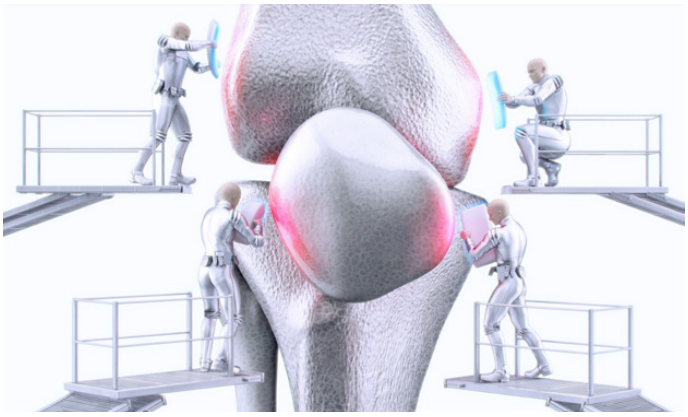
**More Accurate Cuts, But No Change in Revisions?**

"Robotic-assisted total knee may create more accurate bone cuts," explained Dr. Nikkel to *OTW*, "and we wanted to evaluate whether the increased cost of robotic assistance with cementless implants in total knee arthroplasty was leading to improved outcomes, specifically decreased rates of revision operations in the early period. Our prior paper did not show improved two-year implant survival rates among all implant types, so this was a subset of the prior paper of patients who only received cementless implants."

**Study Methodology and Conclusions**

The Johns Hopkins team pulled data from the American Joint Replacement Registry to identify patients 65 years or older who'd been treated with total knee arthroplasty between January 2017 and March 2020 (two-year follow-up, 65 years or older).

The team created two retrospective cohorts: robotic-assisted TKA and conventional TKA.



*Source: Shutterstock*

According to the registry data, 10% (14,216 of 142,550) of TKAs performed during this study period used robotic assist. According to the research team, there was no statistically significant change in the odds of revision at two years between robotic-assisted and conventional TKAs.

In addition, the research team did not find a statistically significant difference in the reasons for a revision surgery between robotic-assisted and non-robotic-assisted TKA—with the exception of increased probability of instability and pain in the robotic-assisted group.

**Preliminary Findings – More Work To Do**

Many questions remain. *OTW* asked Dr. Nikkel if this evidence was enough to influence practice patterns and he said, "These are preliminary findings; early adopters of robotic assistance (and patients selected for cementless implants) may not represent all surgeons or patients who perform or undergo total knee arthroplasty. However, in this broad sample of patients in the U.S. age 65+ undergoing total knee arthroplasty, there does not appear to be an early benefit in terms of implant survival to justify the cost of robotic assistance."

"Some patients may still want robotic-assisted TKA, but we cannot advocate for widespread adoption of robotic-assisted total knee arthroplasty at this point given the increased cost without showing improved outcomes. Longer-term studies are needed and will be initiated once we have adequate follow-up of both this cohort and future groups of patients." — *EH*

**SPINE**

## Data From 1,626 Cervical TDR Revision Cases Released

Of course, this huge, longitudinal study, with data from 1,626 cervical total disc replacement (TDR) patients, comes from the preeminent spine care institution in the United States, The Texas Back Institute (TBI) of Plano, Texas.

Led by the prolific, inestimable co-founder of TBI, Richard Guyer M.D., the TBI team published their study results in a paper titled, "Removals and Revisions of Cervical Total Disc Replacement Devices in a Consecutive Series of 1626 Patients Beginning With the First Case Experience in 2003," in the October 2024 edition of *Spine*.

"At TBI we were the first to embrace motion preservation by implanting the first lumbar disc replacement in March 2000 and later started implanting cervical discs in 2003 as part the various investigational device exemptions studies," explained Dr. Guyer, "We believed that just like hip and knee replacement, disc replacement was a better solution than fusion in the properly indicated patients"

"We looked at 1,626 patients undergoing cervical TDR from 2003 to June 2021," said Guyer, "the TDRs included up to three levels and well as hybrids of TDR and fusion."

The Study Results

According to TBI's research team, there were:

- Out of 1,626 treated cervical TDR patients, only 1.48% (24) had to have their implant removed or revised.
- Of those, 1.41% (23 cases out of 1,626) were to remove the implant.
- Only 1 patient (0.06%) had to have the cervical TDR revised.

