# Foot & Ankle Research Review™

Making Education Easy

Issue 42 – 2019


## In this issue:



**Abbreviations used in this issue:**
**CI** = confidence interval
**MTPJ** = metatarsophalangeal joint
**NSAID** = non-steroidal anti-inflammatory drug
**OA** = osteoarthritis
**OR** = odds ratio
**PAD** = peripheral arterial disease
**RR** = relative risk

## Welcome to Issue 42 of Foot and Ankle Research Review.

The study by Abbott et al., who investigated a smart insole system linked to a smartwatch for monitoring of foot pressures in diabetics is a very thought provoking. If you routinely assess plantar pressures and provide pressure redistribution for people with diabetic foot problems then this is a must-read article. There are also two studies, Menz et al., and Bowen et al., that implicate a mechanical aetiology in the formation of calcaneal enthesophytes and OA features in foot joints.

I hope you enjoy this issue and please keep the feedback coming in.

Kind regards,


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### Independent commentary by Associate Professor Matthew Carroll

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## Innovative intelligent insole system reduces diabetic foot ulcer recurrence at plantar sites: a prospective, randomised, proof-of-concept study

**Authors:** Abbott CA et al.

**Summary:** A UK prospective, randomised, proof-of-concept study tested the idea of an intelligent insole system, which continuously measured plantar pressure and provided smartwatch alerts and instructions when pressures were abnormal, for the prevention of diabetic foot ulcer recurrence in 58 high-risk patients. After 18 months follow-up, 10 ulcers occurred in controls (n = 26; 8638 person-days) versus 4 ulcers in the intervention group (n = 32; 11,835 person-days (RR 0.29; 95% CI 0.09-0.93; p = 0.037). The number of patients experiencing ulcers in each group did not differ (6 vs 4); however, individual plantar sites ulcerated more often in controls (10/416) than in the intervention group (4/512; p = 0.047). Ulcer incidence was reduced by 86% in good compliers (n = 40) in the intervention vs the control group (RR 0.14; 95% CI 0.03-0.63; p = 0.011). Plantar callus severity was greater in re-ulcerating patients than non-re-ulcerating patients (6.5 vs 2.0; p = 0.040).

**Comment:** This article should be read by all who manage diabetic foot ulcers, particularly those who are involved in therapies related to pressure offloading in the lower limb. Research has traditionally examined and made assumptions based upon peak plantar-pressure data during walking. This study investigated the effectiveness of a novel insole system that provided participants with continuous plantar-pressure feedback and encouragement to offload during daily activities. The insole system was connected to a smartwatch which alerted participants when the pressure threshold of more than 35 mmHg was exceeded. To me, the most interesting finding was that the majority (95%) of intervention-group patient's self-reported alerts occurred while in static activities; e.g. sitting working at a computer, driving, or standing still for prolonged periods. Only a minority (11%) described ever receiving alerts while walking. This finding is important, because current literature on diabetic foot ulcer risk features mainly focuses on high pressures sustained during normal gait. These findings warrant a rethink of the nature of activities believed to be high risk for ulceration. Clinically, we must also conceptualise that pressure offloading should not be confined to weight-bearing activities only.

***Reference: Lancet Digit Health 2019;1:e308-18***
Abstract

## Age-related gait standards for healthy children and young people: the GOS-ICH paediatric gait centiles

**Authors:** Alderson LM et al.

**Summary:** This observational study aimed to develop paediatric population gait measurement standards in 624 healthy children and young people aged 1-19 years using a GAITRite walkway to record velocity, cadence, step length, base of support and stance, single and double support (as percentage of gait cycle). Percentile charts were developed for 7 gait variables for contemporary healthy children.

**Comment:** User-friendly, standardised, quantitative tools to describe gait patterns in children remain elusive. In 624 children (303 girls, 321 boys) aged 1-19 years, the study developed age related centile charts for 7 gait parameters (velocity, cadence, step length, base of support and stance, single and double support (as percentage of gait cycle). The development of the gait centiles, which are readily available in the manuscript, provide a useful method to screen children with different pathologies to identify early changes in gait. It may be argued that the sample was too small to be representative of all children as it was based upon a UK sample; however, the sample is the largest yet to examine paediatric gait characteristics.

