Faces of Orthopaedics

1 of every 3 Americans has a musculoskeletal condition requiring medical attention.

These are some of their stories.

Patients advocating for an increase in musculoskeletal research funding

American Academy of Orthopaedic Surgeons
2017 Research Capitol Hill Days Patient Vignettes
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Orthopaedics is the medical specialty devoted to the diagnosis, treatment, rehabilitation, and prevention of injuries and diseases of the body’s musculoskeletal system. This complex system includes bones, joints, ligaments, tendons, muscles, and nerves and provides for movement and activity.

The American Academy of Orthopaedic Surgeons (AAOS) provides education and practice management services for orthopaedic surgeons and allied health professionals. The AAOS also serves as an advocate for improved patient care and informs the public about the science of orthopaedics.

Musculoskeletal conditions are the leading cause of disability and have the highest health care cost. Nearly one third of all Americans suffer from a musculoskeletal impairment requiring medical care. $874 billion is spent annually in the United States on healthcare for persons with musculoskeletal diagnoses, representing 5.7% of the GDP. Musculoskeletal conditions account for 18% of all health care visits. The rate of chronic musculoskeletal conditions found in the adult population is 76% greater than that of chronic circulatory conditions, which include coronary and heart conditions, and nearly twice that of all chronic respiratory conditions.

Together with their physicians, these patients are advocating for an increase in federal funding for musculoskeletal research:

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Ashley Blumenshine has always enjoyed all the beauty that Washington State has to offer. When not at her job as a credit and accounts receivable supervisor, Ashley loved being outdoors, hiking and camping. She took every opportunity to spend time with her friends and family and cheer on the Seattle Seahawks.

On a sunny Sunday afternoon in March 2016, Ashley’s happy and peaceful life changed in an instant. She was driving on the highway to see a movie with her boyfriend and goddaughter, when a suicidal driver entered her lane the wrong way going 80 miles an hour. A horrific accident ensued, involving eight cars and ten people and claiming two lives; the wrong-way driver and Ashley’s boyfriend.

Ashley’s injuries were life threatening. Both of her legs were broken in multiple places and her right foot was crushed. The ligament in her neck that stabilizes her head was severely torn. She had a punctured lung, a vertebral artery tear, traumatic brain injury, and was badly bruised everywhere from her toes up to her neck. She required seven units of blood and spent nearly six weeks in the hospital. So far, Ashley has had five orthopaedic surgeries and another one is scheduled for this spring.

After the accident, Ashley was unable to bear weight on her arms and legs. She spent three months in a wheelchair, and required a lift to get her in and out. Because of her limited mobility, she wasn’t able to go to rehabilitation after being discharged from the hospital. As she healed, she regained some movement and was able to begin physical therapy.

Physical therapy is an ongoing, rigorous process. Ashley recently started aqua therapy in a pool as well as cupping, which has helped with her flexibility and nerve pain. She has multiple orthopaedic specialists overseeing her care.

Ashley’s recovery has been amazing. Her care providers along with her positive attitude have helped Ashley regain the ability to walk. Now that a year has passed, Ashley and her family reflect and give thanks to the many people that have been on this journey with her. Her body has changed, her physical ability has changed, and although she will need to work with limitations for the rest of her life, she remains positive and focused.

As she gains more independence, Ashley aspires to return to the driver’s seat this spring. Driving is her greatest challenge; she is working on reaction time with her right foot injuries as well as the limitations in range of motion in her neck when checking mirrors.

“Our lives are centered on the fact that we can move,” Ashley says. “When walking, giving someone a hug, and basic care such as showering or brushing our teeth; all of this involves movement of our bones, joints, ligaments, tendons and muscles.” Ashley hopes that at some point in her life, she will be able to inspire and give comfort to others who have experienced a traumatic event. Ashley would like to see continued research into treatments for orthopaedic trauma.
Cleveland native Pharaoh Brown is well known for his skill on the football field. As a star tight end for the Oregon Ducks, the 6’6” elite athlete was breaking records left and right. In November of 2014, the 20-year-old college junior sustained a season-ending knee injury, in a 52-27 win against Utah.

In middle of a play, Pharaoh stepped on a teammate’s foot near the goal line. His knee bent nearly 90 degrees in the wrong direction, severely hyperextending and tearing several ligaments. His gruesome injury was broadcast on national television; he was immobilized and rushed off the field in excruciating pain. Pharaoh was taken to a local trauma center.

Upon initial presentation, it seemed that Pharaoh’s lower leg and foot were getting adequate blood flow. However, after a few hours, it became apparent that there was a serious problem. He was taken to the operating room for angiography, a test to view blood flow, and ultimately an arterial repair. Pharaoh had a blockage and a tear in his popliteal artery, a branch of the femoral artery located in the back of the knee. A double vascular bypass was done, restoring the blood flow to his lower leg. Additionally, a long posterior splint was used to protect the bypass and stabilize the knee.

Pharaoh was seen five days later at an outpatient clinic for further evaluation and definitive treatment. He had weakness, swelling, and bruising from his knee to his foot. An MRI revealed a complete tear of his anterior cruciate ligament (ACL), a partial tear of his posterior cruciate ligament (PCL), an avulsion of his lateral collateral ligament (LCL) and bicep femoris avulsion from his fibula. To assist with repair and clearance, vascular and plastic surgery were consulted. Once the surgical team was established, they decided that reconstruction would be performed in two stages. The first would be an open exploration of the common peroneal nerve (CPN) to determine extent of injury and possible repair with plastic surgery. At the same time, a repair of the avulsed LCL and bicep femoris by the fibula was performed by Kurt Spindler, MD. The second stage would be an ACL reconstruction.

After the first stage of the two-part operation, Pharaoh was kept non-weight bearing and in a locked brace. His nerve function was improving, and during his 6-week follow up, he and his surgical team decided to proceed with the ACL reconstruction. Dr. Spindler performed the ACL reconstruction, using bone-patellar tendon-bone (BPTB) autograft. Pharaoh’s recovery followed the ACL protocol developed by the Multicenter Orthopaedic Outcomes Network (MOON), an NIH-funded consortium of 18 sports medicine physicians across 7 sites.

At 13.5 months after his injury, Pharaoh had a remarkable full recovery of the CPN and showed normal strength and range of motion and excellent stability in his ligaments. After 18 months of hard work and rehabilitation, Pharaoh was cleared to return to sport with a specialized knee brace. “The surgery actually saved my leg,” Pharaoh says. “If it wasn’t for the vascular surgery, I would have had my leg amputated. The two ligament reconstructions allowed me make a comeback and play college football again.”

Pharaoh continues to break records, becoming the first Division I or professional player to return to play after a knee dislocation requiring a vascular bypass. After only two seasons out, Pharaoh returned to the Ducks, playing well enough to be invited to the NFL Combine. It is anticipated that he will be drafted to the NFL in the early rounds.

Pharaoh understands the value of orthopaedic research. “In my case I had one of the worst knee injuries in football,” he says. “If it wasn’t for research, I wouldn’t be here walking today.” Pharaoh hopes that his story can inspire other athletes, and one day would like to start a non-profit for at-risk kids.
Math teacher Margaret “Peg” Cagle is no stranger to orthopaedic care. In her early 20s, a skiing accident caused extensive damage to her left foot and ankle. At the time, it was treated as a sprain. For the next 30 years, various physicians told Peg that outside of orthotics, there was nothing that could be done about her ongoing foot pain and instability.

When she was in her early 50s, Peg began experiencing extreme hip pain. In 2006, the severity of pain in her left hip started to impede her daily activities. “It had reached the point where the joint would intermittently lock; I could not move my leg to get up from a chair,” she recalls. “It ached all the time.” Peg was told she had extensive calcification and deterioration of the joint, and would eventually need a hip replacement. This news came as a shock to Peg, as she was otherwise in good health and relatively young.

By 2008, she was walking with a cane. Knowing that the available technology would not offer a solution that would last a lifetime, Peg wanted to put off surgery as long as possible. She explored various options, and was ultimately referred to Daniel Oakes, MD, an orthopaedic surgeon at University of California, Los Angeles. In 2009, Peg had bilateral total hip replacement; her left hip in August, followed by her right in December. On a follow up visit with Dr. Oakes, he remarked on the degree of deformity of her left foot. He pointed out that severe pronation of her foot meant her knee was out of alignment, putting stress on her hip replacement and potentially causing premature failure of the implant. Dr. Oakes assured Peg that there were options to correct her foot, and referred her to Timothy Charlton, MD, an orthopaedic foot and ankle surgeon.

