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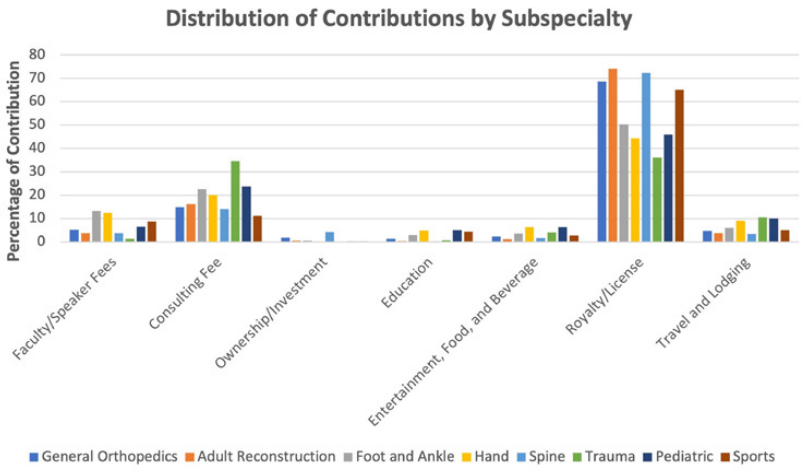
Orthopedics This Week

WEEK IN REVIEW



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: It's been a rough month for ortho equities, which brought out the true value, bargain equities—JNJ, MDT, SNN and IART. The fact that investors have moved on to other sectors is not a reflection on ortho/spine. Procedure volumes are continuing to rise at above average rates and several new CEOs have generated genuine excitement at their respective companies—ZBH, OFIX and BVS. When I was on Wall Street, new CEOs coming in after a some drama and a collapsed stock, was one of the most reliable ways to make money. Buy good companies when their stocks are cheap.

RANK	LAST WEEK	COMPANY	TTM OP MARGIN	30-DAY PRICE CHANGE	COMMENT
1	5	Zimmer Biomet	19.31%	1.38%	2nd best performing stock in ortho, at just 1.38% appreciation in 30 days, but 7th best value and new partner of the Association of Pickleball Players. Also ROSA now cleared for shoulders.
2	2	Pacira Biosciences	12.86	(6.48)	It's been a tough couple months for ortho equity valuations, which allows bargain hunters to pick up top quality companies, like PCRX. #1 innovator in pain management.
3	1	Bioventus	(5.33)	(1.94)	New CEO Claypoole annouced Q4's 14.3% organic revenue growth, sharply lower losses compared to a year ago and 2024 guidance to $520mm in sales and almost $90mm EBITDA.
4	4	Johnson & Johnson	19.22	(4.36)	Anchored at #4 this week on the Power Rankings is venerable JNJ, the largest medical products supplier in the world. 4.76% forward annual dividend rate. A true Buy and Hold equity.
5	NR	Globus Medical	12.74	(4.88)	Blending NUVA into GMED cut operating margin roughly in half. Overtime, the GMED culture will prevail and margins will almost certainly rise. Oh yes, also a new CFO.
6	9	Orthofix	(8.51)	0.71	New president for bone growth, new chief operations officer and, of course, a new CEO. OFIX is finding its footing after 2023's self-inflicted drama. New team is one of the best in years.
7	3	Smith & Nephew	10.06	(9.14)	SNN's stock hit an air pocket last month. News is good, however. AI-driven shoulder robotics system, and expanded sports med line. 2nd cheapest stock in ortho.
8	6	ConMed	12.24	(7.69)	Investors also sold off CNMD. First quarter results are due this month and Wall Street is forecasting 10-12% sales growth to about $308mm and a 12% pop in earnings.
9	10	Integra LifeSciences	17.32	(5.84)	IART closed on the Acclarent (an ENT company) purchase. But Wall Street is still waiting for sales and earnings to fully recover from the Boston snafus. Meantime, cheap IART is even cheaper.
10	NR	Medtronic	19.17	(0.34)	Both Wall Street and MDT management focused on cardio and diabetes leaving spine fending for itself. #1 supplier in spine, but probably not for long. Why buy? High dividend yield, big margins, low price.

Robin Young's Orthopedic Universe

TOP PERFORMERS LAST 30 DAYS

	COMPANY	SYMBOL	PRICE	MKT CAP	30-DAY CHG
1	Alphatec Holdings	ATEC	$13.80	$1,904	5.99%
2	OrthoPediatrics Corp	KIDS	$27.47	$647	1.97%
3	Zimmer Biomet	ZBH	$127.33	$26,113	1.38%
4	Orthofix	OFIX	$14.23	$532	0.71%
5	Medtronic	MDT	$84.56	$112,281	-0.34%
6	Stryker	SYK	$351.02	$133,553	-0.89%
7	Anika Therapeutics	ANIK	$25.62	$380	-1.58%
8	Aurora Spine	ASG.V	$0.23	$16	-1.69%
9	Bioventus	BVS	$5.06	$401	-1.94%
10	MicroPort Scientific	0853	$0.86	$1,586	-2.08%

WORST PERFORMERS LAST 30 DAYS

	COMPANY	SYMBOL	PRICE	MKT CAP	30-DAY CHG
1	SINTX Technologies	SINT	$0.02	$3	-81.15%
2	Xtant Medical Hldgs	XTNT	$0.95	$123	-15.51%
3	AxoGen	AXGN	$7.80	$337	-13.91%
4	SI-BONE, Inc	SIBN	$15.36	$631	-12.88%
5	Dynatronics Corp	DYNT	$0.40	$2	-12.84%
6	Medacta	MOVE	$130.46	$2,609	-9.55%
7	Smith & Nephew	SNN	$24.47	$10,697	-9.14%
8	Nevro Corp	NVRO	$13.29	$484	-8.60%
9	ConMed	CNMD	$77.90	$2,398	-7.69%
10	Pacira Biosciences	PCRX	$28.16	$1,309	-6.48%

LOWEST PRICE / EARNINGS RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	P/E
1	Johnson & Johnson	JNJ	$152.39	$367,227	18.33
2	Medtronic	MDT	$84.56	$112,281	20.04
3	Pacira Biosciences	PCRX	$28.16	$1,309	25.04
4	Zimmer Biomet	ZBH	$127.33	$26,113	26.21
5	Globus Medical	GMED	$51.83	$7,016	28.61

HIGHEST PRICE / EARNINGS RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	P/E
1	Xtant Medical Hldgs	XTNT	$0.95	$123	186.70
2	Medacta	MOVE	$130.46	$2,609	50.89
3	Smith & Nephew	SNN	$24.47	$10,697	40.67
4	Integra LifeSciences	IART	$34.00	$2,672	39.45
5	Stryker	SYK	$351.02	$133,553	37.78

LOWEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

	COMPANY	SYMBOL	PRICE	MKT CAP	PEG
1	Smith & Nephew	SNN	$24.47	$10,697	-5.08
2	ConMed	CNMD	$77.90	$2,398	1.37
3	Globus Medical	GMED	$51.83	$7,016	1.77
4	Medacta	MOVE	$130.46	$2,609	1.82
5	Pacira Biosciences	PCRX	$28.16	$1,309	2.41

HIGHEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

	COMPANY	SYMBOL	PRICE	MKT CAP	PEG
1	Xtant Medical Hldgs	XTNT	$0.95	$123	9.34
2	Medtronic	MDT	$84.56	$112,281	5.76
3	Integra LifeSciences	IART	$34.00	$2,672	4.48
4	Johnson & Johnson	JNJ	$152.39	$367,227	3.90
5	Zimmer Biomet	ZBH	$127.33	$26,113	3.78

LOWEST PRICE TO SALES RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	PSR
1	Dynatronics Corp	DYNT	$0.40	$2	0.05
2	Orthofix	OFIX	$14.23	$532	0.71
3	Bioventus	BVS	$5.06	$401	0.78
4	Aurora Spine	ASG.V	$0.23	$16	0.83
5	ZimVie	ZIMV	$16.82	$458	1.00

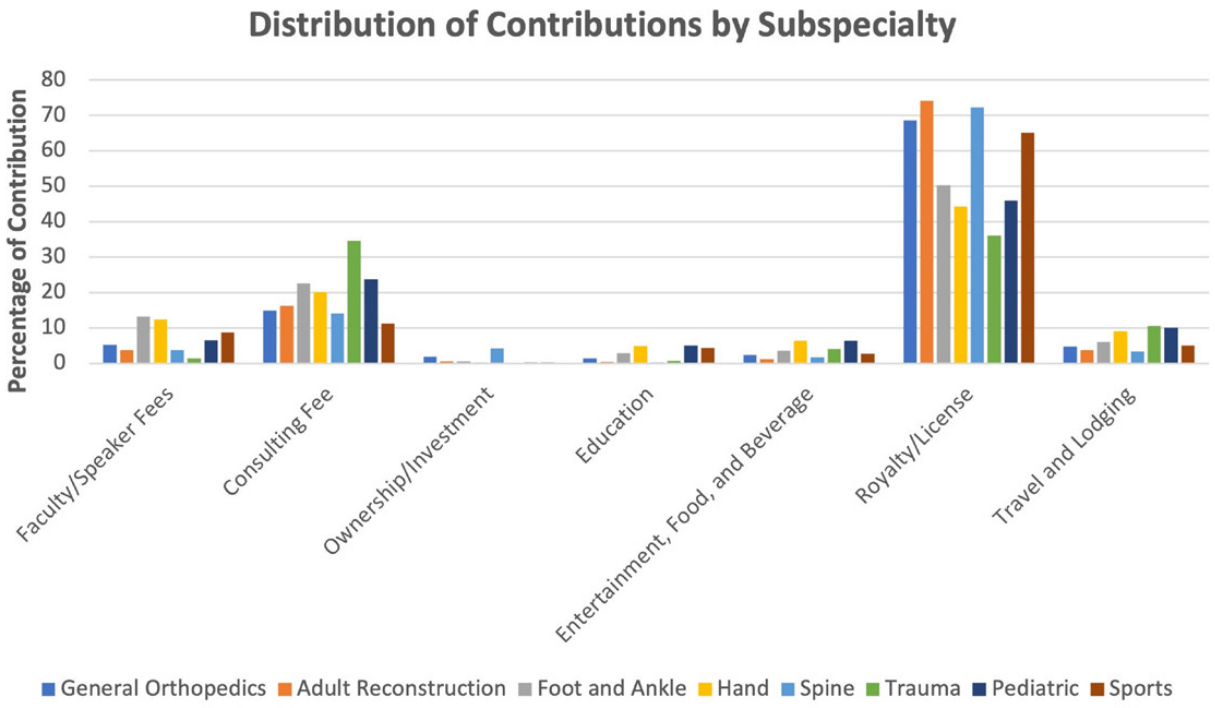
HIGHEST PRICE TO SALES RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	PSR
1	Stryker	SYK	$351.02	$133,553	6.52
2	Medacta	MOVE	$130.46	$2,609	5.11
3	SI-BONE, Inc	SIBN	$15.36	$631	4.54
4	Globus Medical	GMED	$51.83	$7,016	4.47
5	OrthoPediatrics Corp	KIDS	$27.47	$647	4.35

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

Average 5-yr Ortho Surgeon Consulting Fee Was $57k, But…

BY KIM DELMONICO



Distribution of Contribution by Subspecialty / Source: Cureus

The average of five years of consulting payments to orthopedic and spine surgeons was $57,000, but the average for recon surgeons was $225,000 and for spine surgeons was $197,000.

These data came from an analysis of five years of consulting payments to orthopedic surgeons which was published in *Cureus Journal of Medical Science*.

The study is titled "Industry Payments to Orthopedic Surgeons Among All Subspecialties: An Analysis of the Open Payments Database From 2014 to 2019."

The purpose of the study was to examine trends in payments made to orthopedic surgeons during that time period. The study analyzed the different types of industry payments and the differences between the orthopedic subspecialties. According to the study, "a total of 1,048,573 payments (approximately $1.6 billion) were made to orthopedic surgeons between 2014 and 2019."

The data for the study came from a review of the Centers for Medicare and Medicaid Services (CMS) Open Payments Database (OPD). The sample included the following orthopedic subspecialties:

- general orthopedic surgeons;
- sports medicine surgeons;
- orthopedic hand surgeons;
- orthopedic spine surgeons;
- adult reconstructive orthopedic surgery;
- orthopedic foot and ankle surgeons;
- orthopedic trauma surgeons; and
- pediatric orthopedic surgeons.

Orthopedic oncologists and shoulder and elbow orthopedic surgeons were not included in the study.

The study found that the "mean of total payments made to orthopedic surgeons was $56,794.88."

Furthermore, on average, the greatest total payments are being made to adult reconstructive orthopedic surgeons followed by orthopedic spine surgeons. These surgeons received "significantly greater mean individual payments when compared to all other subspecialties."

The mean total industry payments for adult reconstructive orthopedic surgeons was $225,131.10. The mean total industry payments for orthopedic spine surgeons was $197,404.74. By contrast, mean total payments for orthopedic hand surgeons was $14,027.76 and mean total payments for general orthopedic surgeons was $28,405.81.

The sample also included information on the following payment types:

- faculty/speaker fees;
- consulting fee;
- ownership/investment;
- education;
- entertainment, food, and beverage;
- royalty/license; and
- travel and lodging.

