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LOWER EXTREMITY REVIEW

March 26 / volume 18 / number 3

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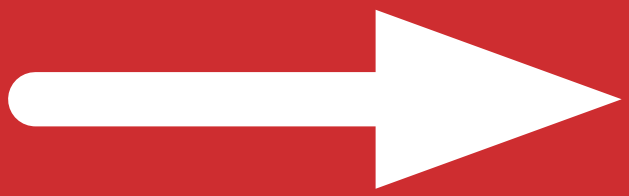

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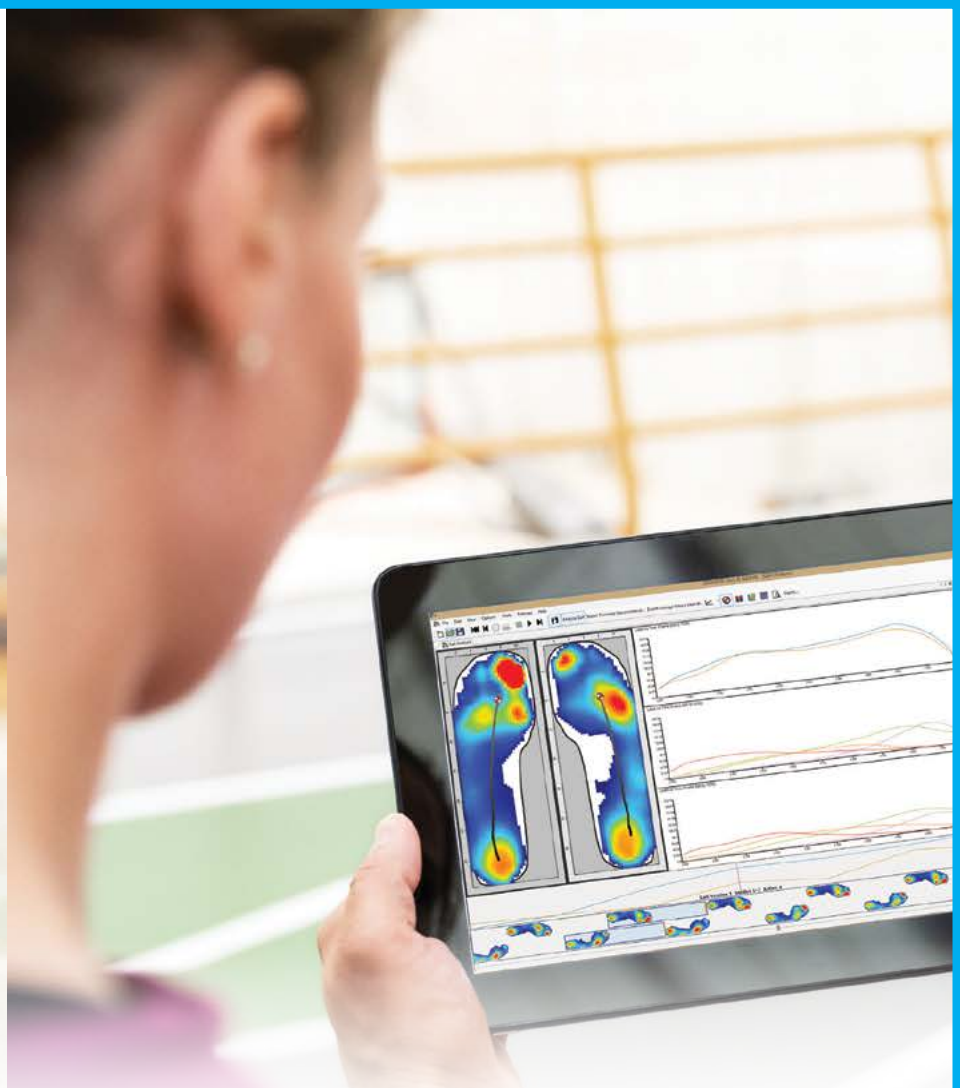

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Showcasing evidence and expertise across multiple medical disciplines to build, preserve, and restore function of the lower extremity from pediatrics to geriatrics.

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- Biomechanics matter
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- Injury prevention is possible
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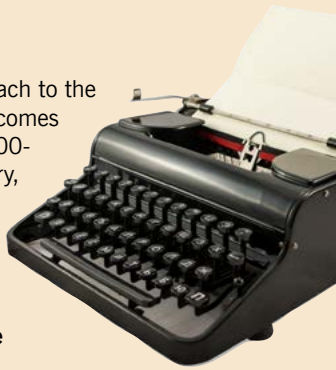

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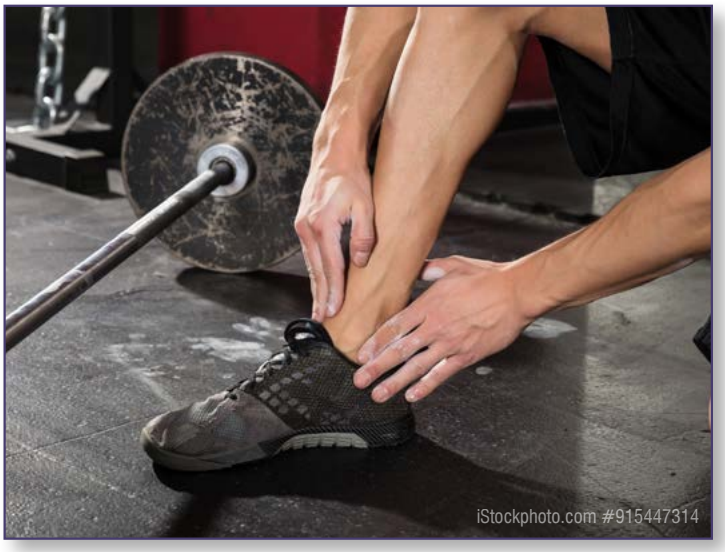
WEIGHTLIFTING-ASSOCIATED LOWER EXTREMITY INJURIES



Weightlifting continues to increase in popularity due to its numerous benefits for physical health, performance enhancement, and age-related functional preservation. Although previous studies have investigated injury patterns in strength athletes, few have examined lower extremity injuries among the general population.

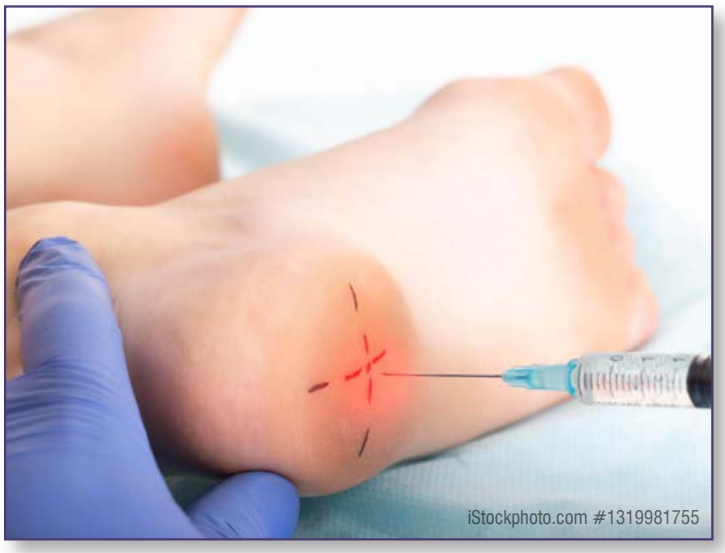
A retrospective cohort study of the National Electronic Injury Surveillance System (NEISS) was conducted to identify emergency department visits for lower extremity injuries related to weightlifting between January 1, 2014, and December 31, 2023.

The sample included 6846 cases (national estimate [NE] = 260,704). The mean age was 32.20 ± 30.71 years, with approximately 69.9% of the study population being male. Common diagnoses were contusion/abrasion (n = 1435; NE = 55,722; weighted percent of NE = 21.0%), fracture (n = 1321; NE = 48,344; 19.5%), and nerve injury (n = 348; NE = 15,397; 5.1%). The most commonly affected body parts were lower trunk (n = 2575; NE = 101,480; 37.6%), toe (n = 1697; NE = 60,871; 24.8%), and foot (n = 1389; NE = 52,860; 20.3%). Pediatric patients experienced the highest proportion of injuries to the toe (NE = 22,328, 35.2%) and foot (NE = 18,223, 28.7%), whereas high rates of lower trunk injuries were observed in young adults, middle-aged adults, and geriatric populations (NE = 60,594, 47.0%; NE = 25,559, 46.7%; NE = 4528, 33.7%; respectively).

The increased risk of foot and toe trauma in pediatric patients and high incidence of injuries due to dropped weights highlight the need for increased supervision, education, and protective equipment. In contrast, adult lifters were commonly injured performing lifting movements, resulting in increased rates of lower trunk injuries.

Source: *Nishida C, Lee PM, Kim N, et al. Weightlifting-associated lower extremity injuries among pediatric and adult patients: a national analysis from 2014 to 2023. Orthop J Sports Med. 2025 11;13(12):23259671251397390. doi: 10.1177/23259671251397390.*

BOTULINUM TOXIN TYPE A IN THE MANAGEMENT OF PLANTAR FASCIITIS

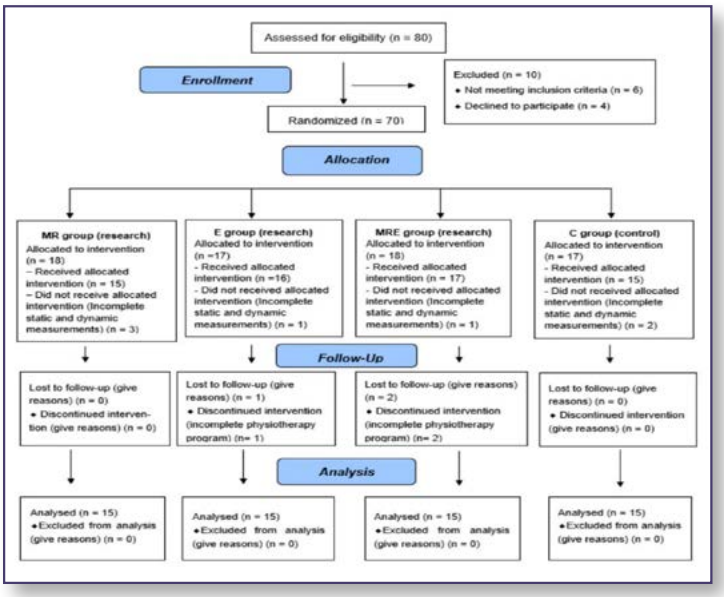


Plantar fasciitis is a prevalent cause of heel pain in adults, particularly among the middle-aged population. It is characterized by microtrauma that exceeds the regenerative capacity of the plantar fascia. Although most cases respond well to conservative treatment, such as stretching exercises, orthotic use, and nonsteroidal anti-inflammatory drugs, some cases progress to chronic stages that require second-line therapies, including extracorporeal shockwave therapy, corticosteroid or platelet-rich plasma injections, or surgical plantar fascia release. This review aims to evaluate the efficacy of botulinum toxin type A (BTA) injections in the management of chronic plantar fasciitis. A narrative review was conducted without any date restrictions, covering the period from 1994 to 2025, through databases including PubMed, Scopus, ScienceDirect, and Google Scholar. Included studies focused on patients with plantar fasciitis unresponsive to conservative treatments, using pain and functional outcomes as endpoints. Three randomized controlled trials demonstrated that BTA injections significantly reduced pain and improved function across short, mid-, and long-term follow-ups. BTA acts at the neuromuscular junctions to reduce muscle tone and modulate pain pathways. BTA injections appear to be a safe and effective option for patients with chronic plantar fasciitis unresponsive to first-line therapies. Image-guided injections (ultrasound or electromyographic) are recommended to enhance accuracy. Further research is neces-

sary to establish standardized protocols regarding the injection site, dosage, guidance technique, and reinjection timing.

Source: *Iziki C, Skalli S, Lahbabi L, Haltout N, Karkouri S. Botulinum toxin type a in the management of plantar fasciitis: a step forward in pain relief. Cureus. 2025 18;17(8):e90415. doi: 10.7759/cureus.90415. Use is per CC BY.*

MYOFASCIAL TECHNIQUES ROM AND FLAT FOOT EFFICIENCY IN ADULTS



Symptomatic flat foot is quite a common pathology in adults. Myofascial release is 1 of the physiotherapeutic methods that are currently used in the treatment of musculoskeletal diseases. This study aimed to assess the impact of myofascial release on the range of motion and functional efficiency of the flat foot in adults. The study involved 60 people with flat feet allocated to 4 groups and therapy lasting 4 weeks: group MRE (Myofascial Release and Exercises): myofascial techniques and an exercise program; group MR (Myofascial Release): only myofascial techniques; group E (Exercises): only an exercise program; and the control group C (Control): no intervention. The range of all tested movements significantly improved after therapy in groups MRE (left foot: dorsiflexion P = 0.017; plantar flexion P = 0.006; inversion P = 0.003; and eversion P = 0.001; right foot: dorsiflexion P = 0.008; plantar flexion P = 0.003; inversion P = 0.008; and eversion P = 0.004) and MR (left foot: dorsiflexion P = 0.001; plantar flexion P = 0.001; inversion P = 0.001; and eversion P = 0.001; right foot: dorsiflexion P = 0.001; plantar flexion P = 0.002; inversion P = 0.001; and eversion P = 0.029). The results were significantly better after therapy in groups MRE (P = 0.010), MR (P = 0.001) and E (P = 0.015). In the people studied, the combination of myofascial techniques and exercises (MRE) was the most effective for improving the tested ranges of motion of the ankle joint.

Source: *Kaczor S, Żmudzińska U, Kulis A. The influence of myofascial techniques on the range of motion and flat foot efficiency in adults with symptomatic flat foot: a controlled randomised trial. Healthcare (Basel). 2025 19;13(16):2046. doi: 10.3390/healthcare13162046.*

COMPARISON OF SINGLE USE AND NEGATIVE PRESSURE WOUND THERAPY DEVICES IN LEUS

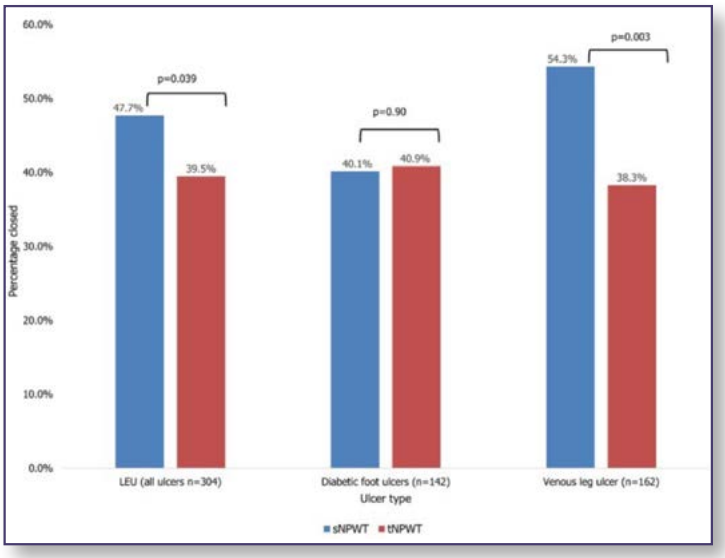


Figure. The rate of wound closure is shown as percent closed (%) when using sNPWT or tNPWT for LEUs (all ulcers), DFUs, and VLUs. DFU, diabetic foot ulcer; LEUs; sNPWT, single–use negative pressure wound therapy; tNPWT, traditional negative pressure wound therapy; VLU, venous leg ulcer.

Annually, 49 million people worldwide are impacted by lower extremity ulcers (LEUs). Diabetic foot ulcers (DFUs) and venous leg ulcers (VLUs) are the most common LEUs. Negative pressure wound therapy (NPWT) has emerged as an effective intervention for complex wounds, offering numerous favorable wound healing outcomes. The objective of this study was to evaluate the effectiveness of single-use NPWT (sNPWT) versus traditional NPWT (tNPWT) for wound closure in LEUs. Real-world data was obtained from the US-based Net Health outpatient database between January 2014 and October 2020 and included patients with LEUs (DFU or VLU) who had been treated with sNPWT or tNPWT. The rate of wound closure and time to wound closure were selected as endpoints. The wound closure rate was significantly higher for all LEUs (P = 0.039), VLUs alone (P = 0.003) and there was no difference for DFU (P = 0.90) that were treated with sNPWT versus tNPWT. The median time to wound closure was significantly shorter for sNPWT (114 days) compared to tNPWT (140 days, P < 0.01). Using sNPWT was associated with significantly higher wound closure rates and shorter time to wound closure. The results provide supportive evidence for using sNPWT for LEUs, demonstrating the opportunity to directly decrease the clinical burden of LEUs on patients. Subgroup analysis revealed a significant

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difference in wound closure rates for VLU, while no significant difference was observed for DFU. The overall LEU findings may be attributed to differences in the mechanisms of action between the 2 devices.

Source: *Garten A, Nherera LM, Lindsay R. Comparison of single use and traditional negative pressure wound therapy devices in lower extremity ulcers: a us real-world evidence analysis of nethealth data. Int Wound J. 2025;22(9):e70756. doi: 10.1111/iwj.70756.*

DEVICE VARIABILITY IN PLANTAR PRESSURE THRESHOLDS AND DIABETIC FOOT CARE DECISIONS

Plantar pressure measurement is used to identify areas of high mechanical loading in people at risk of diabetic foot ulceration. Fixed thresholds, such as 200 kPa for in-shoe and 600 kPa for barefoot measurements, are commonly reported in the literature and applied in clinical decision-making in diabetic foot care. However, the validity of these thresholds across different measurement systems remains uncertain.

