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Barriers and facilitators to pressure injury prevention in hospitals: A mixed methods systematic review

Zijing Wu [a], Bing Song [a], Yu Liu [a], Yongzhen Zhai [b,**], Si Chen [c,*], Frances Lin [d]

[a] School of Nursing, China Medical University, No.77 Puhe Road, Shenyang North New Area, Shenyang, Liaoning Province, China
[b] Department of Infectious Disease, Shengjing Hospital of China Medical University, No.39 Huaxiang Road, Tiexi District, Shenyang, Liaoning Province, China
[c] Department of Neurology, The Fourth Affiliated Hospital of China Medical University, No.4 Chongshan East Road, Huanggu District, Shenyang, Liaoning Province, China
[d] School of Health, University of the Sunshine Coast, Queensland, Australia

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ABSTRACT

Objective: To systematically synthesize research evidence on barriers and facilitators to pressure injury prevention in hospital settings.
Methods: A systematic literature review of quantitative, qualitative, and mixed methods research was undertaken using PubMed, MEDLINE, Embase, CINAHL, and Cochrane Library. Studies that reported barriers or/and facilitators to pressure injury prevention in the acute care settings and published in English from 2008 to 2022 were included. Studies were excluded if they were conducted in residential care facilities and nursing homes, or other long-term community care settings. Two authors independently screened articles against the inclusion and exclusion criteria. Quality appraisal was conducted by two authors by using the Mixed Methods Appraisal Tool. Reported results were mapped to the Theoretical Domains Framework to identify the barriers and facilitators to pressure injury prevention.
Results: A total of 78 studies were included. There were 65 quantitative studies, 11 qualitative studies, and two mix-methods studies. The most salient Theoretical Domains Framework domains identified in this review were "Knowledge", "Skills", "Environmental Context and Resources", "Optimism", "Social/Professional Role and Identity", and "Social influences".
Conclusion: The barriers and facilitators to pressure injury prevention in hospital settings identified in this systematic review were diverse, and included issues at both individual and organizational level. Healthcare organizations can address the barriers and facilitators from the influential Theoretical Domains Framework domains. Future research is required to investigate the effectiveness of behaviour change interventions that specifically target these barriers and facilitators to pressure injury prevention.

1. Introduction

Pressure injury, an adverse event defined as localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device caused by persistent pressure or pressure combined with shear [1], continues to be a major health issue in hospitals worldwide. A systematic review of evidence from 2008 to 2018 showed that in hospitalized adult patients the pooled prevalence of pressure injury and hospital-acquired pressure injury was 12.8% and 8.4% [2]. The high prevalence and incidence rates constitute a substantial financial burden for healthcare systems. For example, in the United States, the cost to hospitals of treating hospital-acquired pressure injuries was estimated to be about $10,708 per patient, and the national cost attributable to hospital-acquired pressure injury inpatient care from the hospital perspective could exceed $26.8 billion based on 2.5 million reported cases in 2016 [3]. In addition, pressure injuries can

* Corresponding author. Department of Neurology, The Fourth Affiliated Hospital of China Medical University, No.4 Chongshan East Road, Huanggu District, Shenyang, 110032, Liaoning Province, China.
** Corresponding author. Department of Infectious Disease, Shengjing Hospital of China Medical University, No.39 Huaxiang Road, Tiexi District, Shenyang, 110022, Liaoning Province, China.
E-mail addresses: zjwu@cmu.edu.cn (Z. Wu), bsong@cmu.edu.cn (B. Song), liuyu@cmu.edu.cn (Y. Liu), zyz200084@sina.com (Y. Zhai), ziyevictory@sina.com (S. Chen), flin@usc.edu.au (F. Lin).

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compromise patients' health and quality of life [4].

Many pressure injuries are predictable and preventable. International guidelines on pressure injury prevention and management recommend a number of strategies to prevent pressure injury, including risk assessment, skin assessment, support surfaces use, repositioning, and nutrition management, whether used as single intervention or in a combined manner [5], which have been reported to be cost-effective in many studies [6,7]. However, studies have demonstrated that many healthcare professionals do not fully follow these recommendations, leading to suboptimal practices in pressure injury prevention [8,9].

