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Review

Patient risk factors for pressure ulcer development: Systematic review

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ABSTRACT

Objective: To identify risk factors independently predictive of pressure ulcer development in adult patient populations?
Design: A systematic review of primary research was undertaken, based upon methods recommended for effectiveness questions but adapted to identify observational risk factor studies.
Data sources: Fourteen electronic databases were searched, each from inception until March 2010, with hand searching of specialist journals and conference proceedings; contact with experts and a citation search. There was no language restriction.
Review methods: Abstracts were screened, reviewed against the eligibility criteria, data extracted and quality appraised by at least one reviewer and checked by a second. Where necessary, statistical review was undertaken. We developed an assessment framework and quality classification based upon guidelines for assessing quality and methodological considerations in the analysis, meta-analysis and publication of observational studies. Studies were classified as high, moderate, low and very low quality. Risk factors were categorised into risk factor domains and sub-domains. Evidence tables were generated and a summary narrative synthesis by sub-domain and domain was undertaken.
Results: Of 5462 abstracts retrieved, 365 were identified as potentially eligible and 54 fulfilled the eligibility criteria. The 54 studies included 34,449 patients and acute and community patient populations. Seventeen studies were classified as high or moderate quality, whilst 37 studies (68.5%) had inadequate numbers of pressure ulcers and other methodological limitations. Risk factors emerging most frequently as independent predictors of pressure ulcer development included three primary domains of mobility/activity, perfusion (including diabetes) and skin/pressure ulcer status. Skin moisture, age, haematological measures, nutrition and general health status are also important, but did not emerge as frequently as the three main domains. Body temperature and immunity may be important but require further confirmatory research. There is limited evidence that either race or gender is important.
Conclusions: Overall there is no single factor which can explain pressure ulcer risk, rather a complex interplay of factors which increase the probability of pressure ulcer development. The review highlights the limitations of over-interpretation of results from individual studies and the benefits of reviewing results from a number of studies to develop a more

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reliable overall assessment of factors which are important in affecting patient susceptibility.

What is already known about the topic?

- Large number of risk factors related to pressure ulcer development.
- Reduced activity/mobility is a risk factor for pressure ulcer development.
- Large number of risk factor studies.

What this paper adds

- Overall there is no single factor which can explain pressure ulcer risk, rather a complex interplay of factors which increase the probability of pressure ulcer development.
- Three primary risk factors include mobility/activity, perfusion (including diabetes) and skin/pressure ulcer status. There has been over-interpretation of results from individual risk factor studies.

1. Introduction

Pressure ulcers are described as 'localised injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear' (National Pressure Ulcer Advisory Panel and the European Pressure Ulcer Advisory Panel, NPUAP/EPUAP, 2009). Pressure ulcers vary in size and severity of tissue layer affected, ranging from skin erythema to damage to muscle and underlying bone (Witkowski and Parish, 1982) and are classified by tissue layer affected using the NPUAP/EPUAP classification system (2009).

Pressure ulcers are a worldwide problem affecting hospital and community patient populations (Kaltenthaler et al., 2001; O'Dea, 1995; Saito et al., 1999; Vangilder et al., 2008). In practice, the emphasis is on identifying patients at risk and implementing appropriate interventions to prevent pressure ulcer occurrence (AHCPR (Agency for Health Care Policy and Research), 1992; NICE, 2003).

It has been argued consistently that pressure ulcer risk assessment scales need to be developed on the basis of multivariable analyses to identify factors which are independently associated with pressure ulcer development (Bridel, 1994; Cullum et al., 1995; Nixon and McGough, 2001). An improved understanding of the relative contribution risk factors make to the development of pressure ulcers and an improved ability to identify patients at high risk of pressure ulcer development would enable us to better target resources in practice. Early epidemiological evidence identified that reduced activity and mobility is the key risk factor for pressure ulcer development, but the relative contribution other risk factors make cannot be reliably determined from individual studies. To inform an emerging National Institute for Health Research (NIHR) Programme Grant on pressure ulcer prevention (PURPOSE: RP-PG-0407-10056) we sought to systematically review existing research to identify factors independently associated with pressure ulcer development, that is, "a risk factor that retains its statistical association with the outcome when other established risk factors for the outcome are included in the statistical model" (Brotman et al., 2005). However, it should be noted that being 'independent' is a statistical concept, depends on the risk factor variables included in the model and does not imply causality (Brotman et al., 2005). Careful consideration should therefore be given to whether the statistical associations have clinical relevance.

The aim of this study was to identify risk factors independently predictive of pressure ulcer development in adult patient populations.

2. Methods

A systematic review of primary research was undertaken. The approach was based upon the systematic review methods recommended for questions of effectiveness (The Cochrane Collaboration, 2009; Centre for Reviews and Dissemination, 2009), and adapted to identify risk factor studies with consideration of the methodological limitations including bias and confounding associated with observational studies (Egger et al., 2001; Hayden et al., 2006).

2.1. Study eligibility

Methodological quality criteria were integrated into the inclusion and exclusion criteria of the systematic review, developed from principles of good research conduct in observational studies and randomised controlled trials which minimise bias (Altman, 2001; Schulz et al., 2010; Maltoni et al., 2005; STROBE, 2005).

Inclusion criteria: (i) primary research, (ii) adult study populations in any setting (iii) outcome was the development of a new pressure ulcer(s), (iv) prospective cohort, retrospective record review or a controlled trial, (v) length of follow-up at least 3 days, with exception of operating room studies for which no minimal was set and (vi) outcome clearly defined as ≥Grade/Stage 1 (AHCPR, 1992; EPUAP, 1999) or equivalent, (vii) multivariable analyses were undertaken to identify factors affecting pressure ulcer outcome and (viii) the unit of analysis was the patient.

Exclusion criteria: (i) paediatric study populations (ii) cross-sectional, case-study, patient recall, patient self-report or analysis of General Practitioner records and (iii) duplicate publication of patient dataset (iv) cohort studies (prospective and record reviews) were excluded from the review if >20% of the study sample were excluded from analysis for reasons including withdrawal, death, loss to follow-up and missing records (Altman, 2001; Egger et al., 2001; Maltoni et al., 2005; STROBE, 2005). Controlled trials