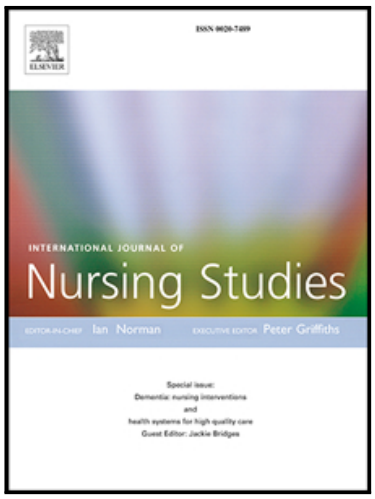

Global prevalence and incidence of pressure injuries in hospitalised adult patients: A systematic review and meta-analysis

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Global prevalence and incidence of pressure injuries in hospitalised adult patients: a systematic review and meta-analysis

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Global prevalence and incidence of pressure injuries in hospitalised adult patients: a systematic review and meta-analysis

Main manuscript file (anonymous)

Abstract

Background: Pressure injuries are frequently occurred adverse event in hospitals, affecting the well-being of patients and causing considerable financial burden to healthcare systems. However, the estimates of prevalence, incidence and hospital-acquired rate of pressure injury in hospitalised patients vary considerably in relevant published studies.

Objectives: To systematically quantify the prevalence and incidence of pressure injuries and the hospital-acquired pressure injuries rate in hospitalised adult patients and identify the most frequently occurring pressure injury stage(s) and affected anatomical location(s).

Design: Systematic review and meta-analysis.

Data sources: Medline, PubMed, Embase, Cochrane Library, CINAHL and ProQuest databases from January 2008 to December 2018.

Review methods: We included studies with observational, cross-sectional or longitudinal designs, reporting pressure injury among hospitalised adults (Ó16 years) and published in English. Outcomes were point prevalence, incidence of pressure injuries and the hospital-acquired pressure injuries rate reported as percentages. Two reviewers independently appraised the methodological quality of included studies. Heterogeneity was assessed by using the I^2 statistic and random effects models were employed. Sources of heterogeneity were investigated by subgroup analysis and meta-regression.

Results: Of 7,489 studies identified, 42 were included in the systematic review and 39 of them were eligible for meta-analysis, with a total sample of 2,579,049 patients. The pooled prevalence of 1,366,848 patients was 12.8% (95% CI 11.8-13.9%); pooled incidence rate of 681,885 patients was 5.4 per 10,000 patient-days (95% CI 3.4-7.8) and pooled hospital-acquired pressure injuries rate of 1,893,593 was 8.4% (95% CI 7.6-9.3%). Stages were reported in 16 studies (132,530 patients with

12,041 pressure injuries). The most frequently occurred stage were Stage I (43.5%) and Stage II (28.0%). The most affected body sites were sacrum, heels and hip. Significant heterogeneity was noted across some geographic regions. Meta-regression showed that the year of data collection, mean age and gender were independent predictors, explaining 67% variability in the prevalence of pressure injuries. The year of data collection and age alone could explain 93% of variability in hospital-acquired pressure injuries rate.

Conclusion This study suggested that the burden of pressure injuries remains substantial with over one in ten adult patients admitted to hospitals affected. Superficial pressure injuries, such as Stage I and II, are most common stages and are preventable. Our results highlight healthcare institutions' focus on pressure injuries globally and supports the need to dedicate resources to prevention and treatment on pressure injuries.

Registration number: PROSPERO CRD42019118774.

What is already known about the topic?

- Pressure injuries are a significant clinical and economic issue, detrimentally affecting patientsô physical and psychosocial quality of life and are costly to healthcare systems.
- Two previous systematic reviews summarising the evidence for the prevalence and/or incidence of pressure injury in the hospital settings have methodological limitations; both also failed to include the unstageable and deep tissue injury stages of pressure injury in their reviews.

What this paper adds?

- This paper provides up-to-date pooled estimates of: i) pressure injury prevalence of 12.8% (95%CI 11.8-13.9); ii) incidence rate of 5.4 per 10,000 patient-day; and iii) rate of hospital-acquired pressure injury of 8.5% (95%CI 7.6-9.3), in hospitalised adult patients, worldwide.
- Globally, Stage I and Stage II pressure injuries represent over half of all pressure injuries among hospitalised adults. The most frequently affected anatomical locations are the sacrum followed by heels and hips.
- Substantial heterogeneity exists among the studies of pressure injury prevalence, incidence and hospital-acquired rate. Subgroup analysis shows significant variations across geographic regions. Meta-regression identified year of data collection, patientsô mean age and gender were statistically significant independent predictors of the prevalence of pressure injury.

