VOLUME 19, ISSUE 33 | NOVEMBER 21, 2023

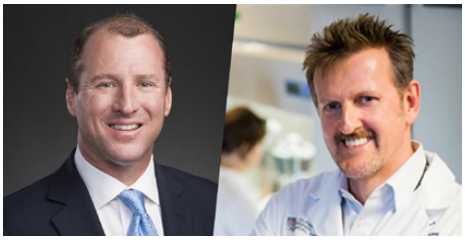
# Orthopedics This Week

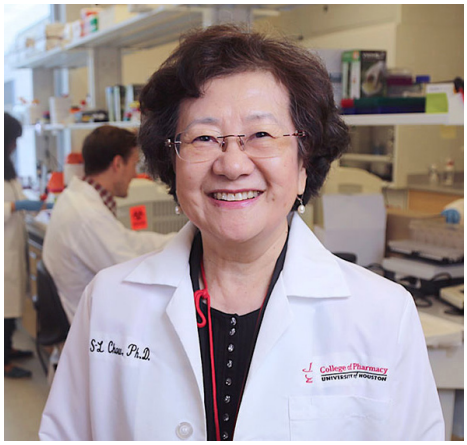
## WEEK IN REVIEW

**4 Supine Is What They Do >>** According to a recent North American Spine Society (NASS) survey, 24% of all spine and neurosurgeons prefer the anterior/supine approach. But…notably…84% of all spine and neurosurgeons would do more of their cases anteriorly if they could get safe and reproducible minimally invasive exposure at L4-S1 in under 30 minutes.

**9 Groundbreaking Spinal Cord Injury Study Gives Hope >>** A drug, Riluzole, which was approved by the Food and Drug Administration 28 years ago to treat amyotrophic lateral sclerosis (aka: ALS or Lou Gehrig's Disease) was found by a team of researchers at the University of Houston to preserve nerve cells in patients facing permanent disability or worse from acute spinal cord injuries.

**12 Steadman Philippon Researchers Receive Orthoregeneration Award >>** Peter J. Millett, M.D., M.Sc. and Johnny Huard, Ph.D. receive the Orthoregeneration Network (ON) Foundation/AGA Orthoregeneration Award for their research into the role that Fisetin can play in treating aging shoulders, hips, and knees.





## BREAKING NEWS



**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:** Overall, orthopedic and spine stocks reported respectable sales and better-than-forecast earnings—due largely to margin expansion—for the September quarter. Valuations have had a nice three week run and all signs seem to point to more upside from here. The two biggest moves came from two regenerative medicine stocks—Bioventus, up 23% in the last 30 days and Axogen, up a whopping 39% in the last 30 days. Both were rebound stocks. Now that 2023 is 75% finished, we can say it will be the best year since 2019. How will 2024 shape up? We think very good.

| RANK | LAST WEEK | COMPANY | TTM OP MARGIN | 30-DAY PRICE CHANGE | COMMENT |
|---|---|---|---|---|---|
| 1 | 1 | Bioventus | (5.33%) | 22.67% | Buyers were very pleased with Q3 report, which beat Wall Street's forecasts, and management's increased guidance for Q4 and 2024. |
| 2 | 2 | Anika Therapeutics | (20.94) | 9.09 | Anika's three new blockbuster products increase its addressable market from $1 billion to $5 billion. 2024 should be an extraordinary year with two, possibly three major product launches. |
| 3 | 3 | Conmed | 7.42 | 13.50 | Q3 results were strong, sales up more than 10%. Buyers attending the Piper and other meetings, apparently liked what they heard. Stock is up by double digits. |
| 4 | 5 | Pacira Biosciences | 23.50 | (5.14) | Sales were down year-to-year in Q3, $164 million vs. $168 million. But an expanded label may soon come from the FDA. Profit margins remain among the highest in ortho. |
| 5 | 4 | Integra LifeSciences | 17.32 | (0.18) | Sales for Q3, were $382 million, down slightly. As a result IART announced a $125 million share buyback. |
| 6 | 7 | ZimVie | (5.96) | 7.79 | ZIMV is tied with Bioventus as the 2nd cheapest equity in ortho. For the September quarter, sales were $209 million, a 4.9% drop from the same period last year. |
| 7 | 10 | Smith & Nephew | 10.06 | 13.61 | SNN reported a 7.7% rate of sales growth for Q3 bringing the quarterly total to $1.4 billion—really outstanding—and a clear signal that the global markets are strong. |
| 8 | 8 | Zimmer Biomet | 19.31 | 5.16 | Sales for Q3 were up 5% to $1.754 billion. 44-year old Ivan Tornos is ZBH's new President and CEO. And he seems to be everywhere on LinkedIn, Facebook and X. |
| 9 | 9 | Medtronic | 18.48 | 2.83 | MDT to report its October quarter results soon and consensus is for a 3% annual sales growth rate—which, if accurate, would be below average market growth. |
| 10 | NR | Axogen | (9.75) | 38.35 | Axogen, the Alachua, Florida, allograft nerve tissue supplier, has had a flury of new buying in the stock. Indeed, Axogen is the #1 stock performer on the Power Rankings. |

# Robin Young's Orthopedic Universe

## TOP PERFORMERS LAST 30 DAYS

| | COMPANY | SYMBOL | PRICE | MKT CAP | 30-DAY CHG |
|---|---|---|---|---|---|
| 1 | AxoGen | AXGN | $5.88 | $253 | 38.35% |
| 2 | Bioventus | BVS | $3.83 | $302 | 27.67% |
| 3 | OrthoPediatrics Corp | KIDS | $31.21 | $729 | 22.54% |
| 4 | Aurora Spine | ASG.V | $0.30 | $21 | 16.93% |
| 5 | MicroPort Scientific | 0853 | $1.71 | $3,138 | 16.67% |
| 6 | Smith & Nephew | SNN | $25.62 | $11,188 | 13.61% |
| 7 | ConMed | CNMD | $107.60 | $3,309 | 13.50% |
| 8 | Anika Therapeutics | ANIK | $21.00 | $307 | 9.09% |
| 9 | ZimVie | ZIMV | $8.86 | $235 | 7.79% |
| 10 | Stryker | SYK | $288.38 | $109,554 | 6.74% |

## WORST PERFORMERS LAST 30 DAYS

| | COMPANY | SYMBOL | PRICE | MKT CAP | 30-DAY CHG |
|---|---|---|---|---|---|
| 1 | SINTX Technologies | SINT | $0.44 | $2 | -29.50% |
| 2 | Globus Medical | GMED | $45.57 | $6,407 | -15.42% |
| 3 | Orthofix | OFIX | $10.49 | $386 | -14.02% |
| 4 | Dynatronics Corp | DYNT | $0.54 | $2 | -9.98% |
| 5 | Alphatec Holdings | ATEC | $11.00 | $1,499 | -6.86% |
| 6 | Pacira Biosciences | PCRX | $27.89 | $1,295 | -5.14% |
| 7 | Nevro Corp | NVRO | $16.58 | $600 | -2.36% |
| 8 | Johnson & Johnson | JNJ | $149.79 | $360,586 | -1.92% |
| 9 | Integra LifeSciences | IART | $38.75 | $3,029 | -0.18% |
| 10 | SI-BONE, Inc | SIBN | $17.54 | $710 | 0.69% |