The analysis revealed that there was a "statistically significant interaction between payment type and orthopedic subspecialty."

Notably, royalties or licensing encompassed the "greatest proportion of open payments for all orthopedic subspecialties." According to the study, the majority of payments made to the following subspecialties came from royalties or licensing:

- "adult reconstructive surgeons (74.19%),
- orthopedic spine surgeons (72.34%),
- general orthopedic surgeons (68.68%),
- sports medicine surgeons (65.08%), and
- foot and ankle surgeons (50.21%)."

The next most significant payment type was consulting fees. The other payment types "contributed to less than 10% of open payments made to all subspecialties." ♦

Here Comes Genetically Engineered OA Therapy

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

The 2024 Orthopaedic Research and Education Foundation (OREF) Clinical Research Award has been presented to Christopher H. Evans, Ph.D. (Mayo Clinic), Steven C. Ghivizzani, Ph.D. (University of Florida), and Paul D. Robbins, Ph.D. (University of Minnesota), for their groundbreaking research on local gene therapy for osteoarthritis (OA).

For more than 30 years, this team has spearheaded and shepherded groundbreaking OA genetic research and patiently, persistently, moved the science from laboratory concept to human clinical trials.

The OREF Award recognizes outstanding clinical research related to musculoskeletal disease or injury.

"Gene therapy was focused on curing genetic diseases when we entered the field," said Dr. Evans, John and Posy Krehbiel Professor of Orthopedics, Mayo Clinic, and Professor of Molecular Medicine, Mayo Clinic Alix School of Medicine in Rochester, Minnesota.

"At the time, studying gene therapy for arthritis was radically different because, instead of treating a genetic disease, we were looking at treating a non-genetic one, albeit one of the most common diseases on the planet. This was not a genetic fix, but we wanted to explore a sophisticated way of delivering anti-arthritic gene products to those who need therapy as there were not many treatment advances for OA."

The 2024 Orthopaedic Research and Education Foundation (OREF) Clinical Research Award was presented to Christopher H. Evans, Ph.D. (Mayo Clinic-pictured here), Steven C. Ghivizzani, Ph.D. (University of Florida), and Paul D. Robbins, Ph.D. (University of Minnesota), for their research on local gene therapy for osteoarthritis (OA) / Source: AAOS

From Concept to Clinical Trials

Initially targeting rheumatoid arthritis (RA), the researchers achieved the first-in-human transfer of a gene to a joint. With the rise of non-genetic RA treatments, however, the team shifted its focus to OA.

In terms of the details of the gene transfer process, Dr. Evans explained, "The gene transfer process involves genetically modifying a harmless virus (Adeno-associated virus; AAV) so that it carries DNA ('gene') that encodes the therapeutic protein product of interest, in our case the interleukin-1 receptor antagonist (IL-1Ra)."

"The modified virus is then injected into the joint with osteoarthritis where the virus delivers its genetic payload to cells within the joint, including synovial cells and chondrocytes. As a consequence, these cells then produce IL-1Ra which accumulates locally within the joint at therapeutic concentrations in a sustained fashion."

"The most challenging part concerns the gene transfer technology, especially which vector to use to transfer the gene into cells within the joint. During the extended pre-clinical development of this project, we tried many different types of vectors, both viral and non-viral. And after the best vector was identified, manufacturing clinical grade material was another huge challenge."

The researchers filed an Investigational New Drug application with the FDA in 2015. In a Phase I clinical trial, nine patients (three cohorts) were injected with scAAV.IL-1Ra in escalating doses of 10 (low dose), 10 (medium dose), or 10 (high dose) by an intra-articular injection into one knee joint with OA.

Eligible patients had mid-stage disease, symptomatic OA and failed at least two conservative treatments prior to the study.

Partial outcomes included:

- No serious adverse events were reported.
- Patients reported improved symptoms based on VAS and WOMAC. Patients who received the lowest dose reported mild and temporary improvement. Patients who received the medium and high doses saw sustained symptomatic improvement during the entire 12-month follow-up timeframe.
- Expression of IL-1Ra, a natural anti-inflammatory protein, was higher in the high-dose and medium-dose groups. This elevated expression in these groups was sustained through the 12 months of follow up, suggesting that the 10 dose could be the most cost-effective dose, but further investigation is needed.

"This was the first study that used localized gene therapy, meaning we could deliver the therapeutic target directly to the joint, which has enormous implications for safety and significantly reduces the cost associated with this procedure/therapy," said Dr. Evans.

"By focusing on the joint, you don't have to treat the whole body as many of the previous vectors delivered systemically go straight to the liver, causing liver damage. The amount of vector we delivered to the knee is significantly less than what is used in systemic diseases, which cuts down on the cost dramatically."

Going forward, asked *OTW*, what are your thoughts on how the level and persistence of IL-1Ra expression in the joint may be affected by immune suppression?

"Although we have fiddled around with the DNA sequence of the gene," said Dr. Evans, "the IL-1Ra protein we express is identical to the IL-1Ra protein produced naturally by the body. For this reason, it should not be recognized as foreign by the immune system and therefore not affected by immunosuppression."

"This was the first suggested use of gene therapy to treat a disease that is not a genetic disease or cancer!" ♦

Nathaniel A. Dyment, Ph.D. Wins AAOS's Investigator Award

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

Nathaniel A. Dyment, Ph.D./ Courtesy of the American Academy of Orthopaedic Surgeons

Nathaniel A. Dyment, Ph.D., assistant professor of orthopedic surgery, Perelman School of Medicine, University of Pennsylvania, has won the American Academy of Orthopaedic Surgeons (AAOS) 2024 Kappa Delta Young Investigator Award.

The award recognizes outstanding clinical research related directly to musculoskeletal disease or injury. Dr. Dyment won his award for his clinical research regarding the biophysical and biochemical cues that direct the growth and development, homeostasis and repair of tendons and ligaments.

"We don't have specific markers that delineate between immature and mature tendon cells and don't fully understand the biological and mechanical inputs that control tendon cell behavior," said Dr. Dyment.

"Therefore, the development of treatments to successfully repair or regenerate tendons is very difficult. Often, a tendon tears near the bone at the enthesis and can frequently be a chronic tear. The degeneration that is happening in tendons can take decades to develop, making successful treatment of these injuries a big challenge. One strategy is to understand the disease process better so we can try to intervene earlier."

Using mechanobiology, Dr. Dyment and his colleagues focused on tendon tensional homeostasis, which is critical to maintaining tendon tissue properties. Tensional homeostasis is the result of extrinsic (applied) loads, such as those from activities of daily living, and intrinsic (internal) loads, often generated by structural proteins inside the cell. The researchers explored how mechanical forces affect tendons during the various stages of embryonic development, postnatal growth, and homeostasis.