Fifteen healthy adults walked under controlled conditions while plantar pressures were recorded using 3 platform systems and 2 in-shoe systems. Peak pressures were extracted for heel, midfoot, and forefoot regions. Analyses examined the frequency of exceeding 200 and 600 kPa thresholds, agreement across devices, the reliability of derived measures, including the rearfoot-forefoot ratio and identification of the region of maximum loading.

The 200 kPa threshold was exceeded in 99.3 % of heel and forefoot data, but distributions of values differed significantly across devices ($P < 0.05$). Agreement, defined as all devices classifying the same participant, foot, and region as either above or below 600 kPa, was low overall (5.4 %), higher in the heel than the forefoot, and differed significantly between platform systems ($P < 0.05$). In-shoe devices consistently reported values below 600 kPa. Limited reliability was observed with the rearfoot-forefoot ratio achieving only 53.6% agreement across devices, and agreement in the most loaded in just 6.7% of cases.

Absolute thresholds such as 200 and 600 kPa are unreliable across commercial systems and foot regions. Common derived measures are also device dependent. Clinical guidelines should move beyond fixed thresholds and adopt device-specific or multidimensional approaches for risk assessment in diabetic foot care.

Source: *Chockalingam N, Giacomozzi C, Healy A, Monteiro RL, Ferreira JSSP, Sacco ICN. Device-dependent variability of plantar pressure thresholds: consequences for clinical decision-making in diabetic foot care. Gait Posture. 2026 11;126:110128. doi: 10.1016/j.gaitpost.2026.110128.*

THE EFFICACY OF HILT AND STRETCHING EXERCISES FOR PLANTAR FASCIITIS TREATMENT

Plantar fasciitis causes heel pain and functional limitations; conservative treatment typically includes plantar fascia and calf stretching. High-intensity laser therapy (HILT) offers deeper photobiomodulation and potential tissue-healing benefits. In this study participants were randomly allocated into 2 groups: the HILT group and the sham treatment group. Both groups received 9 treatment sessions over 3 weeks. The HILT group received active laser therapy, while the sham group received identical treatment without laser emission. In addition to the assigned interventions, all participants performed a standardized self-stretching exercise program targeting the plantar fascia and Achilles tendon throughout the study period. The primary outcome was pain intensity measured using a visual analog scale.

A total of 34 patients diagnosed with unilateral plantar fasciitis were enrolled in this study. Based on intragroup comparison, both groups demonstrated statistically significant improvements in all outcomes compared with baseline ($P < .001$). However, no significant differences were found between the 2 groups across all outcomes. The mean difference in pain reduction, measured by the visual analog scale, was -35.3 (95% CI -45.3 to -25.0) mm in the HILT group and -30.4 (95% CI -46.3 to -14.4) mm in the sham group (-5.0 mm, 95% CI -14.3 to 4.3; $P = .59$). Similarly, reductions in PFT and improvements in FAAM scores showed no significant differences between groups (mean difference -0.02 mm, 95% CI -0.2 to 0.1; $P = .90$ and 5.6 points, 95% CI -1.1 to 12.4; $P = .40$, respectively).

There was no additional clinical effectiveness of HILT on pain reduction, decreased PFT, or increased FAAM scores compared with sham laser when combined with standard stretching exercises for plantar fasciitis and the Achilles tendon.

Source: *Jitpimolmard N, Ouemphancharoen P, Arayawichanon P. Efficacy of high-intensity laser therapy combined with plantar fascia stretching exercises in the treatment of plantar fasciitis: randomized, double-blind, sham-controlled trial. JMIR Rehabil Assist Technol. 2026 20;13:e77419. doi: 10.2196/77419.*

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RETURN TO PLAY AFTER ANKLE SPRAINS AND ACHILLES TENDON RUPTURES IN TENNIS

Ankle sprains and acute Achilles tendon ruptures are common injuries among recreational tennis players. Patients who sustained an ankle sprain (n=39) or an Achilles tendon rupture (n=7) while playing tennis were retrospectively evaluated. Ankle sprain patients were younger (39 years), smaller and lighter (BMI males 24.3, females 22.5) than Achilles tendon rupture patients (49 years, BMI males 26.8). Ankle sprains occurred more often on clay (56% [CI 40-72%]) and Achilles tendon ruptures on carpet courts (57% [CI 18-90%]). The return-to-play rate for tennis was 90% in patients with ankle sprains after a mean of 3.6 months and 29% in patients with Achilles tendon ruptures (2 patients), with returns occurring at 5 and 36 months. The return to any sport was 97% and 100%, respectively. Twenty-one per cent of all ankle sprain patients experienced subsequent events (1-3), with a 10% recurrence rate after a first-time event and a 33% rate in patients with recurrent instability episodes. The return-to-play rate for tennis was high after an ankle sprain and low after an Achilles tendon rupture. The reason for not returning in recreational players was either fear of re-injury or preference for other sports, not because of injury-related disabling factors. Patients after Achilles tendon rupture who returned to play tennis did not have any functional problems, and patients after ankle sprain rarely experienced minor instability or pain.

Source: *Kaiser P, Petry B, Genelin K, et al. Injury characteristics, outcome, and return to play after ankle sprains and Achilles tendon ruptures in tennis. S Afr J Sports Med. 2026 15;38(1):v38i1a22949. doi: 10.17159/2078-516X/2026/v38i1a22949.*

FUNCTION AND INJURY RISK IN ADOLESCENT FEMALE VOLLEYBALL PLAYERS WITH AND WITHOUT CAI

Chronic ankle instability (CAI), a prevalent injury among female volleyball players, can negatively affect functional performance and increase the risk of further injury. The aim of this study was to compare functional movement quality, dynamic balance, vertical jumping performance, hip muscle strength, and risk of injury between adolescent female volleyball players with unilateral CAI and those without CAI. This cross-sectional study included 46 adolescent female volleyball players, divided into CAI (n = 23) and control (n = 23) groups based on predefined criteria. Maximal isometric strength of the hip muscles was measured using hand-held dynamometry, and vertical jumping performance was assessed using countermovement jump tests. Injury risk was classified based on established cut-off values for the FMS-composite and YBT-anterior reach asymmetry scores. The CAI group demonstrated significantly lower FMS-composite scores ($P = 0.007$), reduced anterior reach on the YBT ($P = 0.004$), and decreased strength in the hip flexors ($P = 0.007$) and hip adductors ($P = 0.044$), supported by moderate effect sizes. No significant group differences were observed in the other YBT directions, vertical jump tests, or the other hip muscles ($P > 0.05$). A greater proportion of athletes in the CAI group were classified as high risk for injury based on both FMS-composite ($P = 0.022$) and YBT-anterior reach asymmetry ($P = 0.001$) cut-off values, supported by moderate and relatively strong effect sizes, respectively. Adolescent female volleyball players with unilateral CAI showed impaired movement quality, balance deficits, hip muscle weakness, and increased injury risk. These results highlight the importance of targeted interventions and broader investigations into CAI in adolescent athletes.

Source: *Akoğlu AS, Adın RM, Ada AM, Bayrakcı Tunay V, Erden Z. Comparison of functional movement, balance, vertical jumping, hip strength and injury risk in adolescent female volleyball players with and without chronic ankle instability. Medicina (Kaunas). 2025 28;61(9):1547. doi: 10.3390/medicina61091547.*

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Fibular Nails–Fad or New Standard?


Brian Burgess, DPM

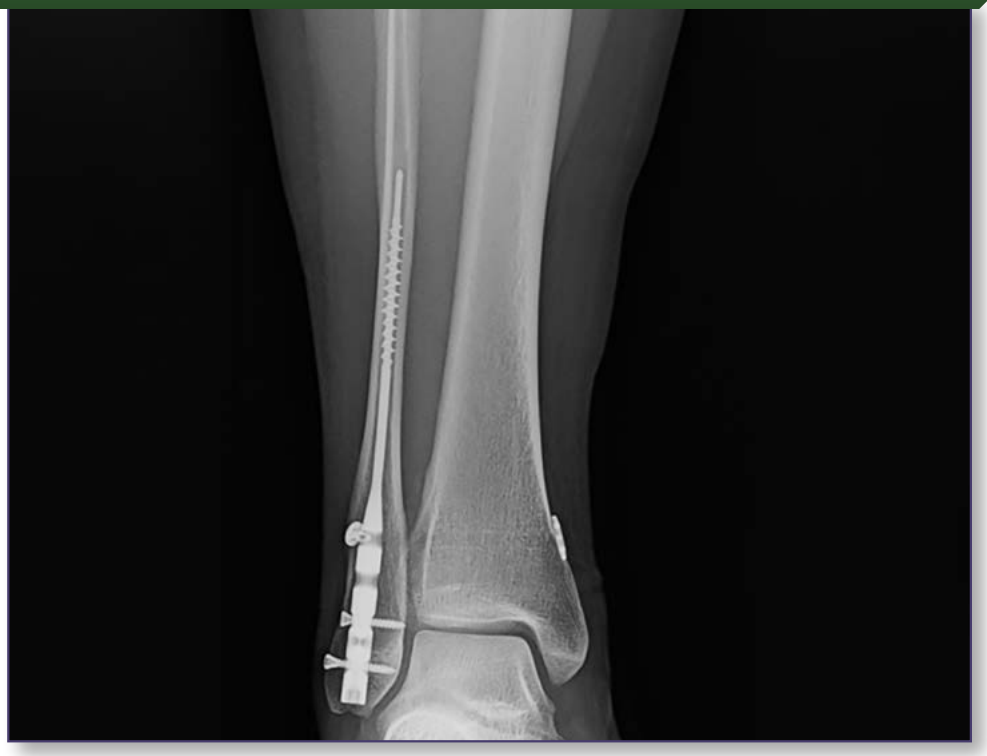

Brad Abicht, DPM, FACFAS


Jeff Dikis, DPM

By Brian Burgess, DPM with Brad Abicht, DPM, FACFAS and Jeff Dikis, DPM

This article synthesizes the key findings, surgical techniques, and clinical insights from a lerEXPO's 2025 Gait Keepers Journal Club regarding the use of intramedullary fibular nails for distal fibula fractures. The primary focus is on a retrospective multi-center study published in the *Journal of Foot & Ankle Surgery* (JFAS) in 2023, which represents the largest cohort of its kind to date.

The transition from traditional Open Reduction Internal Fixation (ORIF) with plates and screws toward intramedullary fibular nailing represents a significant paradigm shift in ankle fracture management. While historically reserved for "train wreck" patients–those with compromised soft tissue, diabetes, or advanced age–current clinical evidence suggests that fibular nails are highly effective for simpler fracture patterns, such as stress-positive Weber B fractures.



Critical Takeaways:

- **Large-Scale Validation:** The 2023 study reviewed 151 patients, confirming that third-generation fibular nails provide safe and effective fixation with low complication rates.
- **AO Principle Alignment:** Nailing better adheres to AO principles regarding the preservation of blood supply and early mobilization compared to traditional plating, which requires extensive periosteal stripping.
- **Accelerated Recovery:** For isolated fibular fractures, immediate postoperative weightbearing is now a viable protocol, significantly improving patient independence and reducing risks associated with immobilization.
- **Reduction Philosophy:** Functional reduction (restoring length and rotation) in the extra-articular fibula is clinically sufficient, as functional outcomes remain excellent even when radiographic reduction is categorized as "fair."

Study Overview: A Retrospective Analysis

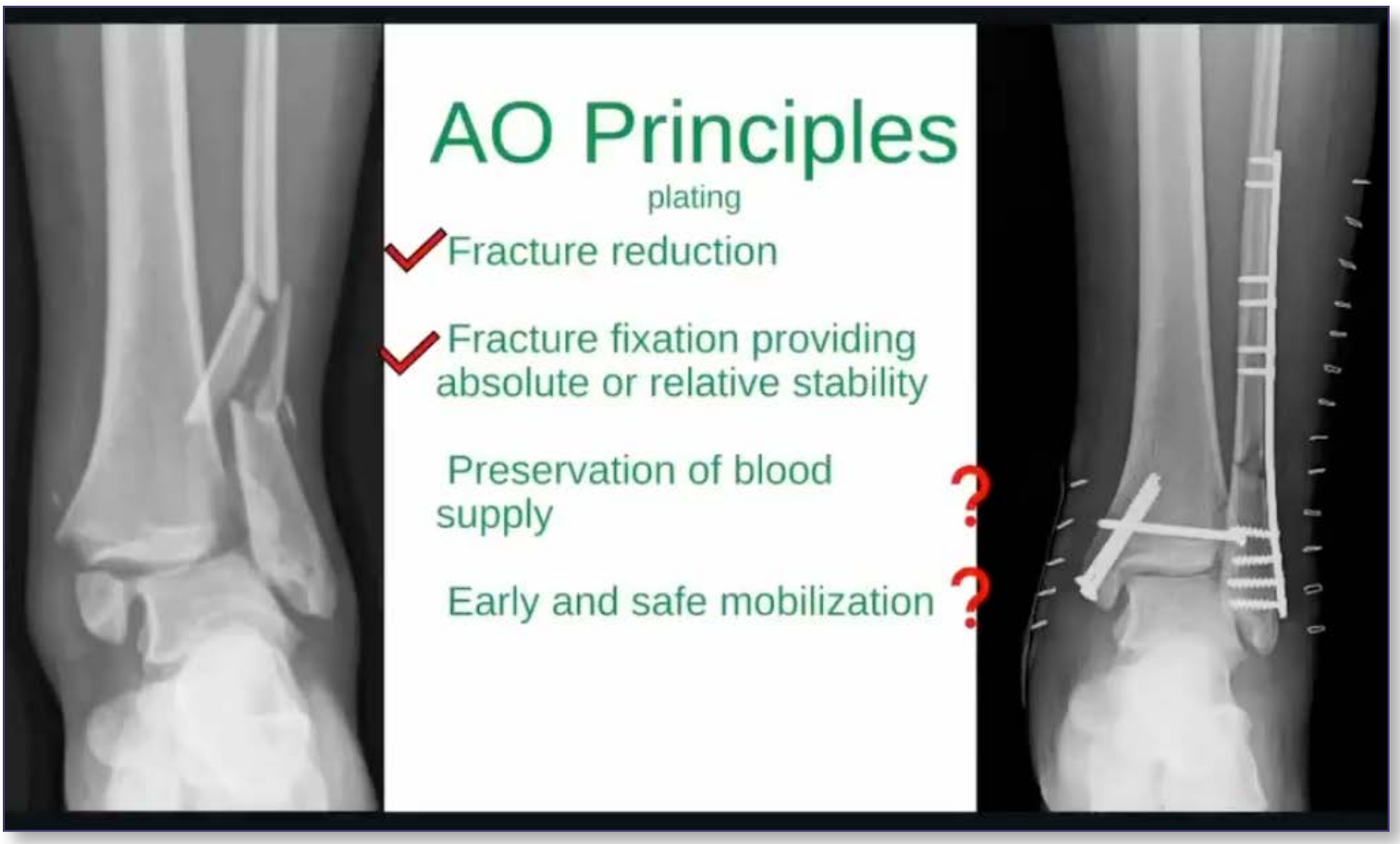
The discussion centers on a Level III evidence study published in *JFAS* 2023, co-authored by Dr. Brian Burgess.

- **Cohort Size:** 151 patients (the largest published cohort to date).
- **Timeline:** January 2015 to July 2021.
- **Demographics:** The average patient age was 52 years, ranging down to 18 years, indicating that the technique is no longer limited solely to geriatric populations.
- **Primary Findings:** The study demonstrated excellent union rates and a significant reduction in wound complications compared to historical ORIF data.

Evolution of Fibular Nail Technology

The clinical success of fibular nailing is largely attributed to the advancement of nail design

This article summarizes the presentation by Dr. Brian Burgess with Dr. Abicht and Dr. Dikis titled, "Fibular Nails–Fad or New Standard?" from Gaitkeepers Journal Club February 25, 2025. To view the full presentation with audience questions and answers–and to see the complete agenda for the program–visit https://gaitkeepers.lerexpo.com/. Continuing education credits are available for this and many other lerEXPO programs.



across 3 generations (see Table).

Rigid vs. Flexible Nails

- **Rigid/Pre-bent Nails:** These nails are designed for stability but operate on the assumption of uniform anatomy. In some cases, the rigidity can "kick out" a perfect reduction during insertion.
- **Flexible Nails:** These can contour to the patient's specific anatomy.
- **Proximal Purchase:** Newer nails often feature expandable proximal fixation to ensure purchase in the wider proximal medullary canal, particularly when using longer nail lengths (eg, 180 mm).

Clinical Indications and Patient Selection

The consensus among practitioners has evolved regarding which patients benefit most from nailing:

1. **Historically Indicated Patients:** High-risk "train wrecks" with poor soft tissue envelopes, smokers, diabetics, and the elderly.
2. **Modern Primary Indications:** Simple, stress-positive Weber B fibular fractures. These patients benefit from minimally invasive surgery (MIS), zero hardware prominence, and small incisions.
3. **Relative Contraindications:** Weber C fractures can be more challenging to reduce with a nail. Highly unstable dislocations in young patients may still require traditional ORIF.
4. **Anatomical Constraints:** Surgeons must evaluate the fibular isthmus preoperatively. Younger, petite, athletic females may have medullary canals too narrow for even a guide wire.

Surgical Technique and Reduction Strategies

A common misconception is that the nail itself achieves the reduction. Experts emphasize that the surgeon must reduce the fracture *before* or *during* nail insertion.

