

# CAREERS THROUGH MATHS: PODIATRIST



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## JOB DESCRIPTION

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A podiatrist is a highly skilled healthcare professional, registered with the Health and Care Professions Council (HCPC), who diagnoses and treats conditions of the foot, ankle, and lower limb. Their daily responsibilities are diverse, ranging from treating common issues like verrucae and ingrown toenails to managing complex, high-risk conditions such as diabetic foot ulcers and biomechanical pathologies. A typical day may involve clinical assessments in an NHS trust outpatient department, a private practice clinic, or through community visits. The work environment demands precision, as podiatrists utilise a variety of instruments for nail and soft tissue surgery, conduct vascular and neurological assessments using Doppler ultrasound and monofilaments, and prescribe and manufacture custom orthotics.

The core of the podiatric role is a rigorous, evidence-based diagnostic process. This begins with a detailed patient history and a comprehensive biomechanical examination. The podiatrist must analyse a patient's gait (walking pattern), which involves observing and measuring joint angles, muscle function, and pressure distribution across the foot. This quantitative analysis is crucial for identifying abnormalities that cause pain or could lead to future injury. For instance, assessing a patient with plantar fasciitis requires calculating angles of joint dorsiflexion and measuring heel alignment to determine the mechanical cause of the strain.

Mathematics is central to virtually every aspect of a podiatrist's clinical reasoning and treatment planning. It is not merely supplementary but the fundamental language through which diagnosis, intervention, and evaluation are conducted. From

calculating safe dosages of local anaesthetic based on patient weight and medical history, to using geometric principles to design an orthotic device that corrects a specific angle of deformity, mathematics provides the objective framework for effective and safe care. The role is a perfect fusion of clinical expertise and applied mathematical problem-solving to improve patient mobility and quality of life.

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## HOW MATHEMATICS IS USED

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- **Biomechanics and Trigonometry:** Podiatry is fundamentally applied biomechanics, which relies heavily on trigonometry and geometry. When conducting a gait analysis, podiatrists measure joint angles (e.g., the ankle joint complex during the gait cycle) using goniometers. These angular measurements are trigonometric calculations used to identify abnormalities such as excessive pronation (eversion) or supination (inversion). For example, calculating the 'subtalar joint neutral position' is a precise trigonometric exercise essential for casting a patient's foot to manufacture an accurate orthotic prescription. The design of the orthotic itself uses geometric principles to apply specific corrective forces, such as a medial heel skive to control calcaneal eversion, which is calculated in degrees of correction.
- **Pressure Analysis and Statistics:** Using sophisticated pressure plate systems (e.g., RSscan or Tekscan systems common in UK clinics and research institutions like the University of Salford's Podiatry department), podiatrists capture and analyse thousands of data points per second to measure plantar pressure distribution. This generates massive datasets requiring statistical analysis. They calculate mean and peak pressures (in kPa or  $\text{N/cm}^2$ ) under specific anatomical areas, such as the metatarsal heads. Comparing these statistics to normative data allows for the identification of pathological high-pressure areas that are risk factors for ulceration in diabetic patients. Statistical process control is then used to measure the efficacy of an intervention, like orthotic therapy, by comparing pre- and post-treatment pressure profiles.
- **Pharmacology and Dosage Calculations:** A core extended role for podiatrists, especially in surgical settings, is the administration of local anaesthesia and prescription of medicines. This requires precise pharmaceutical calculations. A podiatrist must calculate a safe maximum dose of local anaesthetic (e.g., Lidocaine with adrenaline) based on the patient's body weight (mg/kg),

considering their medical history. For example, calculating the maximum safe volume of a 2% solution for a 70kg patient is a critical arithmetic and algebraic task to avoid toxicity. This application is governed by strict NHS trust protocols and requires flawless mathematical execution.

- **Measurement and Proportional Reasoning:** Accurate clinical measurement is a daily mathematical task. This includes using a tape measure to assess oedema (swelling) in a limb, calculating percentage changes in wound size over time to monitor healing, and measuring dermatological lesions. When padding a foot, a podiatrist must calculate areas and volumes to cut and shape materials like felt or EVA to offload a precise area without creating new pressure points. This is a hands-on application of area and perimeter calculations, requiring a high degree of spatial awareness and proportional reasoning.
- **Statistical and Analytical Methods:** Podiatrists are increasingly engaged in audit and service evaluation within the NHS and private practice. This involves using descriptive statistics (means, medians, standard deviations) to analyse patient outcomes, waiting times, or treatment efficacy. They use this data to justify service funding, improve clinical pathways, and contribute to evidence-based practice. Furthermore, podiatrists involved in research utilise inferential statistics (e.g., t-tests, ANOVA) to analyse data from clinical trials, for example, testing the effectiveness of a new dressing protocol on healing rates for diabetic foot ulcers, contributing to UK-wide clinical guidelines.