In 2010, Dr. Charlton confirmed that Peg had posterior tibial tendon dysfunction (PTTD), which contributed to her severe flatfoot deformity. After discussing a range of surgical options, Peg and Dr. Charlton opted for a total flatfoot reconstruction that included bone realignments, tendon transfers, and ligament reconstruction. Recovery involved three months in a cast, non-weight bearing, followed by a surgical boot and a knee scooter. In her transition to partial weight bearing, it became evident that something was not right. Peg was in Washington, DC, on a fellowship for work and was unable to see Dr. Charlton for a month. X-rays ultimately determined that the arch in her foot was sagging, and the ligament reconstruction was failing.

In order to buy time so she could complete her fellowship in DC, Peg had a specialized brace made that she wore underneath her surgical boot. She continued to walk with crutches. “I lived this way for nearly a year, but I did not let it keep me from attending a presidential speech in the rose garden of the White House, high-level meetings in and around DC, and traveling extensively, including participating in an international congress on mathematics education in Seoul, Korea,” Peg says.

Peg returned to California in September 2012 for her second surgery. The surgery was successful, but as she started to return to weight bearing, Peg experienced extreme pain in her ankle. She was diagnosed with a possible tendon tear, which was treated by extending the period of walking with crutches and aided by cortisone injections. In 2013, Peg was diagnosed with small tear of the right posterior tibial tendon, probably brought on by years of compensating for her injured left foot and ankle. She returned to bracing, icing and either crutches or a cane to avoid surgery on what she had come to characterize as her good foot. “Living in pain for years on end takes a toll,” she says. “While it does not impact the quantity of my life, the quality has most definitely been seriously compromised.” Peg hopes that additional research will ultimately provide more options for treatment of soft tissue deformities and improve the materials used in orthopaedic implants.
Six year old Tearrianna Cooke-Starkey was diagnosed with Osteogenesis Imperfecta (OI), also known as brittle bone disease, shortly after birth. Tearrianna was born with a broken arm and multiple other fractures at various stages of healing. She had short, bowed limbs along with a large, disproportionate head. OI was presumed, and later confirmed by genetic testing. OI is a rare bone disease in which collagen, a structural protein, is defective, causing bone fragility.

Only in kindergarten, Tearrianna has already had more than 40 broken bones and almost 20 surgeries. She has scoliosis and lordosis of her spine, severe curvatures that compromise her breathing. Tearrianna experiences pain and discomfort on a daily basis. She is cautious and guarded with her activities, though she longs to play with the other children at school. “She does not want to break bones so she chooses to not engage in certain activities,” her grandmother and adoptive mother Marnie explains. “Her self-preservation often takes priority over playing with other kids.”

Tearrianna is susceptible to pneumonia as a result of restrictive lung disease. She also lives with a colostomy bag due to poor bowel motility and chronic constipation, and requires a feeding tube for nutrition. She experiences frequent dental issues including worn and broken teeth, caused by dentinogenesis imperfecta, a companion disorder to OI.

Tearrianna’s family has developed a close relationship with Laura Tosi, MD, a pediatric orthopaedic surgeon at Children’s National Medical Center, who has performed multiple surgeries to help Tearrianna gain stability and mobility. After several rods in her legs, Tearrianna can now stand on her own and walk with a walker, but typically scoots on the floor to get around. The older and stronger she gets, the fewer fractures she will endure.

Life for the Starkey family is challenging. Marnie and her husband Ted serve as full time caretakers. “With Tearrianna’s special handling needs and various medical issues, we have not been able to find someone we are comfortable leaving her alone with,” Marnie explains.

“One of our biggest issues is always explaining why Tearrianna cannot do what other kids her age do,” Marnie says. “She asks about getting bigger and taller, if she will always have special bones, and if she will live with us forever.” Tearrianna laments being dependent on others for all activities of daily living. She needs assistance with nearly everything; at only 33” tall, she cannot reach anything or navigate steps or stairs.

Like other kids her age, Tearrianna enjoys SpongeBob, playing with Barbies and watching YouTube videos. She loves music and arts and crafts. Her family’s number one wish is for her to be able to live a healthy and fulfilling life. They know that advancements in research have already improved the lives for children and young adults with OI, but further research is needed.

“Rods and bisphosphonates have been the norm for many years now,” Marnie explains. “Kids with scoliosis are difficult to treat or brace with their unique and challenging anatomy.” The Starkeys would like to see advancements in pediatric orthopaedic implants that are less prone to migration, and drug treatments that are as effective as the current IV medications to reduce time in the hospital. “So much more is possible when researchers have the budget to continue their work.”
High school student Audrey Corona comes from a very active family. An avid softball player, Audrey spends her free time practicing throwing and swinging in her yard. In the summer of 2016, Audrey turned to throw a ball and her knee gave out on her. She continued to experience knee instability and pain.

Audrey’s brother Jonathon experienced similar symptoms three years earlier. He was diagnosed with a tear of his anterior cruciate ligament, or ACL. Audrey’s mother Teresa suspected Audrey had sustained an ACL tear as well, and they scheduled an appointment with Donna Pacicca, MD, a pediatric orthopaedic surgeon at Children’s Mercy Kansas City who treated Jonathon.

An MRI revealed that Audrey had a 20% tear of her ACL. The ACL connects the thighbone (femur) to the shinbone (tibia). The ACL runs diagonally down the middle of the knee, and provides stability when the knee rotates. Ligaments connect bone to bone, and the ACL, along with the posterior cruciate ligament (PCL) and the medial and lateral collateral ligaments, act like strong ropes that help keep the knee stable. Athletes that participate in sports involving pivoting or turning the knee are more susceptible to knee injuries. Females are at a higher risk for ACL injuries than males.

In August of 2016, Dr. Pacicca, performed a surgical repair of Audrey’s ACL. ACL tears cannot simply be stitched back together. Surgical repair involves reconstruction of the ligament, using a tissue graft. Audrey’s surgery was done arthroscopically, a minimally invasive technique using an arthroscope through small incisions.

After surgery, Audrey spent several months in physical therapy, regaining strength in her leg muscles and working on range of motion and agility. She wore a large knee brace to maintain stability. While rehabilitating her knee, Audrey struggled with limitations to her mobility and ability to participate in sports. “It has really brought my confidence down and makes me feel like I can’t do as many things as other people can,” she says.

Overall, Audrey’s pain and stability have improved. “My surgery has helped a lot with my injury,” Audrey says. “It no longer gives out on me and I’m able to put my knee in certain positions without it hurting.”

Audrey lives in fear of reinjuring her knee. Her biggest challenges are overcoming the mental hurdles of returning to sport. Audrey hopes to be able to return to play at the same level as her teammates. She would like to see research funding directed at developing better tools for physical and mental therapy after surgery.
Jonathon Corona has a history of knee pain and instability. In 2013, when he was thirteen years old, he sustained a partial tear to his anterior cruciate ligament, or ACL, while running and jumping down a hill with a friend. “I knew something was wrong because it was swollen right away and it was very tight,” Jonathon recalls.

Donna Pacicca, MD, a pediatric orthopaedic surgeon who specializes in sports injuries, performed a diagnostic arthroscopy to confirm a 20% tear. No reconstruction was done at that time. To help him heal, Jonathon was fitted with a brace and did physical therapy to help build strength and regain motion. For the next several years, Jonathon continued to play sports.

Three years after his initial injury, Jonathon was at wrestling practice when his knee twisted, and he felt a tear. “My leg got stuck on the mat,” he says. “That’s when I knew I tore the ACL completely.”

In 2015, Dr. Pacicca reconstructed Jonathon’s ACL, using a hamstring tendon graft from his own leg plus tissue from a donor. The hamstrings are muscles that run down the back of the thigh, and are comprised of three muscles and the tendons that attach them to bone. ACL reconstruction is done arthroscopically; small incisions are made to remove a piece of the hamstring tendon, and are arranged into small strips which are then stitched together. The replacement ACL is secured to the shinbone (tibia) and thighbone (femur) through drill holes with screws or sutures, aligned between the bones to run in the same direction as the original ACL through the knee.