The major findings included:

- Muscle contraction is critical to postnatal growth of the Achilles tendon and can impair growth if reduced.
- Non-muscle myosin II motor proteins, which contribute to cellular organization and regulation and help drive cell tension, are required to maintain the tendon matrix into adulthood.

When torn tendons are sutured back to the bone, these repairs often lead to the formation of scar tissue and don't produce an organized enthesis structure at the attachment site. The research team set out to understand the specific cell populations that participate in the healing response, which can help promote enthesis formation following an injury. Dr. Dyment and his team used the anterior cruciate ligament reconstruction (ACLR) surgical model as a test platform to manipulate specific cell populations during the tendon-to-bone integration process that occurs between the tendon graft and adjacent bone following surgery.

Their findings showed:

- At four weeks post-surgery, zonal tendon-to-bone attachments were seen in the bone tunnels. While more disorganized, the zonal attachments shared common features with native entheses.
- Activating the Hedgehog signaling pathway—a key regulator of enthesis formation during growth and development—increased the production of tendon-to-bone attachments following ACLR. This indicates that the Hedgehog pathway could be a therapeutic target to improve tendon-to-bone repair.

"Using developmental studies—how the tissue originally forms—we determined the elements that are absolutely critical to the establishment of this tissue," said Dr. Dyment. "The Hedgehog pathway was specifically expressed by cells where the tendon inserts into bone that produce fibrocartilage in this area."

Dr. Dyment explained the role of the Hedgehog pathway to *OTW*, "During my graduate studies, we found that cells in the tendon-to-bone insertion site (i.e., enthesis) expressed genes within the Hedgehog signaling pathway."

"We later discovered that these cells would go on to make fibrocartilage

within the enthesis, which is critical to the mechanical function of this tissue. In fact, this pathway is critical for the production and maturation of enthesis fibrocartilage."

"We later investigated whether this pathway was active during tendon-to-bone integration following ACL reconstruction. Indeed, it was expressed by cells that produce the fibrocartilage in the tendon-to-bone attachments, similar to the expression patterns found during enthesis growth and development. We next found that by stimulating the pathway in our ACL reconstruction model, we could improve the tunnel integration process."

"This pathway offers a novel target to potentially improve tunnel integration following ACL reconstruction and could also be more broadly applicable to tendon-to-bone repair in other contexts."

"Growing up playing sports and experiencing injuries, both first and second hand, sparked my interest in sports medicine," stated Dr. Dyment to *OTW*. "I started studying tendons and ligaments as a Ph.D. student in Dr. Dave Butler's Functional Tissue Engineering Laboratory at the University of Cincinnati. Many of the research questions that my lab has today were shaped by the studies and findings we had as a group during my graduate and post-doctoral studies."

"This work would not be possible without the contributions of my excellent mentors, colleagues, and trainees that I've had the pleasure of working with over the years. These people include, but are not limited to, Dave Butler, David Rowe, Lou Soslowsky, Rob Mauck, Andy Kuntz, Joel Boerckel, Lin Han, Eiki Koyama, Catherine Bautista, Mary Kate Evans, Natalie Fogarty, Keitaro Fujino, Yusuke Hagiwara, Xi Jiang, Talayah Johnson, Dakota Jones, Tim Kamalitdinov, Jonathan Marcelin, Rashad Madi and Tonia Tsinman." ♦

COMPANY

ASC Ortho Procedure Volume – 12% Growth Next Five Years

Source: Shutterstock

Have you noticed how orthopedic, and spine ambulatory surgery centers (ASC) seem to be popping up everywhere? Maybe as an adjunct to an existing hospital system or as a standalone?

How fast is that growth? According to a new report "*Impact of Change Forecast*" from Sg2 (a Vizient Inc. company) Ambulatory Surgery Centers (ASC) will likely grow 12% growth in the next five years and 22% growth in the next 10 years.

In ASC Focus, Sg2 Senior Consulting Director of Intelligence Tony Guth wrote, "The services expected to see the greatest movement toward ASCs will be those that are clinically appropriate, reimbursed by payers and done by physicians who are incentivized to work in ASCs."

Guth added, in part, "[W]e expect a continued increase in cases shifting from hospitals for services like orthopedics."

Guth also remarked that ASC growth can differ across markets and is "driven by a few key factors" such as "State and local regulations (CON laws), how physicians are aligned with a market, pressure from payers to move proce-

dures to cheaper care sites, the size and growth of the market, and the level of competition."

According to the report, outpatient surgical volume will grow 18% by 2033, and the top procedures fueling that growth are: total joint replacement, lumbar/thoracic spinal fusion, revision knee replacement, prostatectomy, cervical spinal fusion, cholecystectomy, and bariatric surgery.

Per the report, outpatient service line growth in the U.S. market from 2023 to 2033 for orthopedics and spine is 10% according to the Sg2 OP forecast and 11% according to the population-based forecast.

A 2021 report in Vizient's *Tech Watch* focused on spine program evolution predicted that "due to dynamic market conditions, spinal procedures are expected to follow a similar path [to orthopedic procedures] over the next 10 years, slowly recovering [from COVID-19 disruptions] and transitioning to outpatient facilities." It predicted that "high obesity rates and other lifestyle factors will drive an increase in total demand for spine services."

This trend has become increasingly apparent through recent ASC acquisitions and expansions. One of the latest acquisitions in the ASC spine/orthopedic space is TriasMD's recent acquisition of Thousand Oaks Surgery Center in Thousand Oaks, California.

TriasMD, based in Newport Beach, California, is a musculoskeletal healthcare company. It is the parent company of DISC Sports & Spine Center. This acquisition is the company's third and, similar to the renaming of the other two ASCs, the newly acquired ASC will be renamed DISC Surgery Center at Thousand Oaks.

Thousand Oaks Surgery Center, an AAAHC-accredited, Medicare-certified facility, is led by its owner Alexander P. Hersel, M.D., PMIR. Thousand Oaks Surgery Center offers ambulatory surgical care for a variety of specialties, including, per the press release, "spine, orthopedics, podiatry, pain management, otolaryngology, and plastic surgery."

Under the partnership, TriasMD will be the majority partner. TriasMD and Dr. Hersel will work together to focus on enhancing the ASC's services and expanding patient access. TriasMD also plans to hire additional spine and orthopedic surgeons and invest in instruments and equipment. — *KD*

Accelus Lands $20 Million in New Debt Funding

Source: Accelus and Wikimedia Commons

Florida-based Accelus, a privately held spinal implant and instrument supplier, has closed on a $20 million debt facility with Los Angeles-based Symbiotic Capital.

Based in Palm Beach Gardens, Florida, Accelus is dedicated to developing expandable spinal implant technologies. The funding will be used to help improve Accelus's position in the global spinal surgery industry.