***Reference: BMJ. 2019;104(8)755-60***
Abstract

## Associations between calcaneal enthesophytes and osteoarthritis of the hands and feet

**Authors:** Menz HB et al.

**Summary:** This multicentre UK study evaluated associations between calcaneal enthesophytes and osteoarthritis (OA) in the hands and feet in 532 general practice patients (298 women; mean age 64.9 years) reporting foot pain. There was no association between calcaneal enthesophytes and hand OA phenotypes nor with OA at individual hand joints; however, there was an association between plantar calcaneal enthesophytes and polyarticular foot OA (OR 1.80; 95% CI 1.02-3.17). At individual foot joints, posterior enthesophytes were associated with talonavicular joint OA (OR 1.58; 95% CI 1.02-2.44) and plantar enthesophytes with 1st metatarsophalangeal joint (OR 0.67; 95% CI 0.49-0.98) and navicular-cuneiform joint (OR 2.30; 95% CI 1.40-3.79) OA.

**Comment:** The study adds to the growing evidence that calcaneal enthesophyte formation and OA features in foot joints may be induced by a mechanical aetiology. This point is supported by data demonstrating no association between calcaneal enthesophytes and any hand OA phenotype. These findings suggest that calcaneal enthesophytes may result from a local, biomechanical processes rather than a systemic 'bone forming' process, and therefore may not be part of a systemic form of OA. The research findings should be currently classified as speculative, as further research investigating the link between biomechanical factors such as joint range of motion and enthesophyte formation is required.

***Reference: Arthritis Care Res (Hoboken). 2019;July 19 [Epub ahead of print]***
Abstract

## The natural history of radiographic first metatarsophalangeal joint osteoarthritis: a nineteen-year population based cohort study

**Authors:** Bowen C et al.

**Summary:** This longitudinal cohort study used data from 1995 and 2013-2015 for 193 women (mean age 75.7 years) enrolled in the Chingford 1000 Women study to examine the incidence, prevalence, and progression of radiographic first metatarsophalangeal joint (1st MTPJ) OA. Prevalence of OA in 1995 was 21.76% (left 1st MTPJ) and 24.35% (right 1st MTPJ) and in 2013-15 it was 23.83% (left) and 32.64% (right). Over this 19-year period, incident OA developed in 13.5% of women in the right 1st MTPJ and in 8.3% of women in the left. Both progression and worsening of OA were greater with osteophytes and in the right 1st MTPJs.

**Comment:** This study provides a unique perspective into the long-term progression of arthritis in 1st MTPJs. The study showing increased prevalence and radiographic severity of 1st MTPJ OA from year 6 to year 23. Approximately 20% of participants free of 1st MTPJ OA at year 6 had developed radiographic OA symptoms by year 23. Interestingly 50% of the population remained free of radiographic 1st MTPJ OA over the course of the study. The study used the La Trobe Foot Atlas Scale to score 1st MTPJ OA, for those not familiar with the scale it may be useful to review as it is becoming increasingly used to grade 1st MTPJ OA severity. There are some questions left unanswered that require future investigation, namely the effect of occupation and physical activity on the 1st MTPJ.

***Reference: Arthritis Care Res (Hoboken). 2019. [Epub ahead of print]***
Abstract

## Determining the clinical knowledge and practice of Australian podiatrists on children with developmental coordination disorder: a cross-sectional survey

**Authors:** Smith M et al.

**Summary:** This round survey of 365 Australian podiatrists examined current knowledge of Australian podiatrists regarding presentation, assessment, and management of children with developmental coordination disorder (DCD). Overall, 30% of podiatrists were familiar with DCD as a diagnosis, while 37% were familiar with alternate or outdated terminology associated with DCD. Participants familiar with DCD or related terminology had good knowledge of DCD signs and symptoms. Both familiar and unfamiliar respondents favoured referral to other health professionals rather than completing assessments. Common strategies (footwear advice, orthoses, strength training) were the most frequently selected interventions, although current evidence supports only strength training. Respondents were willing to receive DCD education through online and in-person training.

**Comment:** This survey of podiatrists showed that while many may see children with DCD, less than half of the survey respondents were familiar with the term DCD. These findings parallel previous research in the medical profession. DCD has been an accepted terminology since 1994, but appears not to have been cemented in practice. The study emphasises the lack of familiarity with knowledge surrounding the presentation and terminology as a potential barrier to clinical practice. This manuscript will provide you with some key references to further your knowledge surrounding DCD.