Hamstring reconstruction is a common technique for ACL repair, though not a perfect choice as the hamstrings are important in sport.

After months of physical therapy, Jonathon returned to playing baseball and wrestling. “My surgery helped me get back to where I need to be,” he says.

Jonathon has been an ideal patient; he focuses on exercises to strengthen his legs and has diligently worked to avoid further injury. Two years after surgery, he is back to a full level of activity.

Jonathon’s younger sister Audrey also tore her ACL and had surgical repair. There have not been extensive studies on the familial risk of ACL tear. Future research could help identify genetic risk factors for injury.

Jonathon’s experience has taught him to be patient and strong. In large part to his successful experience in post-operative, rehabilitation Jonathon aspires to be a physical therapist. “My ultimate goal is to help people with their struggles,” he says. He wants to help athletes practice safely and hopes additional research into the prevention and treatment of sports injuries will allow for better outcomes of injured athletes.
One evening in October of 2015, 11 year old Brayden Einck was carving pumpkins with his family. The tool he was using slipped, cutting his pinky finger. Brayden’s parents were quick to determine that this was not a superficial wound and brought him to the emergency room. He received stitches and was sent home.

Brayden was a typical, active 6th grader. He enjoyed video games, YouTube, watching movies, riding his bike, and hunting. Stitched and bandaged, he was able to return to some of his favorite activities; although, bike riding with a right hand with fresh stitches was off the table. As the wound began to heal, Brayden noticed that his finger was not responding as it once had. The wound itself was healing well, but he had lost movement in his finger and could no longer bend his pinky.

The stitches had not fully repaired the damage. Something was not right. Brayden’s parents brought him to an orthopaedic surgeon for a consultation. Brayden’s doctor determined that there was substantial damage hidden beneath the surface, and the flexor tendons in his pinky needed to be completely replaced. Brayden was scheduled for surgery with a hand surgery specialist, Peter Amadio, MD.

Brayden needed a tendon graft. Prior to surgery, Brayden was not able to bend his finger. During surgery, done under local anesthesia while Brayden was awake, Dr. Amadio replaced the damaged finger tendons using a graft from Brayden’s wrist.

“The finger tendons are very specialized, with a self-lubricating surface designed to move with minimal friction,” Dr. Amadio explains. “This surface is similar to the cartilage surface of a joint. There are no tendons in the body that have this specialized surface, other than those in the fingers. So a different kind of tendon, not specialized for gliding, and of a smaller width, had to be used for the reconstruction of Brayden’s finger.”

Immediately following his surgery, Brayden was able to bend his finger. His parents were surprised at how important the pinky finger is to the ability to grip objects, overall hand strength, and how it can affect activities of daily living. While his movement had returned, Brayden’s road to recovery had just begun. Brayden’s successful rehabilitation depends on his dedication to his physical therapy exercises. At 12 years old, it is a challenge for him to remember the frequency at which he must exercise his finger and flex the joint. Brayden’s parents hope that with time, he will regain full mobility of his finger without any lingering joint stiffness.

While Brayden’s finger function is improved after surgery, more research is needed to develop better tendon replacements that are more similar in size and self-lubrication to the tendons in the finger.
When she was in elementary school, Lindsay Ellingson’s life revolved around gymnastics meets and dance competitions. She was both strong and flexible, and loved exploring how far she could push her body to master new moves. When Lindsay was 11, her gymnastics coach noticed that something wasn’t right. He was pressing her hips in a stretch, and observed that the lower left side of her back was raised higher than the right. A visit with her doctor confirmed her diagnosis: scoliosis.

Scoliosis is an abnormal sideways curvature of the spine that is fairly common in children and adolescents. Scoliosis is not life threatening, and most curves do not cause significant problems. However, there are varying degrees of severity; extreme scoliosis can cause considerable deformity and lead to pain and difficulty breathing. Although she had not experienced any pain or abnormality prior to her diagnosis, Lindsay’s initial x-rays revealed that her spine formed an “S”; a 25° curve in her thoracic vertebra from T5 to T11, and a thoracolumbar curve from T12 to L4 measuring 35°. Lindsay was fitted with a rigid back brace, which she diligently wore 23.5 hours a day for the next two years. Her life would never be the same.

Lindsay was no longer able to do gymnastics. “My half hour showers were the highlight of my day,” she recalls. “The brace was made of thick plastic and I was always hot wearing it. It fit tightly around my stomach and closed in the back with leather buckles in an attempt to straighten my spine.” She knew her health was more important than gymnastics, and adapted to her situation. In the sixth grade, she made the dance team; the brace had become a part of her, and she didn’t let it hold her back.

During her two years in the brace, Lindsay experienced massive growth spurts. At each doctor’s visit, Lindsay learned that her scoliosis was progressing, despite the bracing. “By the time I was in seventh grade, I developed hypokyphosis,” she explains. “My thoracic curve had progressed to 54°, while the thoracolumbar curve was up to 57°.” Surgery was her only option.

On July 30, 1998, Lindsay underwent a 7-hour spinal fusion surgery. She spent a week in the hospital working with a physical therapist. “Although I felt physically weak, something in my mind had changed,” she said. “I was determined to get better and to get back on the dance floor.”

Lindsay did just that; after six months of recovery, she returned to dance, competing from eighth grade through her first year of college. Although no longer able to do gymnastics, she felt empowered to do anything and everything she put her mind to. Lindsay graduated in the top ten of her high school class and attended the University of California San Diego to pursue medicine. However, another door opened.

Ten years ago, Lindsay was recruited by a modeling agency. Her new career took her to the runways in Paris. She has since walked in hundreds of fashion shows, been on numerous magazine covers and has been featured in campaigns for Dolce & Gabbana, Tommy Hilfiger, Victoria’s Secret and more. “In 2007, my dream of walking in the Victoria’s Secret Fashion show became a reality,” Lindsay says. “I walked in the show eight times and had the honor of carrying some of the heaviest wings in the show. Most people have no idea that I have two metal rods in my back.”

Lindsay is grateful for her surgeon, who fulfilled his promise that the spinal rods would not restrict her from living the life she wanted. “Had I continued bracing and opted not to have the surgery, my body would have been so twisted and painful,” she comments. “There’s no way I would be where I am today without this life saving surgery.”

“Despite all of my success, the accomplishment that I’m most proud of is the scar on my back,” Lindsay proclaims. “Enduring bracing and spinal fusion surgery helped me develop a depth of character that has convinced me that I can do anything that I set my mind to.” She recently co-founded a cosmetics line and aspires to be an ambassador to young girls with scoliosis. Lindsay, who stays physically strong by practicing yoga and Pilates, hopes that future research will improve the technologies in spinal fusion surgery to allow for more flexibility while stabilizing the spine.
BILATERAL HAND TRANSPLANT

Zion Harvey’s nine years of life have been nothing short of extraordinary. When he was two years old, Zion developed a life-threatening infection. His tiny body had gone septic, and he lost blood flow to his extremities. The infection caused so much destruction that both of Zion’s hands and his legs below his knees needed to be amputated. The infection also damaged his kidneys.

When Zion was four years old, the damage to his kidneys reached a critical point; he needed a transplant. Zion’s mom, Pattie Ray, donated her kidney to save her baby’s life. Zion has taken immune suppressing drugs ever since.

Zion adapted to life without hands and feet. He learned to feed himself, write, and even play games on an iPad with his residual limbs. He was fitted with prosthetic legs that allowed him to walk, run, and jump without any assistive devices. He maintained a happy and positive attitude, and found creative solutions to be able to do nearly everything his friends could do.

Because of the success Zion had with his prosthetic legs, Pattie decided to investigate getting Zion fitted for prosthetic arms. She made an appointment with a specialist at Children’s Hospital of Pennsylvania (CHOP). The surgeons proposed a different plan: hand transplantation.

Zion Harvey

Pattie and Zion were referred to the Hand Transplantation Program at The Children’s Hospital of Philadelphia, led by L. Scott Levin, MD, FACS. Dr. Levin, who performed the world’s first hand transplants in 2011, is the chair of the CHOP Department of Orthopaedics and is a professor of plastic surgery at Penn Medicine. The Hand Transplant program combines CHOP’s Division of Plastic and Reconstructive Surgery and Division of Orthopedics with physicians at Penn’s Transplant Institute.

