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High-Resolution Ultrasound: A Sports Medicine Doctor's Stethoscope

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Musculoskeletal Ultrasound as a Clinical Evaluation Tool

Ultrasound (US) represents a cost-effective (predicted savings of \$6.9 billion when appropriate substitution is made for musculoskeletal US in place of MRI over a 14-year period, and approximately one third to one fifth of the cost to the patients per Medicare¹⁷), readily available diagnostic imaging modality that has gained popularity in musculoskeletal and sports medicine to evaluate a variety of clinical conditions.

Definite technological limitations exist, including narrow field of view, inability to visualize through dense structures such as bony cortex, and decreased resolution for patients with large body habitus due to beam attenuation.

However, advantages include real-time image generation that allows examination of dynamic pathologies, such as snapping hip secondary to iliopsoas or ischiofemoral

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High-Resolution Ultrasound *(Continued from Page 1)*

impingement, or evaluation of meniscus displacement with weight bearing, valgus, or varus stress. Ultrasounds' continuous imaging ability also is an advantage in visualization of small injuries, such as focal fusiform swelling of a peripheral nerve. Precisely placed US-guided diagnostic ultrasound also can be extremely helpful in establishing a correct diagnosis.

Sports medicine clinicians have described musculoskeletal US as the stethoscope of sports medicine/orthopaedic physicians, and our experience is that when US is used as a complement to careful history and physical examinations, musculoskeletal US can assist in accurate, expeditious confirmation of clinical suspicion and timely treatment planning.

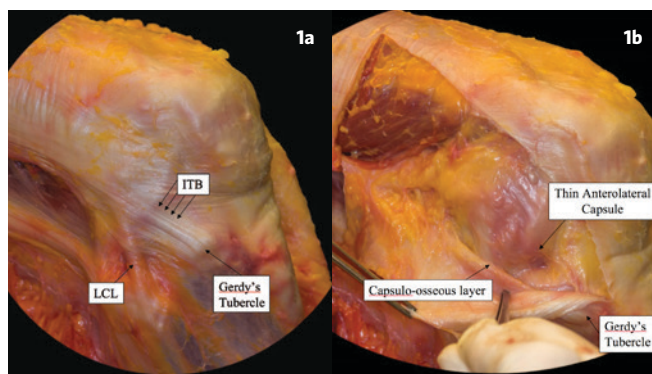


Figure 1a. (left) Dissection of the anterolateral aspect of the knee, showing the superficial layer of the ITB, its relationship with the LCL, and the distal broad attachment to Gerdy's tubercle.

Figure 1b. (right) After reflection of the superficial layer of the ITB, a thin anterolateral capsule is identified. The posterior aspect of the ITB merges with the deeper layer, forming the capsulo-osseous layer.

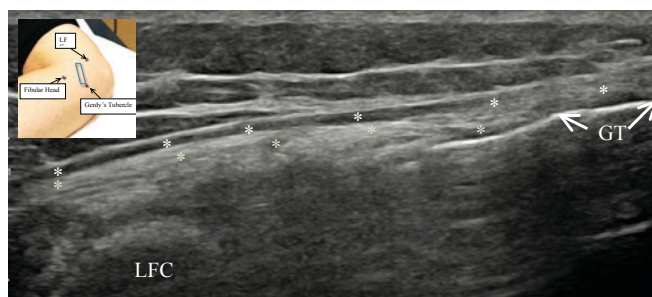


Figure 2. Inset picture showing approximate transducer positioning. Note regional bony landmarks have been marked with a marker on the skin. Sonographic image is the corresponding ultrasound picture at 90 degrees of knee flexion. We typically scan the posterior half of Gerdy's tubercle to find hyper-echoic, bright structure deep to posterior iliotibial band to find anterolateral complex. Transverse view is also obtained but omitted from this article due to space constraint. Left: proximal. Right: distal. LFC: lateral femoral condyle, GT: Gerdy's tubercle, White asterisk: posterior iliotibial band, Green asterisks: anterolateral complex.

Anterolateral Complex of the Knee

Anterolateral Knee Anatomy

Recently, the anterolateral ligament (ALL) of the knee attracted much attention after its description in 2013.⁷ However, in the following years conflicting findings in terms of its presence, insertion site, morphology as well as biomechanical role have been found. Some authors suggest it is an important contributor to restrain internal tibial rotation and therefore the pivot shift phenomenon.²⁰ However, others found the ALL to play a negligible role in knee biomechanics and kinematics. Additionally, some surgeons raised the suspicion that the reconstruction of this ligament may lead to overconstraint of the knee, leading to premature degenerative changes of the knee.^{7,14,19,22}

Our laboratories have undertaken a multidisciplinary approach to further understand anterolateral knee structures with studies including embryological, histological, biomechanical, and imaging.^{8,11,16,18} Layer-by-layer cadaveric dissections using 20+ fresh frozen specimens also have contributed to our current knowledge base, and we have observed that there is no consistent or discrete ligamentous structures in the location previously described. Instead, we observed a previously well-described capsulo-osseous layer (COL) of iliotibial band joining with fascia of the short head of biceps femoris creating a sheet-like knee joint capsule, combining to form what might have appeared ligamentous on embalmed specimens due to expected tissue hardening (Figures 1a and 1b). As such, we felt anterolateral complex (ALC = COL + biceps femoris fascia) was a more appropriate term than ALL when referring to anterolateral knee stabilizers.

Sonographic Evaluation of Anterolateral Complex of the Knee

With anatomic understanding as the basis for further characterization of the ALC, we have endeavored to visualize this complex using high-resolution ultrasound (18-4 MHz linear array transducer, RS80 Prestige, Samsung Medison, Seoul, South Korea). We have sonographically examined more than 50 ALCs in ACL-deficient knees in our patients at various knee angles, using contralateral knees as the control, and we observed expected sono-anatomy based on our anatomic dissection (Figure 2).

Additionally, with increased knee flexion and internal tibial rotations, we have observed improved sonographic visualization of ALCs. This is consistent with our cadaveric observation of increased thickening of ALCs with both knee flexion and internal tibial rotation movements (Figures 3a and 3b).