Keywords

- Incidence
- Pressure ulcer
- Prevalence
- Systematic review
- Meta-analysis

1. Introduction

Pressure injuries, also referred to as pressure ulcers, are one of the most frequently occurring adverse events in hospitalised patients worldwide (NPUAP, 2014; Padula et al., 2018). Pressure injuries are defined as areas of localised injury to the skin and underlying tissue, usually over a bony prominence, as a result of pressure, or pressure in combination with shear (NPUAP, 2014). They are classified according to the severity and level of tissue injury from Stage I ónonblanchable erythemaô to Stage IV ófull thickness tissue lossô. Two other stages óunstageableô and ódeep tissue injuryô are now acknowledged.

Pressure injuries are associated with negative impacts on patients and healthcare systems, causing increased risk of nosocomial infection, pain and disability, prolonged hospitalisation, resulting in both morbidity and mortality (Coleman et al., 2013; Ferris et al., 2019) and high financial costs for healthcare facilities (Dealey et al., 2012; Padula et al., 2019).

Pressure injury prevalence and incidence are indicators of the burden of the condition and quality of care (Baharestani et al., 2009; Burston et al., 2014; Vanderwee et al., 2007). Point prevalence is defined as the number of patients with a pressure injury at a specific point in time (usually on a specific day); incidence rate is defined as the number of patients with a new pressure injury within a specific person-time; hospital-acquired pressure injury rate measures the number of patients with pressure injuries at a specific point in time that were acquired in the hospital (NPUAP, 2014). Establishing global prevalence and incidence of pressure injuries is important in understanding the extent of the condition, inform decision makers and improve planning and delivery of healthcare. However, the use of different pressure injury definitions and data collection procedures challenges researchers who conduct meta-analysis (Tubaishat et al., 2018). In order to address this problem, the European Pressure Ulcer Advisory Panel introduced a valid and reliable methodology to perform pressure injury prevalence studies in 2007 (Vanderwee et al., 2007) and international consensus on pressure injury definition was reached (NPUAP, 2014). Since then, the method has been translated and modified into various languages (Gallagher et al., 2008; Jiang et al., 2014; Tannen et al., 2008; Tubaishat et al., 2013), so data from epidemiological studies throughout the world become more comparable.

There are two published systematic reviews reporting prevalence and/or incidence of pressure injury in hospital settings (Al Mutairi et al., 2018; Tubaishat et al., 2018). Some limitations were found after careful examination, such as the methodological limitations (e.g. not appropriately assessing the risk of bias in included studies); analysing only four stages of pressure injuries (Stage I to IV) which overlooks the occurrence of the ñunstageableò and ñdeep tissue injuryò. And neither review undertook meta-analysis. Thus, in this systematic review and meta-analysis, we aimed to answer the following questions: 1) What is the prevalence and incidence of pressure injury and the hospital-acquired pressure injury rate of all stages in hospitalised adult patients? 2) What is the most common stage(s) and affected anatomical location(s) of pressure injury in hospitalised adult patients?

2. Methods

2.1 Search strategy and selection criteria

Databases including Medline (via Ovid), EMBASE, Cochrane Library, CINAHL (via EBSCO), and ProQuest Nursing & Allied Health were searched. PubMed was used as supplementary source of Medline to get newly published and ahead of print studies. Initial keywords included ñpressure injuryò, ñpressure ulcerò, ñpressure soreò, ñdecubitus ulcerò, ñbed ulcerò, ñbed soreò, ñbedsoreò, ñprevalenceò, ñincidenceò, ñepidemiologyò, ñrateò, ñfrequencyò, ñoccurrenceò, and ñdensityò. The Medical Subject Heading (MeSH) or Emtree terms of each keyword and combinations by using Boolean operators such as óANDô and óORô were explored in each database. The search strategy was developed by the research team in collaboration with a health information specialist. Reference lists of relevant reviews and every included study were hand searched for potential additional studies. Because an internationally recognised definition of pressure injury and a methodology of how to determine pressure injury was published in 2007 (Vanderwee et al., 2007), we only included studies published since 2008 to try to review data that was more consistent in measurement. Date range of the search was from January 1st, 2008 to December 7th, 2018. Search strategies used are presented in *Appendix 1*.