## LOWEST PRICE / EARNINGS RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | P/E |
|---|---|---|---|---|---|
| 1 | Integra LifeSciences | IART | $38.75 | $3,029 | 16.78 |
| 2 | Medtronic | MDT | $74.76 | $99,471 | 17.65 |
| 3 | Johnson & Johnson | JNJ | $149.79 | $360,586 | 18.08 |
| 4 | Globus Medical | GMED | $45.57 | $6,407 | 23.41 |
| 5 | Zimmer Biomet | ZBH | $111.67 | $23,337 | 26.21 |

## HIGHEST PRICE / EARNINGS RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | P/E |
|---|---|---|---|---|---|
| 1 | Medacta | MOVE | $131.54 | $2,631 | 50.30 |
| 2 | Smith & Nephew | SNN | $25.62 | $11,188 | 50.17 |
| 3 | ConMed | CNMD | $107.60 | $3,309 | 39.94 |
| 4 | Pacira Biosciences | PCRX | $27.89 | $1,295 | 35.62 |
| 5 | Stryker | SYK | $288.38 | $109,554 | 32.67 |

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

| | COMPANY | SYMBOL | PRICE | MKT CAP | PEG |
|---|---|---|---|---|---|
| 1 | Smith & Nephew | SNN | $25.62 | $11,188 | -6.27 |
| 2 | ConMed | CNMD | $107.60 | $3,309 | 1.40 |
| 3 | Globus Medical | GMED | $45.57 | $6,407 | 1.44 |
| 4 | Medacta | MOVE | $131.54 | $2,631 | 1.80 |
| 5 | Stryker | SYK | $288.38 | $109,554 | 3.08 |

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

| | COMPANY | SYMBOL | PRICE | MKT CAP | PEG |
|---|---|---|---|---|---|
| 1 | Medtronic | MDT | $74.76 | $99,471 | 5.09 |
| 2 | Integra LifeSciences | IART | $38.75 | $3,029 | 4.66 |
| 3 | Zimmer Biomet | ZBH | $111.67 | $23,337 | 3.78 |
| 4 | Johnson & Johnson | JNJ | $149.79 | $360,586 | 3.48 |
| 5 | Pacira Biosciences | PCRX | $27.89 | $1,295 | 3.10 |

## LOWEST PRICE TO SALES RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | PSR |
|---|---|---|---|---|---|
| 1 | Dynatronics Corp | DYNT | $0.54 | $2 | 0.06 |
| 2 | ZimVie | ZIMV | $8.86 | $235 | 0.26 |
| 3 | Bioventus | BVS | $3.83 | $302 | 0.59 |
| 4 | Orthofix | OFIX | $10.49 | $386 | 0.84 |
| 5 | Aurora Spine | ASG.V | $0.30 | $21 | 1.09 |

## HIGHEST PRICE TO SALES RATIO (TTM)

| | COMPANY | SYMBOL | PRICE | MKT CAP | PSR |
|---|---|---|---|---|---|
| 1 | SI-BONE, Inc | SIBN | $17.54 | $710 | 6.68 |
| 2 | Globus Medical | GMED | $45.57 | $6,407 | 6.26 |
| 3 | Medacta | MOVE | $131.54 | $2,631 | 6.02 |
| 4 | OrthoPediatrics Corp | KIDS | $31.21 | $729 | 5.96 |
| 5 | Stryker | SYK | $288.38 | $109,554 | 5.94 |

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

# Supine Is What They Do

**BY ROBIN YOUNG**

*(Top Left and Bottom Left) Dr. Michael MacMillan, Thomas Murphy, and Raymond Cloutier (Top Right): Thomas Murphy, Raymond Cloutier, and Mike Wefers / Courtesy of NovApproach Spine, LLC*

According to a recent North American Spine Society (NASS) survey, 24% of all spine and neurosurgeons prefer the anterior/supine approach.

But…notably…84% of all spine and neurosurgeons would do more of their cases anteriorly if they could get safe and reproducible minimally invasive exposure at L4-S1 in under 30 minutes.

Going anterior—employing the supine approach—has been a surprisingly effective strategy for young companies bringing new implants and instruments to spine and neurosurgeons.

Why? Because the issues associated with dealing with treating pathologies at L4-S1 and flipping between a lateral or anterior (or both) approach are well known.

If a company could, with its implants and instruments, make treating lumbar pathology at multiple levels via the anterior approach…

- Be more reliable
- Avoid anterior pathologies (adhesions, mesh implants, you name it)
- Be simpler
- Require less vessel manipulation
- Take less time
- Be less troublesome overall

…it would arguably improve standards of care.

## NovApproach – a Company Built on Access and ALIF

NovApproach Spine, LLC, the team you see lying on the floor at NASS (supine), is dedicated to making the anterior approach as reliable and consistently excellent as any other approach. In many ways, NovApproach is riding a long-term trend toward the anterior approach.

As the NASS survey made clear, surgeons want to do more anterior/supine surgery—especially when the patients present with pathology at L4-S1, L4-L5 or L5-S1.

The survey of NASS members (March 10, 2022, by Brian Kuhn, M.D., Associate Program Director Vascular Surgery Residency and Fellowship TriHealth/Good Samaritan Hospital Cincinnati, Ohio—53.4% response rate: 62 responses), revealed the following issues associated with the anterior approach:

- Lack of an approach surgeon
- Lack of training in the anterior approach
- Time required for an approach surgeon:
    - More than **30 minutes** for L5-S1
    - Almost an hour (**50 minutes**) for L4-S1
    - More than **an hour** for L3-S1
- 44% of surgeons choosing the anterior approach have to **abort 1x-5x per year.**

## The NovApproach, Approach

NovApproach relied heavily on approach surgeons to inform its implant and instrument designs. Their advice and ideas resulted in a first-of-its-kind set of implants and instruments.

Founded in 2019 by Raymond Cloutier, former Exactech, Inc. vice president of engineering and development (26 years) and former Zimmer product development engineer (8 years), NovApproach is focused on making anterior surgery safer, more efficient, less complication prone and, ultimately, simpler to perform for surgeons.

If companies are defined by the problems they solve (as opposed to the products they make), then Cloutier's decision to focus on the anterior approach and the more complication prone L4-5, L5-S1 cases, in retrospect, looks prescient.

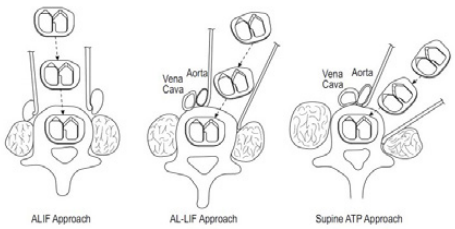
Here's what NovApproach has developed so far.

## A Multiple Angled Implant

NovApproach designed an implant that can be placed anteriorly in more than one angle—giving surgeons more ways to avoid the vasculature. The following images illustrate the point. *(See page 6.)*

## An Implant With More Fixation and Trajectory Options

NovApproach's engineers, working with spine and access surgeons, created the OneLIF™ cage with multiple apertures and angles.