In order to improve the quality of patient care, identifying the barriers and facilitators to implementing evidence-based interventions is a well-acknowledged requirement [10]. It has been shown that a theoretical approach to assessing barriers and facilitators can effectively inform tailored strategies to promote evidence-based practices [11]. Findings from systematic reviews that synthesizes the broad range of barriers and facilitators explored in individual studies can be considered as a way to inform the design of effective interventions to perform evidence-based practice. To date, to our knowledge, there is no systematic reviews published in relation to barriers and facilitators to pressure injury prevention in hospitals.

Therefore, the aim of this review is to synthesize research evidence on barriers and facilitators to pressure injury prevention in hospital settings. Specifically, we aim to answer the following questions: (1) what are the factors that hinder the implementation of research evidence to prevent pressure injury in hospital settings? and (2) what are the factors that facilitate the implementation of research evidence to prevent pressure injury in hospital settings?

2. Methodology

This systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines [12]. Details of the protocol for this systematic review were registered on PROSPERO and can be accessed at (www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018117130.).

2.1. Search strategy

We searched databases including PubMed, MEDLINE (Ovid), Embase, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Cochrane Library. Key search terms and synonyms were searched separately in four main filters: (1) pressure injury terms, (2) prevention terms, (3) barriers and facilitators terms, and (4) knowledge translation terms. These were combined with the "AND" operator. Search terms included "pressure injur*", "pressure ulcer*", "pressure sore*", "bed*sore*", "decubitus ulcer*", "decubitus*", "prevent*", "barrier*", "obstacle*", "facilit*", "driver*", "motivat*", "engag*", "intention*", "enabl*", "attend*", "complianc*", "adher*", "particip*", "attitude*", "belief*", "perception*", "associat*", "relat*", "knowledge translation", "knowledge transfer", "evidence* based practice*", and "implement*". Searches were conducted using medical subject headings and free text words depending on the database. One example of search strategy from PubMed is provided in supplementary material Table A.1. We searched reference lists of the articles included in the review for other potential studies. We conducted the search from the time of database inception to 31 December 2022.

2.2. Inclusion and exclusion criteria

Studies were included if they (1) included healthcare professionals working in hospital settings; (2) were conducted in the acute care settings; (3) reported barriers or/and facilitators to pressure injury prevention in hospital settings; (4) were primary studies and/or literature reviews, employing qualitative, quantitative, or mixed methods designs; (5) were published in peer-reviewed journals in English; (6) were published in the last 15 years (i.e. 2008-2022). Barriers to pressure injury prevention are reasons described by healthcare professionals that have hindered the implementation of pressure injury prevention or make it harder to implement, while facilitators to pressure injury prevention are described as healthcare professionals-reported reasons for motivating/enabling them to implement pressure injury prevention strategies.

Studies were excluded if they (1) were conducted in residential care facilities and nursing homes, or other long-term community care settings; (2) were letters, commentaries, editorials, conference abstracts/presentations, or other case reports on the topic.

2.3. Study selection process

After removing duplicate references, an initial screening of titles and abstracts was conducted against the inclusion/exclusion criteria. Then, full texts of the articles identified during the initial screening were examined. Two authors (ZW and BS) independently completed these two steps. A third reviewer (FL) was available to resolve disagreements between the two reviewers related to the two steps of the screening process where necessary.

2.4. Quality assessment

Included studies were evaluated independently by two reviewer authors (ZW, SC), using the Mixed Methods Appraisal Tool (MMAT) version 2018 as it allows the concomitant appraisal of qualitative, quantitative and mixed method studies using a single tool (supplementary material Table A.2) [13]. Any differences were discussed and resolved with a third reviewer (YZ).

2.5. Data extraction

Data were extracted by one review author (ZW) from the included studies for evidence synthesis, using a pre-piloted form, and then independently verified by a second reviewer (SC). Extracted data included first authors, year of publication, country, study design, aim, sample and sample size, theoretical framework, methods of data collection, and reported barriers and facilitators to pressure injury prevention (see supplementary material Table A.3 and supplementary material Table A.4).