Percutaneous Reduction Tips

- **Manual Restoration:** Use thumbs to push the distal fragment anteriorly and pull it out to length by manipulating the peroneals.
- **Clamping:** Utilize a large, pointed reduction clamp from the medial malleolus to the distal fibula to close the medial clear space. A second percutaneous clamp can be used anterior-to-posterior (A-to-P) to close the fracture site.
- **Maintaining Reduction:** It is recommended to keep the reduction clamp in place while inserting the nail to prevent the hardware from displacing the fracture or causing shortening.

Medial Malleolus and Syndesmosis

- **Fix Medial First:** If a medial malleolus fracture is present, reduce and fix it first to provide an anatomical "anchor" for the rest of the ankle.
- **Open the Medial Side:** Even if the fibula is treated percutaneously, the medial malleolus should often be opened via

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Table. Advancement of Nail Design Across 3 Generations

GENERATION	KEY CHARACTERISTICS	LIMITATIONS/OUTCOMES
First Generation	Basic pin fixation; no proximal fixation.	Poor rotational control; poor reduction maintenance; high failure rates.
Second Generation	Introduction of basic proximal fixation.	Improved length maintenance.
Third Generation	Advanced proximal fixation (sometimes expandable); specific syndesmotic options.	Superior rotational stability; prevents shortening; better functional outcomes.

a mini-incision (1–2 cm) to extract interposing periosteum or tissue that could cause a non-union.

- **Syndesmotic Fixation:** There is a low threshold for adding syndesmotic stabilization (eg, suture buttons). This acts as an "indirect deltoid repair" by sucking down the medial clear space.

Weightbearing and Recovery Outcomes

One of the most significant advantages of fibular nailing is the ability to accelerate weightbearing protocols.

Average Time to Weightbearing (Study Data)

- **Isolated Fibular Fractures:** 3.9 weeks
- **Bimalleolar Fractures:** 3.3 weeks
- **Trimalleolar Fractures:** 5.1 weeks
- **Pilon Fractures:** 6.8 weeks

Current Clinical Practice: For isolated fibular fractures fixed with a nail, some surgeons now permit immediate postoperative weightbearing in a CAM boot. This is rarely possible with traditional plating due to the size of the incision and the increased risk of wound dehiscence with early mobilization.

Radiographic vs. Functional Outcomes

The study utilized the McLennan and Ungersma guidelines to qualify reductions as "good," "fair," or "poor."

- **Reduction Accuracy:** 97% of cases were reduced to length; 100% achieved closure of the medial clear space.
- **Acceptable Displacement:** Approximately 9% of cases showed "fair" reduction, often involving a 1–2 mm posterior displacement. This is frequently due to the syndesmotic screw/button passing through the fracture site.
- **Clinical Relevance:** There is no documented clinical difference in functional outcomes between "good" and "fair" radiographic reductions. Because the fibula is largely extra-articular, a "functional reduction" (restoring gross anatomy, length, and rotation) is sufficient for patient satisfaction and long-term success.

Notable Quotes on Clinical Philosophy

"I really think fibular nailing kind of conforms to the AO principles better than plating... Number 3 is preservation of blood supply. Number 4 is early and safe mobilization. You can't tell me you're putting a big plate on a patient... [and] preserving the blood supply. You're not. You're stripping the periosteum."–**Dr. Brian Burgess**

"If I'm going to use the nail, I want to use it on an elderly patient with a very simple Weber B fracture that doesn't require a lot of reduction and then just throw that up there minimally invasive... and then just get them walking right away."–**Dr. Jeff Dikis**

"One thing that kind of annoys me is when surgeons arrogantly say, 'I don't need fibular nails because I don't have wound complications.' ...If you're doing a fair amount of these, these patients, they're not all young and healthy... there's just no scenario where you're opening every single ankle fracture... and you're not getting wound issues."–**Dr. Brian Burgess**

Dr. Brian Burgess is a board-certified podiatric surgeon who specializes in foot and ankle surgery. His treatment philosophy stresses conservative management and an evidence-based approach to surgical intervention when indicated. Prior to surgery, Dr. Burgess uses a variety of conservative techniques including injections, bracing, orthotics and physical therapy. With an emphasis on minimally invasive techniques, he frequently returns his patients to an active lifestyle in a quick and safe manner.

Dr. Burgess is well-trained in all aspects of the foot and ankle and has a special interest in minimally invasive bunion correction, minimally invasive fracture repair, Achilles tendon disorders, acute and chronic ankle sprains, ankle arthroscopy, heel pain treatment, orthotic therapy, sports-related injuries and trauma/fractures of the foot and ankle.

Dr. Burgess received his podiatry degree from the Dr. William M. Scholl College of Podiatric Medicine in 2009 and his bachelor's degree, with honors, from the University of Illinois at Urbana-Champaign. Dr. Burgess completed a 3-year podiatric surgical residency in trauma and reconstructive surgery of the foot and ankle at Mercy Hospital and Medical Center in Chicago.

In addition to his clinical practice, Dr. Burgess is actively involved with medical education. He is the Fellowship Director of Hinsdale

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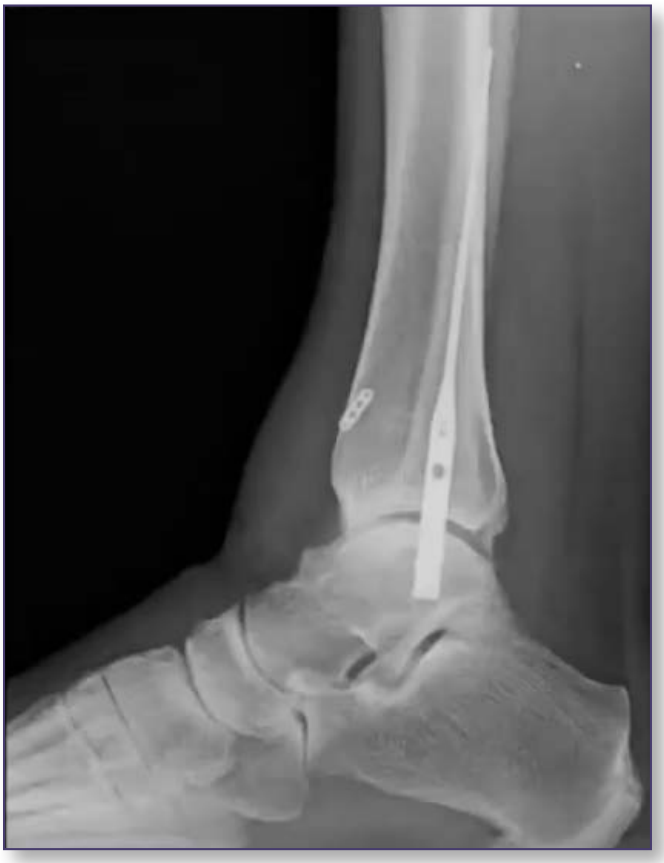

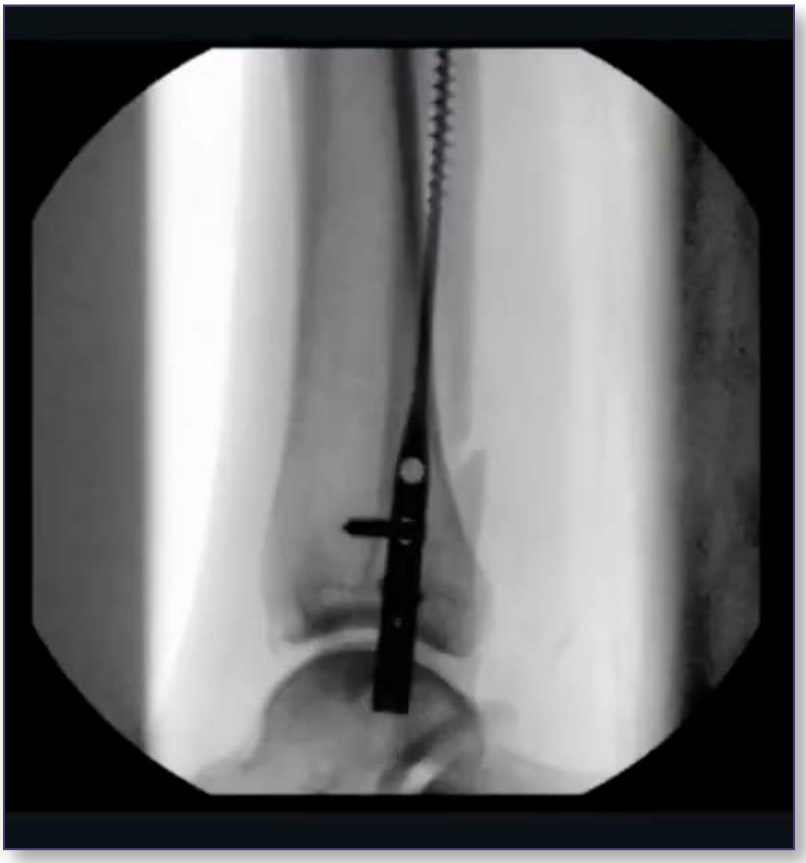

Orthopaedics (IBJI) Foot and Ankle Fellowship. He is actively involved within The College of Foot and Ankle Surgeons where he dedicates considerable time training medical students, residents and experienced surgeons. He frequently lectures nationwide and is an invited faculty at advanced ankle arthroscopy courses and annual scientific conferences.

Bradley P. Abicht, DPM, FACFAS, is the Department Chair of Podiatric Medicine and Surgery at emplify Health by Gundersen in La Crosse, Wisconsin. He is a leader in minimally invasive (MIS) and percutaneous foot and ankle surgical procedures as well as foot and ankle reconstructive surgery, foot and ankle arthroscopy, and foot and ankle sports injuries. An educator to residents and medical students, he is frequently published in peer reviewed journals. A renown national and international speaker and founder of the annual Western WI Foot & Ankle. He also serves as the Medical Director of lerEXPO, Associate Editor of FASTRAC and hosts GaitKeepers Journal Club.

Jeffrey Dikis, DPM currently practices as a partner with McFarland Clinic, Iowa's largest physician-owned multispecialty clinic. After residency at the University of Pittsburgh Medical Center, he worked at an orthopedic group in Tennessee before moving home to Iowa. He is certified in foot surgery and reconstructive foot and ankle surgery by the American Board of Foot and Ankle Surgery. He serves as clinical faculty with the Des Moines University College of Podiatric Medicine and Surgery. Dr. Dikis has extensive training in Arthroscopy, Trauma, Sports Medicine and Reconstructive Surgery, and has taught and lectured at national educational conferences and courses.

He is the host and creator of the popular Pod Patrol podcast, an entertainment and educational podcast, covering topics of the foot and ankle with both podiatric and orthopedic colleagues. He is one-half of the instagram tandem FootDocDuo, producing educational content. He has authored research papers in both The Foot and Foot & Ankle International.

He is married to his wife, Ashley, also a podiatric surgeon, and has 2 young boys. He enjoys music and plays the piano and drums. He is an avid Iowa Hawkeye fan and enjoys coaching his kids' soccer and basketball teams.

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1st Ray Shortening and Elevation Post-Lapidus, How to Address It: A Surgeon's Guide

By Marie Keplinger, DPM, FACFAS

Introduction: The Challenge of Surgical Perfection

Surgery, especially in the world of foot and ankle reconstruction, is like solving a complex, 3-dimensional puzzle. Our goal is to take a structure that has adapted over a lifetime into a painful position and restore its original, functional architecture. One of the most powerful tools we have for this is the Lapidus procedure, which corrects a complex bunion deformity–what surgeons call a triplane deformity. We meticulously realign the bones in all 3 dimensions to give the patient a stable foot that will last a lifetime.

But what happens when the puzzle pieces heal in the wrong position? What do you do when the surgery is a success in terms of healing, but a failure in terms of alignment? This guide explores the surgical challenges that can arise after a Lapidus procedure and reveals the toolkit surgeons use to fix them.

1. The Goal: What a Successful Lapidus Procedure Achieves

The primary goal of a Lapidus procedure is to correct hallux valgus deformity by addressing its true nature as a triplane deformity. This means the bone is misaligned in 3 different geometric planes. To achieve an adequate correction, we must fix the alignment in all 3.

- **Adduction:** The first metatarsal bone has angled away from the foot's midline and toward the second toe, creating the characteristic medial bump. We must bring it back into a straight alignment.
- **Dorsal Elevation:** The metatarsal has tilted upward in the sagittal plane (when viewed from the side), disrupting the foot's arch. We have to bring it back down to bear weight properly.
- **Pronation:** The metatarsal has rotated along its long axis, causing the toenail to face inward. We have to de-rotate it so the toe is properly aligned with the ground.

When all 3 of these planes are corrected, the result is a stable, correctly aligned foot designed to function perfectly for a lifetime.

This is the ideal outcome, but the reality is that achieving this exact anatomic position on the operating table is difficult, and sometimes, complications arise.

2. The Core Problem: Understanding "Malunion"

When a Lapidus procedure doesn't achieve its goal, the most common issue we face is a malunion. In simple terms, a malunion means the bones have successfully fused together–the healing process worked–but they fused in an incorrect or poor position.

These malunions can be the result of placement of the first ray not in an ideal position during initially, technically complex surgery. It's a failure of positioning, not a failure of biology.

Think of it like a series of case files. Each malunion presents a unique problem with a distinct impact on the patient. Let's investigate the most common ones.

3. Case Files: The 5 Common Types of Lapidus Malunions

3.1. The Bunion Returns (Recurrence & Undercorrection)

- **Problem:** This is the most straightforward malunion: the bunion deformity comes back. It happens when the angles of the foot, particularly the angle between the first and second metatarsals, were not corrected enough during the first surgery.
- **Patient Impact:** While an X-ray might show that the deformity has returned, it doesn't always mean the patient is in pain. A 2020 study found that while 46% of cases had radiographic recurrence, only 12% were symptomatic enough to require a second surgery.

Key Insight: Research by Shabuya et al. revealed that the position of the sesamoids is the single most predictive factor for recurrence. The data is striking: they found that when the tibial sesamoid position was greater than 4 (out of a 7-point scale), the recurrence rate was 50%. If it was greater than 5, the rate jumped to 60%. If these bones are not adequately realigned, they exert a pull that gradually causes reoccurence.

This article is a summary of Dr. Keplinger's presentation, "1st Ray Shortening and Elevation Post-Lapidus, How Do I Address it?" from the APMA Surgical Complications Virtual Seminar on January 18, 2025 . To view the full presentation with questions and answers—and see the agenda for the program, visit https://apmasurgical.lerexpo.com/ . Continuing education credits are available for this and many of the lerEXPO programs.

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3.2. The Upward Tilt (Elevation)

- **Problem:** This occurs when the first metatarsal bone heals in an upward-tilted position. This is often due to poor positioning intraoperatively or a failure to completely clean out the cartilage from the bottom part of the joint space during the initial surgery.
- **Patient Impact:** When the first ray is elevated, it no longer carries its share of the body's weight. This pressure is transferred to the other toes, causing a painful condition called transfer metatarsalgia. It can also lead to the development of a stiff, arthritic big toe, known as hallux rigidus.

Surgeon's Tip: To prevent elevation, here is a good technique in the operating room. Before putting in the final screws or plates, place a wide, flat metal plate with small indentations under the patient's foot. My assistant then secures the leg while I simulate weight-bearing. When the plate is removed, I inspect the temporary marks left on the sole of the foot. If the marks are evenly distributed across all 5 metatarsal heads, I know the alignment is acceptable. If not, I'll adjust the position before finalizing the fixation (see image).

3.3. The Short Step (Excessive Shortening)

- **Problem:** While every Lapidus procedure involves some shortening of the bone, excessive shortening occurs when too much bone is removed during joint preparation. The surgical technique plays a major role. The curettage technique, which involves scraping the joint surfaces, causes significantly less shortening than the wedge resection technique, where a slice of bone is removed.
- **Patient Impact:** A first metatarsal that is too short disrupts the foot's natural arch, or parabola. Similar to an elevated ray, this causes an overload of the lesser rays. A finite element study identified a critical threshold: when shortening exceeds 6 mm, the load on the central rays becomes excessive.

3.4. The Downward Press (Excessive Plantar Flexion)

- **Problem:** This is the opposite of elevation. The first metatarsal is healed pointing too far downward (plantar flexed). This is often the result of poor positioning in the operating room.
- **Patient Impact:** A plantarflexed metatarsal causes an overload of the sesamoid complex. This leads to significant pain and callus formation directly under the ball of the foot, making walking uncomfortable.

3.5. The Outward Point (Overcorrection)

- **Problem:** Also known as hallux varus, this malunion occurs when the surgeon has overcorrected the hallux valgus deformity.