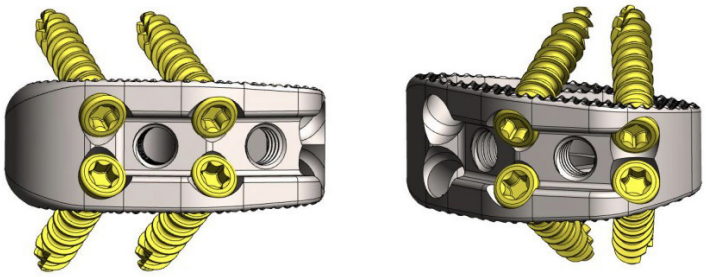




*Courtesy of NovApproach Spine, LLC*

Notice the variety of angles and screw placement options? *(See image on right.)*

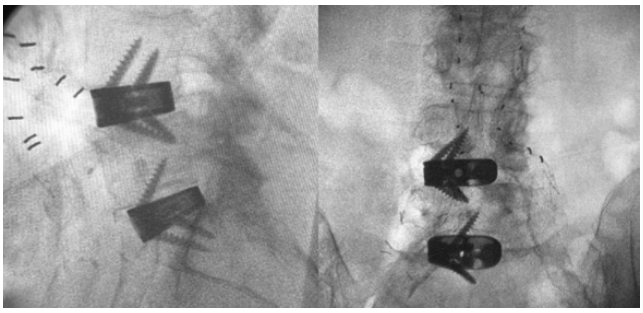
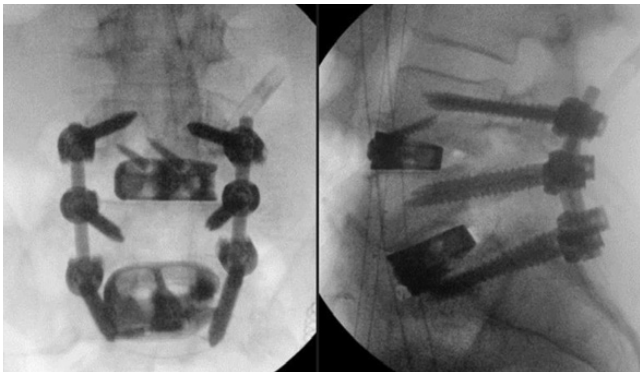
According to NovApproach, these allow surgeons to tailor the approach when confronted with anatomic challenges and differences between patients and differences that exist at each spinal level.

The OneLIF cage's corridor-matched screw trajectories provide reliable opportunities for four points of fixation. This, along with the Supine-ATP® approach, significantly reduces OR time for multi-level (L2-S1) cases because the OneLIF cage can be implanted at all the levels in the supine position vs. having to reposition the patient three times (i.e., supine for lower level ALIF's followed by lateral position for upper levels and then prone for posterior instrumentation).



*Courtesy of NovApproach Spine, LLC*

## Case Reports and Images

| ISSUE | SOLUTION | IMAGES |
|---|---|---|
| • 71-year-old male with DDD<br>• Coronary artery disease, atherosclerosis, and calcified vessels (iliolumbar vein)<br>• Severe calcified vessels | • ALIF L4-5 & L5-S1<br>• Used oblique inserter hole to limit contact with the calcified iliolumbar vein.<br>• Corridor matched screw trajectories minimized need for retraction |  |
| • 83-year-old female with degenerative disc disease, L4-L5 anterolisthesis, scoliosis, and an L4-5 intraspinal mass with severe spinal stenosis.<br>• Prior vascular surgery to repair (stent) an abdominal aortic aneurysm. | The SupineATP® approach enabled circumvention of critical anatomy. Inverting the cage using the oblique insertion and fixation option simplified the use of this modified surgical approach. |  |

*Courtesy of Sigurd Berven, M.D., Professor of Orthopedic Surgery, UCSF San Francisco and Payam Moazzaz, M.D. and Thomas T. Terramani, M.D. San Diego*

### Less Time, Improved Sagittal Correction, Better Efficiencies

Dr. Berven, who reported that the NovApproach implants have been used in about 40 cases and 80 levels, explains why he finds the OneLIF so attractive: "What is special about this implant is the ability (for) the implant to match multiple different trajectories. Whether you are coming from direct anterior, or obliquely or laterally, we've got the ability to actually put the implant in, using either an oblique insertion point or an anterior insertion point, AND to put all the screws in reliably. Reliably with 4 points of fixation."

"My rule of thumb is that I like to have a minimum of 7 mm—more often 8 mm—of posterior height, added Berven, "And the OneLIF cage's sizing enables surgeons to use both traditional anterior sizing or posterior sizing. I will actually work on my release of the interbody space until I am able to get that posterior base distraction—often times taking down the PLL (posterior longitudinal ligament). What I like is that I can dial in the exact amount of distraction and lordosis to simultaneously facilitate indirect decompression and sagittal plane alignment."

### Reducing the Need for Re-positioning

Dr. Payam Moazzaz, Tri-City Medical Center, Oceanside, California, pointed out that "No other device supports this kind of intra-operative decision making." He said that he, "can place the interbody through the direct anterior route or the ATP oblique route and still maintain four-screw fixation along with safety features to prevent screw back-out."

Dr. Erich Richter, Covenant Health, Saginaw, Michigan, reported that "certain levels of the spine can be challenging, based on the patient's anatomy but the OneLIF cage's multi-hole design addresses that issue." He added that NovApproach's "SupineATP® approach allows my access surgeon to expose multiple levels of the spine without needing to reposition the patient."—a major time-saver.

### Time and Access

In a recent NASS talk, Vascular surgeon, Thomas T. Terramani, M.D. of Vascular Associates of San Diego, (title: *High-Volume Approach Surgeons Prospective*

*Date Collection – What we have Learned Symposium – Anterior Lumbar Spine Surgery: How Do we Optimize & Improve Outcomes?*) reviewed data from three approach surgeons and their accumulated 1,691 patient cases.

Among his insights was that the anterior approach was most often employed in three types of cases:

1. L5-S1 level
2. L4-5, L5-S1
3. L4-5

Of the 1,691 cases he reviewed, these three types of surgeries represented 81% (1,374) of all anterior approach cases—the second two (i.e., L4-5, L5-S1 and L4-5) had the highest rates of complications—notably deep vein thrombotic events, wound infections, and fluid collection.

Dr. Terramani concluded that surgeons performing an anterior approach require:

1. Improved exposure safety
2. Improved efficiency of exposure—ideally under 25 minutes
3. Lower complication rates
4. Better complication management

In short, there's a massive opportunity for a company like NovApproach.

## Conclusion

At this year's North American Spine Society annual meeting, there were many important innovations on display and among them was NovApproach. We were able to spend a fair amount of time with the NovApproach team and it was obvious that the company and its philosophy of making the supine/anterior approach more routinely safe and effective was gaining traction.

Finally, the intelligence with which this team has re-thought the market basket of issues with anterior spine surgery, created clear points of differentiation and, as Drs. Berven, Moazzaz and Richter explained so eloquently, implant and instrument superiority for single or multi-level anterior spine surgery cases.

For more information: https://novapproachspine.com/ ♦

# Groundbreaking Spinal Cord Injury Study Gives Hope

**BY ROBIN YOUNG**


*Professor Diana S-L Chow, Ph.D. / Courtesy of University of Houston*

A drug, Riluzole, which was approved by the Food and Drug Administration 28 years ago to treat amyotrophic lateral sclerosis (aka: ALS or Lou Gehrig's Disease) was found by a team of researchers at the University of Houston to preserve nerve cells in patients facing permanent disability or worse from acute spinal cord injuries.

The research team's hypothesis is that Riluzole, which blocks certain sodium channels and is commonly used as an anticonvulsant, could potentially, as lead study author Diana S-L Chow, Ph.D. said, exert a "neuroprotective potential to preserve nerve cells and help people regain some of their lost functions after spinal cord injury".

Dr. Chow is the Paula & John J. Lovoi Sr. Endowed Professor in Drug Discovery and Development and director of the Institute of Drug Education and Research at the UH College of Pharmacy. She is an internationally recognized expert in the development and analyses of new drug formulations and drug-delivery systems for the treatment of leukemia, other cancers, and infection. She has also studied the stability and efficacy of medications used in space flights on the International Space Station.

