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Protocol for an umbrella review of pressure ulcer prevention technologies: appropriate products for appropriate pathways

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Chockalingam, N.

Corresponding author:

Nachiappan Chockalingam

n.chockalingam@staffs.ac.uk

Author Affiliation:

Reading Central PCN.

ADMINISTRATIVE INFORMATION

Support - No specific external funding was received for this review. The review was undertaken as part of the authors' academic work on pressure ulcer prevention technologies, care pathways and product design.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - The authors declare no conflicts of interest directly relevant to this review. The review synthesises published review-level evidence and does not evaluate a proprietary product or manufacturer-specific intervention.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 July 2026 and was last updated on 15 July 2026.

INTRODUCTION

Review question / Objective This umbrella review examines review-level evidence on pressure ulcer prevention and treatment technologies, with prevention as the main focus. The objective is to assess whether existing evidence can guide product selection, product design and integration into clinical care pathways. The review focuses on people at risk of pressure ulcer development or people with existing pressure ulcers in any care setting. Interventions include support surfaces, mattresses, overlays, cushions, seating systems, heel protection devices, repositioning, risk assessment linked to prevention, monitoring technologies, care bundles, nutrition, medical device-related prevention and related treatment technologies. Outcomes include pressure ulcer incidence, time to pressure ulcer development, severity, healing, comfort, usability,

adherence, interface pressure, microclimate, adverse events, implementation outcomes and cost-effectiveness.

Rationale Pressure ulcer prevention has been studied extensively, particularly through reviews of support surfaces, pressure redistribution, repositioning, risk assessment, care bundles and monitoring technologies. However, repeated evidence syntheses have often reached similar conclusions: pressure redistribution is important, but uncertainty remains about which products should be used for which patients, anatomical sites and clinical pathways. Many reviews focus on broad product categories rather than product function, anatomical site, mechanism of injury, usability, care workflow or economic value. This umbrella review was undertaken to synthesise review-level evidence and identify whether current evidence supports pathway-based product

selection and design. The review also examines gaps between clinical evidence, technical performance measures and practical implementation.

Condition being studied Pressure ulcers, also referred to as pressure injuries, are localised injuries to the skin and/or underlying tissue, usually over a bony prominence or related to a medical device. They result from pressure, shear, friction or a combination of these forces. Pressure ulcers occur across acute care, intensive care, perioperative care, long-term care, community care and wheelchair-seated populations. They are associated with pain, impaired quality of life, prolonged care, infection risk, increased treatment burden and substantial healthcare costs. People who are immobile, older, critically ill, neurologically impaired, nutritionally compromised, exposed to prolonged surgery or dependent on medical devices are at increased risk.

METHODS

Search strategy Electronic searches were conducted in MEDLINE via PubMed and Scopus on 21 April 2026. The MEDLINE search was limited to publications dated from 1 April 2006 to 21 April 2026 and yielded 47 records. The Scopus search was limited to publications dated from 2006 to 2026 and yielded 112 records, of which 107 records with English-language abstracts were retained for screening.

PubMed search strategy:

("pressure ulcer"[MeSH Terms] OR "pressure injury" OR "pressure sore" OR "decubitus ulcer") AND ("interface pressure" OR "pressure mapping" OR "pressure distribution" OR "seat interface pressure" OR "support surface" OR "cushion" OR "mattress") AND ("systematic review"[Publication Type] OR "meta-analysis"[Publication Type] OR "systematic review" OR "meta analysis")

Scopus search strategy:

TITLE-ABS-KEY(("pressure ulcer" OR "pressure injury" OR "pressure sore" OR "decubitus ulcer") AND ("interface pressure" OR "pressure mapping" OR "pressure distribution" OR "support surface" OR cushion OR mattress) AND ("systematic review" OR "meta-analysis" OR "meta analysis"))

The searches were intentionally broad to capture direct reviews of support surfaces and related reviews addressing interface pressure, cushioning, seating and device-based prevention. Reference

lists of relevant reviews and contextual papers were also checked.

Participant or population People at risk of pressure ulcer development or people with existing pressure ulcers in any care setting. Settings include acute care, intensive care, perioperative care, long-term care, community care, wheelchair seating, spinal cord injury care and other settings where pressure ulcer prevention or treatment technologies are used.

Intervention Support surfaces, mattresses, overlays, cushions, seating systems, heel protection devices, pressure redistribution technologies, repositioning, risk assessment linked to prevention, monitoring technologies, sub-epidermal moisture assessment, care bundles, nutritional interventions, medical device-related prevention and related treatment technologies.

Comparator Usual care, standard hospital surfaces, alternative pressure redistribution technologies, alternative care pathways, alternative support surfaces, no comparator or other comparators as defined by the included reviews.

Study designs to be included Systematic reviews, meta-analyses, overviews of reviews, umbrella reviews, comparative effectiveness reviews and structured evidence syntheses. Scoping reviews, guidelines, consensus papers and evidence summaries were retained as contextual evidence where relevant.