2.6. Data synthesis

The Theoretical Domains Framework (TDF) [14] was used to inform the synthesis of barriers and facilitators to pressure injury prevention. The TDF, consisting of 14 theoretical domains, can be used to examine the determinants of professional behaviour change and in turn inform intervention development (see supplementary material Table A.5). Each extracted barriers and facilitators were mapped to 14 domains of the TDF by two independent review authors and mediated by a third review author in case of discrepancy. All authors subsequently confirmed the mapping of each TDF domain.

3. Results

The search identified 9631 studies. Following title and abstract screening and removing duplicate, 51 full-text articles were included in this review (Fig. 1). A further 27 articles were identified from reviewing the reference lists of the included studies. Overall, 78 studies met the selection criteria and were included in the review.

3.1. Study characteristics

Supplementary material table A.3 shows the characteristics of the 78 studies which were published between 2008 and 2022. There were 65

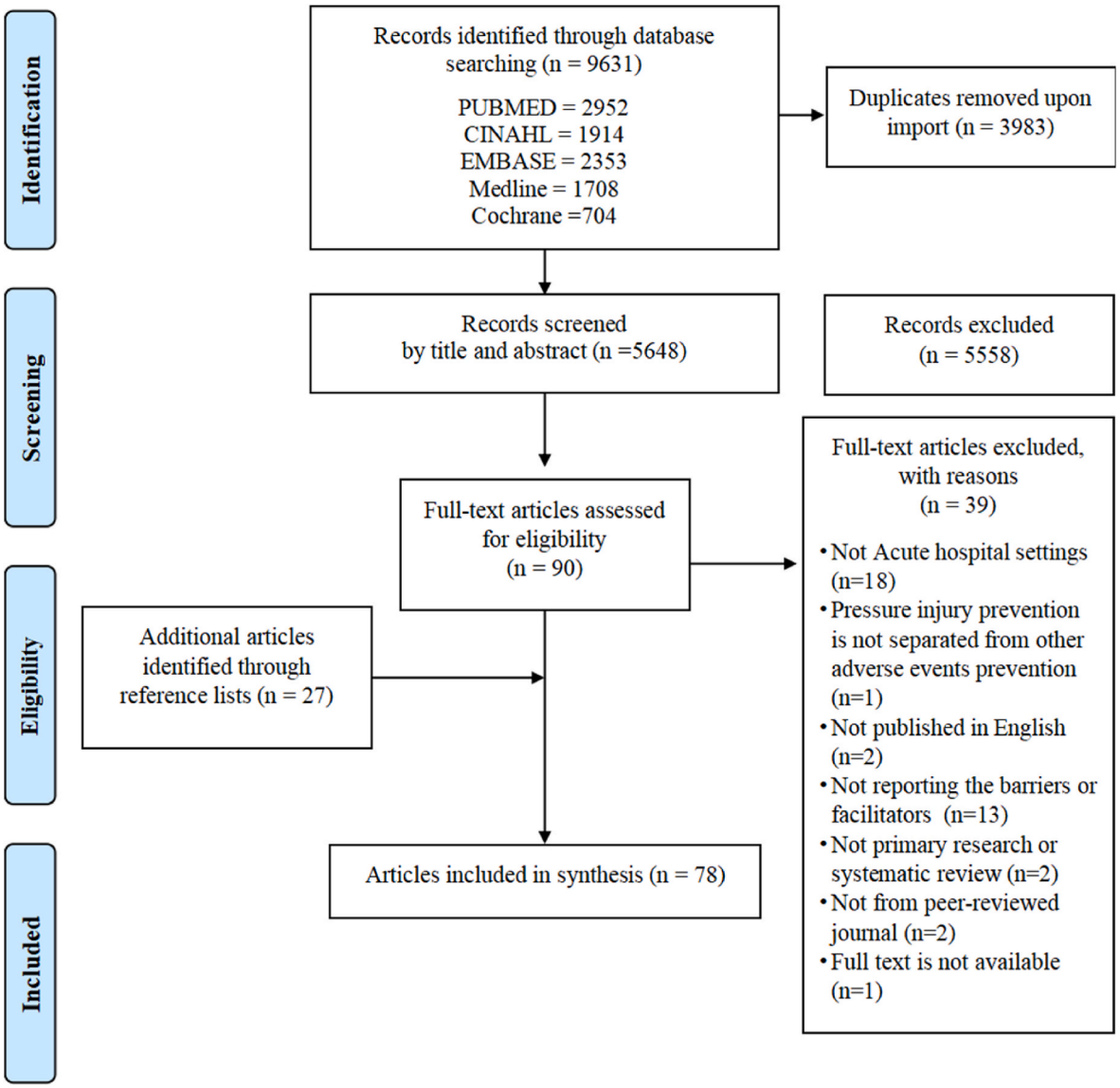

Fig. 1. Flow chart of the study selection process.

quantitative studies, 11 qualitative studies, and two mix-methods studies. Studies were conducted in 25 countries including Turkey [15–24], Iran [25–33], Ethiopia [34–41], Sweden [42–47], Jordan [48–53], Australia [54–58], China [59–63], Nigeria [64–67], Brazil [68–70], Saudi Arabia [71–73], Singapore [74–76], Belgium [77,78], the USA [79,80], Canada [81], Finland [82], Korea [83], UK [84], Cyprus [85], Egypt [86], India [87], Slovakia [88], South Africa [89], Spain [90], Portugal [91], and Uganda [92]. Of the included studies, the type of participants was all nurses in 73 studies. Very few studies included physiotherapists [72,84], occupational therapists [72,84], physicians [43,72], managers [43,47], and patients [46]. The sample sizes ranged from 9 to 1806 healthcare professionals.