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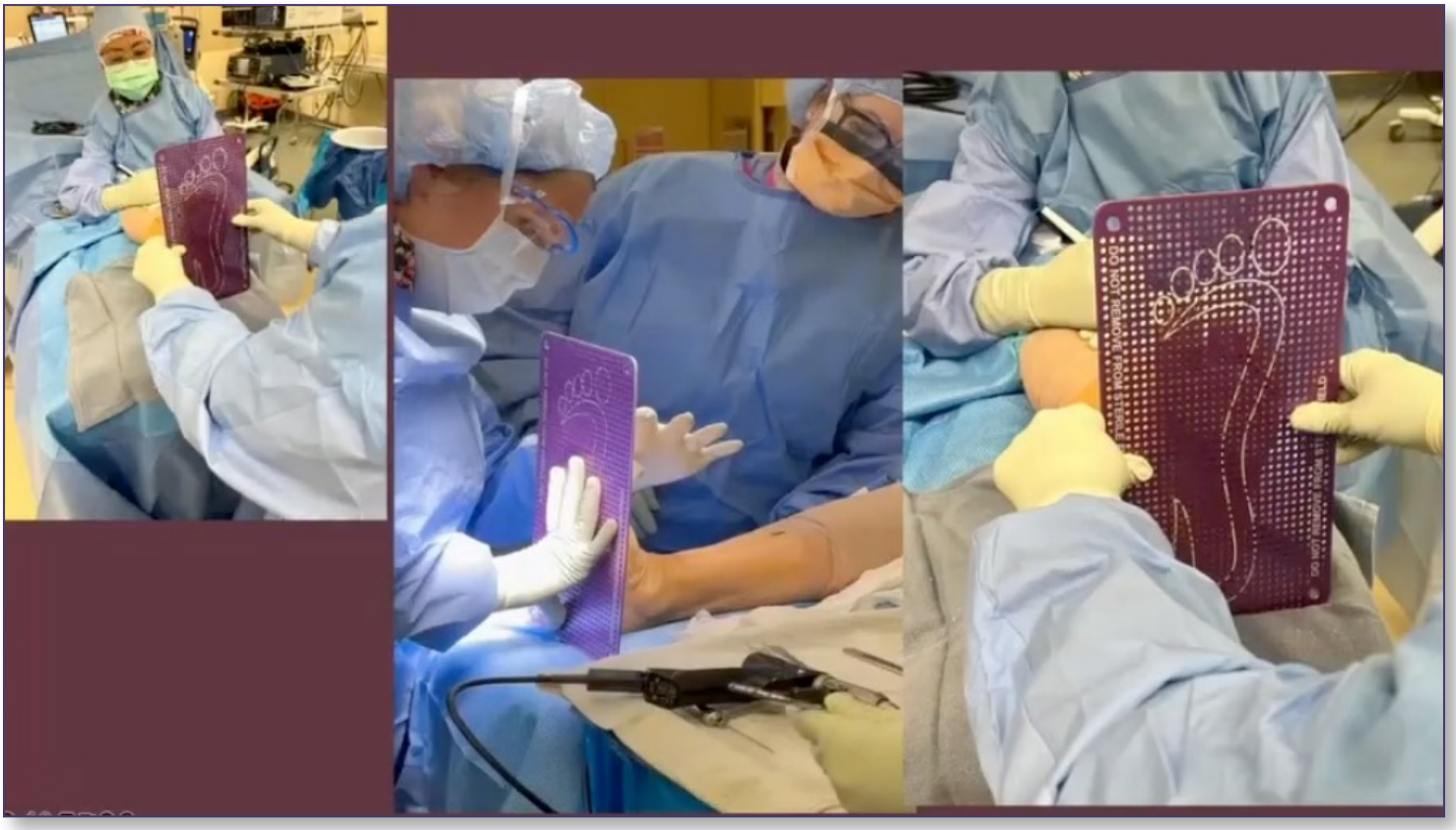

This causes the hallux to point away from the other toes, creating an unsightly gap and potential pain with shoewear.

- **Patient Impact:** Patients with this condition are often asymptomatic. The toe might look unusual on an X-ray, but it doesn't cause pain or functional problems. However, if the toe rubs on shoes or becomes symptomatic, it requires surgical correction.

Each of these malunions represents a distinct anatomical puzzle that has been solved incorrectly. Fortunately, for every problem, foot and ankle surgeons have developed a specific set of tools and techniques to provide a solution.

4. The Surgeon's Toolkit: Solutions for Correcting Malunions

4.1. The Re-Cut: Osteotomies

An **osteotomy** is a procedure where a surgeon strategically cuts a bone to realign it. For malunions where successful arthrodesis has been achieved but simply angled incorrectly, osteotomies are the primary solution. (Table)

4.2. The Stabilizer: First MTPJ Arthrodesis (Fusion)

An arthrodesis is a procedure where a joint is surgically fused, making it stable and permanently immovable. In this case, the procedure involves fusing the main joint of the hallux (the first metatarsophalangeal joint, or MTPJ).

This procedure is ideal for 2 particularly difficult problems where a simple osteotomy won't be enough.

- **Excessively Short First Ray:** When the bone is too short to be effectively lengthened with an osteotomy alone, fusing the big toe joint in conjunction with a bone graft re-establishes the proper length and restores the arch of the foot.
- **Symptomatic Hallux Varus (Overcorrection):** Fusion provides a reliable, tried and true method to get the toe into a good, permanent position, eliminating the risk of the deformity returning a second time.

A common concern is that fusing the big toe joint will limit activity, but studies show up to a 96% return to normal activity, making this an incredibly effective and reliable solution.

5. Conclusion: The Art of the Second Chance

The Lapidus procedure is a powerful but technically demanding surgery. When the bone heals in a less-than-perfect position, it presents a significant challenge for both the patient and the surgeon. However, the field of foot and ankle surgery is built on problem-solving.

For every type of malunion–whether it's recurrence, elevation, shortening, or overcorrection–surgeons have a specific tool in their toolkit. From precise bone cuts (osteotomies) to stabilizing joint fusions (arthrodesis), there is a clear and effective solution for each problem.

When you're going into these cases, you want the best result the first time, but you definitely want it on the second run. You

don't want to have to go back and continue to reoperate. The goal is to fully understand why the first procedure failed and apply the right solution to ensure the patient gets the best possible outcome–a second chance at a well aligned, pain-free foot.

As a highly trained podiatric surgeon, L. Marie Keplinger, DPM, specializes in successfully treating foot and ankle conditions created by sports injuries, trauma, degenerative diseases and complex deformity. Orthopaedic fellowship-trained, Dr. Keplinger's expertise includes reconstructive foot and ankle procedures, tendon repair, arthroscopy, as well as total ankle replacements.

Table. The Re-Cut: Osteotomies

Osteotomy Type	Description	Primary Use Case
Opening Wedge	A cut is made, and a bone graft (allograft) is inserted to open a space, correcting the angle and adding length.	Used to correct elevation by pushing the metatarsal down, or to fix recurrence while maintaining length.
Closing Wedge	A wedge of bone is removed, and the 2 sides are pushed together to close the gap and change the angle.	Can be used to correct recurrence, but the surgeon must be careful as it increases shortening.

EMERGING DEVELOPMENTS IN AFOS

Making Carbon Composite AFOs Work in Podiatric Practice Part III

By Keith Loria

Advances in ankle-foot orthoses (AFOs) are revolutionizing how podiatrists, physical therapists and O&P clinicians support lower-limb mobility and rehabilitation. In this 3-part series, we explore the latest evidence, cutting-edge materials, and innovative design strategies that are shaping the future of AFOs. This short series offers a look at how today's breakthroughs are improving function, comfort and compliancy in the lower extremity world.

In today's outcomes-focused clinical environment, podiatrists are expected not only to diagnose gait deficits and mobility problems but also to deliver solutions that patients will use consistently.

Compliance has long been a challenge in AFO management, particularly when older devices were bulky, rigid or difficult to fit into everyday footwear. Carbon composite AFOs are changing that landscape, offering comfort, function and durability that directly influence real-world use.

Why Comfort Shapes Long-Term Use

Achieving meaningful outcomes still requires careful attention to design, communication and patient expectations.

Compliance begins with understanding what motivates patients to wear or abandon a brace. Many patients are willing to modify their footwear or adjust to a slightly stiffer or more structured device if they perceive that the functional benefits outweigh the inconvenience.

Eric Weber, LCPO, FAAOP, co-chair of the American Academy of Orthotists & Prosthetists' Lower Limb Orthotic Society, noted that patients often weigh what they are receiving against what it costs them. For instance, a thinner composite AFO may fit seamlessly into their shoes, while a custom device may require different footwear but deliver better energy return or stability.

"When the functional gain is clear–fewer falls, less fatigue, more endurance–patients tend to accept these adjustments," he said. ""If a device gives them better energy return or lowers the metabolic cost of walking, patients are usually willing to make the changes needed to wear it."

Michael Lacey, DPM, of Northern Illinois Foot & Ankle Specialists, shared that these advancements have significantly changed his approach to managing gait instability and neuromuscular weakness.

"Modern carbon designs offer a favorable strength-to-weight ratio, allowing for more dynamic response during gait compared to traditional polypropylene or leather AFOs," he said. "Carbon composites store and return energy during stance and push-off, which can improve overall gait efficiency. This is especially beneficial for patients with conditions such as foot drop, peripheral neuropathy or post-stroke weakness where propulsion and balance are compromised."

After all, the lighter weight from the carbon fiber material, reduces the metabolic cost of walking.

"Many patients with neuromuscular weakness report less fatigue over longer distances when using carbon composite devices," Lacey said. "Carbon AFOs can be designed with lower profiles that fit into a broader range of shoes, which improves function in daily life and expands options for patients who want a more discreet orthotic solution."

Daily wearability is influenced strongly by material and design choices. Lightweight composites reduce the energy required to lift and clear the limb, improving endurance for individuals with neurologic or muscular weakness. Footplates designed around contemporary footwear dimensions make it easier for patients to integrate the device into their daily routines.

"For someone who's been falling or can't advance their tibia without collapsing, the right composite design can make the difference between confidence and fear every time they take a step," Weber said.

Anatomically shaped padding and well-aligned strut placement reduce skin irritation and prevent the pressure points that often doom older designs. When the brace feels more like an assistive partner than an imposed restriction, compliance naturally improves.

Prefabricated vs Custom: Matching the Device to the Deficit

The differences between prefabricated and custom composite AFOs also influence wear patterns. Prefabricated devices often excel in managing swing-phase deficits such as foot drop. They are thin, unobtrusive, and typically fit easily into most shoes, which makes patients more willing to use them immediately.

Custom composite AFOs are essential when more complex gait deviations are present. Although they may require a modest shoe adjustment, the trade-off is a device tuned specifically for that patient's motion pattern, strength profile, and structural needs. When custom devices provide noticeable improvements in stability or reduce pain associated with orthopedic anomalies, patients generally become more invested in wearing them.

Certain patient groups demonstrate especially strong long-term compliance with composite AFOs. Individuals recovering from stroke or managing chronic neuromuscular weakness often struggle with fatigue, making the lightweight properties of composites an important advantage.

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Continued from page 26

Rebecca Stack, DPM, a podiatrist at Northwestern Medicine in Illinois, noted carbon fiber has allowed for higher energy return during gait, which improves function while reducing the muscle wasting often associated with more static braces.

"Patients with foot drop and post-operative patients have benefited the most," she said. "These braces allow for a more natural gait while encouraging continued muscle use to prevent fatigue and weakness."

These devices can be tuned to encourage smoother motion, helping patients maintain confidence and reduce fall risk. On the other end of the spectrum, patients with limb-salvage needs–such as those recovering from trauma or partial-foot amputation–often require significant stiffness to protect compromised structures. Carbon composites provide that level of control without producing the excessive weight associated with heavily reinforced plastics. When pain is reduced and mobility improves, adherence follows.

Durability is another factor tied closely to compliance and outcomes.

A brace that maintains its stiffness and structural properties over time gives patients predictability, which is especially important for those relying on the device for balance or endurance. Breakage or fatigue-related failures interrupt continuity of care and can lead to setbacks in strength and confidence. Modern composites, when properly engineered, withstand repeated loading far better than thermoplastics, particularly in long-term users who depend on their AFO daily.

Reimbursement Matters

Reimbursement has become an increasingly important factor in how podiatrists integrate AFOs into their care pathways. Carbon composite AFOs fall under established DME coding, but authorization often hinges on the clarity of documentation rather than the material itself. Insurers typically want to see a functional justification, such as instability, fall risk, difficulty with swing clearance or the inability to perform daily activities without assistive support rather than a device-driven request.

"Podiatrists who describe the patient's mobility limitations in practical, observable terms tend to see smoother approvals," Weber said. "Explaining that a patient cannot maintain endurance during ambulation, loses balance during mid-stance, or demonstrates unsafe foot slap provides a clear rationale for bracing and aligns with payer expectations."

Orthotists report that when this documentation accompanies the referral, the authorization process becomes far more straightforward.

Another factor podiatrists should be aware of is that the cost of manufacturing advanced composite devices is generally higher than that of thermoplastic AFOs, due to the labor involved in lamination, layering and digital fabrication. Although these devices are reimbursed under existing code structures, the margins for providers vary depending on a patient's insurance plan and regional payer policies. Because of this, it is essential to match the complexity of the device to the functional need described in the chart.

"The most important elements are clear documentation of gait deficits, functional limitations, diagnosis, activity level (K-level) and why a carbon composite AFO is medically necessary over a standard plastic AFO–especially for energy return, endurance and dynamic gait assistance," said Tonyclinton Nweke, DPM, a podiatrist based in New York.

For podiatrists considering whether to offer AFOs within their own practice rather than outsourcing to an orthotist, understanding the reimbursement landscape is part of the equation. Many clinicians find that bracing can serve as a consistent DME service line when documentation is thorough and the device prescribed aligns with the patient's clinical presentation. However, the most successful practices approach bracing as an extension of patient care, not merely a revenue channel, ensuring that the device selected is justified by the functional outcomes they are trying to achieve.

Clear Documentation Drives Better Outcomes

Documentation and reimbursement play a role in the success of composite AFOs. Podiatrists who clearly articulate functional goals in their notes help orthotists justify device selection and secure approvals.

Rather than prescribing a specific brace, describing the patient's challenges–frequent falls, inability to maintain endurance, difficulty navigating uneven ground–makes it easier to match the device to the need. This clarity not only speeds authorization but also improves the orthotist's ability to design a brace that the patient will actually use.

Background interviews suggest that many clinicians are becoming more attuned to the economic aspect of bracing, recognizing that a well-chosen AFO can be both clinically and financially meaningful when integrated thoughtfully into a podiatric practice.

Perhaps the most important factor linking compliance to outcomes is communication. When podiatrists and orthotists share a clear understanding of a patient's functional limitations, lifestyle and goals, the resulting device is more likely to perform as intended.

"Shifting from device-specific prescriptions to clear functional goals–such as improved toe clearance, dynamic propulsion, reduced energy expenditure–has dramatically improved outcomes," said Nweke. "Orthotists can customize stiffness, alignment and design more precisely, resulting in better fit, higher patient compliance, fewer revisions, and superior gait efficiency and satisfaction."

A brace chosen solely because it appears lightweight or modern may not address the underlying biomechanical issues. Conversely, a device designed around specific functional objectives–improved tibial progression, reduced foot-slap, relief of midfoot pain–helps patients experience the improvement they're seeking, reinforcing consistent use.

As carbon composite AFO technology continues to evolve, particularly through advances in digital modeling, additive manufacturing, and material optimization, podiatrists have new opportunities to improve mobility and independence for their patients. But technology alone does not guarantee outcomes. The best results occur when clinicians view the AFO not as a commodity but as a functional tool that must integrate seamlessly into a patient's daily life. ler

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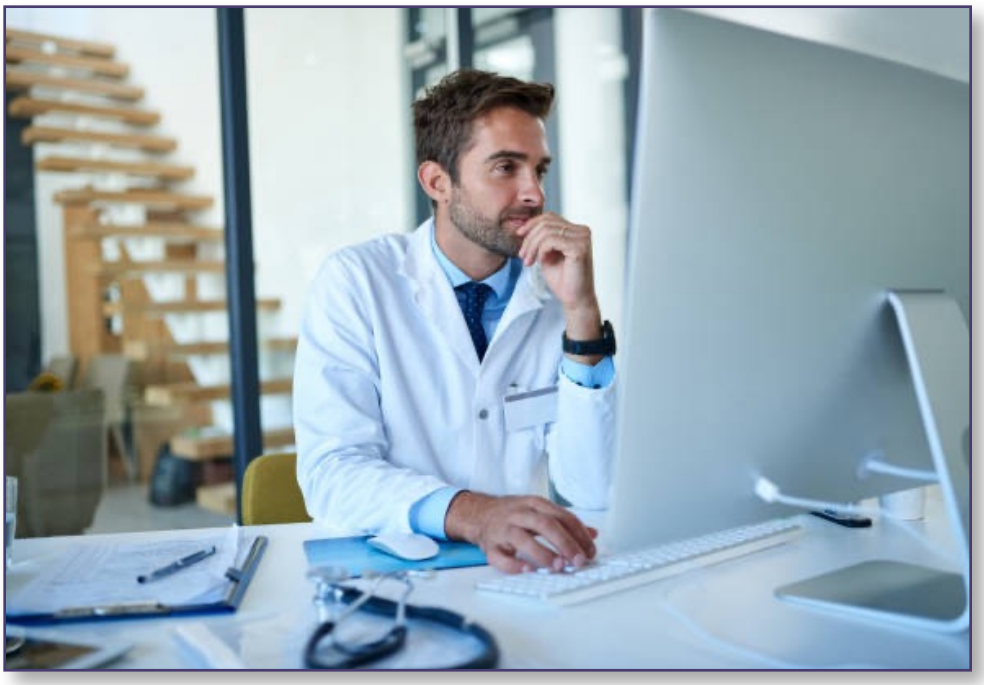
A New Paradigm in the Doctor–Patient Relationship

How Technology Is Altering What We Thought We Understood

By Mikel D. Daniels, DPM, MBA, President and Chief Medical Officer, WeTreatFeet Podiatry



The doctor-patient relationship is dead, at least in the format we were all taught in school and during training. Today, there's a moment, when you walk into an exam room that just didn't exist 20 years ago. It's no longer just you and the patient. There's a third presence sitting between you. It is the electronic health record (EHR), that often-maligned party, and whether anyone says it out loud or not, everyone in the room can feel it.

For most of medical history, the medical record was a prop. It was not an active character in the encounter. The paper chart resided on a counter or in your lap, waiting patiently, without the demands of a glowing screen, pings, required fields, or time-outs that interrupt a difficult conversation. In this pre-EHR era, physicians could maintain eye contact while making notes, and the workflow was intuitive, doctors would listen, think, examine, and then document. Although third-party payers were present at a distance, the conversation itself was clearly between 2 people. Despite existing pressures from short visits, prior authorizations, and relative value units (RVUs), the chart did not compete for attention. It sat there and it simply held the patient's story. Then, almost suddenly, it evolved.