Eligibility criteria Reviews were eligible if they examined interventions, technologies or care approaches for the prevention or treatment of pressure ulcers. Eligible records addressed pressure ulcer prevention or treatment technologies, pressure redistribution, support surfaces, cushions, seating, heel protection, monitoring technologies, care pathways, implementation, risk assessment linked to prevention or economic evaluation. Protocols, corrigenda without independent evidence, duplicate reports, superseded review versions and records outside pressure ulcer prevention or treatment were excluded from the main synthesis. Scoping reviews, guidelines and consensus papers were retained only where they informed technology mapping, pathway interpretation, product design gaps or recommendations.

Information sources Electronic searches were conducted in MEDLINE via PubMed and Scopus. Reference lists of relevant reviews and contextual papers were checked to identify additional relevant

review-level evidence and contextual sources. Search results were imported into a reference management system, deduplicated and screened against predefined eligibility criteria.

Main outcome(s) The main prevention outcome was pressure ulcer incidence. Other main outcomes included time to pressure ulcer development, pressure ulcer severity, anatomical site of pressure ulcer, and pressure ulcer healing for treatment-focused reviews. Where available, comparative findings on effectiveness and certainty of evidence were extracted at review level.

Additional outcome(s) Additional outcomes included comfort, usability, adherence, patient tolerance, adverse events, interface pressure, pressure mapping, microclimate, sub-epidermal moisture, implementation outcomes, cost-effectiveness, resource use, economic value, and whether reviews reported product design, care pathway or anatomical site-specific implications.

Data management All retrieved records were imported into a reference management system and deduplicated before screening. Screening was undertaken in two stages: title and abstract screening followed by full-text review. Data extraction used a structured review-level template. Extracted items included bibliographic details, review type, population, setting, intervention category, comparator, prevention or treatment outcomes, principal findings, stated limitations, certainty or quality indicators, evidence role and synthesis domain. Data were extracted at review level rather than primary study level.

Quality assessment / Risk of bias analysis Methodological quality of included systematic reviews, meta-analyses and overviews was assessed using AMSTAR 2. AMSTAR 2 was used to support interpretation and methodological prioritisation rather than as an exclusion tool. Reviews were considered in relation to protocol registration, search adequacy, duplicate study selection and extraction where reported, risk of bias assessment, appropriateness of synthesis, interpretation of risk of bias and conflicts of interest. Scoping reviews, guidelines, consensus papers and contextual evidence were not treated as core effectiveness evidence and were not weighted in the same way as systematic reviews or meta-analyses. AMSTAR 2 appraisal was undertaken by the lead reviewer.

Strategy of data synthesis A narrative synthesis was undertaken. Findings were organised by

intervention type, clinical relevance and translational value rather than by individual review alone. The synthesis was structured around pressure redistribution technologies; prevention strategies and care delivery; clinical populations and settings; monitoring and emerging technologies; and treatment, healing and economic evidence. Quantitative pooling was not undertaken because of overlap in primary studies across included reviews, heterogeneity in populations, settings, interventions and outcomes, and variation in certainty of evidence. Where multiple reviews addressed the same intervention question, the most recent and methodologically robust review was prioritised. Earlier or overlapping reviews were retained only where they contributed unique data, a distinct population focus or a specific intervention subdomain.

Subgroup analysis Formal subgroup meta-analysis was not planned or undertaken. Evidence was interpreted narratively by clinical setting, population, intervention domain and anatomical or pathway relevance where reported. Particular attention was given to intensive care, perioperative care, long-term care, wheelchair seating, spinal cord injury, heel and foot offloading, support surfaces, monitoring technologies and treatment evidence.

Sensitivity analysis Formal statistical sensitivity analysis was not undertaken because no new meta-analysis was performed. Sensitivity of interpretation was addressed narratively by prioritising higher-quality and more recent reviews, considering overlap between reviews, distinguishing core effectiveness evidence from contextual evidence, and separating prevention evidence from treatment evidence.

Language restriction Only records with English-language abstracts and retrievable English-language full text were included.

Country(ies) involved United Kingdom.

Other relevant information The protocol is being registered retrospectively after completion of the search, screening and synthesis process and before publication, following journal editorial advice. The registration should be interpreted as a transparent public record of the review methods rather than as prospective registration. The search strategy and retrieved search results were checked by an independent reviewer. Screening, data extraction and AMSTAR 2 appraisal were undertaken by the lead reviewer.

Keywords Pressure ulcer; pressure injury; umbrella review; support surfaces; pressure redistribution; care pathways.

Dissemination plans The findings will be submitted for publication in a peer-reviewed journal. Supplementary materials will include the search strategy, evidence mapping, methodological appraisal and full reference list of extracted records. Findings may also inform future work on anatomical site-specific pressure ulcer prevention pathways and product design requirements.

Contributions of each author

Author 1 - Nachiappan Chockalingam - Developed the review question, conducted screening, extracted data, undertook AMSTAR 2 appraisal, synthesised findings and drafted the manuscript.
Email: n.chockalingam@staffs.ac.uk