Dr. Levin spent the next 18 months evaluating Zion. His levels of function and his complex medical history were assessed. As it turns out, the immunosuppressant drugs Zion had been taking and tolerating for years for his kidney transplant helped solidify his candidacy for hand transplant. However, the surgery had never been performed on a child.

In the spring of 2015, Dr. Levin assembled a medical team of over 40 orthopaedic and plastic surgeons, nurses, and anesthesiologists to perform a bilateral vascularized composite allotransplantation (VCA) on Zion. Multiple rehearsals and practice surgeries were done on 3D models. Zion then had to wait for exactly the right donor – a process that could take years.

In July of 2015, just three months later, Zion was matched to a donor. In a surgery lasting nearly 11 hours, Dr. Levin’s team intricately and precisely attached the donor forearms and hands, connecting nerves, blood vessels, muscles, tendons, bones, and skin. When the hands started to turn pink, the surgeons knew they had been successful.

Zion spent the next year in intense physical and occupational therapy, learning to use his new hands. Starting from moving his fingers, Zion progressed to being able to grip, hold a pencil, and even throw a ball. “I’m still the same kid everybody knew without hands,” Zion says. “But I can do everything now. I can do the same things even better.”

Zion’s incredible journey is ongoing, and represents years of research and collaborative efforts. Dr. Levin will continue to monitor Zion throughout his life, and his pioneering surgery will make it possible for others to receive hand transplants in the future.
Martha Hunt has always been inspired by the idea of traveling and meeting new people. As a teenager, she was eager to find opportunities outside of her small town and explore the world. In high school, Martha discovered a love for the spotlight through cheerleading and dance.

When she was 13 years old, she noticed that her posture and alignment were off. One shoulder was higher than the other, and her hips were uneven. Her parents thought she was simply going through an awkward phase. An examination by a specialist indicated that she had mild scoliosis, an abnormal curvature of the spine, which she was told was common in growing girls. Her doctor did not recommend bracing, and no treatment was prescribed.

Throughout high school, Martha was very active. In addition to cheering and dancing, she enjoyed painting and writing. As a child, Martha saw her future in the creative field; however, her aspirations shifted to acting and modeling when her friends encouraged her to look into a career in the industry. While still in high school, Martha went to a talent search in Charlotte, NC, where she met modeling agents from New York.

During this time, Martha was experiencing increasing discomfort in her back and hips. She noticed that her body had become significantly imbalanced; there was a visible lean to the left and her waist was curved on the right side. Her balance was off, and she was in pain after a full day of walking. She remembers experiencing jolts of pain while sneezing. Her scoliosis had noticeably progressed, and she was becoming self-conscious and insecure about the disfigurement in her back.

When she was 17, Martha visited a different specialist, who ultimately referred her to a spine surgeon. Martha’s x-rays revealed a $39^\circ$ curve in her thoracic vertebrae and a $53^\circ$ curve in her thoracolumbar vertebrae. Due to the progression of her scoliosis, surgery was the only treatment.

In June of 2007, after high school graduation, Martha’s spine was fused from T3 to L1. “I recovered at home, motivating myself to get up and take walks daily,” she recalls. “I moved to New York to embark on my career two months after the surgery with the surgeon’s consent.” In retrospect, Martha’s move was overzealous. She was not physically prepared for the work and travel involved with her new career.

Six months into recovery, Martha began to feel better. “It was gradual; I was very stiff those first few months, and trying to get comfortable in my own body,” she says. It took some time for her to find the courage to be physically active again, but regular workouts and stretching are now part of Martha’s normal routine.

“My surgery helped tremendously,” Martha says. “I have less pain and can still do most activities.” She occasionally has some pain and stiffness in her back, neck, and shoulders when traveling or working, but she hasn’t let it affect her career.

Martha found success and fame on the runway, walking the Victoria’s Secret Fashion Show in 2013, 2014, and 2015 and as a Victoria’s Secret Angel since 2015. Martha has walked more than 180 fashion shows for dozens of designers and can be seen in numerous commercials and magazine covers.

Martha hopes that additional research will generate less invasive treatment options for adolescents with scoliosis. She is passionate about bringing awareness to the seriousness of the condition. “There is not enough information out there about the true chronic pain, lower quality of life, and insecurities that scoliosis causes.”
Cars have always been a big part of Michael Jeansonne’s life. He is passionate about restoring old automobiles and much of his free time is spent in the garage. He never imagined that a car would one day take away his ability to walk.

Fifteen years ago, the Louisiana attorney was in a car accident that changed his life. The accident crushed his left leg and severely damaged his right ankle. Michael was unconscious and rushed to the emergency department. The situation was grim. It quickly became apparent that Michael’s leg could not be saved.

Laura Bruse, MD, an orthopaedic surgeon, placed a rod in Michael’s left femur to stabilize it. Due to the extent of his injuries, an emergency, non-voluntary amputation was preformed below Michael’s left knee. He also had plates and screws placed in his right ankle to stabilize it.

Post-surgery, Michael endured several weeks of physical therapy. Ultimately, he was fitted with a prosthetic so he could walk on his own. He struggles with proper fit of his prosthetic leg, resulting in constant attention to friction points in the socket and accompanying open wounds on the residual limb.

Prior to his accident, Michael had onset spinal stenosis, a narrowing of the space around the spinal canal which puts pressure on nerve roots, causing pain and numbness. Lumbar spinal stenosis is a common cause of low back and leg pain, weakness, and numbness. “As a result of the necessity to use a prosthesis, the stenosis has advanced,” he comments.

The pain from his residual limb and the increasing loss of sensation from the spinal stenosis have taken a toll on Michael. He requires the use of a disability cart when shopping or walking long distances and struggles with walking on uneven outdoor surfaces. He is challenged by facilities that are not accessible to carts and wheelchairs, and feels restricted due to his disability.

The stenosis has advanced to the point that it is difficult to walk or stand any length of time. “I cannot walk long distances, have trouble bending over, cannot squat, and am unable to kneel,” Michael states. His inability to kneel interferes with worship at his church. He also struggles with his old automobile hobby; it is challenging to work underneath a car without planning and forethought to get to the floor.

In addition to maintaining a busy law practice, Michael is in the process of establishing an amputee support group. Michael hopes that more public spaces will be accessible in the future. He would like to see advancements in research lead to better fitting prosthetic devices and prosthetic devices that offer a more natural gait pattern.
Thomas Joiner has always been athletic. The 17 year old high schooler spends his free time playing lacrosse and football. Thomas is a linebacker on the Whitefield WolfPack, his school football team, and aspires to play in college.

Thomas had a strong start to his junior year. In September of 2016, during the third game of the season, Thomas’ team was receiving a punt from the opposing team. A returner was nowhere to be found, and Thomas found himself receiving the kick. He had a successful 20 yard return before he was forced out of bounds, where he took a late hit. The tackle immediately brought Thomas to the ground.

The high school athletic director, a former athletic trainer, raced to the field. It was evident Thomas’ leg was broken. Thomas was placed on a stretcher and an ambulance was called. Douglas Lundy, MD, the team doctor, met them at the ambulance and was confident that the injury would require surgery. The x-rays at the hospital confirmed a severe fracture to both his tibia and fibula. Thomas underwent surgery the next day. Dr. Lundy placed a 14 inch titanium rod in his tibia to stabilize his leg.

Thomas was out for the season. He missed two weeks of school, then for an additional two weeks could only attend half days. He walked with crutches for two months, but was able to put weight on his leg after two weeks. Although he was in significant pain from his procedure, the student athlete rehabilitated rapidly.

The injury changed the course of Thomas’ life, but not as one might expect. The surgery has given him hope, and with it a renewed drive to excel at the game that he loves. He is completely dedicated to his rehabilitation and is focused on achieving total leg function once more. He goes to physical therapy twice a week, and will continue to do so for four months. The greatest challenge in his rehabilitation is still on the horizon: running and sprinting. His recovery may be ongoing, but he is still focused on playing collegiate football in the future. He recently attended his first lacrosse practice and played in two games. He still has pain, but wants to play so badly that he powers through it. Dr. Lundy has assured them that his leg is stable enough for activity.

