



Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

1. Determine the quantity and quality of evidence available for a technology of interest.
2. Identify any gaps in the evidence/ongoing evidence collection.
3. Inform decisions on topics that warrant fuller assessment by Health Technology Wales.

Topic:	Clinical photography smartphone applications to assess posture of wheelchair users
Topic exploration report number:	TER269

Introduction and aims

Health Technology Wales researchers searched for evidence on clinical photography smartphone applications (apps) to assess patient posture, particularly in wheelchair users.

Clinical photography apps use sensors within the smartphone to guide the user to orientate the phone so that it is positioned orthogonally to the patient. The photographs are then used by clinicians to assess the posture of the patient and make informed decisions about any adaptations to wheelchairs that may be required (to reduce pressure ulcers, for example). As these photographs can be taken in the community setting, the need for hospital visits could be reduced. The Topic Proposer states that there is currently no alternative to the app: regular smartphone cameras are currently being used with no technology assistance.

Summary of evidence

Clinical photography smartphone applications for assessing posture are digital health technologies and were determined to be a Tier C technology according to the [Evidence Standards Framework for Digital Health Technologies](#). Technologies within this classification help to guide treatment. For technologies of this classification, it is recommended that high-quality randomised-controlled studies are produced to demonstrate effectiveness of the technology.

Secondary evidence

The National Institute for Health and Care Excellence (NICE) clinical guideline (CG179) on pressure ulcers states that infants, children and young people who are long-term wheelchair users should be offered regular wheelchair assessments. However, NICE does not specify how these assessments should be conducted.

Primary evidence

The sagittal-lumbosacral posture of 183 adults (specified as having no back pain) was evaluated with the iHandy Level smartphone app. This app uses the smartphone's built-in accelerometer and a digital display to show the angle measured. Based on the results, the reliability was high for the iHandy Level application for both lumbar curve and sacral slope measurements (Koumantakis et al., 2016).

Another study by Gallego-Izquierdo et al. (2020) assessed the psychometric properties of the mobile application forward head posture (FHFapp) in 44 adults (unknown if any of them were wheelchair users). This app measures cervical posture by measuring the craniovertebral angle from a sideview photograph. The smartphone application exhibited 94.4% sensitivity and 84.6% specificity.

Ongoing work

The Topic Proposer states that they have designed, tested, and validated an app at the Posture and Mobility Service of a Welsh hospital. A user-acceptance study was conducted with clinical staff at the Welsh hospital, comparing photos of the posture of wheelchair users on a normal smartphone to the app. The results showed that the app could potentially be a useful clinical tool. This work has not yet been published, but there are plans to do so soon.

An observational study of 150 adults (unclear whether any of them are wheelchair users) is currently recruiting to investigate a smartphone-based assessment of movement health compared to standardised clinical tests for mobility, stability, and posture (NCT04854148, due to complete April 2022).

Areas of uncertainty

HTW researchers did not identify any evidence for the use of clinical photography smartphone apps to assess the posture of wheelchair users. The evidence that was identified either did not include wheelchair users or did not specify the population. In addition, it is unclear whether the smartphone apps in the evidence identified use the same techniques as the app developed by the Topic Proposer. We were unable to find any evidence relating to cost-effectiveness.

Conclusions

HTW researchers did not identify any evidence for the use of clinical photography smartphone apps to assess the posture of wheelchair users.

The studies that were identified to investigate use of smartphone apps for posture suggest that there could be benefits to using them, but they were relatively small trials and were not/did not specify that they were conducted in wheelchair users. It is recommended that randomised-controlled trials are used to generate evidence for this tier of digital health technology, but the studies we identified were observational. In addition, we did not identify any cost-effectiveness evidence. The Topic Proposer states that evidence for smartphone apps to assess posture, specifically in wheelchair users in the Welsh population, has shown promising results and will be published in the near future.

Brief literature search results

Resource	Results
HTA organisations	
Healthcare Improvement Scotland	We did not identify any relevant evidence from this source
Health Technology Assessment Group	We did not identify any relevant evidence from this source
Health Information and Quality Authority	We did not identify any relevant evidence from this source
EUnetHTA	We did not identify any relevant evidence from this source
International HTA Database	We did not identify any relevant evidence from this source
UK guidelines and guidance	
SIGN	We did not identify any relevant evidence from this source
NICE	Clinical guideline (CG179) (2014). Pressure ulcers: prevention and management: https://www.nice.org.uk/guidance/cg179
Secondary literature and economic evaluations	
https://www.epistemonikos.org/en/	We did not identify any relevant evidence from this source
https://www.tripdatabase.com/	We did not identify any relevant evidence from this source
Cochrane library	We did not identify any relevant evidence from this source
Medline (via Ovid or Pubmed)	We did not identify any relevant evidence from this source
Primary studies	
https://www.epistemonikos.org/en/	We did not identify any relevant evidence from this source
https://www.tripdatabase.com/	Koumantakis GA, Nikoloudaki M, Thacheth S, Zagli K, Bitrou K, Nigritinos A, Botton L (2016). Reliability and Validity Measurement of Sagittal Lumbosacral Quiet Standing Posture with a Smartphone Application in a Mixed Population of 183 College Students and Personnel. <i>Advances in Orthopedics</i> : 3817270: doi: 10.1155/2016/3817270
Cochrane library	We did not identify any relevant evidence from this source
Medline	Gallego-Izquierdo T, Arroba-Diaz E, Garcia-Ascoz G, Val-Cano MDA, Pecos-Martin D, Cano-de-la-Cuerda R (2020). Psychometric Properties of a Mobile Application to Measure the Craniovertebral Angle a Validation and Reliability

	Study. International Journal of Environmental Research & Public 17(18): https://www.mdpi.com/1660-4601/17/18/6521
Ongoing primary or secondary research	
PROSPERO database	We did not identify any relevant evidence from this source
Clinicaltrials.gov	NCT04854148. Validation of a Smartphone-based Assessment of Movement Health. Recruiting, estimated completion date: April 2022: https://clinicaltrials.gov/ct2/show/NCT04854148?term=smartphone&cond=posture&draw=2&rank=4

Date of search:	May 2021
Concepts used:	Smartphone application (app), wheelchair, posture, clinical photography, telerehabilitation