***Reference: J Foot Ankle Res. 2019;12:42***
Abstract

## The progression rate of peripheral arterial disease in patients with intermittent claudication: a systematic review

**Authors:** Mizzi A et al.

**Summary:** This review examined the progression rate of symptomatic peripheral arterial disease (PAD) in patients with intermittent claudication (IC) based on 7 prospective and 1 retrospective cohort (n ranging from 38 to 1244). The quality of evidence was rated as low to moderate, mostly because of limited allocation concealment at recruitment and survival selection bias. Progression rate in terms of haemodynamic measurement varied from a yearly decrease of 0.01 to 0.02 over 1 year in ankle-brachial pressure index (ABPI) in several studies, to a yearly decrease ABPI of 0.14 in 21% of participants in a single study. Inherent difficulties associated with the use of ABPI as a surrogate measure of peripheral perfusion highlighted a probable underestimate of the rate of reported progression of PAD.

**Comment:** This systematic review is the first to evaluate the progression rate of PAD in individuals with IC in terms of haemodynamic assessments. Review data demonstrated that progression rates of PAD in people with IC are likely underestimated. Notably, a review by the TransAtlantic Inter-Society Consensus for the Management of Peripheral Arterial Disease stated aggressive progression of PAD resulted in an amputation rate of 27% in those with IC. The recommended first-line treatment strategy is conservative treatment. This includes lifestyle modification and medical therapy. Unfortunately, this approach ignores the fact that a proportion of patients with claudication will deteriorate to critical limb ischaemia and will require lower-limb interventions. The review emphasises a need for more accurate prediction of patient-specific risk of deterioration to create a paradigm shift in the management of patients with IC. Delaying intervention until the patient has already developed critical ischaemia almost invariably means that more extensive occlusive disease has developed.

***Reference: J Foot Ankle Res. 2019;12:40***
Abstract

## Factors associated with type of footwear worn inside the house: a cross-sectional study

**Authors:** Barwick AI et al.

**Summary:** This Australian secondary analysis of data from inpatients in 5 hospitals across Queensland, sought to identify the self-reported type of footwear worn inside the house and the sociodemographic, medical, foot condition and treatment history associated with the choice of indoor footwear. Protective footwear was worn inside the house by only 11% of participants (4% walking, 4% running, 2% oxford shoes), and was associated with education level above year 10 (OR 1.78; $p=0.028$) and foot treatment by a specialist physician (OR 5.06; $p=0.003$). Most (55%) wore non-protective footwear inside the house (21% slippers, 15% flip flops, 7% backless slippers), and this was associated with older age (OR 1.03; $p<0.001$). 34% of participants wore no footwear (30% barefoot, 3% socks). Those less likely to wear no footwear (socks or barefoot) were older (OR 0.97; $p<0.001$) and from the most disadvantaged socioeconomic group (OR 0.55; $p=0.019$).

**Comment:** Aesthetic preferences, financial priorities, comfort, and presence of foot problems are all influencing factors in footwear decision-making. What advice are you providing patients surrounding footwear to wear in their house? The survey demonstrated approximately half of people wore what the researchers classified as non-protective footwear inside the house (slippers, thongs/flip flops) as opposed to approximately 10% who wore what was classified as protective footwear. Interestingly, wearing protective footwear was not associated with medical or foot conditions that normally require protective footwear e.g., peripheral neuropathy. This demonstrates the disconnection between footwear recommendations and actual footwear use in higher risk populations. Overall, the study highlights that as health professionals who provide footwear prescription and education surrounding shoes to be worn inside may not be providing effective footwear change interventions, particularly for footwear worn inside the house.

***Reference: J Foot Ankle Res. 2019;12:45***
Abstract



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Time spent reading this publication has been approved for CNE by The College of Nurses Aotearoa (NZ) for RNs and NPs. For more information on how to claim CNE hours please **CLICK HERE**.

## Effect of exercise on risk factors of diabetic foot ulcers: a systematic review and meta-analysis

**Authors:** Liao F et al.

**Summary:** This systematic review assessed the effect of exercise on risk factor for diabetic foot ulcers (glycated haemoglobin, PAD, diabetic peripheral neuropathy) among type 2 diabetes mellitus patients in 20 randomised controlled trials (n = 1357). Mean differences were observed between exercise and control groups in post-intervention glycated haemoglobin (HbA1c; -0.45%; $p < 0.00001$) and ankle-brachial index values (0.03; $p = 0.002$); within-group mean differences in HbA1c were -0.19% ($p = 0.1$) for aerobic versus resistance exercise, -0.25% ($p = 0.0006$) for combined versus aerobic exercise, and -0.64% ($p = 0.006$) for combined versus resistance exercise. Evidence of an association between exercise and peripheral neuropathy or risks of diabetic foot ulcers were insufficient.