The research team's small clinical trial with a pharmacokinetic sub-study demonstrated that Riluzole could, in theory and as hypothesized, improve functionality in people with acute spinal cord injuries if the drug is taken within 12 hours post-injury.

Riluzole is among the first drugs to show efficacy for treating acute spinal cord injuries, which affects an estimated 18,000 people in the United States each year.

Dr. Chow cautions that while the results of this study are positive, further investigation is needed given the small number of participants involved in the trial—32 patients with head and neck injuries were enrolled.

"The contribution of our investigation is to offer the proof of concept for the drug discovery and development approach for acute spinal cord injuries so that the scientific community may facilitate future treatments," said Dr. Chow.

## Off-Label Use

Acute spinal cord injuries are true emergencies where patients present in the emergency rooms with spinal cord bruises, partial tears, or complete tears and are at high risk of permanent disability or death.

For that reason, it is important to mention that Riluzole can be prescribed for "off-label" use by physicians in clinical settings for different purposes, such as acute spinal cord injuries.

"These findings have the potential to influence future dosing strategies, ultimately enhancing patient care and improving therapeutic outcomes," added Dr. Chow.

## Study Methodology.

Patients in the study were given a daily oral dose of one 50-milligram tablet twice a day. The same dosage regimen was used for this phase 2/3 multi-center clinical trial repurposing the drug for ACUTE SPINAL CORD INJURIES patients.

Given the acute and progressive nature of traumatic spinal cord injuries and the complexity of secondary injury, the research team also conducted a sub-study of the pharmacokinetics of therapeutics, namely, how the body processes a drug.

For that sub-study, the team developed a model to capture the dynamic nature of the drug's behavior and patient response, including motor scores in elbow flexors/extensors, wrist extensors and finger flexors/abductors in the upper limbs; hip flexors, knee extensors, ankle dorsiflexors/plantar flexors, and a long toe extensor in the lower limbs.

All are influenced by the complex pathophysiology of acute spinal cord injuries and affects the patient healing.

"Our research underscores the need for a specific signal in the body that can tell

us how well a treatment for spinal cord injuries works. In our study, we used an acute spinal cord injury-specific biomarker called phosphorylated neurofilament-heavy subunit (pNF-H) to show how Riluzole helps reduce neuron cell damage in acute spinal cord injuries. Our findings revealed that patients who received the treatment had lower levels of pNF-H, confirming the positive effect of the medication on spinal cord injuries," said Dr. Chow.

The study also established a link between short-term outcomes, such as pNF-H concentration, and long-term improvements in functional motor abilities. "This connection suggests the feasibility of predicting if a patient will benefit from the treatment with long-term functional improvements early in the treatment process at the bedside through the objective biomarker measurement," she added.

Other members of the research team include Ashley Nguyen, a recent UH graduate and clinical pharmacologist at Janssen, Johnson & Johnson; Junghwa Park, PharmD and doctoral student; and Lei Wu, previous research assistant professor and current associate director in clinical pharmacology of AbbVie pharmaceutical company; Elizabeth Gardiner Troups, Houston Methodist Research Institute; James Shields Harrop, Thomas Jefferson University; James David Guest, University of Miami; Karl Michael Schmitt, UTHealth Houston; Bizhan Aarabi, University of Maryland; Michael George Fehlings, University of Toronto; Maxwell Boakye, University of Louisville; and late Robert Geroge Grossman, Houston Methodist Research Institute.

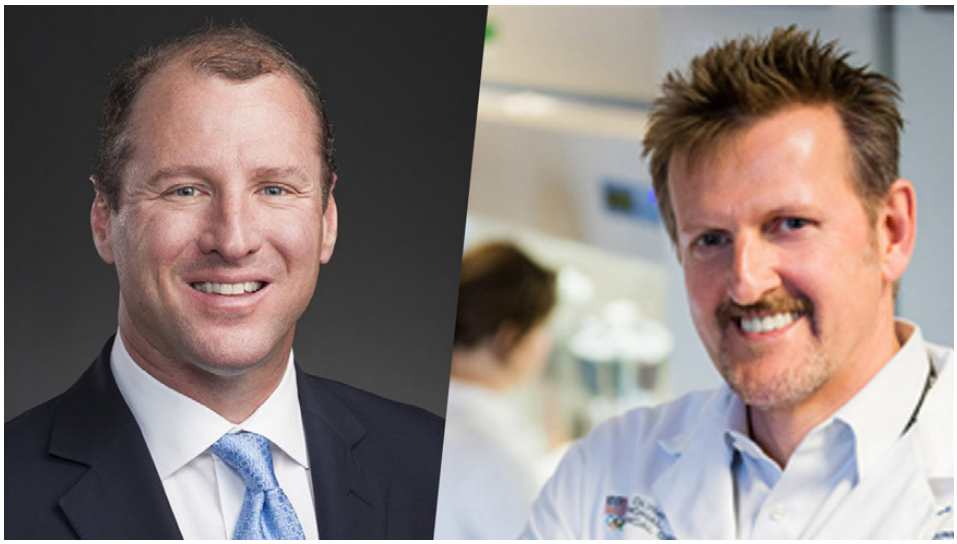
The material in Dr. Chow's report is based upon work supported by the U.S. Army Medical Research Acquisition Activity, the Christopher & Dana Reeve Foundation, with supplemental funding by the Institute for Drug Education and Research (IDER) of the UH College of Pharmacy.

The work, "Pharmacokinetics, Pharmacodynamics, and Impact on Axonal Degradation of Riluzole in Patients With Traumatic Cervical Spinal Cord Injury Enrolled in the RISCIS Phase III Randomized Controlled Trial," is published in the *Journal of Neurotrauma*. ♦

# Steadman Philippon Researchers Receive Orthoregeneration Award

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

Research by the Steadman Philippon Research Institute into an anti-aging compound, Fisetin, a naturally occurring antioxidant found in yellow fruits and vegetables, has resulted in the prestigious Orthoregeneration award being given to Peter J. Millett, M.D., M.Sc. and Johnny Huard, Ph.D. by the Orthoregeneration Network (ON) Foundation/AGA Orthoregeneration Award for their research into the role that Fisetin can play in treating aging shoulders, hips, and knees.



*Peter J. Millett, M.D., M.Sc. and Johnny Huard, Ph.D. / Courtesy of The Steadman Clinic*

Their award-winning study was "Safety and Efficacy of Fisetin for Improving Rotator Cuff Repair: Initial Outcomes in a Sheep Model." The award was presented on September 16, 2023, in Berlin, Germany, by Dr. Matthias Steinwachs, president of the ON Foundation.

Dr. Millett is chief medical officer and an orthopaedic surgeon specializing in shoulder surgery at The Steadman Clinic and Steadman Philippon Research Institute (SPRI). Dr. Huard is the chief scientific officer and director of the Linda and Mitch Hart Center for Regenerative and Personalized Medicine at SPRI. The award is shared by former SPRI International Fellows Drs. Rony and Maria Dey Hazra of Germany, and Jeremiah Easley, D.V.M., professor of Veterinary Medicine at the C. Wayne McIlwraith Translational Medicine Institute at Colorado State University.

"It is a thrill to have our original research recognized by the ON Foundation, an esteemed international organization that is dedicated to orthopaedic tissue regeneration," said Dr. Millett. "Not only do rotator cuff tears increase rapidly with age, but we also see an increased incidence of retears as patients get older."