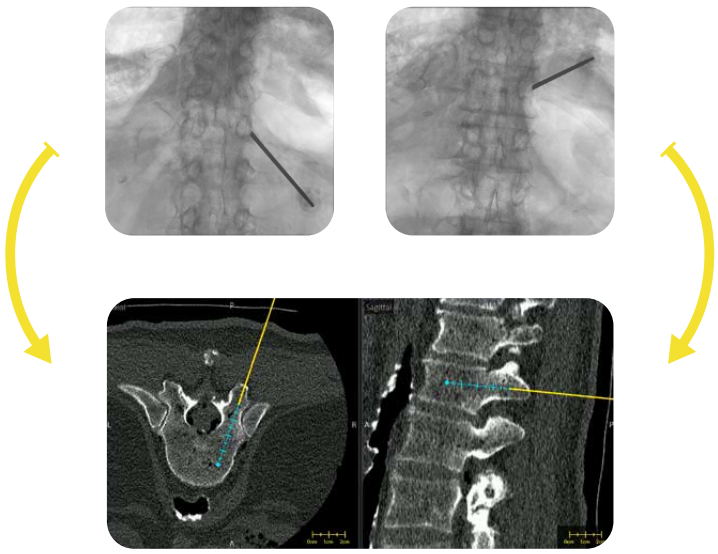
OTW spoke with Accelus President and Chief Executive Officer Kevin McGann about the funds. "Securing this $20 million in debt equity signifies a pivotal step in expanding our reach and accelerating Accelus's growth. We are actively growing our sales team to reach those regions of the country where, until now, our presence has ranged from minimal to nonexistent. This investment will also allow us to prioritize important development projects that further

VUZE MEDICAL

a novel approach to spinal navigation

NO cameras | **NO** markers
NO references | **NO** in-OR 3D
NO tool modifications

requires only a 2D C-arm and a
PC running the VUZE™ software



VUZE overlays unmodified surgical tools from intra-op AP X-rays on axial and sagittal views from a standard pre-op CT

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enhance our flagship FlareHawk and LineSider portfolios, alongside the comprehensive launch of our Toro-L lateral implant and subsequent iterations of our Toro product line."

McGann continued, "Finally, the funding will also bolster our data collection efforts, providing more clinical evidence for the exceptional performance we've seen with our FlareHawk multidirectional expandable lumbar fusion device. We remain committed to establishing Accelus as the global leader in expandable implants and in driving the adoption of our comprehensive product portfolio throughout 2024."

FlareHawk is Accelus's flagship implant. It utilizes Adaptive Geometry™ to, according to the company, "expand simultaneously in width, height, and lordosis after traversing the neural corridor with a small profile." Once expanded, the implant is "designed to reduce subsidence, restore foraminal height, and reestablish sagittal balance from a posterior approach."

Symbiotic Capital is a life science credit firm based in Los Angeles, California. In the press release McGann said, "Symbiotic Capital's investment is a testament to the growth potential of Accelus's technology and our vision for the future of minimally invasive spine care."

McGann continued, "Symbiotic Capital is an ideal partner for Accelus, sharing our commitment to innovations that support surgeons and improve patient outcomes, and their support will be instrumental in broadening our market reach and speeding up our R&D to ensure we stay at the forefront of spinal implant technology." — *KD*

Bolt Navigation Closes Series B Financing Round

Bolt Navigation, the developer of the first handheld spine surgery navigation system, has successfully closed its Series B financing round. Based in Con-

Source: Bolt Navigation

cord, Massachusetts, Bolt Navigation is a privately held developer of handheld surgical navigation systems.

According to the company, these funds will be used to "support commercialization of the Bolt Navigation System in the U.S., EU and other markets, ongoing and new clinical studies, and expansion of the Bolt technology platform into additional indications."

The company did not disclose how much was raised.

OTW spoke with Bolt Navigation Chief Commercial Officer Rob Brown about the clinical studies, and he explained, "We currently have a head-to-head Randomized Control study underway in the Netherlands with Bolt versus CT Navigation system."

Its flagship product Bolt is a handheld spinal surgery navigation system. John Dorman, M.D., a practicing neurosurgeon at West Texas Neurosurgery, developed Bolt. The Bolt system "utilizes an iPod touch, with its A10 fusion chip, 8MP camera, and highly sensitive gyroscope-on-chip technology to efficiently and effectively guide the placement of posterior fixation." The system is also "implant agnostic" which means it can offer "superior accuracy with any implant system."

This financing round was led by Grand Oaks Capital, an investment firm founded by Paychex founder Tom Golisano. Impact Capital, a venture capital firm based in New York, New York, also participated in the financing round. Bolt also announced the addition of Tom Bonadio to the Bolt Board of Directors. Bonadio is Impact Capital's general partner and chairman of The Bonadio Group Board of Directors.

In the press release, Bolt Chief Executive Officer Patrick West said, "We are delighted to have the continued support of Grand Oaks Capital and new investors seasoned in guiding commercial stage companies."

West continued, "We are in a position to execute on our goals of commercializing the Bolt Navigation System, a cutting-edge handheld spine navigation solution. The iOS-based system combines exceptional accuracy, cost-effectiveness, reduced radiation exposure, and seamless integration with existing surgical workflows, setting a new standard in the field." — *KD*

LARGE JOINTS

How to Cut Harmful Bone Cement Fumes in OR

Source: Wikimedia Commons

Researchers from Boston's Brigham & Women's Hospital and Pennsylvania's Heraeus Medical tested five different bone cement mixing systems and types of air flow strategies in the OR to determine which strategy or combination of approaches reduced exposure to harmful bone cement fumes.

The results of their study, "Bone Cement Fumes Generated in Laminar Airflow Versus Conventionally Ventilated Operating Rooms: Does the Mixing System Matter?" was published in the November 1, 2023, edition of *The Journal of Bone and Joint Surgery.*

Bone cement, a staple of many ORs, contains a colorless, clear, flammable liquid known as methylmethacrylate monomer. Considering five cement-mixing systems, the researchers looked at two different operative settings—an OR with conventional ventilation (CV) and an OR with laminar airflow—and compared the methylmethacrylate monomer vapor levels emitted.

First author Matthew P. Jamison, M.D. of the Department of Orthopaedic Surgery at Harvard Medical School and Brigham and Women's Hospital, told *OTW*, "There have been long-standing

concerns regarding exposure to the fumes generated from bone cement in orthopaedic surgery. We wanted to identify available cement mixing devices that would prove effective at minimizing methylmethacrylate monomer fume levels, with and without the assistance of a laminar airflow system in the OR."