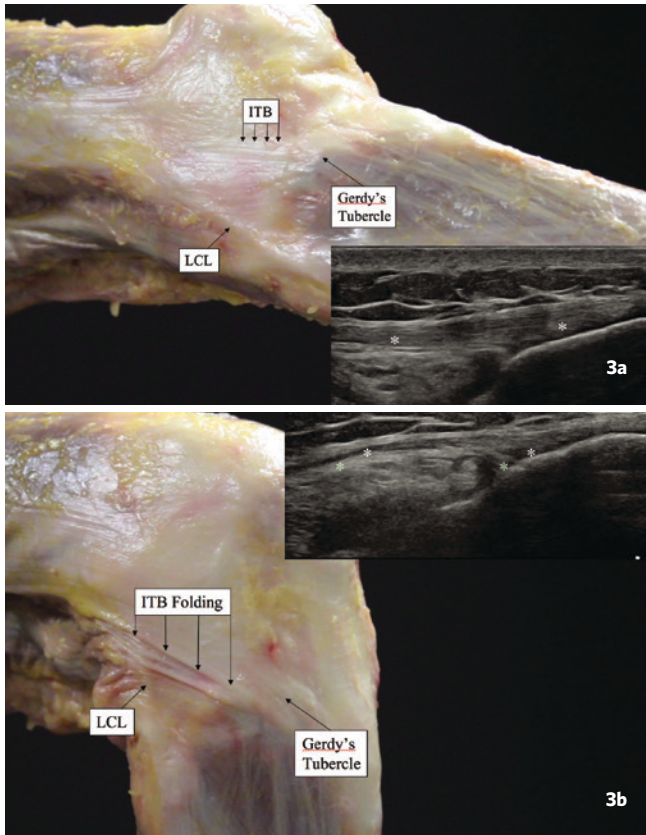


Figure 3a. (top) Lateral aspect of the right knee at 20° of flexion. Note no conspicuous ligamentous structure is noted in space posterior to iliotibial band (ITB) and anterior to lateral collateral ligament (LCL) on the cadaveric specimen or sonographic image. ITB (white asterisks) is obvious. Left side of the image: proximal; Right side of the image: distal.

Figure 3b. (bottom) Lateral aspect of the right knee at 90° of flexion with maximum tibial internal rotation. Note visible folding appears at anterolateral knee region. This corresponds with sonographic thickening of anterolateral complex (green asterisks) with overlaying posterior iliotibial band (white asterisks). Left side of the image: proximal. Right side of image: distal.

Sonographic Evaluation of Segond Fracture

Originally described by a French surgeon in 1879, Segond fracture was recently described to be secondary to an avulsion injury of ALL.⁶ Our sonographic observation of one Segond fracture case showed the attachment contributed from two discrete structures. The attached components were 1) COL of the ITB distally and anteriorly on the fragment, and 2) anterolateral capsule of the knee proximally and posteriorly (Figure 4). This was subsequently confirmed with intra-operative observation (see Figures 5a, 5b, and 5c on Page 10).

Meniscus Subluxation Index

Hoop Tension Mechanism

Meniscus injuries are common among adults of all ages.^{10,12} The role of the meniscus in ensuring normal knee function is multifactorial, but the ability of the meniscus to dissipate axial load through the “hoop tension mechanism” is of particular importance as the loss of this function inevitably leads to osteoarthritis (OA).^{3,9,13,23} The hoop tension mechanism is normally maintained by the anterior and posterior meniscal roots, as well as by interwoven fibers of the body that connect two roots.^{3,13,21} Injury to the meniscus can disrupt its hoop tension mechanism and lead to the radial displacement of the meniscus, a phenomenon known as meniscal extrusion (ME) or meniscal subluxation (MS).^{2,15}

Although medial ME of > 3.0mm and/or lateral ME of > 1.0mm are considered abnormal and have been associated with knee OA, a causal relationship between ME and OA development has not been prospectively established.⁴ Choi et al. recently reported that a high meniscal subluxation index (MSI), represented by the ratio of ME to total meniscal width as measured on coronal plane magnetic resonance imaging (MRI), predicted the development of structural OA in a cohort of 56 patients without MRI evidence of OA at baseline⁵ (see Figure 6 on Page 10).

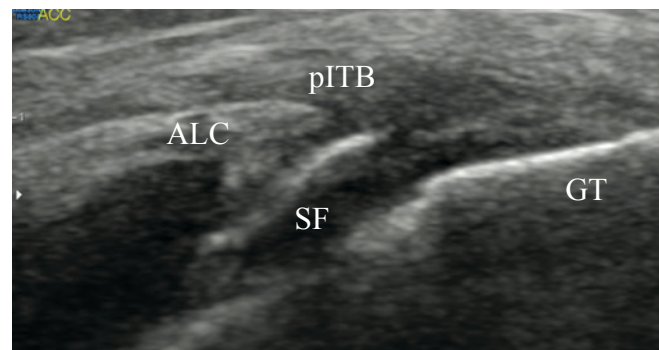


Figure 4. Magnified oblique long axis view of insertional posterior iliotibial band with Segond fragment at 90 degrees of knee flexion. Left side of image: proximal-posterior. Right side of image: distal-anterior. ALC: anterolateral complex of the knee; SF: Segond fragment; pITB: posterior iliotibial band; GT: Gerdy's tubercle.

Sonographic Evaluation of Meniscus

As for sonographic evaluation of the meniscus, Akatsu et al. recently reciprocated results similar to previous investigations on direct visualization of meniscal injuries using sonography, and reported a sensitivity of 88% and a specificity of 85% while scanning 134 menisci.¹ Most early US studies have focused on

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Bundled Payment for Total Joint Arthroplasty: The Multifaceted Response of UPMC

AJ Yates Jr., MD

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A New Paradigm

There has been wide consent that some form of health care reform was needed to deal with burgeoning costs. In January of 2015, U.S. Department of Health and Human Services Secretary Sylvia Burwell announced the goals that by the end of 2016, 30% of Medicare payments would be via an alternative payment model (APM), and by 2018 that would grow to 50%. The two currently accepted forms of APMs are Accountable Care Organizations (ACOs) and Bundled Payments.