"Hypothesizing that age-related cellular aging (senescence) may be a factor, we worked with a rotator cuff tear model, finding that animals receiving Fisetin *and* bone marrow stimulation had reduced creatine kinase in their blood, better muscle relaxation, less degeneration, as well as improved tissue markers and fewer senescent cells."

Co-investigator Dr. Huard noted, "Surgeons and patients need safe, effective solutions for the pain and dysfunction that accompany rotator cuff repairs. This research opens the door for new thinking and better clinical solutions for our patients."

When *OTW* asked Dr. Millett what put them on the trail of using Fisetin this way, he replied, "We have been interested in Fisetin for some time and are actively working on regenerative medicine strategies."

"Fisetin has senolytic (anti-aging) and anti-inflammatory effects that may be beneficial in tendon healing and other types of healing after orthopaedic surgery. It reduces the number of senescent cells—sometimes called zombie cells—that are damaged old cells that accelerate aging and cause inflammation. Senescent cells are important emerging targets for diseases of aging, and Fisetin may help our bodies to rid itself of these damaging cells.

**"Fisetin may be able to slow or prevent cellular aging or senescence"**

"Fisetin is a natural antioxidant found in many fruits and vegetables, particularly those with yellow coloring. Fisetin has been shown to extend the life of lower organisms, hence it is called a senolytic (anti-aging) agent.

Fisetin also has anti-inflammatory properties. Perhaps the most interesting aspect of Fisetin is the role it plays cellular senescence. Fisetin may be able to alter the cellular aging process and slow or prevent cellular aging or senscence."

"The body typically rids itself of senescent cells, but when it fails to do so this maladaptive response can lead to cancer and age-related disease. Dr Johnny Huard from our team and others, such as Laura Niederhofer and Paul Robbins at University of Minnesota and Jim Kirkland at Mayo Clinic have shown that Fisetin reduces senescent cells. Since many orthopaedic diseases are age-related, senolytic treatment with Fisetin is an exciting new area for our research."

*OTW* asked Dr. Millett if any of his orthopedic colleagues are exploring the use of senolytics. "I am not aware of any other orthopaedic surgeons who are using senolytics," he said. "One of the most common anti-aging strategies involves Yamanaka factors which were discovered by Shinya Yamanaka—a Japanese orthopaedic surgeon who won the Nobel prize in 2012 for his discovery that differentiated cells could be induced to become stems cells.

"I certainly know that my partners and I at the Steadman Clinic and Steadman Philippon Research Institute are interested in senolytics," Dr. Millett told *OTW*. "Our Chief Scientific Officer Dr Johnny Huard has been interested for many years and introduced the strategy to us. We are conducting NIH-funded [National Institutes of Health] studies for the use of Fisetin for patients with knee osteoarthritis and studies using Fisetin for postop healing after various orthopaedic procedures, such as arthroscopic hip surgery (Marc Philippon) and rotator cuff repair (myself and Matt Provencher)."

This research was supported by a generous philanthropic contribution from Björn and Kathy Borgen of Vail, Colorado. ♦

COMPANY

# 2000th Scoliosis Patient Treated With The Tether Non-Fusion System

*The Tether / Courtesy of ZimVie*

A major milestone was reached in mid-October 2023 when the 2000th adolescent idiopathic scoliosis patient was treated with the increasingly popular non-fusion system—ZimVie's The Tether™ Vertebral Body Tethering System.

In 2019, the Food and Drug Administration approved The Tether as a Humanitarian Device Exemption on the basis of more than seven years of clinical data.

To date, more than 80 surgeons have performed Vertebral body tethering (VBT) using the market-leading Tether system to treat patients diagnosed with adolescent idiopathic scoliosis.

Dr. Baron Lonner, Chief of Minimally Invasive Scoliosis Surgery and Pediatric Spine at Mount Sinai Hospital and Professor of Orthopaedic Surgery at Icahn School of Medicine in New York, described his experience with The Tether non-fusion system: "I have been in practice dedicating my career to the treatment of patients with scoliosis for 28 years. The Tether has been an

amazing advance that has allowed my patients to have correction of their scoliosis while avoiding a fusion, with a faster return to sports and other activities. It has been a game changer."

"Having brought this technology to over 2,000 children is a milestone that serves as a reminder of our commitment to put patients first, especially those for whom our products can have such profound and prolonged impact," added Rebecca Whitney, Global President of ZimVie Spine.

"The Tether is an important and inspirational part of our motion preservation portfolio. We remain dedicated to developing the market for vertebral body tethering and restoring daily life for this special group of patients."

**What Is "The Tether™" and What Is the Clinical Data?**

Manufactured by Colorado-based ZimVie, The Tether is indicated for skeletally immature patients that require surgical treatment to obtain and maintain correction of progressive idiopathic scoliosis, with a major Cobb angle of 30 to 65 degrees whose osseous structure is dimensionally adequate to accommodate screw fixation, as determined by radiographic imaging.

These are patients who have failed bracing and/or intolerant to brace wear.

In a 57-patient, multi-center study of children with idiopathic scoliosis who were treated with anterior vertebral body tethering, (published in the *Bone and Joint Journal*), researchers found that tethering delivered satisfactory correction of deformity with an "acceptable" rate of complications.

The study, which was a longitudinal, multi-center, prospective analysis of a database of cases between 2013-2016 (earlier versions of a tethering technology), included two years of follow-up data. The team defined clinical success as a major coronal Cobb angle of <35° at the most recent follow-up.

Study citation: Miyanji F, Pawelek J, Nasto LA, Simmonds A, Parent S. Safety and efficacy of anterior vertebral body tethering in the treatment of idiopathic scoliosis. Bone Joint J. 2020;102-B(12):1703-1708. doi:10.1302/0301-620X.102B12.BJJ-2020-0426.R1

Full contraindication and risk information can be found at myscoliosis.com.

**About ZimVie**

ZimVie is a global life sciences leader in the dental and spine markets that develops, manufactures, and delivers a comprehensive portfolio of products and solutions designed to treat a wide range of spine pathologies and support dental tooth replacement and restoration procedures. The company was founded in March 2022 as an independent, publicly traded spin-off of the Dental and Spine business units of Zimmer Biomet to breathe new life, dedicated energy, and strategic focus to its portfolio of trusted brands and products. From its headquarters in Westminster, Colorado, and additional facilities around the globe, the company serves customers in over 70 countries worldwide with a robust offering of dental and spine solutions including differentiated product platforms supported by extensive clinical evidence. For more information about ZimVie, please visit us at www.ZimVie.com. Follow @ZimVie on Twitter, Facebook, LinkedIn, or Instagram. — *RRY*

## Klassic® Knee System + TMINI Robotics = TKA Efficiency

Salt Lake City-based Total Joint Orthopedics, Inc. (TJO), whose Klassic® Knee System, with 28,000 implants, is famous for its one-tray configuration which cover up to 90% of total knee arthroplasty cases, has now received FDA clearance for use with Think® Surgical's innovative TMINI™ Miniature Robotic System.

The TMINI is a small footprint, miniature robotic system designed to follow a CT-based three-dimensional surgical plan. Among its features (aside from its small footprint) is that its robotic handpiece automatically compensates for surgeon hand movement to locate bone pins along precisely defined planes. The surgeon can then connect cutting guides to the bone pins for accurate bone resection.

According to both Think Surgical and TJO, the TMINI system is easy to use and replaces many of the instruments currently used for knee replacement surgery—which, of course, makes TJO's Klassic knee system a natural complement for TMNI.