"While the concerns regarding methylmethacrylate monomer fume expose have led to some investigation into fume levels generated from various devices, the effects of different OR ventilation environments had not yet been quantified. ORs with laminar airflow are becoming more widely utilized. We wanted to contribute to this topic further by conducting these trials in two differently ventilated settings."

The researchers calculated methylmethacrylate monomer vapor release during the cement preparation of a SAWBONES femoral canal, with five different vacuum cement-mixing systems used to mix the same cement type. Methylmethacrylate monomer vapor concentrations were measured during five phases of mixing, and each mixing system was randomly utilized 10 times in each OR.

Dr. Jamison also explained to *OTW* the differences that laminar airflow can make in protecting the health of operating room staff. "In an operating room with laminar airflow, filtered air is brought into the room through a large diffuser directly above the operative table, and air leaves the room through multiple vents on the walls of the room."

"This method of ventilation, along with keeping the room at positive pressure, keeps the stream of air moving in a uniform direction and reduces turbulence. This lack of turbulence makes it much more challenging for contaminated air, particulate matter, and harmful fumes to linger in the room or in the sterile field."

Overall, the researchers found that emissions remained higher in the conventional setting for every system and in nearly every phase. Among the five systems analyzed, System #5, the only entirely closed system, had the lowest overall emissions for each of the five phases in the CV setting.

Dr. Jamison added, "The most interesting and significant takeaway from this study were that laminar airflow is generally better than conventional ventilation at keeping methylmethacrylate monomer fume levels reduced, and that we were able to identify that

using a fully enclosed mixing device is very effective in minimizing methylmethacrylate monomer fume levels in a conventionally ventilated OR. The enclosed mixing device performed well and is a great option especially when laminar airflow is unavailable."

"We looked at five mixing devices in this study, so there is certainly room to test other marketed mixing devices. Also, it is unclear exactly how many facilities in the U.S. now use laminar airflow in the OR for arthroplasty, so knowing precisely how much the utilization of this type of ventilation has increased would be very useful to know." — *EH*

SPINE

New Cerebral Palsy Registry Data: Spine Fusion Infection Rates

It's not the best news for children with cerebral palsy (CP) who have to undergo spinal fusion. When a group of researchers looked at multiyear, multicenter data, they found that infection rates have not declined as much as hoped. The study, "15 Years of Spinal Fusion Outcomes in Children with Cerebral Palsy: Are We Getting Better?" appears in the November 22, 2023, edition of *Spine*.

"We undertook the work now because it has been 15 years since the beginning of our registry of pediatric patients with cerebral palsy who had spinal fusion," stated Paul Sponseller, M.D., chief of the Division of Pediatric Orthopaedics, Johns Hopkins Children's Center, to *OTW*. "Quality improvements are timely topics. We undertook this study to see if the hoped-for improvements have really happened."

As for why they studied this procedure in particular, Dr. Sponseller explained to *OTW* "Spinal fusion is a very high intensity intervention for these patients who have many medical comorbidities and challenges. We undertook this registry to see if we could quantify the outcomes and make improvements."

Good news, noted Dr. Sponseller, was that "The operations have become faster with the use of improved instrumentation. The use of anti-fibrinolytic agents such as tranexamic acid and aminocaproic acid have made the big difference in blood loss."

Furthermore, according to the latest data from the multicenter registry of pediatric CP patients who underwent spinal fusion from 2008 to 2020, the researchers found:

- A decline in mean estimated blood loss and transfusion volume
    - o from 2.7±2.0 Liters in 2008 to 0.71±0.34 Liters in 2020 and
    - o from 1.0±0.5 Liters in 2008 to 0.5±0.2 L in 2020, respectively, with a concomitant increase in antifibrinolytic use from 58% to 97%.
- A decline in unit rod and pelvic fusion use:
    - o from 33% in 2008 to 0% in 2020 and
    - o 96% in 2008 to 79% in 2020, respectively.
- A decline in mean postoperative intubation time:

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  - from 2.5±2.6 days to 0.42±0.63 days,

- no changes in pre- and post-operative coronal angle and pelvic obliquity, operative time, frequency of anterior/anterior-posterior approach, and durations of hospital and intensive care unit stays.

The "Improvements in the Caregiver Priorities and Child Health Index of Life with Disabilities postoperatively" did not change significantly over the study period.

Complication rates, including reoperation, superficial and deep surgical site infection, and gastrointestinal and medical complications remained stable over the study period.

"Radiographic correction has always been excellent," Dr. Sponseller told *OTW*. "Of the issues that remained constant, i.e., degree of radiographic correction, the rates of surgical and medical complications, and health-related quality-of-life measures, is there one that is able to be readily addressed (more than the others)?"

"The answer is 'yes'. We wanted to try to improve on medical complications such as infection rates. That is stubbornly elevated, and that is the main finding of our article. Across a multicenter study, which is very representative of U.S. practice, infection rates have not meaningfully declined as much as we would like. We hope that this will spur researchers to identify more effective means to bring these down."

Looking forward, said Dr. Sponseller to *OTW*, "We need improved infection prevention, perhaps starting with a change in the implant or implant coding or treatment." — *EH*

PEOPLE

Gwo-Chin Lee, M.D. Takes Helm at JAAOS Global Research & Reviews

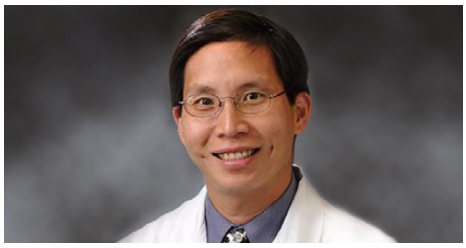
Gwo-Chin Lee, M.D., FAAOS is the new editor-in-chief of the *Journal of the AAOS Global Research & Reviews*. Dr. Lee, a professor of orthopaedic surgery at Weill Cornell Medical College in New York City, began fully overseeing the publication January 1, 2024.

Now a hip and knee reconstruction specialist at Hospital for Special Surgery, Dr. Lee was a professor of orthopedic surgery and served as director of the adult reconstruction fellowship at the University of Pennsylvania in Philadelphia.

Dr. Lee obtained his bachelor's degree in biological sciences from Stanford University and his medical degree from Baylor College of Medicine in Houston. He then completed his orthopedic surgery residency training at the Mayo Clinic School of Graduate Medical Education in Rochester, Minnesota, and his fellowship in adult reconstruction at the Insall Scott Kelly Institute in New York City.

"*The Journal of the AAOS (JAAOS)* and more recently *JAAOS Global* have always been excellent resources for orthopedic surgeons at various stages of their careers," Dr. Lee said. "The caliber of high-quality, peer-reviewed content is unmatched, as it provides well-researched, topical, clinical, and balanced information on relevant topics affecting our daily practices."