When combined, total hip and knee replacement represent the greatest procedural cost to the Centers for Medicare and Medicaid (CMS), and it is no surprise that it was quickly targeted. Since 2013, there have been scattered demonstration models of Medicare bundles for joint replacement through the voluntary Bundled Payments for Care Improvement (BPCI) program. Given that experience and the recently stated goals, it was not unexpected that CMS announced, in July 2015, a mandatory retrospective payment bundle program for joint replacement titled the Comprehensive Care for Joint Replacement (CJR). The final rule was published in November 2015, and the data collection and implications for hospitals began April 1, 2016. This program is required for all fee-for-service Medicare patients in 67 metropolitan statistical areas, accounting for almost 24% of all such cases in the country. Allegheny County, the home county for UPMC Presbyterian and UPMC Shadyside, and five other UPMC hospitals, was selected along with its five surrounding counties.

The program is retrospective; all Medicare Part A and Part B billings are included in the total cost of care from three days before joint replacement to 90 days afterward. The hospital is expected to be the convener of risk. This risk can be shared to up to 50% with other providers. CMS establishes a price target based in part on historical billings, as well as regional performance, that is then driven through a calculation that includes other factors.

This new target ranges from 10% to 18% less than historical cost. Should the hospital perform under that new set-point, there is an opportunity for reward. If they fail to lower costs below that point, there is a pay-out to CMS.

Eligibility for reward and the actual target price are both further determined by meeting acceptable performance versus other hospitals in quality performance measures, such as rate of complications and hospital satisfaction scores. The only risk adjustments are the Diagnosis Related Group (DRG) designation of the patient having major co-morbidities, and whether or not the arthroplasty was in response to a fracture.

UPMC Response

The UPMC Department of Orthopaedic Surgery was already well positioned to respond to this new challenge given several years of work on improving quality and reducing costs in anticipation of participating in bundled care. A long-standing Total Joint Pathway Workgroup, chaired by Adult Reconstruction Division chief Larry Crossett, MD, had already paved the way for the system to better understand costs and work on shared savings with the UPMC Health Plan. Dr. Crossett also helped chair a successful prosthetic cost-reduction program. Adolph Yates Jr., MD, vice chair for quality management, also had already been working on the Pathway development, as well as on the creation of a system-wide registry for joint replacement and reduction of readmissions and complications. MaCalus V. Hogan, MD, vice chair of education and residency director, and medical director of outcomes for the Donald D. Wolff Jr. Center for Quality, Safety, and Innovation at UPMC, and Jay Irrgang, PhD, chair of Department of Physical Therapy and vice chair of clinical outcomes for the Department of Orthopaedic Surgery, had worked in recent years to build a tablet-based, EPIC-integrated patient-reported outcomes collection platform that could be utilized across musculoskeletal subspecialties and maximize registry development efforts across the enterprise. These already-in-place programs for the Pathway, cost reduction, data management, outcomes measures, and reduction in complications and readmissions gave UPMC a running start into responding to the CJR initiative.

Within a week of the announcement of the proposed rule, a committee was formed and chaired by Tami Minnier, chief quality officer for UPMC, and MaCalus Hogan, MD. Other members of the orthopaedic department on the committee include Andrea Badway, vice president of orthopaedic services, and Adolph Yates Jr., MD.

Multiple other parts of UPMC were brought in including finance, post-acute programs, rehabilitation, the Pathway group, hospital administration, and the UPMC Health Plan. One of the most important decisions was to accept the challenge of the CJR, not only in caring for the Medicare fee-for-service patients, but to treat all patients the same across all payers.

Given the set price of the DRG payment to the hospital, the group immediately recognized the importance of the after-care costs, especially skilled nursing and inpatient rehabilitation facilities. It also recognized the need to redouble efforts to reduce complications and readmissions. Subcommittees were established to provide innovation for the preoperative, inpatient, and post-acute periods, as well as contracting initiatives.

New Tools and Directions

The preoperative period was determined to be critical in terms of preparing the patient for surgery and post-acute care. The surgeons in the collective hospitals have agreed on the need to help patients with reversible risks to maximize their health before elective surgery. Preadmission rehabilitation has been initiated to help screen for the more frail patients and their needs, as well as to demystify the postoperative recovery period. UPMC has made the preoperative education system already in place more robust and has made it a requirement for surgery. Required patient-reported outcomes metrics are now being more efficiently collected, including the use of digital tablets in the office and online entry through UPMC patient portals.

The inpatient period has been analyzed for potential efficiencies, and data collection through a registry will allow for finding best practices. UPMC has joined the American Joint Replacement Registry (AJRR), which will allow for external benchmarking. Reducing variability has become more practical with more widespread use of the Pathway-created Power Order Sets.

The post-acute care period has been targeted for risk-sharing with skilled nursing facilities and improvements within UPMC-owned facilities. One of the most important goals of all of these efforts is to safely get patients home who expect to go home, and for those who cannot, to get them home sooner, with an earlier return to function.

The most important part of the UPMC response has been recognizing the need for data and its management. Surgeons are now receiving reports on their costs, discharge designations, complications, and readmissions, and they are being benchmarked against their peers. There has already been a reduction in skilled nursing facility utilization with no change in quality or patient satisfaction. The goal, in the near future, is to show improvements in quality metrics while reducing costs, ideally guiding all patients on a safe passage to a reliable outcome.



MaCalus V. Hogan, MD, Larry Crossett, MD, and Adolph Yates Jr., MD

The Future

The future has come quickly. In July of this year, CMS announced a rules proposal to establish bundles in cardiac care, as well as all surgically treated hip fractures, the latter of which will include the already-affected hospitals within the CJR. That rules proposal also gave the CJR the status of being an Advanced APM, which has implications for participating surgeons in terms of the implementation of the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA).

As the registry gathers information and the AJRR reports on UPMC's relative performance versus other centers, it will be increasingly possible to target inefficiencies and create best practice patterns. There is no penalty for missing the target in year one, but that risk begins in year two and runs through the current timeline of five years. By the fourth year, the target price will be set by the regional experience, which for UPMC will be those hospitals within the CJR in New Jersey, New York, and Pennsylvania.

CMS has initiated a Health Care Planning and Action Network with the stated goal of harmonizing their APM goals with those of private payers and Medicare Advantage providers. The advantages to the payers are apparent to them: it is highly likely that such bundles will be the norm for the future, not the exception.

The introduction of a CMS bundle for cardiac care shortly after creation of the CJR is proof that CMS intends to hit the target of 50% of all care being reimbursed through an APM by 2018. The UPMC response to the total joint CJR program will hopefully prove to be the model for responding to the bundling of future diagnostic and procedural groups by CMS.