The TMINI system also comes with Implant Data Hub (ID-HUB), a proprietary databank of partner implants which opens up access and choice for surgeons.

**The Rise of Both Robotics and ASC-Style Joint Arthroplasty Care**

According to the just released American Joint Registry (AJRR) annual report for 2023:

- Ambulatory surgery centers (ASCs) are increasingly the care center of choice for patients in the U.S. There are now 42,228 procedural cases reported by ASCs in the AJRR, an 84% increase since 2022.
- Over the past 6 years, the utilization of robotics in TKA has increased over 6-fold and is now reported in over 13% of procedures, whereas computer navigation use has remained relatively stable.

According to Chris Fronk, THINK's chief commercial officer, "Pairing world-class robotic technology with truly differentiated implant solutions such as TJO's Klassic Knee System allows physicians, hospitals, and ASCs more choice when it comes to picking a total knee offering."

"This is a huge step forward for the next generation of robotic-assisted surgery, and the TMINI System and the Klassic Knee System together provide ground-breaking innovation for any surgical setting."

"We are honored to work with THINK Surgical," said Erin Hofmann, TJO's CEO.

**The TMINI System**

The TMINI system includes a wireless robotic handpiece that assists surgeons in performing total knee replacement.


*TMINI™ Miniature Robotic System and Klassic® Knee System / Courtesy of Think Surgical, Inc. and Total Joint Orthopedics, Inc.*

With a small footprint, open implant platform and intuitive workflow, the TMINI™ system opens up robotic possibilities for more clinics, operating rooms, and surgeons.

TMINI is easy to use and replaces many of the instruments currently used for knee replacement surgery.

THINK Surgical is committed to an open implant library and will continue to add new implant options to the platform over time. This open implant approach combined with the ease of use of the TMINI system should appeal to a broad customer base who may have been resistant to robotics until now.

**The Klassic ONE Tray System**

Most modern implant companies vary the number of trays and instruments needed to perform a single surgery. Some implant companies require up to 9 trays of instruments per case.


*THINK Surgical's TMINI™Miniature Robotic handpiece, developed in partnership with Sagentia Innovation / Courtesy of Sagentia Innovation*

The Klassic ONE Tray System provides all that is needed for a successful total joint arthroplasty in 90% of the cases. Furthermore, decreasing the number of trays makes set up and turn around faster while also reducing sterilization and storage costs.

Most users of the Klassic ONE tray can save up to 20 minutes prep time per case (Tibesku et al. 2013a). Since fewer instruments are opened, there is less OR prep time, which reduces contamination risk and increases overall patient safety. (Dalstrom et al. 2008).

**About Total Joint Orthopedics, Inc.**

"Total Joint Orthopedics, Inc. (TJO) is a Mission-Driven™ medical device company focused on improving the episode of care by pushing the boundaries in orthopedics. Using human-centered design, we have crafted our approach, Efficiency by Design®, as the cornerstone that positions us as pioneers in helping orthopedic stakeholders address the shifting healthcare landscape. TJO's flagship Klassic® Knee and Klassic HD® Hip Systems feature modern implant innovations requiring a maximum of three instrument trays. These products improve operating room efficiency, relieve the burden on surgical staff, and bring down the overall cost of healthcare."

Since TJO's founding in 2009, the company has donated up to one joint for every ten implanted to Operation Walk and similar organizations. To learn more, please visit tjoinc.com.

**About THINK Surgical, Inc.**

"THINK Surgical, Inc., is a privately held U.S.-based technology innovator that develops and markets orthopedic robots. THINK Surgical robots are open platforms providing support for implant brands from multiple manufacturers, enabling the choice of implant to be driven by the surgeon. THINK Surgical actively collaborates with healthcare professionals around the globe to refine our orthopedic products, improving the lives of those suffering from advanced joint disease with precise, accurate, and intelligent technology. Please refer to the instructions for use for the TMINI Miniature Robotic System for a complete list of indications, contraindications, warnings, and precautions."

For additional product information, please visit https://thinksurgical.com/. THINK Surgical and TMINI are trademarks of THINK Surgical, Inc. — *RRY*

*Klassic ONE® Tray System / Courtesy of Total Joint Orthopedics, Inc.*

LEGAL

# A Malpractice Lawsuit: What Are the Odds?


*Source: Wesley Tingey and Unsplash*

The answer will depend on your specialty. If your specialty is orthopedics, you are more likely to find yourself in a malpractice lawsuit than most other specialties. This is according to "Is Your Risk of Being Sued Climbing? Medscape Physicians and Malpractice Report 2023."

For this year's report, 3,037 physicians from more than 29 specialties completed the survey. Their responses provided insight into the realities of facing a lawsuit and the effects of litigation on their practice, finances, emotional health, and patient relationships.

Orthopedics was one of the most frequently sued specialties. According to the report, 82% of orthopedic surgeons have been either a malpractice defendant or co-defendant. The only other specialties that are more likely to be sued are, first, general surgery at 90% and, second, obstetrics and gynecology at 85%.

In the report, Vice President of Research for the Medical Professional Liability Association Bill Burns explained, "Surgeons are at the top of the list because of the complexity of what they do."

Burns continued, "That's typically why insurance premiums are higher for surgeons, since companies price doctors from highest-risk to lowest-risk."

Your specialty may not be the only indicator of how likely you are to be sued as a physician. Where you choose to practice may also be an indicator. In 2023, 72% of physicians practicing in Louisiana reported to Medscape that they had been involved in at least one malpractice lawsuit. This was the highest percentage across the states. Following Louisiana were Indiana and Kentucky, with 68% of physicians from those states reporting being involved in at least one malpractice lawsuit.

According to the report, geography may be related to lawsuits due to several factors. This includes tort reforms, such as a damages cap in personal injury lawsuits.

It's interesting to note, according to the report, that "the more often a physician is sued, the more likely he or she will be sued again." The report referenced another analysis supporting this position. Characteristics that the report highlighted as being "significantly associated with recurrence of claims" included the amount of previous claims and the physician's specialty.

The report also provided insight into the malpractice allegations doctors are most likely to face. Failure to diagnose or delayed diagnosis was the top allegation reported by physicians. This has been the top allegation since Medscape's 2015 report. Other top allegations that were reported by physicians include complications from treatment or surgery and failure to treat or delayed treatment.

Looking forward, physicians may be wondering about steps they can take that could potentially discourage malpractice lawsuits. A majority of physicians indicated that they thought better communication and rapport with patients could discourage malpractice lawsuits. Nearly half of physicians indicated that having a medical panel screen cases for merit could also help to discourage complaints.

