Technoleg Iechyd Cymru
Health Technology Wales

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:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number:	TER331
Topic:	Bed monitoring and alarm systems in care homes
Summary of findings:	Health Technology Wales researchers searched for evidence on bed monitoring systems that aim to prevent falls and pressure injury in care homes. We identified one systematic review relating to the effectiveness of these systems in care homes and a further review on barriers and facilitators to use. We also identified one systematic reviews on the effectiveness of these systems in hospital settings and barriers. There is a high level of uncertainty on the effectiveness of these systems with some studies suggesting they may lead to a small reduction in falls, whilst others suggest they may lead to an increase in falls. There are a wide range of bed monitoring and alarm systems available, but there is insufficient evidence to determine whether any specific systems or approaches may be more effective than others. Further research using high quality study designs in care home settings are needed to determine whether bed monitoring and alarm systems can prevent falls and pressure injury and improve quality of care for residents.

Introduction and aims

Bed monitoring and alarm systems aim to reduce the prevalence of falls in care homes by alerting staff when a person is about to get out of their bed so that assistance can be provided. More advanced systems also aim to measure whether a person has moved sufficiently to avoid pressure injuries and may reduce the need for manual repositioning by staff. Systems have varied approaches to monitoring movement and generating alerts. Some use pressure pads placed under a person that alert staff when contact with the pad is broken, whereas more recently developed systems use wireless technology to measure movement or earlier physiological predictors of movement. The topic proposer highlighted the Vitalerter Vitals system that uses a wireless approach to monitor cardiac activity and uses artificial intelligence algorithms to predict when assistance from staff is necessary.

Health Technology Wales (HTW) researchers searched for evidence on bed monitoring and alarm systems, including Vitalerter Vitals and other systems, to prevent falls and pressure injury in care homes.

Evidence overview

Systematic reviews

We identified a Cochrane review that aimed to assess the effectiveness of a broad range of interventions for preventing falls in older people in care facilities (Cameron et al. 2018). The review included one trial of a monitoring or alarm system that evaluated a wireless position monitoring system in a skilled nursing facility in the United States. The study reported that over 4222 participants-days, participants had fewer falls (13 vs. 24, $p < 0.05$) and fall-related injuries (1 vs. 7, $p < 0.01$) while the monitoring system was in place compared to standard care. However, the study was based on a small sample of residents in a single facility and had important limitations, such as failing to adjust for its cross-over design. More broadly, the review concludes there is a lack of research in this area but available evidence suggests that a range of intervention types have little or no impact on the rate of falls.

We identified another systematic review examining barriers and facilitators of bed monitoring and alarm system use that are reported in the literature (Mileski et al. (2019). Across 28 studies in this area, they found reference to 118 factors that may facilitate or present barriers to use and collated these into themes. Themes for facilitating use related to perceived effectiveness and technological improvements of alarms, proper training and support in using alarms, and positive staff views. Themes under barriers related to perceived ineffectiveness as a standalone intervention, burden on staff and difficulty implementing within the care home settings, fatigue caused by alarm noise and false alerts, resident reluctance, and the cost of systems.

Due to the limited evidence available for care homes, we also searched for evidence on bed monitoring and alarm systems in other settings. We identified one systematic review and meta-analysis that aimed to examine the effectiveness of bed and chair monitoring and alarm systems for hospital inpatients (Cortés et al. 2021). The review included three randomised controlled trials and report that pooled outcomes suggest that use of monitoring and alarm systems is associated with an increase in falls (risk ratio, 1.20, 95%CI, 1.04 to 1.37). It should be noted that the review did not report findings according to whether falls occurred while rising out of bed or out of a chair and the largest study examined an intervention to increase use of alarm systems that were already routinely available across a hospital.

We did not identify any systematic reviews or individual studies that examined the effectiveness of bed monitoring and alarm systems in preventing pressure injury in either the care home or hospital setting.

Other evidence

The Vitalerter website reports that use of their Vitals system can lead to a 42% reduction in falls and a 68% reduction in pressure ulcer. However, no evidence is provided in support and we were not able to identify studies that reported the methods supporting these findings. The topic proposer highlighted an evaluation by Wigan Council that suggested use of Vitalerter reduced falls by 66% and led to an average reduction in turns of 2.45 turns per resident per night, although this appears to be based on a small sample of residents using uncontrolled methods. We did not identify any other published evidence that evaluated the approach used by Vitalerter (i.e. accuracy of artificial intelligence algorithms using cardiac activity) to predict movement or the effectiveness of this approach in reducing falls or pressure injury.

Areas of uncertainty

There is limited evidence on the effectiveness of bed alarms and monitoring systems in care homes. Although some evidence from the hospital setting is available and has been included here for information, a high level of caution should be used in generalising these findings to care home settings due to differences in population, staffing levels, procedures for preventing falls, and bed design. A wide range of systems are available and it is possible that more advanced wireless technologies have more promise than earlier pressure sensors. Further research in this area using randomised or higher quality quasi-experimental designs may be able to demonstrate whether this is the case.

Literature search results

Evidence reviews and economic evaluations
Cameron et al. (2018). Interventions for preventing falls in older people in care facilities and hospitals. *Cochrane Database of Systematic Reviews, 12.* https://doi.org/10.1002/14651858.CD005465.pub4 Cortés et al. (2021). Systematic review and meta-analysis of clinical trials. In–hospital use of sensors for prevention of falls. *Medicine, 100,* e27467. https://dx.doi.org/10.1097%2FMD.0000000000027467 Mileski et al. (2019). Alarming and/or Alerting Device Effectiveness in Reducing Falls in Long-Term Care (LTC) Facilities? A Systematic Review. *Healthcare, 7*, 51. https://doi.org/10.3390/healthcare7010051
Information from company website
Vitalerter (2021). *Vitals Sensor.* Retrieved from https://www.vitalerter.com/vitals-sensor/

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Concepts used:	bed; monitoring; alarm; sensor; fall; residential; home