3.2. Quality of the included studies

Table 1 summarizes the methodological quality assessment for the included studies. There were 53 studies rated as extremely high-quality, meeting all the quality criteria for their study design [15,17–19,21, 27–43,45–47,49–52,54,55,57,58,60,62–69,71–73,75,76,80,83,85, 89–91]. Authors sometimes provided insufficient information to make a quality assessment resulting in many "Can't Tell" judgements. Nonresponse bias was the main source of bias in quantitative surveys, often being high risk or poorly reported. A common source of bias for mixed method studies was methodological issues in quantitative components. According to instructions from MMAT user guide, no studies were excluded due to low methodological quality.

3.3. Domains of the TDF as represented by the reported barriers and facilitators

This systematic review produced new knowledge on the barriers and facilitators to pressure injury prevention in hospital settings and was interpreted within the TDF theoretical framework [14]. This process has identified three domains of the TDF where no primary facilitators or barriers were identified in the included studies: "Beliefs about capabilities", "Beliefs about consequences", and "Memory, attention and decision process". The most salient TDF domains identified in this review were "Knowledge", "Skills", "Environmental Context and Resources", "Optimism", "Social/Professional Role and Identity", and "Social influences". A small number of artilcles identified five domains: "Reinforcement", "Intentions", "Goals", "Emotion", and "Behavioral regulation". A summary of barriers and facilitators by TDF domain identified in each of the included studies is provided in Table 2.

Table 1
Quality appraisal of the included studies (n = 78).