Without surgical intervention, Thomas would still be in a cast and unable to bear weight on his injured leg. This would have delayed his recovery significantly, keeping him from both sporting seasons his junior year. The advanced recovery period will enable him to participate in football camps this summer, where he has the chance to impress college scouts. Thomas still has a chance at fulfilling his dream of a college football career.
At age 17, Craig King was an athletic honor student, playing both football and baseball at his South Carolina high school. At the beginning of his senior year, Craig noticed a lump on his leg and overlooked it as a sports injury. Although the lump grew as his senior year progressed, Craig played every game. With hopes of one day becoming a teacher, he graduated from high school and prepared for college.

Less than two months after graduation, he bumped his leg and was shocked by the pain. He saw multiple doctors before he was diagnosed with osteogenic sarcoma – bone cancer – in his left leg. Instead of packing for college, Craig underwent eleven months of chemotherapy to aggressively treat the cancer. During his chemotherapy, Craig had limb salvage surgery to save his leg and his life. His tibia was removed and replaced with a donor bone and his knee was reconstructed using orthopaedic cement and chrome cobalt.

Craig underwent intensive physical therapy after his surgery. “One of the biggest challenges was learning how to walk again,” Craig remembers. He experienced significant pain in his leg for months following surgery. He used a wheelchair to get around. Eventually Craig progressed to crutches, then a walker, and eventually was able to walk on his own. “Physical therapy was hard, but the hospital provided a great support staff, and my family and faith played a significant role in my rehabilitation.”

Osteogenic sarcoma is one of the most common types of bone cancers in children and young adults, representing 35% of all bone cancer cases. To prevent the spread of the cancer, osteogenic sarcoma patients require surgery to remove bone tumors and surrounding tissues. New techniques and materials in limb salvage surgery, reconstruction, and prosthetic technology continue to be a focus of musculoskeletal research.

While Craig is no longer able to play physically demanding sports, he was able to return to school and pursue his teaching degree. In 2007, Craig earned his Master’s degree in Rehabilitation Counseling. He served as an adjunct professor at South Carolina State University, teaching leadership development to incoming freshmen. Now the Director of Governmental Affairs for the Palmetto State Teachers Association, Craig serves as an advocate for public education in South Carolina. Recently, Craig developed a workshop for male teachers. Craig is also active in many community organizations serving children with cancer. Craig co-founded Craig Q. King’s Celebration of Life Gala with his mother in 2010. The biennial gala benefits Camp Kemo, an oncology camp for children with cancer, and the American Cancer Society’s Relay for Life. To date, the gala has raised over $17,000.

Craig, a 16-year cancer survivor, serves as an Ambassador for the American Cancer Society, traveling throughout South Carolina to advocate the need for further research. Additionally, Craig has traveled to Washington, DC, for several years to advocate for musculoskeletal research on Capitol Hill. “Without musculoskeletal research, I might not be doing the things I am doing today,” Craig says. Additional research funding can improve the lives of people suffering from bone cancer by helping to develop better surgical techniques and advancements in materials and technologies that can save limbs and avoid amputation. “This type of research might allow others like me to be given a chance to reach their goals with a powerful testimony on life.”

Craig recently launched his own consulting company, the Craig King Group, LLC. In February 2015, he was selected as a recipient of the 20 Under 40 Award by The State Newspaper for his service to the community. In 2016, his alma mater honored him with the Distinguished Young Alumnus Award. Craig is married to Tasia King, and has one daughter, Saniah.
Ted Lauder is an insurance agent in downtown Chicago. He enjoys spending time outside and staying active through tennis, kayaking, fishing, and golfing. About six years ago, Ted started having trouble with his left shoulder. Over time, pain, stiffness, and loss of range of motion forced Ted to give up his favorite activities.

“The pain in my shoulder was affecting my sleep every night,” Ted recalls. “Every time I rolled over on my left shoulder, the pain would wake me up.”

Ted consulted Anthony Romeo, MD, an orthopaedic surgeon specializing in the management and surgical treatment of shoulder and elbow conditions, at Midwest Orthopaedics at Rush. Dr. Romeo diagnosed Ted with degenerative osteoarthritis of the shoulder. Over time, the smooth cartilage surfaces of the ball and socket joint become rough and rub against each other. Dr. Romeo recommended arthroplasty, or shoulder replacement surgery, to alleviate Ted’s pain and stiffness.

In December of 2016, Dr. Romeo performed a total shoulder arthroplasty in Ted’s left shoulder. In arthroplasty, the damaged parts of the joint are replaced with a prosthesis. Since Ted is only a few months post-operative, he is still working in physical therapy twice a week to regain strength and range of motion, in addition to working out on his own.

“I am now back to work and feel productive,” he says. “I was at the point where early retirement looked like the path I might take, but now I feel so much better that I intend to continue working until I am 70.”

Arthritis is the most common cause of disability in adults in the United States. It is among the leading conditions that restrict the ability to work. It is predicted that by 2030, nearly 67 million adults, or one quarter of the adult population, will be diagnosed with arthritis. Corresponding arthritis-attributable limitations on activity are estimated to affect 25 million people.

Ted hopes to continue to be able to work, travel with his wife, and enjoy a pain-free life. He acknowledges that orthopaedic surgery helps people regain function and the ability to be productive, contributing members of society.

“Once you are forced to give up due to pain, you become defeated,” Ted explains. “We all want to be contributors by working. Living in pain and on disability is defeating. When there is a way to fix a condition like mine, it’s better for everyone.”
Spunky second grader Vivienne Liedtke was born with a rare muscle condition called Spinal Muscular Atrophy (SMA), though she was not officially diagnosed until she was 21 months. Until just after her first birthday, it appeared that Vivienne was developing normally. She was able to pull up to standing, crawl, and cruise. She gradually became weaker, losing the ability to crawl by age two. She required help with every aspect of daily living, and needed to be monitored 24 hours a day.

SMA is a disease that affects nerve cells in the spinal cord, affecting the ability to walk, eat, and breathe. It leaves Vivienne with low overall skeletal and cardiac muscle tone, and confines her to a wheelchair. “Our lives have changed drastically,” her mother Helena says. “SMA dictates our life. Nothing is how it was before.” After her diagnosis, Vivienne began weekly therapy in the pool as well as hippotherapy, which aims to improve balance, strength, and coordination through horseback riding.

In 2012, Vivienne began a drug injection treatment as part of a clinical trial to treat SMA. She responded to the treatment, which was only recently approved by the FDA, and is gaining strength. “Her quality of life has increased dramatically,” Helena says. “Before the trials, she couldn’t even open a marker; now she bends over takes markers out of the drawers, can sit back up by herself, and open and close the markers.” Vivienne loves arts and crafts and playing with toys, especially her battery powered car. Because of her treatment, she has the ability to push the pedal with her foot, can move the steering wheel, and can keep herself from falling over.

As she continued to grow, the SMA caused significant scoliosis and kyphosis in Vivienne’s spine as well as contractures of her knee joints and pain in her hips. She was no longer able to stand or use her walker because of the pain. In June of 2015, Brian Snyder, MD, PhD, a pediatric orthopaedic surgeon at Boston Children’s Hospital, performed surgery to stabilize Vivienne’s hips. Before surgery, Vivienne had a 26 degree spinal curve; the hip surgery helped realign her spine and relieved hip pain. “She is back to enjoying her time in her walker, she can use her stander without pain again and does plenty of knee walking and many other exercises she didn’t want to do due to discomfort and pain,” Helena says.

Since the surgery, Vivienne’s sleep has dramatically improved. Before the operation, she would wake up several times a night. Two months later, when she no longer required a brace, she was able to largely sleep through the night.

Vivienne’s life is consumed by therapies. Her family hopes she will continue to get stronger and find new ways to gain independence. She has a deep desire to walk and join other children in activities. She is frustrated by the lack of autonomy in her life, and her parents hope that with more independence, she will feel more in control and act out less.

Vivienne has directly benefited from research to treat her condition. Though the drug treatment is not a cure, it generates significant improvements to quality of life and the ability to be independent. “There is a huge difference between spending a life lying down or being able to sit up or even stand up, maybe walk,” Helena says. “Instead of weeks or months in the hospital fighting respiratory illnesses, kids could go about their lives not having to fear deadly germs.” The Liedtkes believe that additional SMA research would provide a better understanding the physical and emotional effects of the disease, leading to new treatment options.
In May of 2016, Terry Rassieur was enjoying a beautiful spring day on his bicycle. He was riding along a road in St. Louis County when a car turned in front of him, hitting him and his bike. Terry’s cycling shoes disengaged from the pedals and he was thrown over the car, smashing the windshield and damaging the hood. His bicycle and helmet were left in pieces.