When I first started in practice, my first boss told me about when he started in practice, his visit notes were written on 3 x 5 cards. He was at that time using a SOAP template. Two notes preprinted on a standard 8.5 x 11 in sheet of paper, and (I hate to admit this) most of his plans were just listed as "99213 or 99202" I have to say, it was horrifying. He retired before we started using an EHR. Can't imagine how that would have worked for him.

Today, the EHR changed all of that. Not just by digitizing the note, but by inserting itself into the relationship as an active, attention-seeking third party. The long-felt feelings of patients and physicians are now confirmed. Unfortunately, today physicians spend significantly more time looking at screens than they ever did looking at a paper chart. This results in a bit (maybe a lot) less time looking directly at patients. Problematically, many clinicians feel EHRs worsens documentation time and drain their energy. Many physicians, often more than half in some surveys, report a negative impact on time and workload. The computer's physical presence effectively "triangulates" the encounter. This is the new part of the doctor-EHR-patient relationship. Many patients often perceive it as an intrusion into what should feel like a private human exchange.

This intrusion manifests itself in subtle ways. The patient starts a story, the art of taking the narrative and translating it into a subjective complaint. While the patient is pouring out heart and soul (sole in my case, but I am a podiatrist) the physician's gaze flicks to the allergy field that's still blank. A difficult disclosure can be made, and sometimes missed as the physician is entering data, and watches while the hourglass spins. The physician's hands are typing while the patient is trying to read their face. The quiet, and often not discussed dangerous part are the micro-behaviors patients show. These subtle signs might tell a different story, maybe the patient gazes off more often looking for words to describe the problem or doesn't complete a thought due to more interruptions. All while there is more multitasking by the physician. The visit still happens, but the quality of presence is thinner. The third party that used to be "insurance" is now embodied as a screen full of required fields, alerts, and billing prompts. All of these are visible, all urgent, and all sitting between the physician and the person who came for help.

Care itself hasn't necessarily been documented differently (for some doctors), but it's been fundamentally re-engineered. One of the

big shifts is moving from narrative to checkboxes. The long, coherent narrative of a paper note has been sliced into discrete, billable elements (remember NLDOCAT), problems, orders, quality metrics, and structured fields. While EHRs can improve certain aspects of care, like medication safety and guideline reminders, its primary effect is pushing clinicians toward template-driven thinking. You are no longer just telling the patient's story; you're satisfying the story the system needs. Now you are getting paid not to treat patients, but to document that you treated the patient. Sorry, but it's so cynical.

The next devastating change is the swap from listening time to screen time. Eye-tracking and video studies confirm that physicians now spend a large proportion (even the majority) of the visit looking at the computer. This leaves less uninterrupted face-to-face connection. Ever had a good conversation in person when the other party was always looking away? This new paradigm is shaping the future of medicine. Today residents and interns are now logging staggering hours in the record, literally learning medicine through a screen. In my world, this translates into treating test results, not treating patients. Think bone sticking out of a toe, and ordering an MRI to see if there is osteomyelitis?

Finally, we've moved from "with" the patient to "about" the patient. The record shifted from a backstage tool to a front-stage actor. Sharing the screen can sometimes deepen engagement, but the problem is that the EHR is rarely used as a shared tool. Not to mention, then you are often forced to explain every checked medical term to a patient that wants to debate the merits of that choice. The chart note is now a private portal for billing, compliance, and risk management. The simple, and harsh truth, is that the EHR didn't just join the visit. It has become the main audience. Notes are written for auditors, payers, quality programs, and malpractice defense, with whatever is left over for the patient or the next clinician. The patient is present, but the record is who the doctor is treating. The problem is that most of the time, the EHR isn't used as a shared tool. It's used as a private portal into billing, compliance, and risk management, and the patient watches the top of a bent head instead of the eyes of their physician.

Underneath all of this is a simple truth, the EHR didn't just join the visit; it became the main audience. Notes are written for auditors, payers, quality programs, malpractice defense, and only secondarily for the patient or the next clinician. The patient is present, but the record is who the doctor is really conversing.

AI: Fourth Wheel or Quiet Ally?

Now, entering into this already crowded room, we're adding Artificial Intelligence. AI can often become another voice, another party entering into the doctor–patient relationship. A well programmed and customized system actually might hold the potential to be the invisible assistant that the EHR should have shipped with in the first place. It offers a genuine opportunity to help. But how and what are the drawbacks?

AI can free the clinician's eyes and hands. AI-powered scribes can listen to the visit, generate the note, and drop it into the record, all with minimal correction or attention. This crucial shift returns time and attention back to the patient. With the physician no longer typing, they can finally sit back, lean forward, watch the patient's face, and actually listen. Early tools already deliver on this promise by summarizing histories, pulling meds and labs into records, and even drafting letters in plain language after the encounter.

This could sharpen physician judgment, but could it replace it?

AI systems are becoming adept at flagging risk, recommending diagnoses, and suggesting relevant guidelines. From allergy alerts to imaging comparisons, this is entering the doctor patient relationship. This capability doesn't make the clinician obsolete, but it simply makes the cognitive load more manageable in a data-drowning environment. Used wisely, this efficiency allows the physician to spend more time explaining conditions to the patient. Ideally, this will result in significantly less time hunting through tabs, PDFs, and button clicking.

Turning The EHR Into Something Patients Can Actually Use

AI has the ability to translate dense, clinical data into human-readable narratives. It can then tailor education to a patient's specific conditions (even translating from medical jargon to common language) and keep remote monitoring streams from becoming unmanageable noise. When patients can see and understand their own information, in language that feels human, the record transforms from a black box back into a shared education tool.

There is, of course, a catch. If AI is owned, designed, and deployed primarily to serve the same interests that shaped the EHR in the first place (documentation, billing, and control), then it will only become a more efficient way to automate all the wrong things. This will inevitably, bring us back to the other third party in the room.

Using This Technology, Myself, I Have 3 Main Problems

First, there are times when AI just makes stuff up. Called hallucinations, the AI can hear a patient say something and alter the significance of that problem in the medical record. As an example, I ask all my diabetics about their control and numbers. The EHR (sometimes) makes that a primary diagnosis, and lists treatment options and programs, and includes information about diet and lifestyle that I didn't discuss and make recommendations on medications. Fortunately, you can tell most systems not to do that. However, if you don't pay attention, your EHR could be putting sliding scales into your high-risk diabetic foot care visits.

Second, and what I consider my bigger problem, is that with AI, documentation is often completed at a later time. Since all I need to do is proofread the note and sign it, I might do it tomorrow. By then, I might have forgotten about the patient, the visit, or maybe a small detail that was important, but the AI missed. To combat this, I put reminders in the EHR so

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when I complete that note, I make sure it is listed. However, if I am putting items in the EHR, doesn't that defeat the purpose of the AI?

Lastly, for this to work, you need to verbalize physician findings. Ever been in the middle of an exam saying palpable pedal pulses 2/4 bilateral? If you did, patients often start saying "what does that mean" or worse, disagreeing with your physician assessment. Can you really afford to take the valuable minutes you are spending with the patient and explaining a normal finding in plain English?

What about 3rd Party Payors and Insurance?

Third-party payors have been warping the doctor-patient relationship for decades, primarily through delays, denials, and an endless appetite for documentation. The EHR gave them a direct pipeline into the exam room, and AI is about to change that relationship again. This will likely occur in a few key directions.

The first is a move toward automated prior authorizations vs automated advocacy. AI tools are emerging to help payors streamline prior authorization, utilization management, and payment integrity. So essentially scaling their ability to approve, deny, or question care. Simultaneously, provider-side AI can instantly assemble clinical evidence, generate appeals, and optimize coding to capture revenue. The result is a new kind of negotiation. AI agents on the provider side talking to AI agents on the payer side, often faster than humans can even keep up. We all know that when your computer freezes, restart it. Can AI restart itself, or will our claims get stuck in the hourglass screen of death?

The second direction is a shift from opaque decisions to explainable friction. When a claim is denied today, the reasons are often buried in jargon. AI has the potential to make both sides' logic more understandable. It can tell exactly which criteria aren't met, what data is missing, or what alternative pathway is available. That transparency could either build trust or simply reveal how much of the system is designed to say "no" as cheaply as possible.

AI offers a chance at shifting the emotional burden. If these systems handle much of the back-and-forth, checking coverage, suggesting alternatives, drafting appeals, the physician can spend less time as the messenger of bad news ("your insurance won't cover this") and more time as an advocate, helping the patient navigate choices. However, if AI is deployed primarily to tighten payor controls, it risks deepening the sense that both doctor and patient are playing a rigged game run by algorithms they don't control. Another party in the doctor-patient relationship.

Now, if I were an insurance company that wanted to streamline this process, I would do what car insurance companies are doing today. See the car insurance apps that are developing ways to track how you are driving (how it knows if you are driving or just a passenger beats me). They know how fast you drive, how quick you stop, how long you go without stopping. They use this data to set your rates. Imagine if the insurance company gave you a free AI, and this determined all your billing and documentation needs. Maybe claim adjudication would be sped up? Not sure that is a desirable goal of an insurance company but would be a game changer.

Today, tension is already visible in the market. Investors are throwing money at the expanding opportunity in AI tools designed specifically for payors to optimize risk adjustment, payment integrity, and prior authorization workflows (ie, deny payment). This projected rapid growth is a clear signal that without deliberate guardrails, the same technology that could liberate clinicians may instead super-charge the administrative machinery that exhausts them.

The core question at that time isn't simply "Will AI help?" but "Who is AI primarily serving in this relationship?" If AI's main job is to reduce clicks, shorten documentation, surface clinically relevant information, and remove the physician from low-value fights with payors, then the doctor-patient relationship stands a chance not only surviving, but might even recover some of what's been lost. If, instead, its primary job is to algorithmically deny care, optimize billing against outcomes, or watch clinicians for productivity and compliance, then the room just gets more crowded, and the patient is pushed even further to the edge of the relationship.

The relationship started as a conversation between 2 people and a quiet paper chart. The EHR pulled a fluorescent third chair up into the treatment room and demanded basically all of the attention. AI now gives us a rare chance to decide who that third chair really belongs to. Used well, it becomes the mostly invisible colleague who takes the notes, deals with the bureaucracy, and lets the human beings in the room look at each other again. Used badly, it becomes the new face of the same old pressures. AI would be just a faster, quieter, and harder party to argue with. The technology is here either way. The choice, who it serves, and who it answers to, is still up for grabs. Under any of these circumstances, the doctor-patient relationship is dead. Which third party remains, the EHR or some new AI "colleague" remains to be seen.

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Dr. Daniels earned his Doctor of Podiatric Medicine from Temple University and an MBA in Healthcare Administration, combining clinical expertise with business strategy to deliver efficient, patient-centered care. His work focuses on complex reconstructive procedures, diabetic limb salvage, sports injuries, and minimally invasive techniques designed to accelerate recovery.

A Fellow of the American College of Foot and Ankle Surgeons and the American Professional Wound Care Association, Dr. Daniels also consults for biomedical technology firms and serves as a principal investigator in clinical research. His insights have appeared in Forbes, Parade Magazine, and CNN, and through his writing and mentorship, he continues to advance innovation and value-based care in podiatric medicine.

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Pedorthic Toolbox

By Teresa Alpert

Consumers of high-end running/walk footwear products are coming to you not only to fit them with footwear, but also to solve problems and enhance their performance, prevent injuries and enhance wellness. Some retail shoe stores, and certainly online direct purchases, do not offer the expertise that is required to provide the solutions the consumer is seeking to justify the expensee of the purchase. Pedorthists have an opportunity to network with retailers and vice versa to share their knowledge and distinguish themselves as a niche market for their consumer base. Not everyone needs to be a doctor, but when you are fitting shoes, you need solutions that solve problems and immediately promote improved biomechanical outcomes. "The Pedorthic Toolbox" is your opportunity to engage in conversations with your clients, patients, customers–the people you help every day. So what's in it?

1. Knowledge: Understand Basic Anatomy

The foot has 26 bones, use the terminology but don't talk over someone's understanding. The heel bone is the calcaneus, the ball off the foot is made up of metatarsals. Understand pathologies or diagnosis and complaints that your clients express to you. "I have pain in my big toe every time I push off and sprint, my doctor told me I have a bunion." You as the professional need to know that they need a stiffer sole, shoe, rocker, or an orthotic with a turf toe extension to control Hallux Rigidus. Diagrams, foot models and samples can be very helpful tools. (Figure 1)

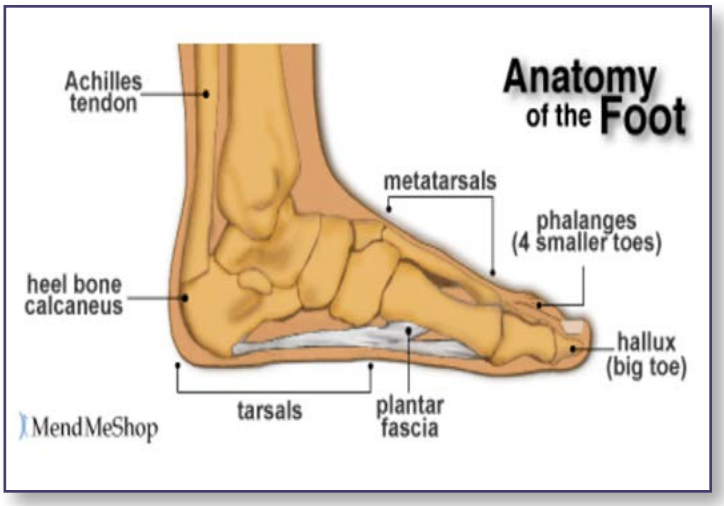

Figure 1. Knowledge: Understand basic anatomy

2. Ancillary Foot Aides

Together with your client you will define the problem and brainstorm solutions. You are the expert and will pick the appropriate inventory and complementary enhancements to assure you are implementing a comprehensive educated purchase.

Understand the pathology and what solutions must help reduce shear, friction, and pressure, relieve pain and enhance performance during walking and running. Fitting aides, tapes, instructions on how to cut and file their nails, proper foot hygiene and foot and toe exercises are ideal examples of solutions you can offer. Samples in your toolbox for them to try on will give them confidence that together you are implementing that shared purchase decision. (Figure 2)

3. Footwear

Everything begins with and ends with footwear. Knowing your inventory and understanding the mechanical properties of the function of the footwear is critical to helping your clients. If your referral source sends someone to your store or office and the only information you have is Achilles pain, understand that a negative heel height could be detrimental to treatment. If someone presents with Gout understand that your footwear inventory with a rigid carbon shank with a rocker is going to be beneficial. Today the athletic and comfort shoe market offers so many features to enhance foot health and biomechanics. Often in my experience if you have provided your client with properly fitted footwear, the need for a custom orthotic is diminished. And don't forget

Figure 2. Ancillary Foot Aides

the socks, they are the first interface to the foot. Equally as important is to check for edema or lymphedema, make the appropriate referrals and measure and fit for compression socks. (Figure 3)

The new tools you have today will enhance your customers' experience and your confidence in solving their shoe-fitting challenges. Continue to learn, and join your colleagues at Pedorthic Footcare Association.

Teresa specializes in lower extremity biomechanics. She is a respected leader in her industry, lecturer, and educator. She holds a faculty appointment at the University of Colorado as the Orthotist at the Foot and Ankle Institute. She created and implemented the DME, O&P division for the orthopedic department. She is responsible for training the Residents and Fellows, working with the Gait Lab, and researching and directing patient care. Teresa Alpert completed her orthotics and prosthetics coursework at Northwestern University in 1987. In addition, she attended Ball State University, Apex University, and Eneslow Pedorthic training. Certified by both the ABC and BOC as an Orthotist and Pedorthist, Alpert has been in private practice for over 30 years. Teresa was the past Chairwoman for (BOC) the Board of Orthotist, Prosthetists, Pedorthics Certification, and Education Chairwoman for the National Shoe Retailers Association. She was past president of Pedorthic Footcare Association (PFA) and currently is the Executive Director. Teresa is passionate about helping people each step of the way.

Figure 3. Footwear

A Foot Forward for Optimum Health

"A Foot Forward for Optimum Health" is a column designed to enlighten the old guard in a new way about lower extremity impairment as it pertains to foot drop. The intent is to challenge evidence-based research and practice so that it addresses real world issues shaped by social determinants of health. For every common issue is an uncommon response that will provide insight to improve health outcomes by putting one foot forward at a time–efficiently and effectively.