A “Lean and Green” Approach to Hand Surgery

Mark Baratz, MD

Our country faces a crisis. The cost of medical care is on the rise. This is placing financial pressure on medical systems, providers, and patients. At the same time, we have the appropriate mandate to improve patient safety and satisfaction. Hovering in the

background is the impact of medical waste on our environment.

The “Lean and Green Movement” in hand surgery was initiated as an approach to reduce surgical cost and waste, and at the same time improve

patient care. The “Lean and Green Movement” involves performing procedures that typically were done under sedation or general anesthesia with local anesthesia. Procedures performed under local anesthesia do not require preoperative testing, and patients can typically drive themselves to and from the hospital on the day of surgery, saving themselves the costs and other effects of formal anesthesia.

This approach is not applicable to every hand and arm orthopaedic surgical procedure, but the approach can work quite well for simple procedures, such as carpal tunnel release, trigger finger release, tendon or nerve repair in the hand, and tendon transfers. Procedures performed under local anesthesia also do not require the extensive paper drapes, disposable plastics, and other surgical equipment typically used for a wide range of hand and arm procedures. By being more judicious in the materials used, surgeons can minimize the amount of paper and plastic that is disposed of after surgery.

There also is the issue of quality of care, one that includes patient safety and the effectiveness of the procedures performed. Wrong site surgery can be avoided when patients are awake for their procedure. Patients who are awake for a trigger finger release procedure are able to immediately assist the surgeon to prove that the triggering has been resolved by the procedure. When a tendon is being repaired under local anesthesia, the quality of the repair can be

The “Lean and Green Movement” in hand surgery was initiated as an approach to reduce surgical cost and waste, and at the same time improve patient care.

	Number (% of Metric, % of All Cases in Study)			
Metric	Waste Data	Survey, General	Survey, Fear/Anx/Pain	Survey, Satisfaction
Total Cases	178 (100%)	73 (41%)	43 (24%)	95 (53%)
Physician 1, Pack S	80 (45%)	30 (41%, 17%)	0 (0%, 0%)	47 (49%, 26%)
Physician 2, Pack M	98 (55%)	43 (59%, 24%)	43 (100%, 24%)	48 (51%, 27%)
WAHS	87 (49%)	37 (51%, 21%)	38 (88%, 21%)	42 (44%, 24%)
Sedation & Local	91 (51%)	36 (49%, 20%)	5 (12%, 3%)	53 (56%, 30%)

Figure 1. Number and Percent of Respondents by Metric, Analyzed by Physician and Anesthetic Choice; Pack S = standard disposable-material custom pack for hand surgeries; Pack M = minimized hand custom pack; WAHS = wide-awake hand surgery (local only); Anx = Anxiety.

confirmed by having the patient move their finger to visually confirm the desired results.

Hand and upper extremity orthopaedic surgeons at the University of Pittsburgh initiated a collaborative effort with the Departments of Obstetrics and Gynecology, and Ophthalmology, and the Mascaro Center for Sustainable Innovation at the University of Pittsburgh to create a Center for Sustainable Medicine. This initiative was possible with the guidance of Melissa Bilec, PhD, director of the Mascaro Center for Sustainable Innovation, as well as three of the hand and upper extremity orthopaedic surgeons from the Department of Orthopaedic Surgery. Robert Goitz, MD, and Christopher C. Schmidt, MD, performed over 100 surgical procedures (Figure 1) with either local anesthesia and minimal draping or local anesthesia with sedation and conventional draping. Patients rated their overall experience (Figure 2), and their experience with the anesthesia, as equivalent between the two approaches. Using local anesthesia, we were able to reduce surgical cost and produced 50 less pounds of medical waste (Figure 3).

We continue to examine the cost and environmental impact of this initiative while trying to improve the quality and safety of patient care.

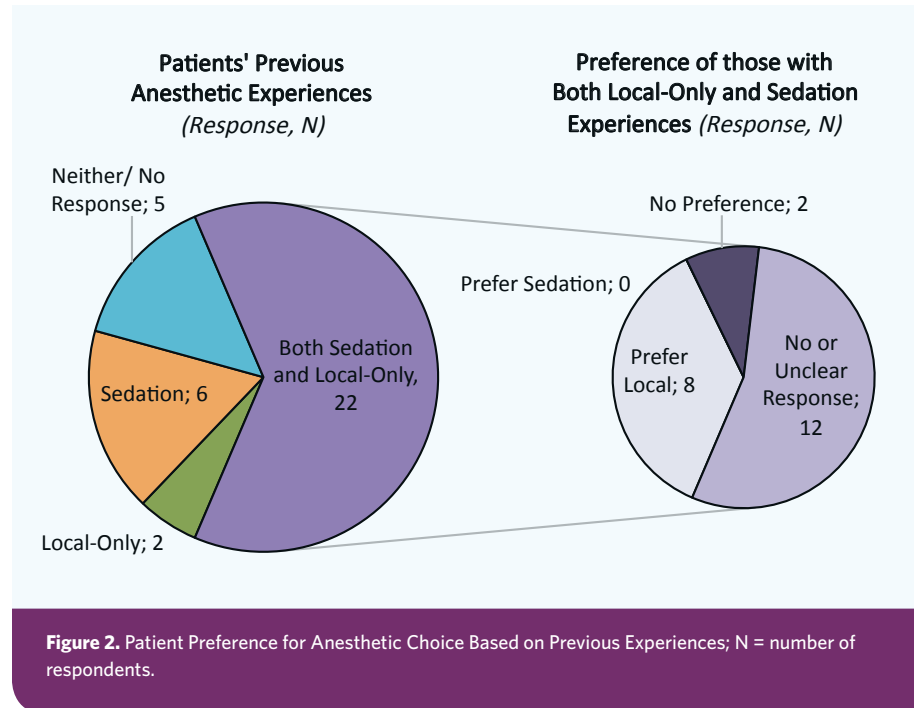


Figure 2. Patient Preference for Anesthetic Choice Based on Previous Experiences; N = number of respondents.