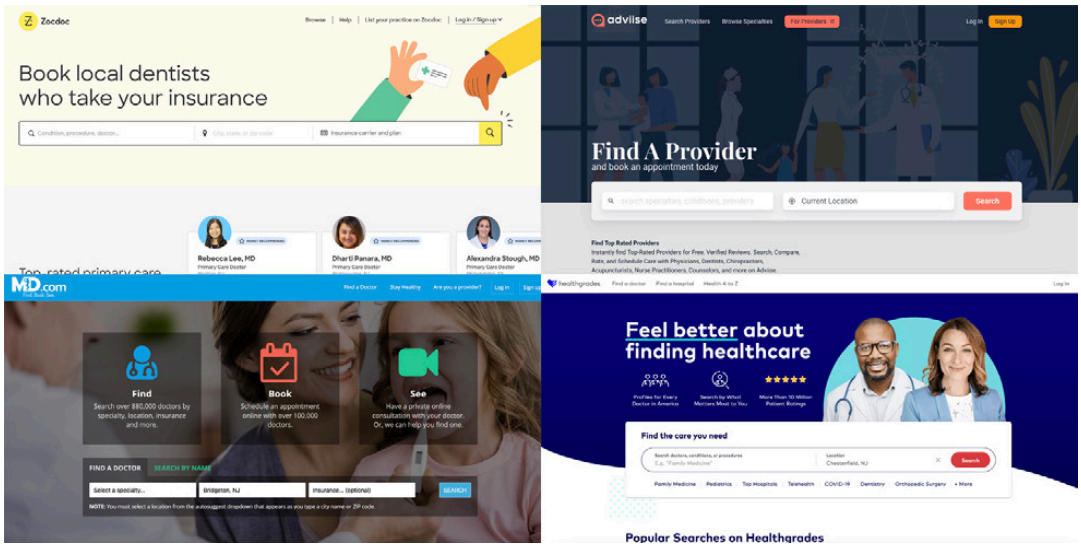
Do you think the risk of being sued is climbing? Let us know in the comments online below. — *KD*

## NY Ortho Surgeon Fined $100K for Posting Fake Reviews

Mark J. Mohrmann, M.D., a New York-based orthopedic surgeon, will pay $100,000 in penalties for obtaining fake positive reviews and suppressing negative reviews for his orthopedic practice.

The efforts to manipulate online reviews involved Dr. Mohrmann, Highline Orthopaedics, PLLC (Dr. Mohrmann's orthopedic practice), and Alexandra Mohrmann (Dr. Mohrmann's wife). According to the assurance of discontinuance in the matter, the manipulation efforts were purportedly directed at a number of online platforms including the following: ZocDoc, Google, Yelp, Healthgrades, Vitals, Md.com, RateMds.com, the Better Business Bureau, and Adviise.

Since 2017, Dr. Mohrmann had allegedly been, according to the assurance of discontinuance, "suppressing authentic, negative patient reviews" while simultaneously procuring "fraudulent, positive reviews." Dr. Mohrmann purportedly did this with the help of his wife and some members of his staff.




*Source: ZocDoc, Healthgrades, Md.com, Adviise*

Dr. Mohrmann supposedly utilized a variety of tactics to remove negative reviews by patients. On Google Dr. Mohrmann would allegedly falsely flag negative reviews as inappropriate so that the reviews would be automatically removed.

Dr. Mohrmann was also supposedly able to suppress negative reviews on ZocDoc through a variety of methods. He allegedly offered one patient reimbursement of a $50 copay for the removal of a negative ZocDoc review. He also allegedly "repeatedly prevented patients from leaving a potentially bad review by falsely indicating on the platform that they had failed to appear at a scheduled appointment."

According to the assurance of discontinuance, from July through November 2019, Dr. Mohrmann and his practice purportedly "received 1,494 bookings through the ZocDoc platform and marked 756 of those patients, more than 50%, as no-shows."

In addition to suppressing negative reviews, Dr. Mohrmann and his wife allegedly worked together to illegally obtain fraudulent positive reviews. From 2017 through 2021, Dr. Mohrmann with the assistance of his wife, staff, paid contractors, and others, was purportedly able to procure "hundreds of fake reviews, employing several different tactics." In addition to the $100,000 in penalties, Dr. Mohrmann and his wife are required to use their best efforts to remove the fake positive reviews.

In the Office of the New York State Attorney General press release, New York Attorney General Letitia James commented, "Many patients rely on online reviews when choosing which doctor to trust with their health, and it's important that these reviews are authentic."

James continued, "Dr. Mohrmann deceived patients through a secret campaign to remove negative reviews and unfairly obtain positive reviews to boost his practice. These actions are illegal and unacceptable, particularly for critical services like medical care. My office will continue to take action against those trying to mislead patients in New York." — *KD*

LARGE JOINTS

# Which TKA Patients Will Convert to Inpatient From Outpatient?

*Source: Shutterstock*

What kind of patients are more likely to convert from having their knee replacement (TKR) surgery inpatient to outpatient?

Researchers from NYU Langone Health designed and conducted a study to map the characteristics of patients who were initially slated for total knee arthroplasty (TKA) with an outpatient status, but who then converted to an inpatient status. Their work, "Patient Designation Prior to Total Knee Arthroplasty: How Can Preoperative Variables Impact Postoperative Status?" appears in the September 2023 edition of *The Journal of Arthroplasty.*

"As payment models change, we wanted to gain insight into which patient characteristics may influence an inpatient vs outpatient stay," said co-author Ran Schwarzkopf, M.D. "Many authors have reported in the past about same day discharge and how to select and

guide patients into this pathway. We wanted to evaluate this differently and see which patients actually stay and have an inpatient designation."

The team retrospectively reviewed all patients who underwent a primary TKA at NYU Langone Health between January 2, 2018, and April 26, 2022. They found that of the 2,313 patients originally slated for outpatient TKA, 627 (27.1%) required a stay of two midnights or longer.

Those in the inpatient group had significantly higher facility discharge rates compared to the outpatient group. Factors predictive of conversion included age of 65 years and older, women, arriving at the post anesthesia care unit after 12:00pm, body mass index greater than 30, and Charlson Comorbidity Index of 4 and higher.

Being the first case of the day and being married were both protective against conversion.

Dr. Schwarzkopf told *OTW*, "I think we validated the notions we had, i.e., that older, more obese and patients with a higher comorbidity burden had a longer stay, an inpatient stay, and had a higher non-home discharge. Also, we have shown that patients that don't live alone find it easier to go home on the day of surgery."

As for how surgeons can use the patient-specific factors in decision-making, Dr. Schwarzkopf said, "I think in today's environment, especially in urban settings where patients may have less social support, surgeons may need to think about preoperative education and patient engagement on when and how will the patient feel most comfortable going home after surgery." — *EH*

## Insights From American Joint Registry's Annual Report

The American Joint Replacement Registry (AJRR), representing more than 3.1 million primary and revision hip and knee arthroplasty procedures performed between 2012 and 2022 (a 23% rate of procedural growth from the last annual report!) is now available.

According to James I. Huddleston, III, M.D., FAAOS and chair of the AJRR Steering Committee, "The information in this year's Annual Report gives the most comprehensive picture to date of patterns of hip and knee arthroplasty practice and outcomes in the U.S."

Specifically, the 2023 AJRR Annual Report presents a decade's worth of data and in that dataset are illuminating insights, national trends and risk-stratified outcome analyses related to Medicare patients who undergo hip and knee arthroplasty procedures.

Added Dr. Huddleston, "This provides a more complete picture of our patient population and their associated comorbidities and outcomes, including longitudinal outcomes of patients who receive care at non-AJRR participating sites."

**Leveraging the Power of Registry Data to Improve Patient Care**

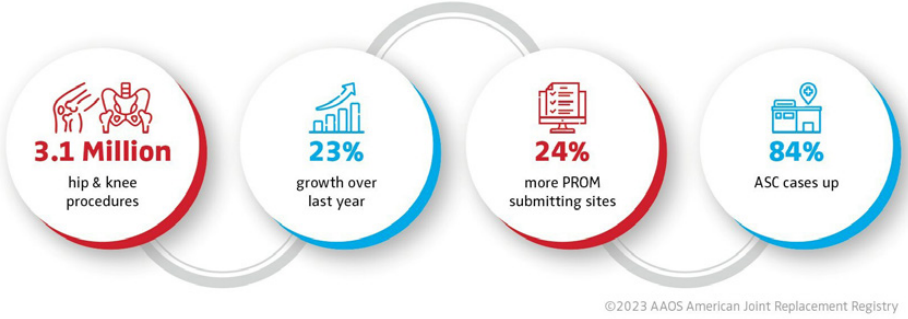
Indeed, this data is meant to be put to work—by the research community, hospital and clinic managers, suppliers, and regulators—all members of the broader musculoskeletal community. Indeed, as the report itself makes clear, its aims are to deliver valuable information to orthopedic surgeons, hospitals, ambulatory surgery centers (ASCs), private practices, device manufacturers, payers and most importantly patients.