No.	First author, year	Screening		Qualitative study quality criteria					Quantitative study quality criteria					Mixed method quality criteria				
		S1	S2	1.1	1.2	1.3	1.4	1.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
1	Acosta-Hernández, 2022	✓	✓	✓	✓	✓	✓	✓										
2	Adibelli, 2022	✓	✓	✓	✓	✓	✓	✓										
3	Al-Ghamdi, 2017	✓	✓						✓	✓	✓	✓	✓					
4	Al Kharabsheh, 2014	✓	✓						✓	✓	✓	U	✓					
5	Aslan, 2016	✓	✓						✓	✓	✓	×	✓					
6	Aydin, 2010	✓	✓						✓	✓	✓	✓	✓					
7	Aydogan, 2019	✓	✓						✓	✓	✓	✓	✓					
8	Barakat-Johnson, 2019	✓	✓	✓	✓	✓	✓	✓										
9	Beeckman, 2011	✓	✓						✓	U	✓	U	✓					
10	Berihu, 2020	✓	✓						✓	✓	✓	✓	✓					
11	Cebeci, 2022	✓	✓						✓	✓	✓	✓	✓					
12	Chaboyer, 2014	✓	✓	✓	✓	✓	✓	✓										
13	Charalambous, 2019	✓	✓						✓	✓	✓	✓	✓					
14	Chianca, 2010	✓	✓						✓	✓	✓	✓	✓					
15	Claudia, 2010	✓	✓						✓	✓	U	×	✓					
16	Coyer, 2019	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓
17	De Meyer, 2019	✓	✓						✓	✓	✓	U	✓					
18	Dilie, 2015	✓	✓						✓	✓	✓	✓	✓					
19	Dirgar, 2022	✓	✓						✓	✓	✓	×	✓					
20	Ebi, 2019	✓	✓						✓	✓	✓	✓	✓					
21	El Enein, 2011	✓	✓						✓	✓	✓	U	✓					
22	Erbay Dalli, 2021	✓	✓						✓	✓	✓	✓	✓					
23	Esan, 2018	✓	✓						✓	✓	✓	✓	✓					
24	Etafa, 2018	✓	✓						✓	✓	✓	✓	✓					
25	Fulbrook, 2019	✓	✓						✓	✓	✓	✓	✓					
26	Gaspar,2022	✓	✓	✓	✓	✓	✓	✓										
27	Getie, 2020	✓	✓						✓	✓	✓	✓	✓					
28	Ghazanfari, 2022	✓	✓						U	✓	✓	U	✓					
29	Gul, 2017	✓	✓						✓	U	✓	✓	✓					
30	Gunningberg, 2015	✓	✓						✓	✓	✓	✓	✓					
31	Halasz, 2021	✓	✓						✓	✓	✓	×	✓					
32	Hommel, 2017	✓	✓	✓	✓	✓	✓	✓										
33	Hu, 2021	✓	✓						✓	✓	✓	×	✓					
34	Ilesanmi, 2012	✓	✓						✓	✓	✓	✓	✓					
35	Ilesanmi, 2014	✓	✓						✓	✓	✓	✓	✓					
36	Iranmanesh, 2011	✓	✓						✓	✓	✓	U	✓					
37	Iranmanesh, 2013	✓	✓						✓	✓	✓	✓	✓					
38	Jiang, 2020	✓	✓						✓	✓	✓	✓	✓					
39	Kaddourah, 2016	✓	✓						✓	✓	✓	✓	✓					
40	Khojastehfar, 2020	✓	✓						✓	✓	✓	✓	✓					
41	Khong, 2020	✓	✓						✓	✓	✓	×	✓					
42	Kim, 2019	✓	✓						✓	✓	✓	✓	✓					
43	Li J, 2022	✓	✓						✓	✓	✓	U	✓					
44	Li Z, 2022	✓	✓						✓	✓	✓	✓	✓					
45	Lotfi, 2019	✓	✓						✓	✓	✓	✓	✓					
46	Malinga, 2020	✓	✓						✓	✓	✓	✓	✓					
47	Miller, 2017	✓	✓						✓	✓	✓	×	✓					
48	Mirshekari, 2017	✓	✓						✓	✓	✓	✓	✓					
49	Miyazaki, 2010	✓	✓						✓	✓	✓	✓	✓					
50	Muhammed, 2020	✓	✓						✓	✓	✓	✓	✓					
51	Mwebaza, 2014	✓	✓						✓	✓	U	×	✓					
52	Nuru, 2015	✓	✓						✓	✓	✓	✓	✓					
53	Parisod, 2021	✓	✓						✓	✓	✓	×	✓					
54	Qaddumi, 2014	✓	✓						✓	✓	✓	✓	✓					
55	Rafiei, 2014	✓	✓						✓	✓	✓	✓	✓					
56	Ravindra, 2022	✓	✓						✓	✓	U	U	✓					
57	Roberts, 2016	✓	✓	✓	✓	✓	✓	✓										
58	Rodrigue, 2016	✓	✓						✓	✓	✓	U	✓					
59	Saleh, 2013	✓	✓						✓	✓	✓	✓	✓					
60	Saleh, 2019	✓	✓						✓	✓	✓	✓	✓					
61	Sengul, 2020	✓	✓						✓	✓	✓	×	✓					
62	Strand, 2010	✓	✓						✓	✓	✓	×	✓					
63	Sving, 2012	✓	✓	✓	✓	✓	✓	✓										
64	Sving, 2014	✓	✓						✓	✓	✓	✓	✓					
65	Sving, 2017	✓	✓	✓	✓	✓	✓	✓										
66	Tallier, 2017	✓	✓						✓	✓	✓	✓	✓					
67	Tan, 2020	✓	✓	✓	✓	✓	✓	✓										
68	Tayebi Myaneh, 2020	✓	✓						✓	✓	✓	✓	✓					
69	Tayyib, 2016	✓	✓						✓	✓	✓	✓	✓					
70	Tesfa Mengist, 2022	✓	✓						✓	✓	✓	✓	✓					
71	Teo, 2019	✓	✓	✓	✓	✓	✓	✓										
72	Tirgari, 2018	✓	✓						✓	✓	✓	✓	✓					
73	Tubaishat, 2013	✓	✓						✓	✓	✓	✓	✓					