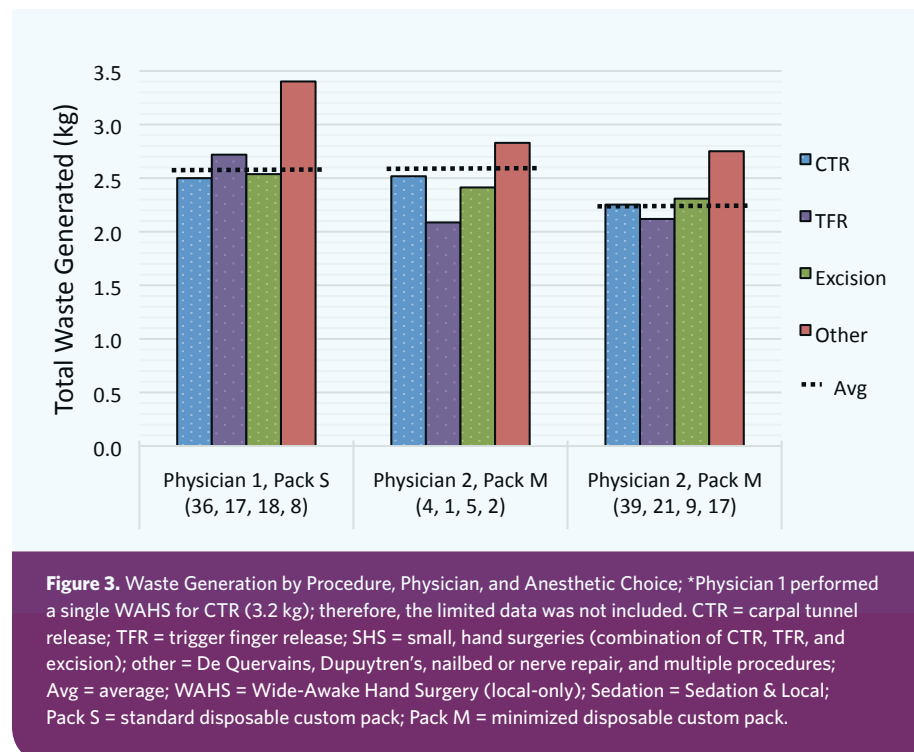


Figure 3. Waste Generation by Procedure, Physician, and Anesthetic Choice; *Physician 1 performed a single WAHS for CTR (3.2 kg); therefore, the limited data was not included. CTR = carpal tunnel release; TFR = trigger finger release; SHS = small, hand surgeries (combination of CTR, TFR, and excision); other = De Quervains, Dupuytren's, nailbed or nerve repair, and multiple procedures; Avg = average; WAHS = Wide-Awake Hand Surgery (local-only); Sedation = Sedation & Local; Pack S = standard disposable custom pack; Pack M = minimized disposable custom pack.

The U.S. Food and Drug Administration (FDA) has approved the marketing of two devices to assess a patient's cognitive function immediately after a suspected brain injury or concussion. Both ImPACT® (Immediate Post-Concussion Assessment and Cognitive Testing) and a new test, Pediatric ImPACT, have been granted "de novo" clearance. ImPACT is the first and only device to receive FDA clearance for concussion assessment. The device is manufactured by ImPACT Applications. **Micky Collins, PhD**, Director of the UPMC Sports Medicine Concussion Program, credits the hard work and support of his colleagues and staff throughout the rigorous approval process. Over 250 peer reviewed manuscripts and extensive accompanying data were submitted to support the application.

The Department of Orthopaedic Surgery co-hosted the 18th Annual OREF/ORS Regional Resident Research Symposium in Pittsburgh. The program began with a Keynote Address from Shepard Hurwitz, MD, executive director of the American Board of Orthopaedic Surgery titled, "*The Value of Being Board Certified - Meeting the Expectations of the Public and Payers.*" Orthopaedic Surgery residents from Pitt, AGH, HSS, Duke, Ohio State, Summa Health System, Columbia, and Rutgers presented their work over the course of the morning. All presentations were judged, and the three best presenters were awarded an OREF/ORS Resident Research Award. The first place award was presented to Justin Arner, MD (Pitt PGY-3) for his presentation titled, "*The Influence of Anterolateral Capsular Injury on Knee Laxity of Anterior Cruciate Ligament Injured Patients.*" Second place was presented to Robert A. Duerr, MD (Allegheny General Hospital) for his presentation titled, "*Preprionibacterium Acnes Colonization Impairs Fracture Healing in a Rat Model of an Open Femur Fracture Treated with Intramedullary Fixation.*" The third place award was presented to Kwadwo A. Owusu-Akyaw, MD (Duke University Hospital) for his presentation entitled, "*The Effect of Dynamic Activity on Localized T1rho Relaxation Time and Strain Measurements in the Articular Cartilage of the Tibial Plateau.*"

The Division of Pediatric Orthopaedics hosted the POSNA-APPOS traveling fellows. The traveling fellows were Husuan Kai Kao, MD (Taiwan ROC), Matthew Boyle, MD (New Zealand), and Evelyn Kuong, MD (Hong Kong). In addition to visiting Pittsburgh, the traveling fellows also visited BC Children's Hospital in Vancouver and the Mayo Clinic.

MaCalus V. Hogan, MD, and his two Nth Dimensions Medical Student Scholars, Justin J. Hicks, MSIII (Wake Forest School of Medicine), and Jorge L. Rocha, MSIV (Rutgers Robert Wood Johnson Medical School), had a strong representation in the Orthopaedic Section of the Annual Scientific Assembly of the Society of Black Academic Surgeons held in Columbus, Ohio. Justin Hicks had two podium talks at the conference from research he performed in the Musculoskeletal Growth and Regeneration Lab co-directed by Drs. MaCalus V. Hogan and Hongshuai Li. Justin presented his work titled "A Novel Tissue Engineered Approach for Osteoarthritis Treatment and Partial P65 Blockade Improves Bone Quality Without Inhibiting Fracture Healing." Jorge presented the following three posters: "The Impact of Value-Based Healthcare on Orthopaedic Residency Education," "The Development and Implementation of an Orthopaedic Service Line in an Integrated Medical Financial System," and "Patient-Reported Outcomes: Surgical Fixation of Jones Fractures with Biological Augmentation in the Elite Athlete."

Nth Dimensions is an educational, nonprofit organization that develops and facilitates scholarship programs focused on increasing diversity in medicine, decreasing gender and health disparities, and promoting professional development of aspiring physicians.