Terry was taken by ambulance to the trauma center at Mercy Hospital, where x-rays revealed fracture to the left tibia, a fracture to the left femur and hip, a fractured pelvis, a compression fracture to T5, and cracks to C6 and C7 in his spine. Terry was in critical condition, losing almost a third of the blood in his body. Fortunately, he was under the care of Lisa Cannada, MD, an orthopaedic traumatologist, who operated on him the day of the accident to control his bleeding, stabilize his pelvis, and allow for traction of his left leg.

Terry spent two weeks in the hospital and endured multiple additional surgeries. Dr. Cannada placed a plate and screws in his left leg to stabilize his femur and hip. About a week after that, he had another operation to place a plate and screws to stabilize his pelvis. Terry suffered a pulmonary embolism, but Dr. Cannada and the trauma team successfully treated it before it caused irreversible damage. He was discharged to a rehabilitation hospital, where he spent the next two weeks learning how to navigate life in a wheelchair with a neck brace, a torso brace, and a leg brace. He went back in for an additional procedure on his pelvis to clean up the surgical wound, which affected the use of his bladder for several months.

Terry had homecare therapists for three months, and outpatient therapy for seven weeks after that. His main focus in therapy was to strengthen his left leg so he could walk with a normal gait. He is able to walk and lightly jog on an aqua treadmill, but still requires a cane to walk outside of the pool.

“After 7 weeks, I was able to remove a neck brace and turtle shell. After 8 weeks, I was able to remove a brace on my left leg. After 12 weeks, I was allowed to put weight on my left leg,” Terry recalls. “I progressed from a wheelchair, to a walker, to crutches, and now to a cane.” After six months, Terry was able to get back on the bike, though he is avoiding the roads for now.

Terry has had a challenging year, but is thankful for the work of his doctors and therapists. “Without this surgery, I think it is obvious that if I had lived, I would have never walked or ridden a bicycle again,” he says.

“Your life and your priorities change radically when you are hit by a car, but I plan to embrace the lessons and do what I can to live a productive and fruitful life.” Terry has been able to return to work full time and is once again active in his volunteer endeavors. He helped to start both a church and a charter school in the City of St. Louis, and serves on the Finance Committee of the St. Louis Effort for AIDS.

Terry has a cycling trip planned with his wife this fall. He hopes to be riding well by then, and is currently working on walking without a cane. He hopes to someday return to jogging and playing tennis.
Kristin Rice was an active and athletically talented child, involved in volleyball, cheerleading, dancing, and water sports. When she was 11 years old, Kristin began experiencing back pain, and her parents noticed that her back and hips were not straight. She was diagnosed with scoliosis, an abnormal curvature of the spine, and fitted with a back brace to slow the progression of the spinal curves.

Idiopathic scoliosis is diagnosed when there is an asymmetry when bending forward combined with a spinal curvature of <10° with no known cause. The prevalence of adolescent idiopathic scoliosis in children 10 – 16 years old is about 3%, and girls are more likely to be affected. Typically, bracing is prescribed for patients with a spinal curve of 25 – 45° and surgery is considered for curves exceeding 45°.

Kristin continued to pursue her activities, removing her brace to swim, play volleyball, and compete in dance competitions. “I would hurt when I did not have it on,” Kristin recalls. “I showed my volleyball team my brace because I thought that it was really cool and they did not make fun of me. I would go to dance competitions so I would have to carry it around with me because when I danced I could not have it on because it was hard to move.”

Ultimately, Kristin’s spinal curves progressed to 56.7°, and the decision was made to proceed with corrective surgery. Dale Blasier, MD, a pediatric spine surgeon at Arkansas Children’s Hospital, performed a spinal fusion in June of 2016.

Postoperatively, Kristin did physical and respiratory therapy. She healed well from the procedure, and has gradually been able to return to all of her activities. “I’m so glad that I had surgery because now I can do most anything I want,” Kristin says. “I don’t have to worry about putting my brace back on after I go swimming, play volleyball, dancing or cheering.”

Now 14 years old and in eighth grade, Kristin hopes to remain pain free and be as active as her peers. Kristin has used her experience with scoliosis to educate fellow students, friends, and adults about the condition. She and her family hope that further research could identify earlier diagnosis and improvements in bracing and surgical treatments.
Shortly after starting a new job as a flight attendant, 23-year-old Pamela Schroeder was in a terrible automobile accident. The accident claimed the lives of two people and severely injured four. Pam’s lower body was completely crushed. Nearly every bone had been broken, including both legs and her spine. Only her arms and neck were spared. Pam had a collapsed lung and a ruptured spleen. Doctors were unsure if she would live through the night.

It was a miracle Pam survived. Shortly after the accident, Pam had surgery to repair her crushed ankle and lower spine. Six pins were used to stabilize her ankle. Two separate spinal surgeries fused nine of her vertebrae, sparing her from paralysis. Three bone grafts were required.

Months of intensive physical therapy followed. Eventually, Pam was able to walk again and was slowly able to return to her job. Her activities were limited, and her lifestyle changed completely. “I cannot risk damaging my spine and joints, so I have to be careful in choosing the activities I can do,” she says. She has never been able to return to skiing and dancing, two of her favorite pastimes before the accident. However, she is grateful for the ability to walk and to not be confined to a wheelchair. Pam’s tenacity allowed her to raise two children and work to support them.

Over the last three decades, Pam has had multiple surgeries due to damage from the accident and joint deterioration from posttraumatic arthritis. She struggled with significant pain in her back and ankles. In 2008, Pam had her knee replaced. In 2005, she had total ankle replacement surgery on her right ankle, performed by Steven Haddad, MD, an orthopaedic surgeon at the Illinois Bone and Joint Institute who specializes in complex foot and ankle reconstruction. “Within five years, materials testing and computer-assisted design allowed orthopaedic surgeons to develop a new generation of total ankle prostheses which provide better stability, bone integration, and longevity than the prior generation,” Dr. Haddad says. In 2009, he performed revision replacement surgery on Pam’s right ankle with the new implant.

In September 2012, Pam had a second knee replacement surgery, marking her 33rd surgery in 34 years. The joint replacement surgeries helped Pam live with a lot less pain. She still faces challenges with climbing stairs, lifting, and bending due to her spinal fusions.

“The accident completely changed my life,” Pam states. “There are so many things I could never try or had to give up. There were years of pain and surgeries, and my quality of life changed. However, I am grateful for what orthopaedic surgery has done to help my life.”

In 2014, over 65.8 million musculoskeletal injuries were reported, representing 77.4% of all unintentional injuries. Pam hopes that research funding will continue to improve the technology available to treat orthopaedic trauma. “New technologies must continually be developed to successfully help treat patients in the future.”

Pam is a dedicated advocate for orthopaedic surgery and advancements in musculoskeletal research. She served on the American Academy of Orthopaedic Surgeons Patient Advisory Board for five years and has advocated on Capitol Hill for musculoskeletal research funding. Pam spends her free time talking to patients considering ankle replacement surgery. She takes pride in the work of her surgeons and her renewed lease on life.
California native Noah Shohet was preparing for his freshman year of college at the University of Michigan when he started to experience mysterious pain in his right knee. Although he was active in soccer and golf, Noah had not suffered any injuries. After several doctor’s visits, the cause of his pain was eventually identified: a large bone tumor.

In the summer of 2015, Noah was diagnosed with Ewing’s Sarcoma, a rare cancer of the bone and soft tissue. Ewing’s Sarcoma is the most common type of cancer in children, most frequently seen in patients 10 – 20 years old. When diagnosed early enough, there is a 70% survivability rate with chemotherapy and surgery.

Noah endured ten months of rigorous chemotherapy and radiation following his diagnosis. There was a chance he would lose his leg. However, a limb salvage surgery procedure allowed Noah’s orthopaedic surgeon to remove the tumor and surrounding bone, replacing the deficit with a specially designed knee implant for tumor patients.

After surgery, Noah did months of physical therapy to regain strength and movement. His cancer is now in remission, and he has largely recovered from the surgery. Noah has not returned to soccer, but is able to play golf and spend time on his music – drums and guitar.

“Having cancer has made me much more motivated in school, and has changed the way I feel about healthcare and my future as a potential doctor,” Noah says. “I have learned a lot about myself from the experience and I am certainly more thankful for my health now than ever before.”