"As a deputy editor for *JAAOS* prior to assuming my current role, I learned many things," Dr. Lee told *OTW*. "First,



Gwo-Chin Lee, M.D., FAAOS / Source: American Academy of Orthopaedic Surgeons

I was excited to see that the quality of research within our field is continually increasing. The increase in the level of evidence of our studies will allow us to make data-based decisions to improve the quality of care for our patients."

"Second, I came to appreciate how journals which form the repository of knowledge rely greatly on the 'labor of love' from our consultant reviewers. Without their expertise and insight, this improvement in research quality would not be possible. Therefore, one of my goals as editor-in-chief is to continue to uphold the high-quality standards of JAAOS Global Research and Reviews and to work to help ease the barrier to publication to our contributors, reviewers, and editors."

"I believe that one of the most important initiatives of AAOS and its journals is to increase the collaboration with our global partner societies. I believe that good orthopedic care can come in various forms and be determined by traditions, training, and resources."

"We recognize that orthopedic care may be different in other regions and parts of the world. Therefore, I would like our journal to be more inclusive and reflective of the global voice. We are working hard to engage global societies and associations to increase the number of contributions to our journals. I believe that through research and mutual learning we can improve the quality of musculoskeletal care worldwide." — *EH*

REMEMBRANCES

Greg Lutz, M.D., Pioneer, Founder and Professor, Dies at Age 61

Gregory Lutz, M.D., founder of the Regenerative SportsCare Institute in New York City, and a leading expert in interventional orthobiologics passed away on Tuesday, March 5, 2024, at the age of 61 years old.

Dr. Lutz was a pioneer, inventor, and entrepreneur in the field of regenerative orthopedic medicine.

Dr. Lutz earned his medical degree from Georgetown University School of Medicine in 1988 and went on to specialize in Physical Medicine & Rehabilitation at the Mayo Clinic.

In 1993, he completed an Orthopedic Sports Medicine Fellowship at the Hospital for Special Surgery in New York City and by 1997, he had founded the Department of Physiatry there.

Dr. Lutz was the Hospital for Special Surgery's (HSS) first Physiatrist-in-Chief from 1997 to 2012. He also established the Spine & Sports Medicine Fellowship at HHS and served as a Professor of Clinical Rehabilitation Medicine at Weill Medical College of Cornell University.

In 2016, he opened the Regenerative Sports Care Institute, a center for regenerative orthopedic medicine in Manhattan.

Lutz pioneered the use of intradiscal biologics and published the first clinical trial on the efficacy of intradiscal platelet-rich plasma therapy for select patients with lower back pain.

He also co-authored more than 60 publications during his career and wrote a book: Heal Your Disc, End Your Pain: How Regenerative Medicine Can Save Your Spine.

Dedicated to helping his patients become pain free, he invented the DiscCath™ medical device and established the Regenerative SportsCare Foundation whose mission is to find a cure for degenerative disease.

He is also the co-founder of Orthobond Corporation which develops antimicrobial nanosurfaces for medical devices.

Lutz is survived by his wife, Paula and his three children, and grandson Kuno, as well as his siblings Mary Bernadette, Michael, and Christopher. — *TR*

Stephen Haas, M.D., Professor/White House Consultant Dies, Age 84

Stephen S. Haas, M.D., Air Force veteran, former orthopedic consultant to the White House and nationally recognized sports medicine researcher and pioneer, died on February 23, 2024, at the age of 84 in Washington, D.C.

Haas along with his colleague Carl MacCartee, M.D., co-founded the Washington, D.C.-based orthopedic surgery practice, MacCartee & Hass, in 1975.

The practice grew and became Washington Orthopaedics and Sports Medicine, which is considered one of the premier orthopedic and sports medicine practice in mid-Atlantic region.

Haas was also a clinical professor of orthopedics at George Washington University and chaired Sibley Memorial Hospital's orthopedic surgery department from 1996 to 2006.

Highly respected and revered in the world of orthopedics and sports medicine, Dr. Haas served as an orthopedic consultant to the White House medical staff for 16 years and was the team physician for several professional athletic teams including the 1996 gold medal-winning USA Olympic Basketball Team.

Although Dr. Haas retired in 2009, he never completely left medicine serving as medical director of the NFL Player Medical Benefits Plan and co-hosted and founded the popular podcast Bone Docs.

Dr. Haas earned his medical degree in 1965 from the University of Oklahoma College of Medicine and then chose George Washington University for his internship and residency in general and orthopedic surgery.

From 1967 to 1969, Dr. Haas served as a flight surgeon in the U.S. Air Force. His service to his country during those difficult years of the Vietnam War drew the notice of President Lyndon B. Johnson who called Dr. Hass's mother to thank her for raising "a great American!"

Haas is survived by his wife of 44 years Barbara B. Hass, his son and daughter, two stepchildren and his six grandchildren. He also leaves behind his brother Clifford Haas. — *TR*

Pennsylvania Orthopedic Surgeon and Inventor Dies at Age 90

Fred R. Amsler, Jr., M.D., one of two orthopedic and spine surgery inventors and pioneers who grew up in Oil City, Pennsylvania (the other being the Art Steffee, M.D.) passed away on Tuesday March 5, 2024 at the age of 90.

Dr. Amsler, Naval Medical Officer, inventor, and renown orthopedic surgeon, was a true renaissance man with a passion for medicine, aviation, and inventing unique products to help people.

Dr. Amsler earned his medical degree from Temple University Medical School in 1959, the same year John Charnley delivered his now famous lecture to the British Medical Association saying that it was "probable" that a prosthetic "femoral prosthesis, articulating in a PTFE socket" would work better than his original double cup design. Dr. Amsler went up north to St. Luke's Hospital in Duluth, Minnesota, on the shores of Lake Superior to complete a one-year internship.

In 1960, Dr. Amsler began his orthopedic surgical residency at Hamot Hospital in Erie. After only one year, though, he was drafted into the U.S. Navy Medical Corps and would serve his country for the next nine years—during the entire course of the Vietnam War.

Dr. Amsler was first assigned to the USS Boxer, LPH-4, a helicopter aircraft carrier serving at the time in the Caribbean, as the Assistant Medical Officer. Two years later he transferred to the U.S. Naval Hospital in Philadelphia, where he completed his residency in orthopedic surgery.

After completing his residency, he served at the U.S. Naval Hospital in Camp Lejeune, North Carolina before being sent to Vietnam to be a member of the surgical team assigned to the Amphibious Force Alpha. A year later he transferred back to the U.S. where he served at a naval hospital in New York.

Dr. Amsler was honorably discharged from the United States Navy in July of 1969.

Dr. Amsler and his family moved to Williamsport, Pennsylvania, where he joined the practice of Francis V. Costello, M.D., and associates. His specialty was the emerging practice of modern orthopedic surgery.

