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Effective Prevention Of Diabetic Foot Ulcer

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Abstract

Foot ulcers can develop if there is a prolonged increase in the skin surface pressure at the feet. It can happen, especially in people with diabetic polyneuropathia, because to insufficient nerve warning messages and inadequate tissue relief. After a while, a healthy individual would move and ease the foot. Without any natural alarm signals, a patient can be warned by a medical wearable. The necessary wound indications are not yet known, though. This work introduces a medical wearable that can monitor surrounding skin temperature, blood oxygen saturation, and pressure load at wound risk locations. In conjunction with artificial intelligence data analysis, we seek to find the pertinent wound predictors. Consequently, we carry out a clinical study As a result, we carry out a clinical trial on those who are at risk of developing diabetic foot ulcers.

Key words:
Medical wearable, prevention of diabetic foot ulcers prediction of ulcers, machine learning, KIPRODE, diabetic polyneuropathia

Introduction

Because there are more diabetic people worldwide, there are more cases of diabetic foot ulcers. As is well knowledge, 8–15% of people with diabetes will develop ulcers at some point in their lives. Every 13.4 minutes, a diabetic-related amputation is necessary in Germany [1]. Consequently, lowering these figures and preventing diabetic ulcers, which are the main cause of amputation, is a significant challenge for all of us. The primary cause of wounds is a loss of peripheral sensitivity, which prevents the detection of an elevated pressure load. We therefore look for a device to shield patients from excessive plantar pressure.

Methods and Procedures

The Fraunhofer EMFT, Munich, Technical University Munich, MRI, and Foot Net Bavaria collaboration created a wound prophylaxis tool with a sole foil coupled to a wearable electronic kit as part of the established project "KIPRODE" [2]. the electronic wearable that is mounted above the ankle and connected to a sensor foil.

To distinguish between sitting, standing, and walking, we also gather information on skin temperature, oxygen saturation, and movement. Machine learning is used to evaluate the data and look for trends that might be used to forecast the occurrence of wounds. According to the research hypothesis, pressure load alters the skin before and during the early phases of wound occurrence and causes hyperkeratosis to develop. That may lead to skin deterioration and more harm, maybe followed by Amputation is predicted by infections and deeper wounds [3,4]. To avoid this, we provide a compact and portable gadget, shown in, that uses machine learning techniques to identify and notify the risk of a pressure injury.

Result

Our patients were required to utilise the tool while sitting, moving around, and offloading for at least 4 hours during the day.

The various pressure patterns might be tracked and compared to other sensor data, such as skin temperature, patient movement, SpO2 readings, and a patient's diary. There was also a continuous connection to the nurses and doctors who came to check on the foot twice a week. It is possible to clearly extract the period of movement, the amount of pressure, the skin temperature, and SpO2.

Further research will make use of machine learning to extract the necessary early wound indicators. The patient will receive a signal telling them to stop immediately, and the doctor or podiatrist can be informed.

References

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