2.2 Study selection

This systematic review followed the recommendations from Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. We included studies that reported all

stages of pressure injury in the hospitalised adult population, which we have classified to be 16 years and older because 16-year-olds can be admitted to adult wards in some hospitals. To be regarded as ñwhole hospitalò, studies must have reported data on at least surgical, medical and ICU patients. We included studies with observational, cross-sectional or longitudinal design and peer-reviewed, full text published in English. No restrictions were placed on patientsô diagnosis, severity of disease or geographic location. Studies with outcomes of point prevalence, incidence rate and the rate of hospital-acquired pressure injury reported as percentages or as rates were included. Specific operational definitions and formulas for pressure injury outcomes are provided in *Appendix 2*. We excluded studies focused on specific subgroups (e.g. patients with spinal cord injury, older patients or only patients at risk) and any non-hospital settings. We excluded studies that reported period prevalence because hospitalised patients were followed up for differing lengths of time in these studies, which does not meet the definition of period prevalence (Appendix 2). We excluded experimental studies and case control studies because they have specific inclusion and exclusion criteria, which are unlikely to represent the general hospitalised population. We also excluded studies that excluded Stage I or only focused on specific type of pressure injury (e.g. medical device related pressure injury, heel pressure injury), sample size less than 20 (i.e., very small hospitals or very small samples from bigger hospitals); and animal studies. A PRISMA flow chart of search results and screening process for included studies was created (Figure 1). An explicit study protocol is available on PROSPERO with the registration number of CRD42019118774.

2.3 Data extraction and quality assessment

Data extraction was performed by two reviewers: ZL extracted data to a modified Joanna Briggs Institute data extraction form for prevalence and incidence studies (Joanna Briggs Institute, 2014) and FL double checked the extraction for accuracy. Discrepancies between the two reviewers were resolved by discussion or by the involvement of a third reviewer (WC). Three main categories of data were extracted: characteristics of the samples, methodological characteristics of each study, and prevalence, incidence estimates of pressure injury and the rate of hospital-acquired pressure injury, including numerator (number of patients and number of pressure injury or hospital-acquired pressure injury), denominator (number of defined total population or person-time), stages and anatomical

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Figure(s)

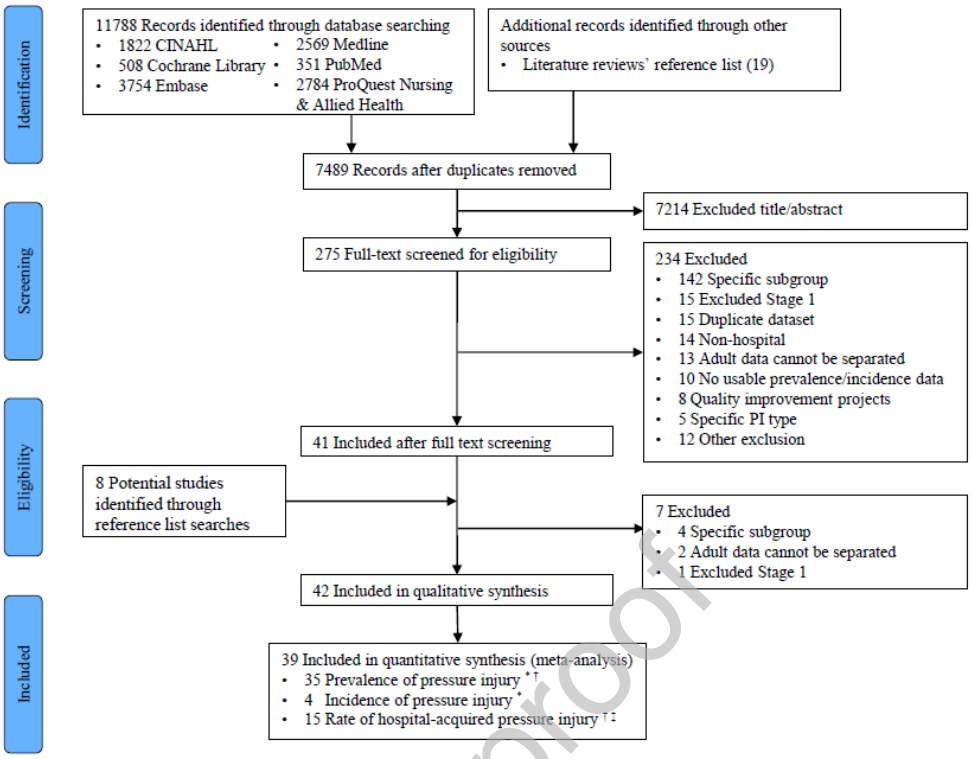

Figure 1: Flowchart of study selection

Notes: *1 study reported both prevalence and incidence of pressure injury
†14 studies reported both prevalence of pressure injury and rate of hospital-acquired pressure injury
‡1 study reported only rate of hospital-acquired pressure injury