Sensory Input is Needed for Motor Output: The Type of Self-Work for the Best Foot Work Matters

By Dr. Jennifaye V. Brown

Introduction

I recently explored and explained the use of mobilization and tactile stimulation (MTS) in the previous article titled, "Sensory Input is Needed for Motor Output–The Foot of the Matter." In this article, I focus on self-mobilization of the foot and ankle to promote self-efficacy for individuals with lower extremity (LE) sensory impairment resulting in limited joint movement and or inefficient or absent muscle activity. After a stroke, the ankle may become stiff due to immobility from sensory or motor loss and usually assumes a downward position, typically known as foot drop. True foot drop is "…a symptom that is described as weakness or complete absence of dorsiflexion of ankles and toes" [2] or the "…inability to lift the forefoot due to the weakness of dorsiflexors of the foot."[3] Individuals with foot drop from any neurological diagnosis may not have the opportunity to have continued services until there is full recovery of impairments at the body structure function or activity level. Therefore, it is imperative that healthcare professionals, particularly physical therapy practitioners educate clients on economical, efficient, and easy activities that can promote self-mobilization through weightbearing (WB) or loading of the LE primarily through the ankle joint and other joints of the foot to improve proprioceptive input and promote dynamic stability and mobility needed for gait.[4-6] This dynamic stability and mobility comes through eccentric, isometric, and concentric muscle activity as the hindfoot, midfoot and forefoot are loaded and unloaded in different positions.[5]

Intervention Review and Modifications for Carryover at Home

The physical therapy practitioner can use hand placements to stabilize different parts of the foot (Figures 1 and 2) and create muscle activity across those joints by asking the client to weight shift (WS) in different planes toward and away from the WB foot. Furthermore, the client can engage in functional activities such as scooting and partial stand. This sequence of activities is known as mobilization with movement and is a recommended intervention in individuals with stroke.[1,7-8] However, how do these interventions transfer to adherence at home? I use a simple doorstopper depending on hindfoot, midfoot, and forefoot mobility. I use a small (short) or large (tall) rear height doorstopper (Figure 3). Placement depends on the impairment and foot section (hindfoot, midfoot, or forefoot) mobility. I have the person practice during a treatment session with shoes first then nonskid socks on both feet (Figure 4). I also practice with the ankle foot orthosis (AFO) on if the foot plate is contoured to the sole of the foot and has a flexible toe plate at the area distal of the metatarsal heads. This flexibility is required to allow extension of the toes and movement of the metatarsal heads up and down creating a transverse arch from the first to the fifth metatarsal. The metatarsophalangeal joints are critical for extension needed at terminal stance and preswing. The first metatarsal along with the medial cuneiform plantarflexes or "drops down" during terminal stance and preswing of gait.

Refer to the chart for suggestions of how to use a door stopper based on foot impairment (Table).

I proceed to have the client WS forward and backward through the trunk and pelvis as a unit in the frontal and sagittal planes and move diagonally toward the 5th toe. At the end range, I have the individual hold the position for a 5-second count then increase to 10-second count. As confidence builds with WS toward and WB through the foot with the door stopper in various positions, I proceed to have the individual scoot forward and backward, side to side, squat clearing the buttocks 2–5 inches, and then demonstrate partial stand. During squatting, I place items of different heights between the seat surface and the buttocks, so the individual can get a sense of positioning if possible, through muscle activity and proprioceptive input of the joints based on the load and tension of tendons and ligaments through the range of motion (ROM) at the joints involved. Again, at the end range, I have the individual hold the position for a 5-second count then increase to 10-second count. I allow clients to use a mirror to look at their body position then I take it away so they can sense the body position through load at different joint positions and muscle activity.

What Does the Evidence Say?

Stroke outcome depends on the location, size, and the severity of motor and sensory impairment.[9] Progressive resistance training is a proven mechanism to strengthen muscles via force generation and close kinetic chain activities

Table. How to use a door stopper based on foot impairment

Impairment	Suggestions	Image
HINDFOOT		
1. Inversion (Varus)	1. Narrow end under lateral calcaneus (heel)	1. Figure 5
2. Eversion (Valgus)	2. Narrow end under medial calcaneus (heel)	2. Figure 6
MIDFOOT		
1. Collapsed Arch - Pronation	1. Narrow end under distal medial calcaneus or navicular	1. Figure 7
2. Atypical High Arch - Supination	2. Narrow end under distal lateral calcaneus or cuboid	2. Figure 8
FOREFOOT		
1. Inversion (Varus) – WB1 on the 5th Ray	1. Approach from the lateral border, proximal end of the metatarsals and move distally as appropriate; Narrow end to the medial border of a metatarsal so that the most medial metatarsal will drop down during WB1	1. Figure 9
2. Eversion (Valgus) – WB1 on the 1st Ray	2. Approach from the medial border, proximal end of the metatarsals and move distally as appropriate; Narrow end to the lateral border of a metatarsal so that the most lateral metatarsal will drop down during WB1	2. Figure 10
3. 1st–5th Rays Plantarflexed on the Navicular, Cuneiforms, and Cuboid	3. Approach from the toes; the narrow end toward the base of the metatarsal; therefore, 1 metatarsal is under the small door stopper and 2 are under the large doorstopper **NOTE:** This intervention works best if hammer or claw toes are NOT present	3. Figure 11 & 12

1=Weightbearing

using body weight as a form of resistance. This is an optimal solution as functional mobility skills are being practiced.[5,10-11] Furthermore, these activities improve proprioception through self-mobilization providing sensory feedback by loading the joints and stimulating sensory organs in the muscles and tendons.[5,12] Also, research indicates that proprioception gets worse over time after unilateral stroke in both lower extremities which may be due to improper pre-gait and gait mechanics of which improper loading, inadequate joint ROM and or strength deficits may be a culprit.[13] Ankle proprioception is considered the most important factor for improving walking distance and the ability to detect joint position (proprioceptive acuity) when compared to active joint ROM which requires a strength component.[4] This is probable and makes sense because an individual can use an AFO to pull the foot up for clearance during midswing or increase hip and knee flexion during swing phase as compensatory measures. It would not make sense to look down at the foot during walking or other functional activities due to proprioceptive loss, as one would not be able to interact with the surrounding environment. Sensory recovery is needed for full motor recovery, hence the term sensorimotor system. Proprioception links sensory information about the joint position and movement to improve motor output.[12,14] One cannot separate the 2 systems of sensory input and motor output. Thus, a home program should optimize the potential of regaining safe functional mobility by incorporating self-mobilization with movement in WB positions to improve proprioception, joint ROM and muscle strength.

If you have any questions regarding this article, leave them in the comment box.

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ation 4-time 10-year board certified neurologic physical therapist in Charleston, South Carolina, specializing in stroke rehabilitation, specifically gait analysis and treatment, AFO design, and the redesign of lived spaces allowing individuals with disabilities to age in place. She is the author of the book, Brace Yourself: Everything You Need to Know About AFOs After Stroke.

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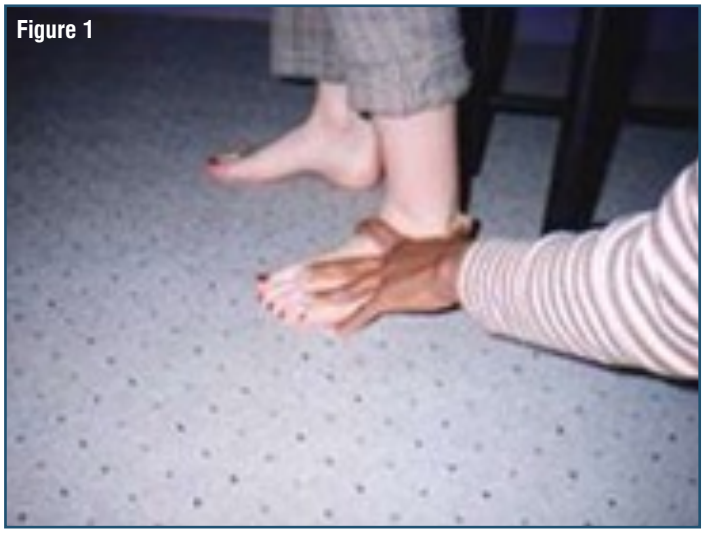
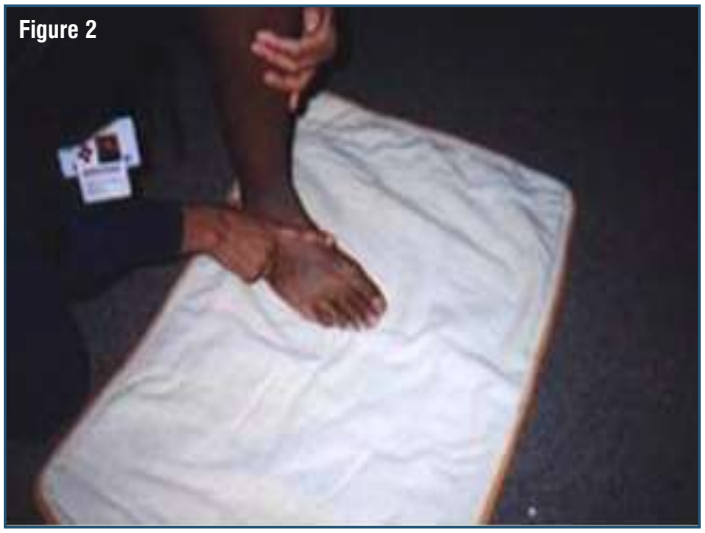




NOTE: With both techniques, as tibia moves forward, pronation occurs and tibia internally rotates. During lift off into knee extension, the tibia internally rotates.

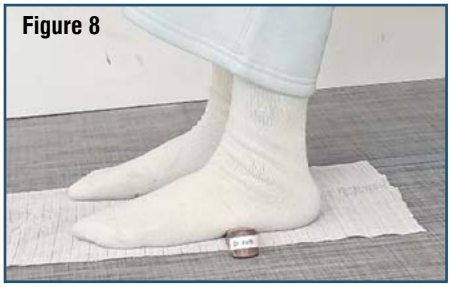
Figure 3: Small (short) and large (tall) rear height doorstoppers.

Nonskid socks or wear shoes on non-skid material.

Placement for Hindfoot Inversion (Varus)

Placement for Hindfoot Eversion (Valgus)

Placement for Collapsed Arch–Pronation



Placement for Atypical High Arch–Supination

Placement for Inversion (Varus)–WB on the 5th Ray

Placement for Eversion (Valgus)–WB on the 1st Ray

Placement if 5th Ray Plantarflexed on Cuboid

Placement if 1st Ray Plantarflexed on the Navicular and Medial Cuneiform

AAOS
American Academy of Orthopaedic Surgeons

March 2–6, New Orleans, Louisiana

2026 AAOS Meeting Highlights

Meeting Highlights from the 2026 Annual Meeting of the American Academy of Orthopaedic Surgeons

AAOS HIGHLIGHTS NEW AJRR DATA

The American Academy of Orthopaedic Surgeons (AAOS) Registry Program highlighted new findings from the American Joint Replacement Registry (AJRR) during the 2026 AAOS Annual Meeting in New Orleans.

Analyses presented at the meeting examined implant survivorship, complication trends, and outcomes associated with surgical approaches and implant constructs that help surgeons identify trends, improve outcomes, and guide best practices.

"Schwarzenegger's message not only resonates with us as physicians and surgeons but also serves as a powerful motivator for all our patients to prioritize their well-being," said Ned Amendola, MD, FAAOS, 2025 president of the AAOS, in meeting coverage.

To read and download the latest AJRR annual report and supplementary materials, visit AAOS.org.

Source: *American Academy of Orthopaedic Surgeons. American Joint Replacement Registry (AJRR) annual report update. Rosemont, IL. AAOS. 2026.*

E-BIKE ORTHOPAEDIC INJURIES AMONGST PEDIATRIC AND ADOLESCENT PATIENTS AT A LEVEL I TRAUMA CENTER

INTRODUCTION: Electronic bicycle (E-bike) use is on the rise in the United States. E-bikes are a convenient, cost-effective, environmentally friendly transportation option that do not require a license to operate. However, these conveniences come with significant injury risks. The aim of this study is to quantify the rates and patterns of orthopaedic injuries related to e-bike use compared to standard pedal bikes in pediatric and adolescent patients.

METHODS: A retrospective review was performed reviewing all trauma activations associated with micromobility (e-bike, bicycle, e-bike versus auto, bicycle versus auto) for patients < 18 years of age from 2017 to 2023 at a single, level 1, tertiary referral pediatric hospital. Patients were stratified by micromobility mode. Demographic data including age, sex, race, ethnicity, and home address were obtained from the medical record. Socioeconomic neighborhood disadvantage via area deprivation index scores (ADI) were calculated based on residential postal code. Mechanism of injury, length of stay (LOS), use of helmets, presence of orthopaedic injuries, head injuries, thoracic injuries, injury severity scale (ISS), Glasgow coma scale (GCS), requirement for operative treatment (orthopaedic versus non-orthopaedic reasons), and ICU

admissions were evaluated. Continuous data were found to be non-parametric and were evaluated with the MannWhitney U test. Categorical data were evaluated with Pearson's chi-square or Fisher's exact test. Statistical significance was defined as $P < 0.05$.

RESULTS: Over the 6-year period of study, 338 pedal bike or e-bike-related trauma activations were identified. E-bikes were increasingly responsible for these trauma activations throughout the study period, increasing from only 1.75% in 2017 to 39% in 2023. Patients in e-bike accidents were more likely to be older (12.6 vs. 10.3 years, $P < 0.001$) and more likely to have more socioeconomic advantage (based on ADI state quartile) (1.7 vs. 2.8 $P < 0.001$) than those involved in pedal bike accidents. Moreover, patients involved in e-bike accidents were more likely to sustain extremity injuries (OR = 4.2, $P < 0.001$) and sustained more fractures (0.6 vs 0.2 fractures, $P < 0.001$) as compared to those involved in pedal bike accidents. Patients in pedal bike accidents were less likely to be wearing a helmet (OR = 3.0, $P < 0.001$) and more likely to sustain head injuries (OR = 2.4, $P < 0.001$) compared to e-bike accidents. There were no significant differences in length of stay, ICU admissions, or operative treatment requirements between groups.

DISCUSSION AND CONCLUSION: E-bikes have risen in popularity over recent years, as have associated injuries. This mode of micromobility can reach greater speeds, harboring the potential for higher energy injuries, especially in children who are not familiar with or licensed in the use of motorized mobility. This study cohort demonstrated an increasing incidence of e-bike-related trauma activations, with an increasing incidence of associated extremity injuries and fractures. These findings highlight the need for focused strategies surrounding injury prevention, regulation, and education regarding e-bike usage in addition to further investigation regarding orthopaedic injury patterns and prevention.

Source: *Tran A , Ghetti C, Tran-Heflinger M, et al. Presented at 2026 Annual Meeting of the American Academy of Orthopaedic Surgeons. New Orleans, LA: March 2-6, 2026.*

EARLY SPORTS SPECIALIZATION IS ASSOCIATED WITH INCREASED ORTHOPAEDIC INJURY INCIDENCE IN NFL ATHLETES

INTRODUCTION: Single-sport specialization during adolescence has been increasingly adopted by youth athletes in pursuit of collegiate scholarships and professional careers. However, this early commitment

to one sport has been associated with increased exposure to repetitive stress, potentially contributing to higher injury rates at elite levels. While the short-term musculoskeletal risks of early specialization have been documented, its long-term consequences in professional football athletes remain unexamined. This study investigates whether early sport specialization during high school is associated with increased likelihood of orthopaedic injuries among NFL athletes.

METHODS: A retrospective cohort analysis was conducted on 2,556 NFL players drafted between 2011 and 2023. Players were categorized based on verified high school athletic participation as "multi-sport" (one additional varsity sport beside football) or "single-sport" (football only). Orthopaedic injury data, including both total injuries and major injuries (defined as ≥4 missed games or Injured Reserve placement), were obtained from ESPN and ProSportsTransactions.com. To account for differential career exposures, injury incidence was calculated per 1,000 career snaps played. Poisson regression, with an offset for snap count, was used to compare injury incidence rate ratios (IRRs) between groups. Sensitivity analyses were performed across draft rounds and positions.

RESULTS: Multi-sport athletes demonstrated significantly lower rates of total injuries (1.113 ± 1.655 vs. 1.565 ± 2.201 per 1,000 snaps, $P < 0.001$) and major injuries (0.849 ± 1.498 vs. 1.238 ± 1.885, $P < 0.001$) compared to their single-sport counterparts. Poisson regression was associated with a 20% reduction in total injury incidence (IRR 0.801, 95% CI 0.757–0.849, $P < 0.001$) and a 23.5% reduction in major injury incidence (IRR 0.765, 95% CI 0.714–0.818, $P < 0.001$) in multi-sport athletes. These differences were consistent across most position groups, excluding quarterback and offensive linemen. No significant difference was found between draft round and injury rate.

DISCUSSION AND CONCLUSION: NFL athletes who participated in multiple sports during high school were significantly less likely to

Continued from page 39

Table. Difference Between Single-Sport and Multi-Sport Cohorts by Raw Injury Rates (per 1000 snaps)

Multi-Sport		Single-Sport		Mean Difference		P Value	
Mean Major Injury Rate (± SD)	Mean Total Injury Rate (± SD)	Mean Major Injury Rate (± SD)	Mean Total Injury Rate (± SD)	Major Injury Rate (95% CI)	Total Injury Rate (95% CI)	Major Injury Rate	Total Injury Rate
0.849 ± 1.498	1.113 ± 1.655	1.238 ± 1.885	1.565 ± 2.201	-0.389 (−0.531, −0.247)	-0.452 (−0.615, −0.288)	<0.001	<0.001

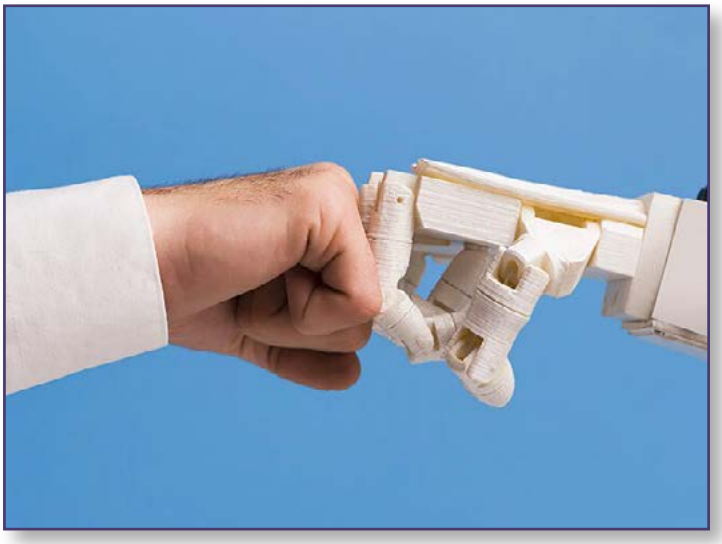
sustain both total and major orthopaedic injuries on a per-play basis. This suggests that early sport diversification may lead to superior motor learning, joint stabilization, and musculoskeletal resilience. The findings add to growing evidence discouraging early single-sport specialization and support youth athletic development models that prioritize movement diversity and gradual progression in training intensity. Orthopaedic surgeons and sports medicine professionals should incorporate early sport history into risk stratification models and consider this factor when advising young athletes and their families. Further longitudinal research is warranted to explore the biomechanical and physiological mechanisms by which early sport diversification protects against injury at the elite level.