Of the removals:

- 78% (18 cases) were converted to an anterior cervical discectomy and fusion
- 22% (5) received a replacement total disc arthroplasty
- 22% (5) were diagnosed with osteolysis with/without Cutibacterium acnes
- 17% (4) were diagnosed as device displacement/migration

*Richard Guyer M.D. and cervical disc replacement device / Source: Texas Back Institute and OpenPR*

- 17% (4) were diagnosed with posterior spinal pathology, and
- 1 (0.04%) EACH for:
    - metal allergy,
    - approach-related complications,
    - malpositioning,
    - subsidence, and
    - hypermobility.

**Ten-Year Follow-Up**

Sixty-six patients reached the 10-year (or longer) follow-up milestone—and none had removal/revision surgery after the index surgery. Additionally, the research team found that there was no relationship between the occurrence of removal/revision and age, sex, body mass index, or physician experience. Interestingly, the removal/revision rate was significantly higher for those patients who were treated as part of the FDA trials as opposed to patients who received their treatment after FDA approval (4.1% vs. 1.3%).

"The most vital result was showing the safety and durability of the cervical discs in our series with only 1.48% of revision," said Dr. Guyer. "The only surprising finding was the occurrence of osteolysis and infection. Though low, we did not see these in our series of lumbar disc replacements. This phenomenon is now being further investigated by us and other centers."

"From this work we can conclude that cervical disc replacement in the properly selected patient is a successful and durable solution with a very low revision rate." — *EH*

## Spinal Cord Stimulation vs Conventional Management

How effective is spinal cord stimulation? And compared to what?

A research team led by the chairman and founder of The American Society of Pain and Neuroscience, Timothy Deer, M.D., designed a prospective, randomized control, multicenter study to compare dorsal spinal cord spinal stimulation to medical management for the treatment of low back pain.

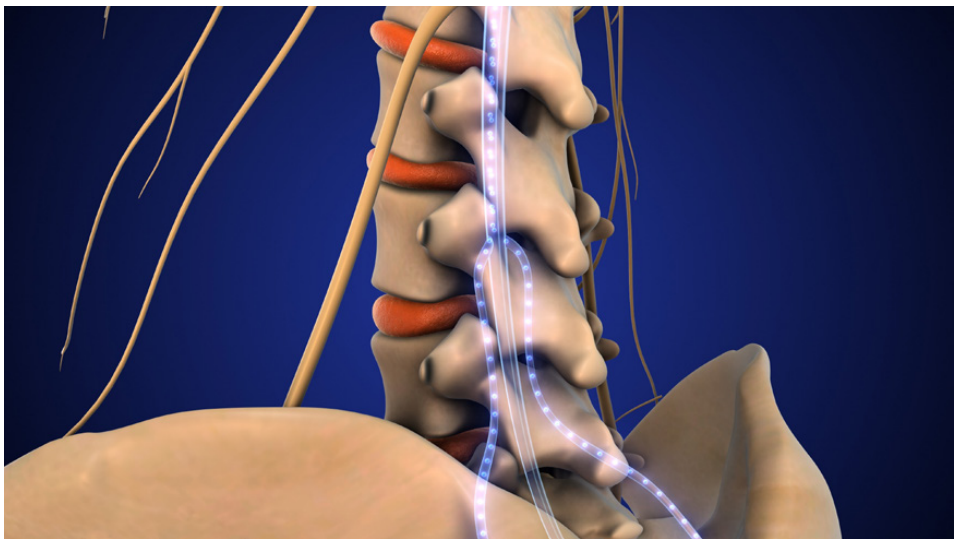
Patients who had experienced chronic, refractory axial low back pain and had yet been treated with lumbar surgery and for whom surgery was not an option were selected for the study.

The results were published in August 2024 edition of *The Journal of Pain Research* under the title: "Comparing Conventional Medical Management to Spinal Cord Stimulation for the Treatment of Low Back Pain in a Cohort of DISTINCT RCT Patients."

According to Dr. Deer, "The orthopedic spine surgery community and the interventional spine community felt there was a need to investigate how patients with chronic low back pain and no surgical options would do with spinal cord stimulation compared to typical medical management. There have been several articles showing efficacy and safety for Failed Back Surgery Syndrome, Complex Regional Pain Syndrome, and Diabetic Peripheral Neuropathy, but there had not been a high-level evidence-based study on non-surgical correctable lumbar pain."

According to the study authors, the particular technology being employed, a passive recharge burst spinal cord stimulation, is a unique stimulation design characterized by a five-pulse train with an internal frequency of 500 Hz delivered at 40 Hz, with a 1-millisecond pulse width. The charge accumulates during the intraburst phase, and after the burst packet, there is a period of passive discharge of energy.

"The accumulated charge gradually dissipates over time…and uniquely mimics neuronal burst firing patterns



*Source: Shutterstock*

in the nervous system and has been shown to modulate the affective, attentional components of pain processing in addition to the nociceptive components."