Promotions

William Anderst, PhD, was appointed to the faculty as assistant professor of Orthopaedic Surgery in the tenure stream. Dr. Anderst previously served as a research scientist in the Department of Orthopaedic Surgery. Dr. Anderst also was appointed director of the Biodynamics Laboratory. He is an experienced researcher and has served as principal and co-investigator on a number of NIH, industry, and foundation-funded research projects over the past 10 years. He was recently awarded a \$2.4 million R01 NIH grant as principal investigator.

Alicia H. Puskar, PsyD, was promoted to Assistant Professor of Orthopaedic Surgery.

Erin W. Reynolds, PsyD, was promoted to Assistant Professor of Orthopaedic Surgery.

Jianying Zhang, PhD, was promoted to Research Associate Professor of Orthopaedic Surgery.

New Faculty

Thomas Lozito, PhD, was appointed research assistant professor. Since 2009, Dr. Lozito has worked in the Center for Cellular and Molecular Engineering and is being mentored by Rocky Tuan, PhD.

Dongzhu Ma, MD, PhD, was appointed research assistant professor of Orthopaedic Surgery in the Division of Musculoskeletal Infection Basic Science Research. Dr. Ma previously worked in the Department of Microbiology and Molecular Genetics.

Gele Moloney, MD, was appointed assistant professor of Orthopaedic Surgery in the Division of Orthopaedic Traumatology. Dr. Moloney received her medical degree from SUNY at Stony Brook School of Medicine. She completed her residency training in orthopaedic surgery in the UPMC Medical Education Program on the clinical scientist research track and served as junior faculty. She completed fellowship training in orthopaedic trauma at the Hospital for Special Surgery.

Michael J. O'Malley, MD, was appointed assistant professor of Orthopaedic Surgery in the Division of Adult Reconstruction. He received his medical degree from Temple University School of Medicine. Dr. O'Malley completed his residency training in orthopaedic surgery in the UPMC Medical Education Program on the clinical scientist research track. He completed fellowship training in adult reconstruction at the Rothman Institute.

Alicia Sufrinko, PhD, joined the Division of Sports Medicine/Concussion as a clinical instructor. Dr. Sufrinko received her MA in clinical psychology and her PhD in clinical health psychology from East Carolina University. She completed a predoctoral internship at the UF Health Shands Hospital. She served as a neuropsychology postdoctoral fellow under the direction of Micky Collins, PhD prior to her appointment to the faculty.

Dong Wang, MD, PhD, was appointed research associate professor in Orthopaedic Surgery. Dr. Wang is working in the Ferguson Lab for Spine Research, and is being mentored by Dr. Nam Vo.

Wenzhong Wei, PhD, was appointed research associate in Orthopaedic Surgery. Dr. Wei is working in the Molecular Therapeutics Lab and is being mentored by Dr. Bing Wang.

Faculty Notes

Freddie Fu, MD, served as the 18th Robert Leach Visiting Professor at Boston University. The Visiting Professorship at Boston University honors Dr. Robert Leach for his numerous contributions to the specialty of sports medicine. Dr. Leach has made major academic contributions to the field of sports medicine, and his contributions to the specialty of sports medicine are innumerable.

- Dr. Fu presented the Eleventh Annual Charles H. Epps, Jr, MD, Lecture at the Department of Orthopaedic Surgery and Rehabilitation at Howard University College of Medicine and Hospital. Dr. Fu presented "Individualized Anatomical Anterior Cruciate Ligament Reconstruction."
- Dr. Fu presented the Keynote Lecture at the 13th Beijing Orthopedic Association, in Beijing, China. Dr. Fu presented "20 Thoughts for Young Doctors."
- Dr. Fu served as Keynote Speaker for 2016 Pitt Med White Coat Ceremony. He presented "Thoughts for Young Doctors."

Micky Collins, PhD, attended a House Energy and Commerce Committee Roundtable regarding treatment for concussion. The roundtable was titled "Broad Review on Concussions: Initial Roundtable." In addition to Dr. Collins, the panel included experts from the medical, military, athletic, and research communities.

Anthony Kontos, PhD, spearheaded a study looking at injuries in youth ice hockey. In a study published online in the *Journal of Pediatrics* (January 2016), Dr. Kontos followed nearly 400 players associated with youth ice hockey teams in western Pennsylvania, Boston, and Birmingham, Alabama. Study results showed that the number of collisions among players in youth hockey are typically higher in younger players than older ones, mostly because of the players' inexperience and difference in body size, strength, and development.

Mark Sakr, DO, served as team physician for the Men's Eagles, the USA Men's National Rugby Team, in their match against Italy at Avaya Stadium in San Jose, California.

Rocky Tuan, PhD, delivered his inaugural Distinguished Professorship Lecture. Dr. Tuan was introduced by School of Medicine Dean Arthur Levine, MD, Provost Patricia Beeson, and Chancellor Patrick Gallagher. Dr. Tuan presented "Adult Stem Cells and Biomimetic Matrices for Tissue Engineering and Modeling: Repair, Restore, and Re-create."

- Dr. Tuan, Co-Director of the Armed Forces Institute of Regenerative Medicine (AFIRM), the Department of Defense-funded national, multi-institutional consortium, hosted a visit of the Department of Defense Regenerative Medicine Traveling Exchange Program (TEP) to the University of Pittsburgh. The TEP aims to enhance the interaction between research-minded military physicians and researchers of leading academic health centers of the nation involved in AFIRM in areas that are of relevance to military medicine. During their visit, the TEP visitors were introduced to the activities of Pitt's Center for Military Medicine Research and the McGowan Institute for Regenerative Medicine.

UPMC Sports Medicine physicians **Vonda Wright, MD**, and **Mark Sakr, DO**, covered the Women's Rugby Sevens tournament in Atlanta, Georgia.

Bing Wang, MD, PhD, was selected to serve as the Deputy Editor for *Molecular Therapy – Methods & Clinical Development*. As Deputy Editor, Dr. Wang will be in charge of cell therapy and tissue engineering papers, especially in the field of the musculoskeletal system.

James H-C Wang, PhD, was elected to the American Institute for Medical and Biological Engineering (AIMBE) College of Fellows. A nonprofit, honorific society, the AIMBE College of Fellows represents the most accomplished and distinguished medical and biological engineers responsible for innovation and discovery.