Source: *Chundi G, Dawar A, Jones T, Fuller Z, Lingam S, Galdi B. Early sports specialization is associated with increased orthopaedic injury incidence in nfl athletes. Presented at 2026 Annual Meeting of the American Academy of Orthopaedic Surgeons. New Orleans, LA: March 2-6, 2026.*

ROBOTIC-ASSISTED TOTAL KNEE ARTHROPLASTY IS ASSOCIATED WITH IMPROVED QUALITY OF LIFE AND INCREASED PATIENT SATISFACTION ONE YEAR AFTER SURGERY

INTRODUCTION: Approximately 15–20% of patients undergoing conventional total knee arthroplasty (cTKA) report dissatisfaction one year after surgery. Robotic-assisted TKA (raTKA) provides greater precision in bone resection and ligament balancing, which may improve patient outcomes and satisfaction. The purpose of this study was to evaluate the impact of raTKA on quality of life (QOL) and satisfaction compared to cTKA at 1 year after surgery.

METHODS: Patients undergoing unilateral primary raTKA and cTKA at a single institution were prospectively enrolled. The Knee Injury and Osteoarthritis Outcome Score-12 (KOOS-12) was collected preoperatively and at 1 year postoperatively. Patient satisfaction was assessed at 1



year using the International Society of Arthroplasty Registries (ISAR) satisfaction scale that was validated by the Swedish Arthroplasty Registry. To control for baseline differences, a multivariate regression model with 95% CI was used to assess the association between surgical technique (raTKA vs. cTKA) and KOOS-12 QOL score improvement from baseline to 1-year after surgery. Satisfaction rates between the raTKA and cTKA groups were also compared, and differences were analyzed using multivariate logistic regression analysis.

RESULTS: A total of 1,154 including 941 consecutive cTKA patients and 213 consecutive raTKA patients were included. KOOS-12 QOL improvement was predicted to be 5.0 points higher in the raTKA group compared to the cTKA group using multivariate regression analysis. Among patients under 75 years of age, raTKA was significantly associated with higher satisfaction (93.5% satisfied in the raTKA group vs. 84.6% in the cTKA group). Multivariate regression analysis further showed that raTKA patients are 3.2 times more likely to be satisfied when compared to cTKA patients (Odds Ratio = 3.2, 95% CI (1.22-8.47); $P = 0.018$).

DISCUSSION AND CONCLUSION: Robotic-assisted TKA is associated with greater improvements in quality of life and higher satisfaction compared to conventional TKA at 1 year after primary TKA. These findings suggest potential benefits of robotic assistance in enhancing TKA outcomes. Further large-scale, multi-center studies are warranted to validate the generalizability of these findings.

Source: *Yousef M, Zheng H, Ayers DC. Presented at 2026 Annual Meeting of the American Academy of Orthopaedic Surgeons. New Orleans, LA: March 2-6, 2026.*

AAOS

Table. Five-Year Incidence of Bone and Joint Disorders in GLP-1 RA Users Versus Matched Controls

Outcome	GLP-1 RA Cases (N)	GLP-1 RA Incidence (%)	Control Cases (N)	Control Incidence (%)	Risk Ratio (RR)	95% CI	P-Value
Osteoporosis	2955	4.1	2284	3.2	1.29	1.22–1.36	<0.001
Gout	5407	7.4	4832	6.6	1.12	1.08–1.16	<0.001
Osteomalacia	125	0.2	49	0.1	2.55	1.83–3.55	<0.001

GLP1 RECEPTOR AGONIST USE IS ASSOCIATED WITH INCREASED RISK OF OSTEOPOROSIS, GOUT, AND OSTEOMALACIA IN ADULTS WITH TYPE 2 DIABETES AND OBESITY

INTRODUCTION: Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) have become central to the treatment of type 2 diabetes mellitus (T2DM) and obesity, with proven benefits in glycemic control, weight loss, and cardiometabolic risk reduction. Despite emerging hypotheses suggesting possible skeletal benefits, long-term effects of GLP-1 RA exposure on bone and joint health remain poorly understood. Mechanistic studies have raised concerns about altered calcium homeostasis and bone turnover, but real-world outcomes data are lacking. Recent studies have demonstrated potentially protective effects of GLP-1-RAs in this domain, but with limited power and generalizability. This study aimed to evaluate the 5-year risk of osteoporosis, gout, and osteomalacia in patients with T2DM and obesity treated with GLP-1 RAs compared to matched controls, using a large multi-institutional electronic medical record (EMR)–derived database.

METHODS: We performed a retrospective cohort study using a federated EMR-derived national database. Adults aged 18 years or older with concurrent diagnoses of T2DM and obesity (BMI ≥30 kg/m²) were included. Patients who received GLP-1 RAs, including semaglutide, liraglutide, dulaglutide, or exenatide, were identified and matched 1:1 to GLP-1 RA-naïve controls using propensity score matching. Matching covariates included age, sex, race, BMI, hemoglobin A1c, tobacco use, and comorbid conditions such as chronic kidney disease, rheumatoid arthritis, and baseline osteoporosis. Patients were followed for 5 years from the index date of GLP-1 RA initiation or matched entry date. The primary outcomes were incident diagnoses of osteoporosis, gout, and osteomalacia. Risk ratios (RRs) and 95% confidence intervals (CIs) were calculated; statistical significance was defined as $P < 0.05$.

RESULTS: After matching, cohort sizes were 73,483 patients per group with balanced baseline characteristics. At 5 years, patients exposed to GLP-1 RAs had a significantly increased risk of osteoporosis compared to controls (4.1% vs. 3.2%; RR 1.29, 95% CI 1.22–1.36; $P < 0.001$). The greatest relative risk increase was observed for osteomalacia, with a 5 year incidence of 0.2% among GLP-1 RA users versus 0.1% in the control group (RR 2.55, 95% CI 1.83–3.55; $P < 0.001$). All differences in absolute and relative risk reached statistical significance.

DISCUSSION AND CONCLUSION: In this large, matched cohort study of adults with T2DM and obesity, treatment with GLP-1 RAs was independently associated with significantly increased 5-year risk of osteoporosis, gout, and osteomalacia compared to non-users. These findings contradict recent assertions of musculoskeletal protection and suggest that GLP-1 RA exposure may confer increased long-term skeletal risk. As these agents are increasingly prescribed for both diabetic and non-diabetic indications, clinicians should consider bone health surveillance and monitor for delayed-onset complications in at-risk populations.

Source: *Wajahath M, Lawand JJ, Hill BW, Khan A, Abboud JA, Horneff JG. Presented at 2026 Annual Meeting of the American Academy of Orthopaedic Surgeons. New Orleans, LA: March 2-6, 2026.*

Targeted Protection Against Friction and Shear Forces

Background

Diabetic foot ulcers and other skin conditions such as blisters, calluses, and general skin irritation pose significant health challenges. These issues often stem from excessive friction and shear forces acting on vulnerable areas of the skin. Individuals who rely on specialized footwear, orthopedic braces and prosthetic devices are particularly susceptible to these types of injuries. When left unaddressed, these conditions can lead to pain, infection, and even long-term mobility complications or limb loss.

Challenge

In environments where medical or performance equipment interfaces with the skin–such as prosthetic sockets, insoles, and orthotics–managing friction and pressure is a persistent imperative. Traditional padding and liners focus on reducing pressure but often ignore and fail to effectively reduce shear forces, resulting in irritation, breakdown, and discomfort. For diabetic patients who often can't feel this damage, these complications can escalate rapidly into chronic ulcers that get infected and become difficult to treat. Patients and their providers require a reliable solution that prevents these issues before they start and quickly heals them if they happen.

Solution

ShearBan, a patented, self-adhesive material, offers a proven, innovative approach to friction and shear force management. Unlike other solutions, ShearBan is applied directly to the device or shoe, providing targeted protection to the contact area that needs it most. By dramatically reducing friction and shear at the skin–device interface, it helps prevent the skin damage that can lead to blisters, calluses, and diabetic foot ulcers. ShearBan's unique design and durable material allows it to be applied easily and directly to the surfaces of problem areas on orthopedic braces, prosthetic sockets, footwear and insoles, rather than the skin, providing long-lasting protection by strategically reducing friction at the contact area.

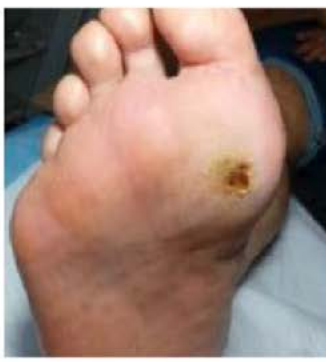
The result is enhanced comfort, improved device performance and wear times, expedited healing, and reduced risk of injury or skin breakdown.

Results:

MAY 29 | 2023

MAY 29 | 2023

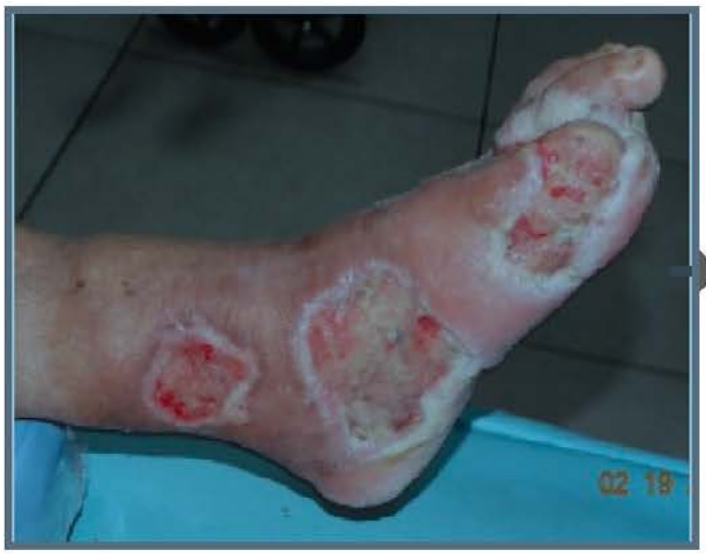
ShearBan strategically applied to targeted area of plastazote mold in the offloading sandal.



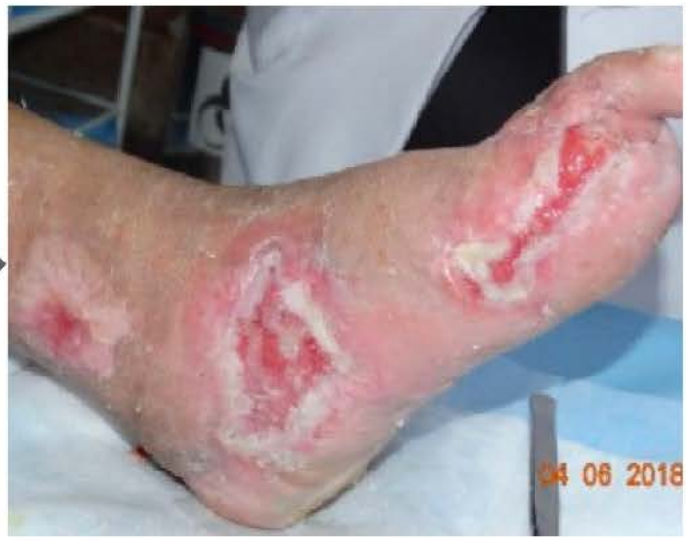
JUNE 20 | 2023

Complete wound closure and nearly complete healing of foot ulcer after 23 days. ShearBan use continues.

Example 1. 39-year-old patient with diabetes and peripheral neuropathy diagnosed with Wagner Grade III diabetic foot ulcer.



FEB 19 | 2018

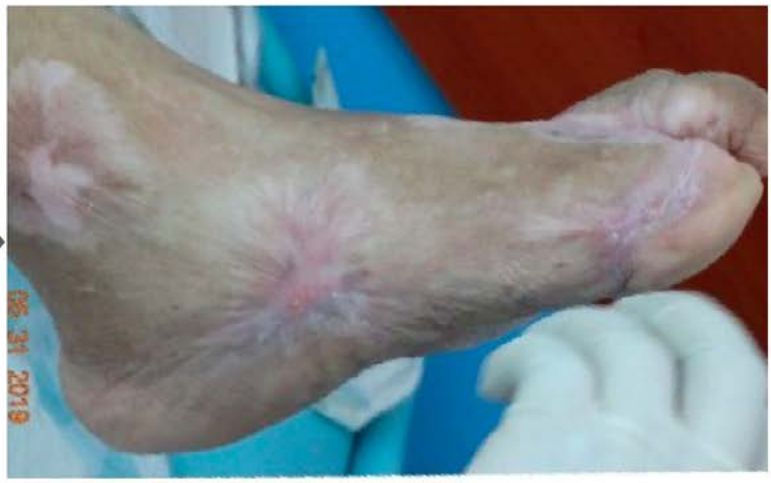


APRIL 06 | 2018

Wound care regimen begins to be administered twice per week.

JULY 06 | 2018

ShearBan strategically applied to targeted areas of orthopedic insoles.



JUNE 31 | 2019

Ulcers are completely healed after 12 months. ShearBan use continues to help prevent recurrence.

Example 2. 68-year-old patient with diabetes and peripheral neuropathy diagnosed with Wagner Grade 2 diabetic foot ulcers.

Wound Care Game Changer

Help More Patients Relieve Plantar Pathologies — Offload In Their Shoes!

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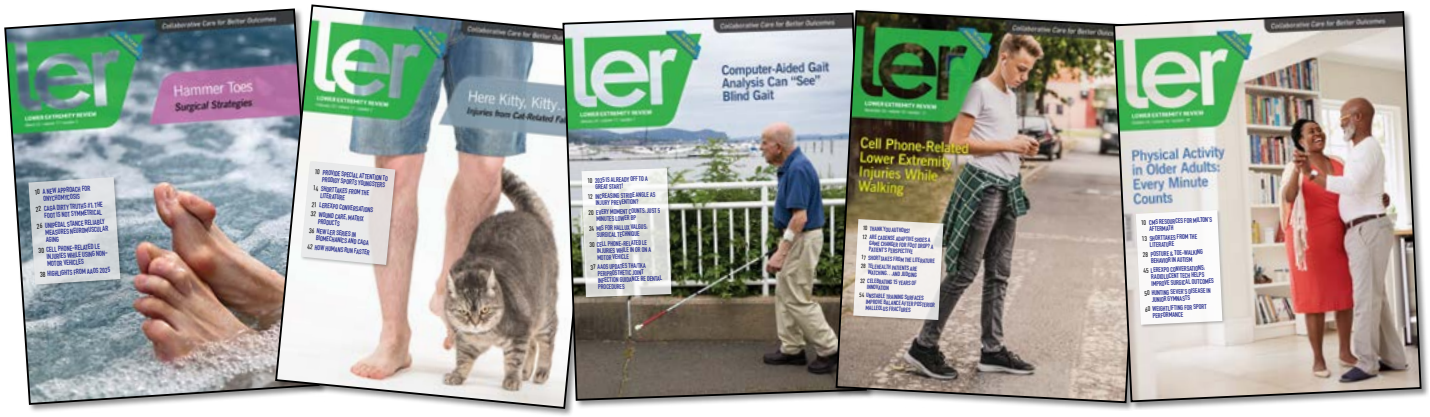

LOWER EXTREMITY REVIEW

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New & Noteworthy

Noteworthy products, association news, and market updates

FOOT AND ANKLE FIXATION SYSTEM ADDRESSES COMPLEX SMALL BONE RECONSTRUCTION

The Brachiator™ Mini-Rail External Fixation System is a platform designed for precise, multi-planar correction, rapid construct assembly, and workflow efficiency for the correction of bone deformities and stabilization of fractures of the foot and ankle. Engineered with extensive surgeon feedback, the system combines compact design, universal pin compatibility, and intuitive clamp mechanics to support a wide range of procedures. Where conventional mini fixators rely on rigid, fixed-angle clamps–or require mid-procedure construct teardown to achieve adequate reduction–the Brachiator System introduces built-in, in-plane, and out-of-plane rotational control. This enables surgeons to perform fine, multi-axis reduction even after pins are placed. The compact rail and carriage design maintains a ≥2 cm soft tissue–friendly profile above the skin surface, which is designed to support patient tolerance and postoperative management.

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855/786-2828
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ADA RELEASES "STANDARDS OF CARE IN DIABETES–2026"

The American Diabetes Association® (ADA) recently released the "Standards of Care in Diabetes–2026," the gold standard in evidence-based guidelines for diagnosing and managing diabetes and prediabetes. Based on the latest scientific research and clinical trials, the guidelines include strategies for diagnosing and treating diabetes in children, adolescents, and adults; methods to prevent or delay diabetes and its associated comorbidities like obesity; and care recommendations to enhance health outcomes.

Notable updates to the 2026 "Standards of Care in Diabetes" include those on diabetes technology, glucose-lowering medications, nutrition, and diabetes management. Other noteworthy changes include a new discussion on emerging technologies in foot care and information on adjunctive advanced therapies for diabetic foot ulcers.