In total, the researchers enrolled 269 patients: 162 were randomly assigned to spinal cord stimulation and 107 were assigned to conventional medical management (supervised medical care, including physical modalities, medication optimization, and interventional therapies).

The researchers found that patients treated with this novel form of spinal cord stimulation reported a 72.6% pain scale improvement while patients in the conventional medical management arm reported 7.1% pain scale improvement.

The team then calculated a composite measure of function improvement or pain relief and found that 91% of the spinal cord stimulation patients reported either functional or pain improvement or both while a much smaller 16% of the medical management patients reported either function or pain or both improvement.

Using the Oswestry Disability Index, the spinal cord stimulation group reported a pain/function improvement of 30 points during the testing term, while the conventional medical management group reported a 1-point change.

Dr. Deer summarized the study to *OTW*, "We were surprised that spinal cord stimulation was so much better for not only pain but also much better with function and quality of life. I think it will lead to improved patient access, reduce the need for high-dose opioids, and reduce disability." — *EH*

## More Precise Pain Measurement Drives Outcomes?

You can't study what you can't measure. Right?

A new, presumably more precise or, hopefully, more relevant, pain scale, named the Detroit Interventional Pain Management Tool, was put to the test in a Level One Trauma Center on 201 patients and the results of that study, "Evaluating Postoperative Pain Management Using the Detroit Interventional Pain Management Tool After Fracture Surgery: How Well Are We Really Doing?" were published in the November 1, 2024 edition of the *Journal of Orthopaedic Trauma*.

"We felt that the current pain scales were confusing, didn't help with decisions and didn't reflect postop pain referenced to medication usage," co-author Rahul Vaidya, M.D., chair of the Wayne State University School of Medicine's Department of Orthopaedic Surgery, explained to *OTW*.

"All of these things make the assessment and treatment of pain impossible. You can't study something if you can't measure it. That's what we set out to do: make a simpler scale that people could understand and use to communicate with each other. Also, we wanted to be able to study pain outcomes after surgery, know if the surgery cured pain, and if patients were still on narcotics."

The study, performed in a Level One Trauma Center, was a prospective prognostic cohort study for postoperative patients with fracture. An independent observer evaluated patients at 2 weeks, 6 weeks, 3 months, and 6 months postoperatively using Detroit Interventional Pain Assessment questionnaires regarding their postoperative pain and opioid usage. (Opioid prescriptions were verified by the Michigan Automated Prescription System.)

Patients were divided into:

- major fractures (tibia, femur, acetabulum, pelvis, calcaneus, talus, and polytrauma) and
- minor fractures (scapula, clavicle, humerus, radius, ulna, scaphoid,


*Source: Wikimedia Commons and GeoTrinity*

carpal/metacarpal, patella, fibula, ankle, and metatarsal)

and were followed for two years.

The research team, who collected data from 201 patients, found that with better data they were able to determine what percentage of patients used opioids and the extent to which their daily prescribed morphine milligram equivalents changed.

The team found that opioid use decreased significantly—from 48.2% (21.6 morphic milligram equivalents) at 2 weeks to 10.3% (8.13 morphine milligram equivalents) at 6 months.

Furthermore:

- 51% of patients were off opioids at 2 weeks,
- 64.5% at 6 weeks,
- 84.2% at 3 months, and
- 89.7% at 6 months.

All opioid prescriptions at 6 months and 2 years were prescribed to patients with polytrauma who underwent sequential surgeries, and these prescriptions originated from outside prescribers.

Pain management efficiency scores were worst at 2 weeks (67.2%) but improved at 3 months (82.6%).