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## KEY SKILLS & TOOLS

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Skill/Tool	Application
Gait Analysis Software (e.g., RSscan)	Software processes raw data from pressure plates and motion capture cameras to generate visual maps and quantitative reports. Podiatrists mathematically interpret peak pressure graphs, force-time integrals, and centre of pressure trajectories to diagnose biomechanical faults and plan interventions.
	UK orthotic labs use CAD systems (e.g., Rodin4D). Podiatrists digitally manipulate a 3D scan of a patient's foot, applying precise angular corrections (e.g., posting angles in degrees) and geometric

Computer-Aided Design (CAD) for Orthotics	modifications based on their biomechanical calculations to design a fully customised orthotic device.
Statistical Analysis Software (e.g., SPSS, Excel)	Used for clinical audit and research. Podiatrists input patient data to calculate descriptive statistics, run correlation analyses between variables (e.g., HbA1c levels and healing times), and create control charts to monitor key performance indicators for an NHS trust's podiatry department.
Doppler Ultrasound	Used to assess vascular status. The podiatrist calculates the Ankle-Brachial Pressure Index (ABPI) by dividing the systolic pressure in the ankle by that in the arm. This ratio is a crucial mathematical diagnostic tool for peripheral arterial disease, determining treatment options and compression therapy suitability.
3D Scanners & Digital Callipers	Used to capture precise digital moulds of feet. The software calculates volume and surface area. Digital callipers provide exact measurements (in millimetres) of foot deformities, lesions, or orthotic adjustments, providing the raw numerical data for clinical decision-making.
Clinical Reporting Systems (e.g., SystemOne)	Podiatrists must succinctly document complex mathematical findings (ABPI results, joint angles, pressure analysis data) in patient records. They translate this data into clear, justified treatment plans for multidisciplinary team members, including GPs and diabetic specialists.
Quality Assurance Protocols	Adherence to clinical standards set by the Royal College of Podiatry and HCPC. This includes mathematical precision in sterilisation autoclave cycle validation, calibration of measurement equipment, and audit cycles to ensure statistical targets for patient outcomes are met.

**Typical Pathway:** The standard route to becoming a podiatrist in the UK is to complete a HCPC-approved degree in Podiatry (BSc Hons), which requires GCSEs (typically including Maths and Sciences at grade 4/C or above) and A-levels (often including a Science subject). Many universities, such as the University of Southampton and Queen Margaret University in Edinburgh, offer these programmes. Upon graduation, registration with the HCPC is mandatory to practise. Most graduates begin as Band 5 Podiatrists within the NHS, rotating through specialities like diabetes, rheumatology, and biomechanics. Career progression can lead to Band

6 (Specialist Podiatrist), Band 7 (Advanced Practitioner), and into management or research roles. Pursuing an MSc or Doctorate allows for specialisation in areas like podiatric surgery (requiring fellowship training) or academia. Continuous professional development (CPD) is mandated by the HCPC and facilitated through the Royal College of Podiatry.

**Industry Demand:** Demand for podiatrists in the UK remains strong, driven by an ageing population and rising rates of diabetes and obesity, which significantly increase the risk of foot complications. The NHS Long Term Plan emphasises community care and preventing hospital admissions, placing podiatrists at the forefront of managing long-term conditions. Recruitment for NHS podiatry posts is consistent, with particular demand for specialists in diabetes and high-risk wound care. The private sports medicine and musculoskeletal sector also offers significant opportunities for podiatrists with strong biomechanical skills.

**Real-World Impact:** Podiatrists have a profound impact on UK public health and the economy. By preventing and managing diabetic foot ulcers, they drastically reduce the risk of amputations, saving the NHS an estimated £1 billion annually in associated costs and preserving individuals' independence. In sports medicine, their biomechanical expertise helps elite athletes at organisations like UK Sport and professional football clubs optimise performance and recover from injury. Through their mathematical and clinical expertise, podiatrists are essential in keeping the UK population mobile, reducing pain, and alleviating pressure on acute NHS services.