Kurt Weiss, MD, was selected as an AAOS Leadership Fellow for the class of 2016-2017. Dr. Weiss is one of 10 members in the 2016-2017 class selected by the AAOS Leadership Development Committee (LDC) from a pool of outstanding applicants. Established in December 2001, the AAOS Leadership Fellows Program (LFP) is a one-year program designed to facilitate the development of future AAOS leaders.

Awards

Freddie Fu, MD, was selected for induction in the AOSSM Hall of Fame. The AOSSM Hall of Fame was established in 2001 to honor members of the orthopaedic sports medicine community who have contributed significantly to the specialty. Selection into the AOSSM Hall of Fame is one of the Society's highest honors, with only a select few inductees named each year. Dr. Fu was honored at the AOSSM Annual Meeting in Colorado Springs, Colorado.

Patrick Bosch, MD, was awarded funding from the Scoliosis Research Society for his research proposal, "Phase II: Coagulation Analysis of Patients Receiving Tranexamic Acid." The project will receive funding of \$25,000 over two years.

John Fowler, MD, received funding from the American Foundation for Surgery of the Hand for his research proposal, "Ultrasound of the Median Nerve for Diagnosis of Carpal Tunnel Syndrome." The project will receive support of \$40,000 over two years.

Richard McGough, MD, received the Golden Apple Award during Resident/Fellow Graduation, for the most outstanding contribution to resident education. Dr. McGough is an associate professor of Orthopaedic Surgery, chief of the Division of Musculoskeletal Oncology, and co-director of the Sarcoma Specialty Center, University of Pittsburgh Cancer Institute.

Volker Musahl, MD, and **Vonda J. Wright, MD**, were accepted for membership in The American Orthopaedic Association. Nominees for AOA membership must demonstrate the core values of Leadership, Professionalism, Community, and Unification.

Volker Musahl, MD, was presented with the Pitt Innovator Award at the University of Pittsburgh Innovation Institute's 11th Annual Celebration of Innovation. Dr. Musahl was honored with the award for his role in the creation of PIVOT technology. Impellia, a Pittsburgh-based sports medicine startup company co-founded by former Pittsburgh Steeler Charlie Batch, recently chose PIVOT as a Pitt-created technology to develop and promote.

Rocky Tuan, PhD, received the 2016 Clemson Award for Contributions to the Literature from the Society for Biomaterials. This award is presented to the candidate who has made significant contributions to the literature on the science or technology of biomaterials.

- Dr. Tuan was honored with the Life Sciences Award by the Carnegie Science Center. The Life Sciences Award recognizes and honors scientific advances in new and innovative biomedical and life sciences endeavors. Awardees were honored during a formal celebration.
- Dr. Tuan and his research group received a major grant award from The Center for the Advancement of Science in Space (CASIS) for the Bone/Cartilage-on-a-Chip Project for the International Space Station submission. Two research groups will share \$1 million in grant funding awarded by CASIS. The proposed project is, "A Microphysiological 3D Organotypic Culture System for Studying Degradation and Repair of Composite Skeletal Tissues in Microgravity Environment." CASIS has been tasked with managing and promoting research onboard the International Space Station (ISS) U.S. National Laboratory. The awards are part of the "3D Microphysiological Systems for Organs-On-Chips Grand Challenge" and were announced at the White House Organ Summit.

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High-Resolution Ultrasound *(Continued from Page 3)*

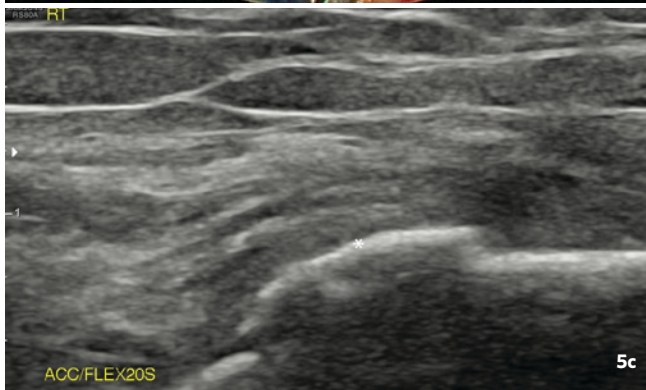
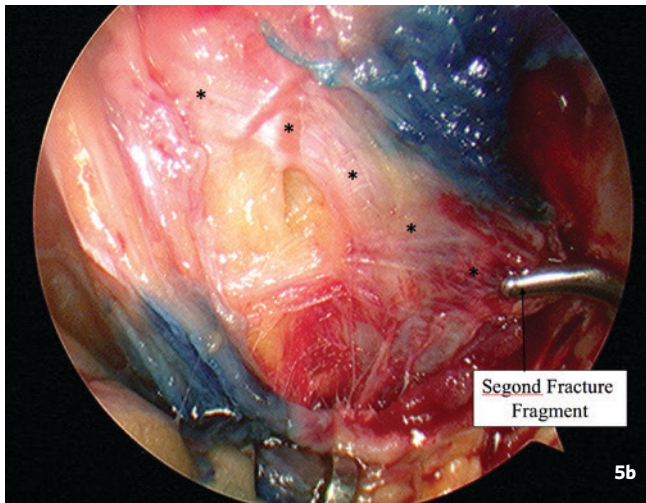
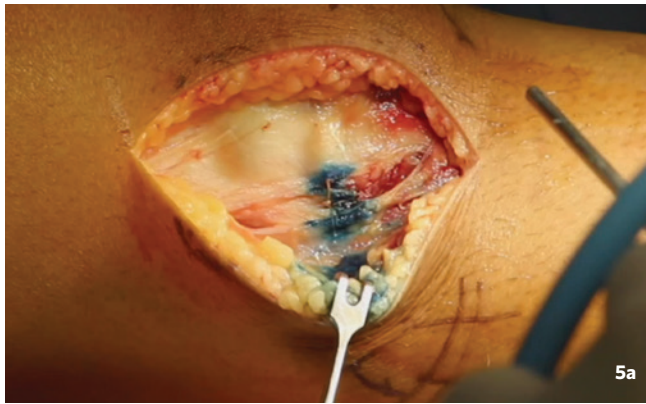


Figure 5a. (top) Lateral approach showing the ITB longitudinally incised over the sonographically-guided methylene blue injection to the Segond fracture site.

Figure 5b. (middle) Intra-operative lateral view of the knee with visible anterolateral knee complex (*) inserting to the Segond Fracture fragment. Sonographically-guided methylene blue injection was performed prior to operation for improved accuracy in identifying the fragment.