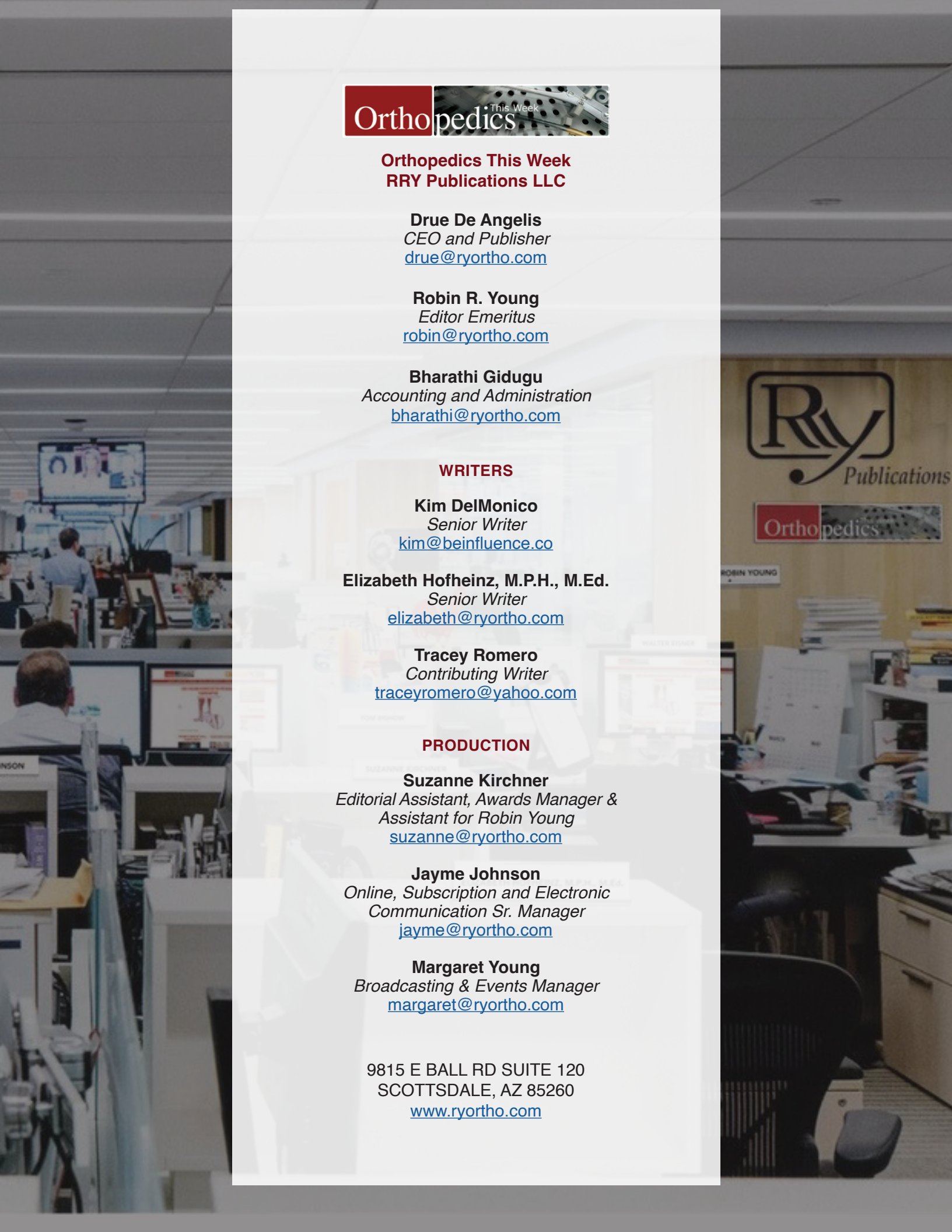
"We showed that 90% of patients could be weaned off narcotics in this population by three months," co-author Sasha Stine, M.D., an orthopedic surgeon with Detroit Medical Center in Michigan, told *OTW*. "This work demonstrated that patients who needed narcotics beyond that were at risk for chronic narcotic use/abuse and that patients with multiple and sequential surgeries were at highest risk for chronic narcotic addiction."

And given that the polytrauma patients were receiving prescriptions from elsewhere, was it difficult to get a true assessment of patient use?

"No," said Dr. Vaidya to *OTW*, "because the Michigan Automated Prescription System catalogues every narcotic tablet prescribed to the patient."

When it comes to musculoskeletal care, which is, at its essence, pain treatment, you can't study what you can't measure and you can't do your job without the best pain measurement scales. — *EH*

*Advertisement*



**Orthopedics This Week**
**RRY Publications LLC**

**Drue De Angelis**
*CEO and Publisher*
drue@ryortho.com

**Robin R. Young**
*Editor Emeritus*
robin@ryortho.com

**Bharathi Gidugu**
*Accounting and Administration*
bharathi@ryortho.com

**WRITERS**

**Kim DelMonico**
*Senior Writer*
kim@beinfluence.co

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

**Tracey Romero**
*Contributing Writer*
traceyromero@yahoo.com

**PRODUCTION**

**Suzanne Kirchner**
*Editorial Assistant, Awards Manager & Assistant for Robin Young*
suzanne@ryortho.com

**Jayme Johnson**
*Online, Subscription and Electronic Communication Sr. Manager*
jayme@ryortho.com

**Margaret Young**
*Broadcasting & Events Manager*
margaret@ryortho.com

9815 E BALL RD SUITE 120
SCOTTSDALE, AZ 85260
www.ryortho.com