During his career he was primarily affiliated with Williamsport Hospital and Devine Providence Hospital and served patients in North Central Pennsylvania—very close to where he grew up, in Oil City, where he was born in 1933.

During his childhood, Dr. Amsler also lived in Titus, Pennsylvania, then Millcreek Township, graduating from Millcreek High School (now called McDowell High School) in 1951. He received his bachelor's degree from Bucknell University in 1955.

Besides his passion for medicine, Amsler also loved flying and was an instrument rated pilot with FAA licenses for several different types of aircraft from a glider to a multi-engine aircraft. He was also an inventor, best known for The Mattress Jack which is available online.

Amsler was preceded in death by his wife, Ilene App Amsler in 2015, and his partner Donna J. Amer in July 2019. He is survived his children, Patricia Becknell, Jeffrey Amsler, Kathyrn Corrigan and Karen Wukitsch, and his grandchildren. — *TR*

Theodore John Vigeland, M.D., Dies Age 80

Former associate professor of orthopedics in the department of orthopedics and rehabilitation at Oregon Health Sciences University (OSHU) and the Leo S. Lucas, MD, Outstanding Orthopaedic Educator at OSHU, Theodore John Vigeland, M.D., passed away on January 31, 2024, at the age of 80.

Dr. Vigeland had served orthopedic patients throughout Oregon and taught the next generation of orthopedists for 23 years.

Dr. Vigeland also saw patients at the VA Medical Center and the Adventist Health Medical Center-Columbus Gorge in The Dalles.

In 2003, he was appointed interim chair of the department at OSHU. He also served as president of the OSHU Alumni Association, president of the Multnomah County Medical Association, and president of Meridian Park Hospital.

He was the Oregon representative on the Board of Councilors of the American Academy of Orthopaedic Surgeons and the recipient of the Charles A. Preuss, M.D., Distinguished Alumnus Award at OSHU and the Leo S. Lucas, MD, Outstanding Orthopaedic Educator Award at OSHU.

During his distinguished career, he went on many volunteer medical missions to Peru and Ecuador with Capitol City Medical Teams where he repaired bone deformities for children.

He earned his medical degree from the Oregon Health Sciences University School of Medicine and did an internship and orthopedic surgery residency at Oregon Health Science University Hospital.

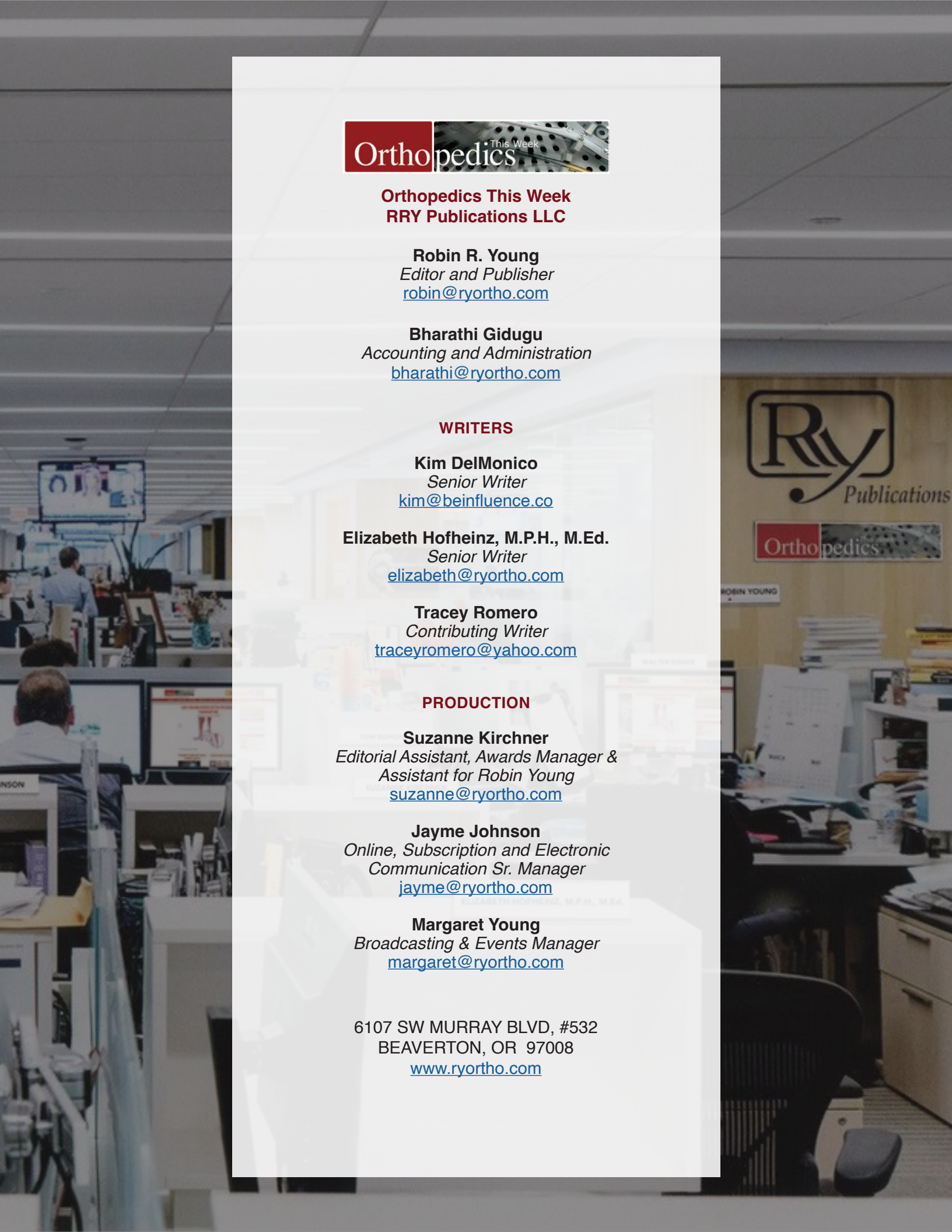
Vigeland was born on April 13, 1943, in St. Paul, Minnesota, to Dr. George Norman Vigeland and Margaret Vangstad Vigeland. He was the second eldest of five siblings.

He grew up mostly in Rugby, North Dakota, but spent his senior year of high school in Salem, Oregon. He then went to Pacific Lutheran University in Tacoma, Washington, for his undergraduate degree.

After medical school, he served as a Major in the U.S. Army Medical Corps from 1969 to 1973 at a base in Germany.

His family called Vigeland a quiet hero not only at the hospital but at home where he was always supportive of his wife's and children's dreams.

He is survived by his wife, Julie, daughter Tess, son Jay and six grandchildren. He also leaves behind brothers, George, Bruce and Jim and sister Peggy. — *TR*



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