Figure 5c. (bottom) 3-month Postoperative image of Segond fragment being successfully reduced/proximated to donor site. Magnified oblique long axis view of insertional posterior iliotibial band with Segond fragment at 90 degrees of knee flexion. Left side of image: proximal-posterior. Right side of image: distal-anterior.

direct visualization of meniscus lesions, but no study had investigated the ability of US to visualize the internal margin of the meniscus.

A recent investigation in collaboration with The Mayo Clinic Sports Medicine (Rochester) attempted to sonographically measure meniscus width (Figure 7) and compared the measurements to anatomic measurements using unembalmed cadaveric specimens. Preliminary results showed a mean margin of error of less than 0.4mm, allowing fairly accurate calculation of MSI.

Although extrapolating results from a cadaveric investigation to diverse clinical populations requires caution, the result from this investigation supports the use of US to functionally evaluate the ME/MS and to calculate MSI to assist in determining incompetent, surgical meniscus.

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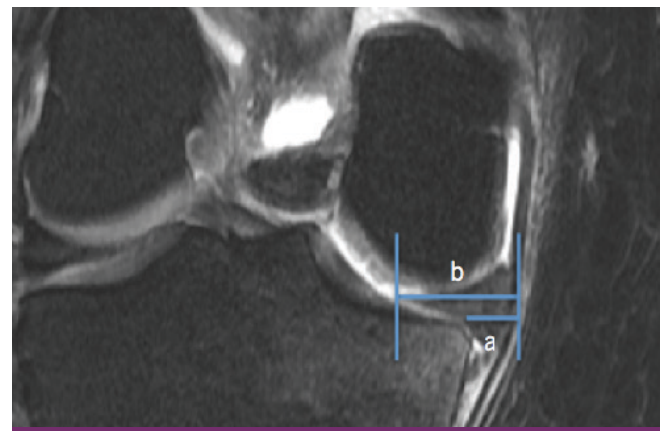


Figure 6. Coronal T2 MRI image of medial meniscus extrusion. Image taken in the mid-coronal plane deep to the medial collateral ligament. Meniscal subluxation index (MSI) = a/b . In this case, the MSI = 0.40. MRI courtesy of Naveen Murthy, MD, Mayo Clinic.

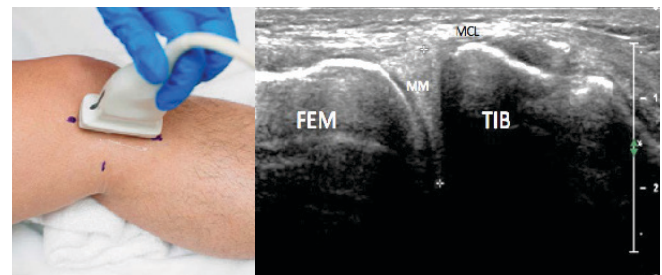


Figure 7. Probe position for short axis sonographic medial meniscus width measurements with corresponding sonographic image. Electronic calipers are seen in sonographic image placed at the outer and inner meniscal margins. FEM = femur; TIB = tibia; MM = medial meniscus; MCL = medial collateral ligament. Images courtesy of Jay Smith, MD, Mayo Clinic.

Kenneth Urish, MD, PhD, received a 2016 OREF New Investigator Grant for his project, "Biofilm Dynamics in Periprosthetic Joint Infection." The project will receive a one-year grant award of \$50,000.

- Dr. Urish was awarded a Junior Investigator Grant by the Musculoskeletal Transplant Foundation Board of Directors. The project, "Biofilm Dynamics on Infected Bone Allograft," received a one-year grant award of \$100,000.

James H-C Wang, PhD, and **MaCalus V. Hogan, MD**, were awarded a Pittsburgh Pepper Center Pilot Award for their research proposal titled "Exercise Improves Aging Tendons by Including Cellular and Molecular Changes." The project will receive funding of \$25,000 over one year. The goal of the Pilot/Exploratory Studies Core (PESC) of the Pittsburgh Pepper Center is to promote and fund innovative, multidisciplinary pilot research in the topic areas of balance, mobility, aging, and their interfaces.

Kurt Weiss, MD, received a \$50,000 grant from the Sarcoma Foundation of America for his project "Using In Vivo Fluorescence Angiography to Evaluate the Impact of Small Molecule Anti-Metastatic Inhibitors of Osteosarcoma."

- Dr. Weiss received a 2016 OREF Mentored Clinician-Scientist Grant for his NIH/NCI K08 project "Exploring Sarcoma Metastatic Potential." The project will receive an annual \$20,000 stipend.
- Dr. Weiss was appointed to the Board of Directors for the Connective Tissue Oncology Society (CTOS). The CTOS is an international group of physicians and scientists with a primary interest in the tumors of connective tissues.

- The *Pittsburgh Business Times* (PBT) named Dr. Weiss a 2015 Health Care Hero. Dr. Weiss was nominated in the Health Care Provider/Physician category. The PBT Health Care Heroes Gala celebrates the people and organizations who are leaders in the health care field.

Resident Awards

The American Academy of Orthopaedic Surgeons has selected **Ermias Abebe, MD** (PGY5/Super Chief) to receive one of the *Alan Levine Scholars in Orthopaedic Graduate Medical Education Scholarships* to attend the 49th Annual AAOS Course for Orthopaedic Educators. This course will be held at the OLC Education and Conference Center (AAOS headquarters) in Rosemont, Illinois.

- Dr. Abebe (PGY5/Super Chief) was selected to receive the 2016 Richard L. Simmons, MD, Speak Up for Patient Safety Award. The award honors the dedication of Dr. Richard Simmons to improving the quality of health care and patient safety, and recognizes those physicians who embody Dr. Simmons' values of passion for patient safety in caring for patients. Nominated by MaCalus Hogan, MD, associate program director for the orthopaedic residency program, Dr. Abebe is honored for his identification of a need for improved transfer of information across the orthopaedic care team at UPMC Presbyterian. This improved sign-out protocol was implemented with a subsequent improvement in patient care coordination across the teams. Dr. Abebe was recognized at the 2016 Dr. Loren Roth UPMC Quality and Patient Safety Symposium awards reception.

High-Resolution Ultrasound *(Continued from Page 10)*

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