In addition to changing his career path, Noah has shared his story in a video for Teen Cancer America. He hopes to live a healthy life and inspire others to live healthier lives.

“We have only come this far in medicine on the back of research,” he comments. “A few years ago, a tumor the size of the one I had would have caused my entire leg to be amputated.” He is grateful to have his leg, but is aware that orthopaedic implants like his don’t last forever. “More research funding could allow people like me to have less risky, more effective implants that don’t need to be replaced as often.”
Helene Soper

OSTEOARTHRITIS OF THE SHOULDER

Helene Soper is not your average grandma. At 85-years-young, Helene is an adventurous world traveler and community activist. The mother of six and grandmother of fourteen leads an active life, exercising every day and walking up to two miles.

In 2004, Helene amped up her exercise routine on some heavy duty machines. Within days of the new regimen, she developed a significant pain in her right shoulder. Likely aggravating an old injury, Helene stopped the exercise. However, the pain never went away. Within a year, she could hear the bone on bone grinding of arthritis in her shoulder. In retrospect, Helene attributes the wear and tear arthritis to overuse from painting, wallpapering, and refinishing wood in her family’s large home.

Plans to visit an orthopaedist were halted several years later when Helene was diagnosed with stage two breast cancer. “The breast and several lymph nodes were removed in 2012, while at the same time I was having constant shoulder pain of increasing severity,” she recalls. Helene lost her husband that year, and her world as she knew it would never be the same.

In 2014, Helene consulted with Carolyn Hettrich, MD, an orthopaedic surgeon at the University of Iowa specializing in the shoulder joint. That year, Dr. Hettrich performed a shoulder arthroplasty to remove the damaged cartilage and bone and replace it with an implant to improve her pain and mobility. The surgeries took a toll on Helene, and she was concerned that she wouldn't be able to feel like herself again.

Just two months after her surgery, Helene spent two months in Europe by herself. Within a year of her shoulder replacement and by following a strict physical therapy protocol, Helene was completely pain free and her range of motion was close to normal. By the following year, her right arm was almost as strong as her left. “Constant, severe pain is dehumanizing,” she says. “To be pain free is not only a gift, but a testament to the skill and training of the orthopedist.”

Helene is back in control of her life and taking it by storm. This past summer, she camped with her daughter and son in law, in a tent, from Canada to Lake Tahoe, California. On her adventure, Helene became the oldest woman to ride the rapids in a raft, handling the paddle through huge rocks with no discomfort.

When she’s not working at her church or at her community’s free lunch program, Helene spends time with the families of her six children, who are spread throughout the country, caring for her grandchildren when their parents travel and otherwise doing most of the cooking. She continues to stretch daily to retain her shoulder mobility, and aspires to stay as healthy as possible for as long as she can, enjoying her family and the great outdoors.

Helene intimately understands the value of and continued need for research. Her husband was a pediatric surgeon at a time when that specialty was in its infancy. She notes that research has been paramount in the field, specifically in the area of fetal surgery. “There are never enough dollars given to medical research to meet the needs of greater findings and better training for those whose career is to improve the quality of life,” she says.
Michigan native Justin Sydloski is a college freshman living with a mild form of Osteogenesis Imperfecta (OI), a rare genetic disease that affects bone strength. OI is a disorder of collagen, a protein that helps strengthen bones, and is also known as “brittle bone disease.”

There is not a cure for OI; individuals with the condition live with it their entire lives. Through surgical and pharmacologic management, people with OI can lead healthy and productive lives and live an average lifespan. OI does not discriminate; although an uncommon condition, it occurs equally in both sexes and in all racial groups. An estimated 25,000-50,000 Americans live with OI. Justin, whose mother Ellen also suffers from OI, was diagnosed before birth through genetic testing.

As a child, Justin was energetic and willing to try a variety of physical activities. He played soccer and basketball in kindergarten and elementary school, learned karate, and played tennis in high school. He endured multiple fractures, and was no stranger to casts. Justin’s family wanted him to live as normal a childhood as possible, and not to live in fear.

Justin’s condition progressed throughout puberty, causing more frequent fractures and increasingly complex surgeries. At age 12, he had surgeries on both legs to straighten and lengthen his shinbones, or tibias, including internal rods for stability. At age 13, Justin broke his elbow, requiring another surgery with several screws and plates.

When Justin started high school, it became apparent that his condition was progressing rapidly. Justin’s spine became increasingly curved; scoliosis he developed from his condition caused noticeable deformity and pain and instability while walking. At age 14, Justin had his spine fused; two rods and sixteen screws now stabilize his back.

“The operations allowed for me to be increasingly able to participate in physical activities in which I found more difficult beforehand,” Justin says. “They also halted the progression of curvature in my spine, preventing the possibility of chronic back pain in the future.”

Justin’s greatest challenge is acknowledging the fact that he is unable to do everything that others can do. “One can become accustomed to not doing as much or living more cautiously,” he says, “but it is difficult to swallow the fact that I am physically made weaker than others.” Justin also suffers from Tourette’s Syndrome, which causes repetitive body jerks, though neither condition has stopped him from pursuing his dreams.

Justin excelled academically, acing advanced placement classes and thriving on the work and commitment required. His grades, coupled with his volunteerism through Big Brothers Big Sisters, Youth to Youth International, and several community groups, sealed his acceptance to Harvard University, where he is currently in his freshman year. Justin plans to study pre-medicine and pursue a career in neurology to help more people.

The Sydloski family hopes additional research will not only lead to advancements in the treatment of OI, but other disorders of bone weakness such as osteoporosis. “Our lifestyles will be improved by the advancements in technology, and hopefully the lives of other citizens will also be improved as they age and their bodies grow weaker,” Justin says.
When Ellen Mazique-Sydloski found out she was pregnant with twins, she didn’t know what to expect. Ellen, who lives with Osteogenesis Imperfecta (OI), already had one son with the disorder. Ellen knew there was a 50% chance her children would inherit the disease. Kaleb Sydloski was born with OI, known as “brittle bone disease.” His twin brother was not.

Like his older brother Justin, Kaleb played soccer and basketball when he was young. He was open to trying new things and would take on any challenge. He sustained numerous injuries throughout the years due to his condition. “The older Kaleb has gotten, the more breaks and surgeries he has sustained,” Ellen says, “creating an issue with his ability to stay active and maintain his weight and overall health.”

Michelle Caird, MD, a pediatric orthopaedic surgeon at the University of Michigan, manages the Sydloski kids’ OI. She has performed numerous surgeries on both boys. Kaleb’s first surgery was at 8 years old, when Dr. Caird implanted a rod in after Kaleb fractured his tibia. When he was 10, an ankle fracture was the impetus for another surgery, involving pins and screws. At age 11, Kaleb had bilateral osteotomies, which realigned his legs to correct bowing and stabilize his legs. In middle school, Kaleb fractured his elbow and endured two surgeries six months apart.

Kaleb’s anxiety about breaking is pervasive. He lives in fear that he will be injured, and prefers to avoid any situation that has the potential to cause a break. “We have really had to encourage him to try things, and our philosophy is that if you break, you will heal,” Ellen says.

Kaleb regularly goes to physical therapy, which has helped significantly with both physical and emotional healing. He is learning how to participate in activities in a safe manner. The surgeries have enabled Kaleb to walk with a stable gait and he is building confidence to try new things. As he matures, Kaleb is becoming a stronger person who knows how to make the best out of his situation. “The older he gets, the more he demonstrates that he feels more control over his health which decreases his anxiety,” Ellen states.

Now a sophomore in high school, Kaleb is getting stronger every day, though he continues to struggle with not being to participate in sports or other activities with his friends. He recently had an osteotomy and tibia rotation of his right leg, including a rod and screws.

“Having my children have OI has made me stronger in that I will fight through my battles,” Ellen says. “I have instilled in them to fight through theirs no matter what.”

Continued research into rare bone conditions such as OI have the potential to advance care and help increase overall health and quality of life for those living with the disease. “Research may find new ways to treat these types of disorders which may decrease the need for additional surgeries or equipment, saving money for insurance companies.”
Philip Tatman has always been on the go. In high school, he was active in multiple sports and loved exploring the great outdoors. As the starting wide receiver for his high school football team and a track runner, Philip’s life was revolved around sports. He spent his free time in the mountains – rock climbing, ice climbing, and skiing. When he was fourteen, he starting experiencing knee pain and inflammation. He noticed a decrease in his mobility, and was ultimately told to stop running and playing team sports. Activity modification resolved his discomfort, but Philip wasn’t interested in being restricted by pain.