**Comment:** Supporting the prescription of exercise for people with type 2 diabetes mellitus, data from the review indicated that exercise intervention significantly reduced HbA1c levels and improved ankle-brachial index in people with type 2 diabetes mellitus. Further to this, combined exercise had greater benefit on HbA1c reduction compared with either aerobic exercise or resistance training alone. However, why this is the case was unclear. Data also showed that exercise induced a significant increase in ankle-brachial index compared with non-exercise, suggesting the role of exercise in prevention or counteraction of PAD in patients with type 2 diabetes mellitus. Despite these positive findings the studies included in this review did not show change over time and the relative efficacy of differing types of exercise. Also problematic, and making comparisons between studies in the review difficult, were the wide range of exercise therapy durations, (range 8 to 103 weeks). The findings are positive, but the role of exercise therapy in diabetic neuropathy remains unanswered with little high-quality research available.

***Reference: Am J Phys Med Rehabil. 2019;98(2): 103-16***
Abstract



## Return to play after surgery for isolated unstable syndesmotic ankle injuries (West Point grade IIB and III) in 110 male professional football players: a retrospective cohort study

**Authors:** D'Hooghe P et al.

**Summary:** This retrospective study (2011-17) in 110 male professional football players assessed the effect of surgical stabilisation of isolated unstable syndesmosis injuries (West Point grade ≥IIB) on the time to return to play. Mean time to on field rehabilitation was 37 postoperative days, mean time to team training was 72 days and mean time to first match play was 103 days. Multivariate analysis indicated that severity of injury, concomitant talar cartilage injury and player age were significantly associated ($p < 0.00001$) with time to on field rehabilitation, team training and match play.

**Comment:** Although the incidence of syndesmosis injuries (high ankle sprains) are relatively low they are associated with a significantly greater time loss to play when compared with lateral ankle sprains. This results in a higher inability to train and play official matches compared with those with simple lateral ankle sprains only. If left intreated, unstable syndesmotic injuries are associated with persistent ankle pain and premature ankle arthritis. Despite a well-developed evidence base to guide management, most clinicians advocate conservative measures for stable low-grade syndesmosis injuries (West Point ≤IIA), and surgical stabilisation of high-grade unstable (West Point ≥IIB) syndesmosis injuries. The research showed that surgical stabilisation of high ankle sprains allowed for a relatively quick return to activity. Return to play was longer if there was concomitant cartilage damage and patients were of older age. This is a good reminder for those who routinely manage high ankle sprains to be vigilant in cases of persistent pain.

***Reference: Br J Sports Med. 2019 [Epub ahead of print]***
Abstract

## Management of hallux valgus in general practice in Australia

**Authors:** Menz HB et al.

**Summary:** Analysis of data from the Bettering the Evaluation and Care of Health program (2000-16) aimed to describe the management of hallux valgus by general practitioners (GPs) in Australia. Among 1,568,100 patient-encounters, hallux valgus was managed 658 times (4.2 per 10,000 encounters). There were 60,000 GP-patient encounters across Australia in the most recent year data (2015-16). There was a 3-fold higher hallux valgus management rate in female compared to male patients, and management was most frequent among patients aged 45 to 64 years. Management of this condition was predominantly via referral to orthopaedic surgeons (28 per 100 management occasions), counselling or advice (25 per 100) and referral to podiatrists (16 per 100). Twenty patients per 100 received pharmacological management, mainly involving prescription of NSAIDs (7 per 100).

**Comment:** This Australian-based research indicates that management of hallux valgus by GPs in Australia is primarily managed by referral to orthopaedic surgery, podiatrists or counselling and advice. The referral of patients to orthopaedic surgeons more often than to podiatrists is consistent with the management of foot and ankle pain reported in UK-based research. This suggests they may have a preference for surgical compared to conservative management, although the decision-making processes underpinning hallux valgus treatment options is yet to be explored. GPs frequently provided medications to patients with hallux valgus. The most commonly used medications were NSAIDs and is consistent with the GP management of foot and ankle osteoarthritis from this dataset. The preference for surgical referral emphasises there is still a lack of understanding surrounding conservative management options and general education related to hallux valgus.

***Reference: Arthritis Care Res (Hoboken). 2019;Sept 24 [Epub ahead of print]***
Abstract