In-shoe diagnostic technologies for ulcer prevention of the diabetic foot

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Background

When the skin is subjected to continuous plantar stresses in the diabetic high-risk foot, the skin temperature at the area of stress rises, weakening the ability of the surrounding tissues to resist biomechanical abnormalities.

To date, monitoring of skin temperature and plantar pressure mapping measurement, can only be obtained separately using a thermographic camera and an in-shoe pressure device, a technique which can result as both expensive and time consuming. In view of this, researchers have been attempting to develop and validate innovative in-shoe devices that can serve as an alternative to the current impractical technologies that are currently available.

The aim of this systematic review is to provide a more rigorous analysis of existing literature related to the technologies used to read and measure both in-shoe plantar pressures and skin temperature.

Method

Literature related to the topic was searched in database sources. Outcome measures of interest included validity, reliability and responsiveness of in-shoe temperature/pressure mapping device used, quantity of sensors used, anatomical landmarks. Quality of evidence and risk of bias was evaluated using the QUADAS-2. Nineteen studies were identified and included.

Results

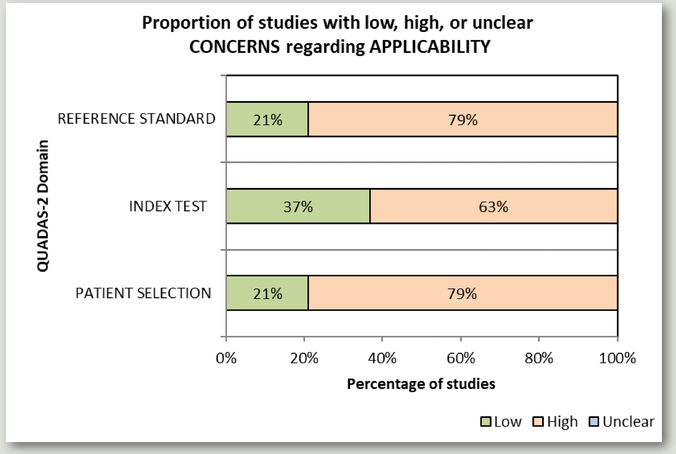
All studies have shown excellent validity but only 6 tested for the reliability of the device. None of the studies tested for responsiveness.

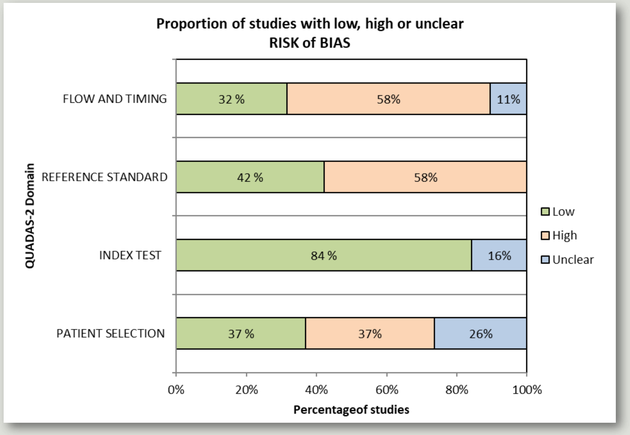
Quality assessment results scored high-risk in view of ‘patient selection’, ‘use of reference standard’, ‘applicability’, and low-risk in view of ‘use if index test’ and ‘flow/timing’.

The majority of studies used a small sample size of healthy participants.

Studies focused on diabetes but investigated on healthy individuals.

Only 5 studies have utilized devices that are able to measure in-shoe pressure and temperature simultaneously.





Conclusions

Current evidence on the validity, reliability and responsiveness of device that is able to measure in-shoe temperature and pressure simultaneously, is not robust enough.

This review provides a comprehensive understanding of the available technologies that simultaneously measure in-shoe plantar pressures/temperature. This review confirms that further reliability testing and clinical validation these devices is required. Information gathered from this review, can be useful in identifying functioning characteristics of mentioned devices to develop a reliable and valid, in-shoe pressure and temperature device that can be used to predict ulceration.