After high school, Philip pursued a career as a climbing guide. He worked in the mountains until 2010, when his knee pain became so severe that he had to stop. “Eventually the pain in my knees became so great I knew I had to leave guiding and pursue a different career,” Philip says. It wasn’t until two years later that he sought medical treatment and was diagnosed with patellofemoral arthritis, a degeneration of cartilage in the knee cap, in both knees. Patellofemoral arthritis is typically caused by knee malalignment and patellar instability.

In October of 2012, Dr. Albert Gee, an orthopaedic surgeon specializing in sports medicine, performed a lateral release on Philip’s right patella. In this procedure, the lateral retinaculum, a fibrous tissue on the outside of the kneecap, is cut, or released, allowing the patella to align more medially and track better over the femur. When the kneecap is properly aligned, it is less likely to rub and grind. In October of 2013, Philip had the same procedure on his left knee.

“My surgeries helped immensely. Before surgery, I would wake up at night due to the pain, have to quit workouts early, and I couldn’t do a full day of skiing,” Philip recalls. “I remember having to stand in class because my knees hurt too much to sit at a desk.” After surgery, his relief was so great that he did not require pain medication and immediately noticed improvements in his sleep. “I could exercise until tired, rather than exercising until I couldn’t handle the pain.”

Philip’s primary activities are now cycling and physical therapy. The skeletal malalignment and kneecap instability are managed by a knee brace and strengthening the quadriceps, which helps reduce inflammation. “The combination of surgery, proper strengthening, knee bracing, and NSAIDs have helped me manage my condition satisfactorily.”

Knee pain has been a significant source of unhappiness in Philip’s life. Quitting sports and being forced to leave the job he loved were socially and emotionally devastating. He still relies on exercise for stress relief, which is hindered by knee pain.

Philip is now taking a different path and climbing to new heights as he works toward dual doctorate degrees – MD and PhD. He struggles with knee pain and stiffness and is striving to achieve work-life balance. “The disease has progressed to the point of daily pain that limits my capacity to exercise and to sit with bent knees for extended periods of time,” Philip says. “I am aware that I will likely require many more surgeries as I age, and will likely require a dual knee replacement.”

Philip knows that orthopaedics is on the verge of a massive breakthrough in regenerative medicine. “More research funding for the development of regenerative therapies will result in additional treatment options that will cure arthritis,” he predicts. “Considering stem cell therapies already exist for small cartilage defects, additional funds will help researchers expand their scope to tackling full joint replacements.”
Johnnie Yellock was born into a military family. In April of 2007, the 22-year-old chose to continue his family’s tradition of service and enlisted in the Air Force Special Operations Command as a Combat Controller. After completing the Combat Control pipeline in June 2009, he was a certified air traffic controller, trained static line and free fall jumper, and a U.S. Army qualified combat scuba diver.

On his second deployment in July of 2011, Johnnie was on mounted patrol in eastern Afghanistan. Command Controllers stand in the back of a vehicle, manning radios and GPS, providing amplified guidance with friendly aircraft. Johnnie was on the outside of his tactical vehicle when it hit and detonated an improvised explosive device, or IED.

Exposed directly to the blast, Johnnie’s feet and ankles sustained a heavy blow. The injuries to his lower extremities were life threatening. After applying tourniquets to his own legs to keep from bleeding out, he continued to perform his job duties by providing landing zone guidance to the Medevac team.

Johnnie was ultimately taken to Brooke Army Medical Center in San Antonio, where he spent the next three years recovering from his injuries and multiple bone infections. He endured 30 surgeries to save his legs. Joseph Hsu, MD, Chief of Orthopaedic Trauma at the U.S. Army Institute of Surgical Research at the time, was part of Johnnie’s surgical team. Dr. Hsu performed multiple limb salvage procedures, including fusions in both of Johnnie’s ankles.

“I should have lost both legs on the field that day,” Johnnie says. “Because of the progress that has been made in limb lengthening and reconstruction, Dr. Hsu was able to save my legs and improve my quality of life.”

Johnnie’s intensive rehabilitation regimen included balance and strength exercises and education on how to care for his wounds and deal with sensitivity and nerve pain. Johnnie was fitted with an Intrepid Dynamic Exoskeletal Orthosis, or IDEO brace, on both legs. The IDEO, developed in the Center for the Intrepid, returns functionality to patients with nerve and muscle loss below the knee, by storing energy and restoring capabilities that an injured ankle cannot perform.

The IDEO braces allow Johnnie to walk, jog, and engage in his true passion – golf. He has been able to return to all of the activities he did before, including skydiving and scuba diving.

Johnnie was awarded the Bronze Star, Purple Heart, and Combat Action Medal for his actions. He medically retired from active duty in November of 2013 and works extensively with numerous veteran charities. He champions the Mark Forester Foundation to honor his best friend who was killed in action in Afghanistan. He was also awarded a new perspective on life. Johnnie has spoken to numerous groups about his experience, and hopes to continue to be a positive influence to others and a role model for perseverance.

Body armor and tourniquets saved Johnnie’s life, and the skill of orthopaedic trauma surgeons in the field saved his legs. “To have been able to keep my legs was a direct result of research available to the surgeons,” he says. “Ongoing research will further improve the effectiveness and availability of life-changing procedures.”
BY THE NUMBERS
Musculoskeletal Conditions
Diseases, disorders, and injuries relating to bones, joints, and muscles

Leading Cause of Disability/Health Care Cost
- **1 in 2** (126.6 million) adults are affected, twice the rate of chronic heart and lung conditions
- **$7,800**: Average annual cost per person for treatment
- **$874 billion (5.7% GDP)**: Annual U.S. cost for treatment and lost wages**

Most Prevalent Musculoskeletal Conditions
- Arthritis and Related Conditions
- Back and Neck Pain
- Injuries: Falls, Military, Sports, Workplace
- Osteoporosis
- **51.8 million** adults report they have arthritis
- **75.7 million** adults suffer from neck or low back pain
- **4.5 million** sports musculoskeletal injuries require medical attention each year, 64% of all sports injuries
- **1 in 2 women and 1 in 4 men** over age 50 will have an osteoporosis-related fracture, with 20% mortality rate within 12 months of a hip fracture
- **Millions** suffer from spinal deformities, congenital conditions, cancers of bone and connective tissue

Health Care Impact
- **18%** of all health care visits*
- **52 million** health care visits for low back pain*
- **6.7 million** hospitalizations for arthritis and other rheumatic conditions*
- **65.8 million** health care visits for injuries; **14.4 million** health care visits for childhood injuries*
- **1.14 million** hospital discharges for fractures, 53% for persons age 65 and over*

Economic Impact: Lost Work Time and Wages
- **83.1 billion**: hospital cost to treat injuries**
- **291 million**: lost work days due to back and neck pain***
- **3 days longer** off work than for other types of workplace injuries
- **461.5 billion**: annual earnings loss for persons with arthritis condition**

* 2010, ** 2011, *** 2012

THE BY NUMBERS: Musculoskeletal Conditions is sourced from

The United States Bone and Joint Initiative (USBJI) is part of the worldwide campaign to advance understanding, prevention, and treatment of musculoskeletal disorders through education and research. To learn more, visit www.usbji.org.
References: For additional information, refer to the tables listed below at www.boneandjointburden.org.

Leading Cause of Disability and Health Care Cost


Prevalent


Health Care Burden


In Partnership With:

American Orthopaedic Foot and Ankle Society
American Orthopaedic Society for Sports Medicine
American Shoulder and Elbow Surgeons
Limb Lengthening and Reconstruction Society
North American Spine Society
Orthopaedic Research Society
Pediatric Orthopaedic Society of North America
Scoliosis Research Society
ORTHOPAEDIC CARE has changed the lives of millions of people. When Zion Harvey was two years old, he lost both hands and both feet to a life-threatening infection. He is able to walk, run, and jump with prosthetic legs. When his mother investigated hand prosthetics, the doctors proposed a novel idea: hand transplantation. With months of preparation and planning and a surgical team of over 40 individuals, Zion became the first ever pediatric hand transplant recipient. To read more about Zion’s story, turn to page 9.