The "Standards of Care in Diabetes–2026" is now available online as a supplement to the January 2026 issue of *Diabetes Care*®. In addition, a convenient Standards of Care app, available for iOS and Android systems, offers the latest guidelines with interactive tables and algorithms for easy reference. Additional resources, including a comprehensive slide deck and a webcast offering CE credit, are available on the ADA's professional website, DiabetesPro®.

To access the journal, visit https://diabetesjournals.org/care/issue/49/Supplement_1.

STUDY SHEDS LIGHT ON WHY TENDONS ARE PRONE TO INJURY

Scientists at the University of Portsmouth, England, have created the first detailed 3D map of how a crucial piece of connective tissue, called calcified fibrocartilage (CFC), in our bodies responds to the stresses of movement and exercise. CFC acts like a biological shock absorber where tendons attach to bone. Damage to the CFC tissue–common in sport-related injuries–does not mend well. To improve healing treatments, scientists need to better understand the structure of this tissue and how it reacts to varying types of pressure.

Research by Atousa Moayedi, a PhD student in the university's school of electrical and mechanical engineering, has been able to demonstrate that the center of the CFC tissue changes shape more than the surrounding areas, when stressed at different angles. In areas where the microscopic cavities within the tissue were more densely packed, the distortion was greater. This means that the way the tissue layers are arranged, and how thick they are, strongly influences how stretching (strain) is dispersed where the tendon meets the bone.

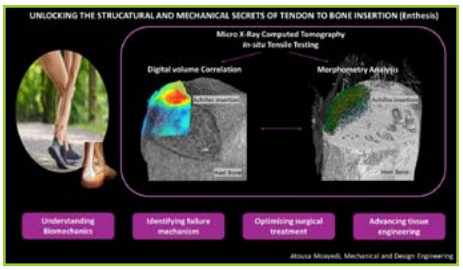

Image courtesy of University of Portsmouth.

The research team used high resolution 3D scanning and artificial intelligence–powered image reconstruction to map the way in which CFC tissue behaves under pressure in a mouse model, as well as how and where it might fail. Importantly, they were also able to identify the features that would be important for healing.

Overseeing the study, was Professor Gordon Blunn, PhD, from the University's School of Medicine, Pharmacy and Biomedical Sciences. "The weak link in the way that load is transferred from muscle to the skeleton is where the tendon joins with the bone," he said. "After injury this region is slow to heal and difficult to repair. Importantly, Atousa's

work identifies the way that load is naturally transferred in this region and serves as a model for the repair and regeneration of tissues at this site."

POWERED-ANKLE LIFESTYLE PRODUCT

The Dephy Sidekick is a new category of bionic footwear designed to help people move farther, longer, and with greater confidence in their everyday lives. Worn at the ankle and integrated into compatible footwear, the Sidekick provides a subtle, responsive boost with each step, helping movement feel easier and more natural. It is built on Dephy's proprietary technology and is engineered to work in harmony with the body, responding intelligently to movement and providing support when and where it's needed. The Sidekick adapts to the user, preserving a natural and intuitive walking experience. The device learns an individual's walking pattern in just 20 strides, no app or complicated calibration required, enabling personalized, responsive support. The lightweight wearable incorporates advanced sensors and real-time adaptive control to anticipate motion and reduce physical effort over time.

Dephy
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SUPPORT FOR HEALTHY TOENAILS

ProNail Complex is a topical mist spray that supports nail appearance, strength, and surface clarity by delivering plant-based oils, vitamins,

and antifungal compounds directly to the nail and surrounding skin. The spray disperses ultra-fine particles designed to reach under the nail edge and around the cuticle. Users apply it directly to clean nails once or twice per day, making compliance far easier than multi-step treatments. Each application contains a blend of tea tree oil, aloe vera, clove bud oil, lavender oil, vitamin E, and undecylenic acid. During the first 2 to 3 weeks, most users report subtle surface-level changes, including reduced dryness around the cuticle, improved nail comfort, and a cleaner overall appearance; at this stage the nail is being conditioned, not replaced. Gradual improvements in nail clarity, thickness, and smoothness are realized over 6 to 8 weeks; this timeline aligns with how nails naturally grow and regenerate.

ProNail Complex
thepronailcomplex.com

TRULIFE RECEIVES 2025 HANGER PARTNER AWARD FOR OPERATIONAL PERFORMANCE

Trulife has been awarded the 2025 Hanger Partner Award for Operational Performance at Hanger Live 2026, recognizing excellence in electronic data interchange transaction accuracy and consistently high on-time delivery performance. The recognition carries particular significance given Hanger's position in orthotic and prosthetic patient care, known for its clinical network and commitment to operational and clinical standards, focusing on empowering patient mobility. Being recognized and awarded

by such a trusted industry leader underscores Trulife's focus on reliability, process excellence, and long-term partnership sustainability.

SMART HYDROGEL ACCELERATES DIABETIC WOUND HEALING

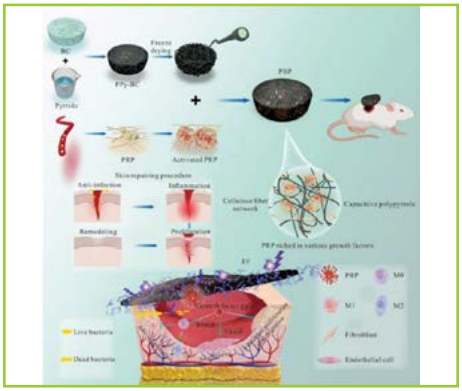

Image courtesy of Department of Biomedical Engineering, College of Life Science and Technology, Huazhong University of Science and Technology, Wuhan, China.

Researchers have engineered a smart hydrogel dressing that replicates the skin's natural healing process to promote faster and more effective wound closure. The study introduces a composite hydrogel that integrates bacterial cellulose (BC), conductive polypyrrole (PPy), and platelet-rich plasma (PRP) into a single multifunctional platform. The hydrogel, referred to as PBP (polypyrrole/bacterial cellulose/platelet-rich plasma), is designed to address the key barriers to diabetic wound healing: persistent inflammation, bacterial infection, and poor tissue regeneration. BC provides a porous, biocompatible scaffold that mimics the extracellular matrix, while PRP–rich in growth factors like VEGF, EGF,

and PDGF–supports cell proliferation and angiogenesis. PPy, a conductive polymer, not only enhances the hydrogel's antibacterial properties through capacitive charging but also enables electrically triggered release of growth factors.

In laboratory tests, the charged PBP hydrogel demonstrated over 98% antibacterial efficacy against both E. coli and S. aureus, common pathogens in diabetic wounds. The hydrogel's electrical stimulation capability further boosted its performance, promoting fibroblast and endothelial cell growth while modulating macrophage polarization from a pro-inflammatory (M1) to a pro-healing (M2) phenotype.

In a diabetic mouse model, wounds treated with the PBP hydrogel–especially when combined with electrical stimulation–showed significantly faster healing. By day 14, nearly complete wound closure was observed, with enhanced collagen deposition, vascularization, and epidermal regeneration. The hydrogel also maintained a moist microenvironment, absorbed exudate, and reduced inflammatory cytokines, all critical for optimal wound repair.

What sets this dressing apart is its ability to mimic the physiological phases of skin repair: inflammation control, tissue formation, and remodeling. Unlike conventional dressings that offer passive protection, the PBP hydrogel actively participates in the healing process. Its electroresponsive nature allows for on-demand drug release, making it a potential platform for personalized wound care.

By integrating bioinspired design with smart material functionality, the PBP hydrogel offers a promising, clinically translatable solution for diabetic wound healing. Future work will focus on refining the material's mechanical properties, extending growth factor release duration, and validating its efficacy in larger animal models and human trials.

SMART INSOLES DESIGNED TO PREVENT FALLS

A University of Bristol, England, engineer has developed a smart shoe insole with hundreds of

Image courtesy of University of Bristol.

tiny sensors that could help prevent falls among the elderly. Jiayang Li, PhD, a lecturer in electrical engineering, created the smart shoe insole prototype after noticing his mentor, who still edits research papers at age 89, was becoming unsteady on his feet. The insole contains 253 sensors that provide real-time gait analysis, generating pressure maps that can be displayed on a mobile device to assess balance and fall risk.

The technology uses an advanced microchip to simultaneously read all sensors while consuming just 100 microwatts of power, allowing it to run for about 3 months on a single charge. The concept builds on Li's previous work with University College London developing advanced sensors for lung function monitoring. For the shoe insole, the team adapted similar techniques to create a mobile, accessible solution for everyday use. "Although this detailed analysis could be obtained in hospital, the challenge was to make the technology more mobile and accessible in everyday life," Li said.

The team plans to conduct clinical evaluations with larger groups to validate fall risk prediction and refine the technology before exploring mass production.

FLEXIBLE SYNDESMOTIC FIXATION DEVICE

Stryker's Synchfix™ EVT is a next-generation flexible syndesmotic fixation device designed to simplify surgical deployment while supporting ankle stabilization in patients with syndesmotic disruptions. Commonly associated with sports trauma and ankle fractures, ankle syndesmotic injuries can significantly affect patient mobility and recovery. Synchfix EVT builds on the legacy Synchfix platform, incorporating design en-

hancements that reduce procedural complexity compared to the predicate device. The device features an all-in-one system that integrates suture tensioning handles within the implant instrumentation, along with a handle design for one-handed surgical implant deployment. The device is engineered to provide a seamless user experience with an ergonomic handle and a low-profile titanium medial implant. It is intended for soft tissue and bone fixation for ankle syndesmosis disruptions with or without ankle fractures and as an adjunct in connection with hardware for ankle fractures such as Weber B, Weber C, and Maisonneuve in adult and adolescent patient populations.

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STUDY REVEALS INJURY PATTERNS BASED ON GENDER, AGE

One of the largest MRI-based studies comparing knee injuries between men and women reveals surprising differences in injury patterns based on gender and age. The findings can be used to improve risk assessment and develop early intervention strategies.

The study included 13,549 consecutive routine knee MRI exams performed between 2019 and 2024 at 4 outpatient radiology facilities affiliated with Johns Hopkins Hospital. The patients reported knee pain as their chief complaint. The researchers extracted the following features from radiology reports: tears in or injuries to the medial and lateral menisci, anterior cruciate ligament (ACL), posterior cruciate ligament, me-

dial collateral ligament (MCL), lateral collateral ligament complex, and extensor mechanism or patellofemoral dislocation.

Analysis of the MRI reports revealed that specific injuries were observed more often in men compared to women, including ACL tears alone, ACL tear with medial meniscal tear, or ACL tear with lateral meniscal tear.

Arrows show a complete ACL rupture in an 18-year-old male who had a knee injury while playing football. Image courtesy of Ali Ghasemi, MD, and RSNA.

Men had a greater number of injuries overall. The researchers also found that meniscal and MCL tears occurred more frequently in men under 40 and among older women. The findings suggest that older women are more prone to injuries that lead to joint degeneration over time.

Recognizing the injury patterns may help radiologists and clinicians tailor imaging protocols, risk assessments, and early intervention strategies to optimize patient outcomes.

PROFESSIONAL LOWER-LIMB COMPRESSION THERAPY AT HOME

Built on Professional Sequential Air Compression Technology, the QN-071A features 4 independent air chambers that rhythmically inflate from foot to thigh. This wave-like compression mimics the body's natural muscle pump, enhancing circulation, promoting lymphatic drainage, and flushing out lactic acid–so your legs feel lighter, fresher, and ready for your next challenge. With an integrated pressure sensor, the QN-071A automatically calibrates to your leg size and optimal pressure level. The digital controller offers 8 intensity

levels (50–120 mmHg), 3 massage modes (sequential, Ccrculation, combination), and 3 timer settings (20–30 minutes). The product is U.S. Food and Drug Administration 510(k) cleared and FSA/HSA eligible, giving users the same confidence trusted by medical professionals. Every session is backed by verified safety, durability, and effectiveness.

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The Recovery Loop™ is a wearable, battery-operated, rechargeable device designed to soothe tired muscles, relieve aches, and support the body's natural recovery process. By harnessing the company's patented MultiWave® technology, the device delivers multiple wavelengths of light that work together to increase local blood circulation, relax muscles, ease stiffness and soreness, and temporarily relieve muscle and joint pain. Worn comfortably with adjustable straps, it's available in both 1 Pod and 2 Pod kits for targeted or larger treatment areas, making it ideal for post-workout recovery, arthritis pain relief, and everyday wellness. The wearable, portable design allows for hands-free use with adjustable straps for arms, legs, waist, and more. Recovery Loop brings professional-grade wellness to consumers, helping them recover faster, feel better, and keep moving. Made in the United States. Built to last with a 2-year warranty.

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INFORM DIAGNOSTICS COMPLETES ACQUISITION OF BAKO DIAGNOSTICS

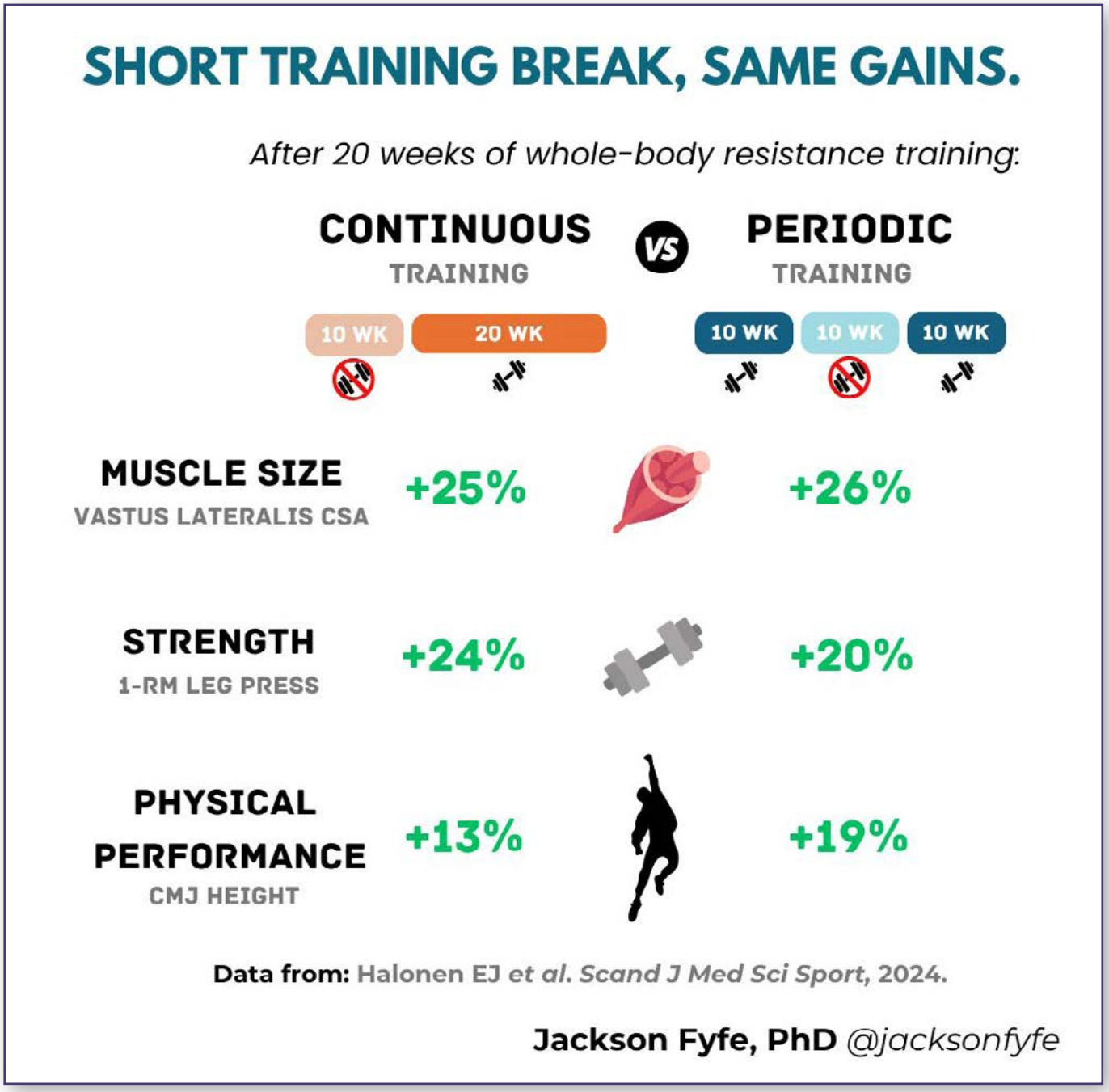
Inform Diagnostics, a Fulgent Genetics company, announced that the acquisition of Bako Diagnostics was completed on March 17. Fulgent is an innovative leader in the clinical diagnostic and pathology fields. The acquisition underscores the company's unwavering commitment to the podiatric medical community and strengthens its leadership position within it for years to come. This new chapter ensures the company's continued innovation, digital capabilities, enhanced efficiency, and test menu expansion.

Bako Diagnostics will continue to serve the podiatric medical community in the same manner it has for many years.

Short Training Break, Same Gains.

Consistency is hard. We all know it matters - especially for long-term pursuits like exercise. But being consistent doesn't mean never taking a break, either. Too often we beat ourselves up the moment we fall out of routine.

Whether it's a busy period, illness, low motivation, or life in general… even a short disruption and suddenly we tell ourselves we've "ruined" our progress.



Source: Halonen EJ, Gabriel I, Kelahaara MM, Ahtiainen JP, Hulmi JJ. Does taking a break matter-adaptations in muscle strength and size between continuous and periodic resistance training. Scand J Med Sci Sports. 2024 Oct;34(10):e14739. doi: 10.1111/sms.14739.

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