Ultimately, its grandest purpose of all is to help clinicians change practice and improve patient outcomes.

The AJRR is the largest orthopedic registry by annual procedure count.

Here are a few intriguing details.

- **Patient-Reported Outcome Measures (PROMs) are increasingly being utilized to evaluate the success of a hip or knee arthroplasty procedure.** By the end of 2022, 496 participating sites sub-




*Courtesy of The American Joint Replacement Registry (AJRR),*

mitted PROMs, which is a 24% increase compared to the previous year. Collection of PROMs data through the KOOS, JR. score revealed that 86% of patients achieved a meaningful improvement after total knee arthroplasty (TKA).

- **Ambulatory surgery centers (ASCs) continue to play an increasingly important role** in the delivery of total joint arthroplasty care in the U.S. There are now 42,228 procedural cases reported by ASCs, an 84% increase since 2022.

- **Hospital discharges to home versus a skilled nursing facility trend upward –** Approximately 93% of patients are now being discharged to home following elective primary total hip arthroplasty (THA) with far fewer patients (8%) being discharged to skilled nursing facilities compared to just a few years ago.

  The percentage of patients being discharged to skilled nursing following primary total knee arthroplasty (TKA) also continues to decrease and now represents less than 6% of all discharges.

- **Rate of technology use for assistance in elective primary total hip arthroplasty has increased substantially –** Over the past 6 years, the utilization of robotics in TKA has increased over 6-fold and is now reported in over 13% of procedures, whereas computer navigation use has remained relatively stable.

  According to Dr. Huddleston, the continued collection and analysis of robotic data will eventually allow surgeons to assess the value proposition of these technologies.

- **New analyses offer new perspectives on patient outcomes –** Additional analyses provided for the first time in the 2023 AJRR Annual Report including hip and knee survivorship comparisons between pre- and post-COVID-19 emergency declaration, revision outcome following revision THA between dual mobility and standard designs, and survivorship among fracture patients treated with THA vs. hemiarthroplasty.

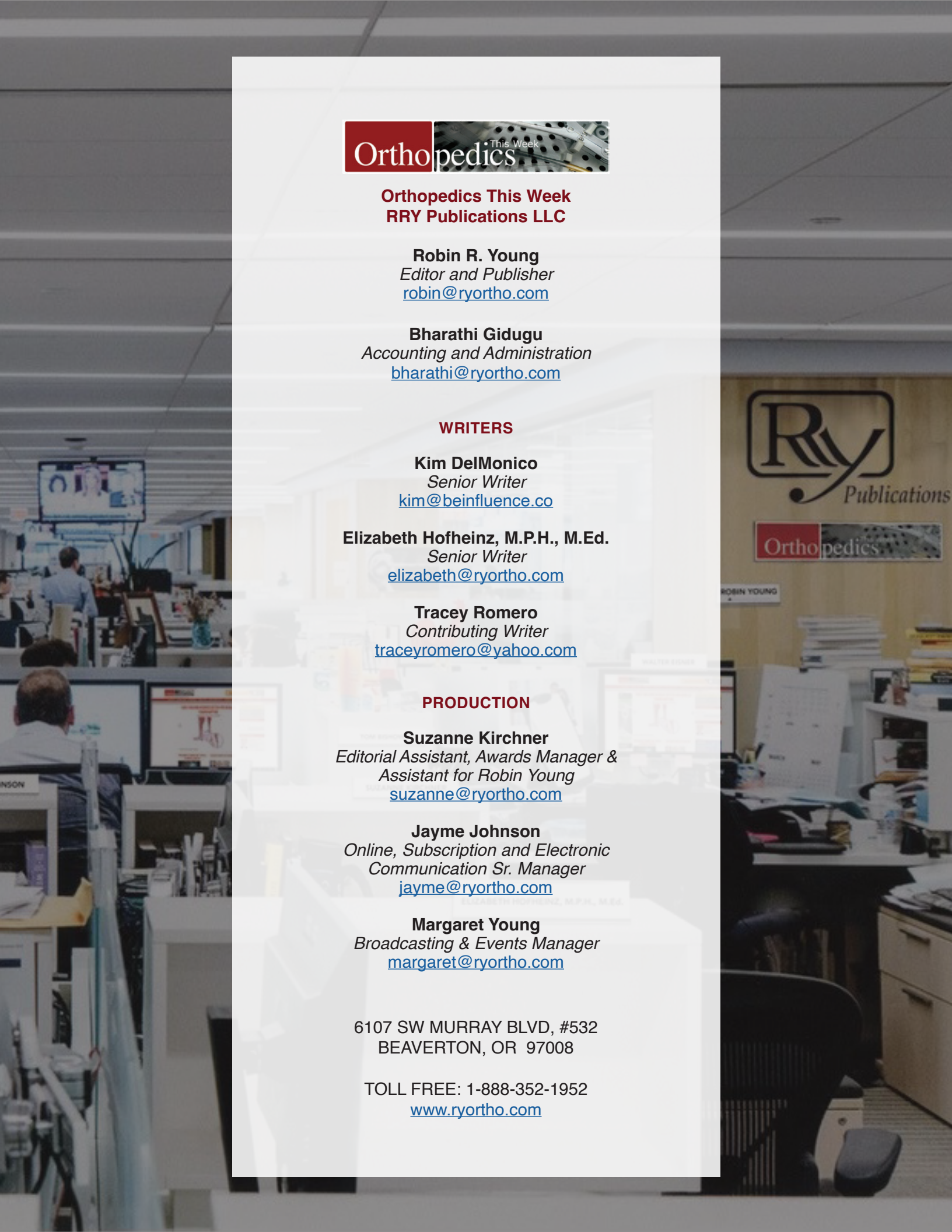
These new analyses offer critical insights into the impact of COVID-19 on patients and shed light on the performance of new technologies and treatment paradigms.

"The publication of the 10th edition of the AJRR Annual Report further validates the commitment of healthcare institutions, clinicians and patients to improving the quality of musculoskeletal care," says James A. Browne, M.D., FAAOS, chair of the AJRR Publications Subcommittee and editor of the AJRR Annual Report. "The ever-growing submission and compilation of data is driving new insights and fueling our desire to improve the value of care for our patients."

For slides with figures and data tables as featured in the report, email media@aaos.org.

**AAOS Registry Program**

The AAOS Registry Program's mission is to improve orthopaedic care through the collection, analysis, and reporting of actionable data. The American Joint Replacement Registry (AJRR), the Academy's hip and knee replacement registry, is the cornerstone of the AAOS's Registry Program, and the world's largest national registry of hip and knee joint replacement data by annual procedural count, with more than 3 million procedures contained within its database. Additional registries include the Fracture & Trauma Registry (FTR), the Musculoskeletal Tumor Registry (MsTR), the Shoulder & Elbow Registry (SER), and the American Spine Registry (ASR), a collaborative effort between the American Association of Neurological Surgeons (AANS) and the AAOS. — *RRY*



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