

The Diabetic Foot

Assessment and assistive devices

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i Hörsal Arvid Carlsson, Academicum, Medicinaregatan 3, fredagen den 31 mars 2017, klockan 9.00.

av **Ulla Hellstrand Tang**

leg. ortopedingenjör

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Avhandlingen baseras på följande delarbeten

- I. Hellstrand Tang U, Zügner R, Lisovskaja V, Karlsson J, Hagberg K and Tranberg R. Foot deformities, function in the lower extremities, and plantar pressure in patients with diabetes at high risk to develop foot ulcers. *Diabetic Foot & Ankle*, 2015; 6.
- II. Hellstrand Tang U, Siegenthaler J, Hagberg K, Karlsson J and Tranberg R. Foot anthropometrics in individuals with diabetes compared with the general Swedish population - implications for shoe design. Submitted.
- III. Hellstrand Tang U, Tranberg R, Zügner R, Karlsson J, Lisovskaja V, Siegenthaler J and Hagberg K. The D-Foot, an eHealth tool useful in risk classification and foot assessment in diabetes - construction and reliability. Submitted.
- IV. Hellstrand Tang U, Zügner R, Lisovskaja V, Karlsson J, Hagberg K and Tranberg R. Comparison of plantar pressure in three types of insole given to patients with diabetes at risk of developing foot ulcers - A two-year, randomized trial. *Journal of Clinical & Translational Endocrinology*, 2014; 1(4):121-132.

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Abstract

Diabetic foot ulcers (DFU) are a serious complication in diabetes and the most common factor leading to lower extremity amputation. An annual foot check for all 400,000 diabetes patients in Sweden is recommended. However, there is a need to standardise the foot check routines. For those patients that have been identified as having a foot at risk, assistive devices, podiatry service and access to medical specialists should be offered.

This thesis focuses on health-care providers at departments of prosthetics and orthotics (DPO) and methods that accurately assess the risk of developing DFU are presented. Moreover, the effects of assistive devices (foot orthoses and shoes) have been evaluated.

The patients that were studied in this thesis (n = 216) were all referred to a DPO. Clinical tests, surveys and in-shoe pressure measurements were used to assess the risk factors that were present in the studied group. Several risk factors were found to be present, e.g. foot deformities, calluses and neuropathy.

A valid and reliable eHealth tool, the D-Foot, which gives an objective DFU risk classification was constructed. The plantar peak pressure using foot orthoses (prefabricated and custom-made) inserted in normal walking shoes was approximately 200 kPa under the sole of the foot.

In conclusion, the D-Foot is recommended as a clinical tool to assess the risk of developing foot ulcers in diabetes. Moreover, foot measurements and plantar pressure measurements are assessments that facilitate the provision of assistive devices. It is expected that early identification and rapid intervention with prevention and care will reduce the number of DFUs and amputations, leading to positive effects for the individual and society.

Keywords: assessment, assistive devices, diabetic foot, diabetic foot ulcers, costs, eHealth, foot anthropometrics, foot deformity, risk factors, orthoses, insoles, pressure measurements, prevention, quality of life