(*continued on next page*)

Table 1 (*continued*)

No.	First author, year	Screening		Qualitative study quality criteria					Quantitative study quality criteria					Mixed method quality criteria				
		S1	S2	1.1	1.2	1.3	1.4	1.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
74	Tubaishat, 2014	✓	✓						✓	✓	✓	×	✓					
75	Uba, 2015	✓	✓						✓	✓	✓	✓	✓					
76	Unver, 2017	✓	✓						✓	✓	✓	×	✓					
77	Worsley, 2017	✓	✓	✓	✓	✓	✓	✓	U	U	✓	✓	✓	✓	✓	✓	✓	U
78	Zhang, 2021	✓	✓						✓	✓	✓	✓	✓					

The Mixed Methods Appraisal Tool (MMAT) (Pluye et al., 2009); S1, S2, 1.1, 1.2, 1.3, 1.4, 1.5, 4.1, 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3, 5.4, and 5.5 denote the quality assessment item under under each study design. √: Yes; × : No; U: Can't tell.

3.3.1. Knowledge

Lack of knowledge about pressure injury prevention [17–23,26–29,31,33,34,36,38–40,42,48,49,51,53,54,57,59–62,65,67–70,73,74,77–82,84–90,92], including pressure injury etiology and development, classification and observation, risk assessment, and measures to prevent, was identified as a barrier, whereas acceptable or adequate level of knowledge about pressure injury prevention was reported as a facilitator in some studies [25,35,41,44,50,56,63,64,72].

3.3.2. Skills

Engaging in continuing education activities, clinical experience and communication were identified as both barriers and facilitators. Nurses with little or no opportunity to participate in continuing education activities, such as lack of attending in-service training on pressure injury prevention [16–18,20,22–24,29,30,33,36,37,39,49,52,60,67,70,75,78,80,84,86,87,90], lack of having higher level of education [17,20,21,78,82], and not reading articles or guidelines about pressure injuries [16,19,36,37,52,57,80], were less likely to carry out pressure injury prevention activities. While receiving relevant training on pressure injury prevention [19,43,47,54,56,58,59,62,64,76,77,81], having higher level of education [19,38,41,59,77], and reading articles/books about pressure injuries [22] were identified as enablers. Having clinical experience with patients or pressure injury patients was reported as a facilitator to performing pressure injury prevention [17,20,22,25,28,32,39,52,56,63,68,74,82,88,89]. On the other hand, nurses with more years of nursing experience was reported as a barrier in one study [68]. Communication was identified as occurring through documentation, handover, and education sessions. A lack of communication, such as difficulty with electronic documentation system, unable to discuss pressure injury prevention during a routine handover, efficient records absence, and inconsistencies in the nurses and doctors records, was reported as a barrier to pressure injury prevention [80,84,90,91]. While optimal communication within and across different levels of nurses was a facilitator in two studies [45,76].

3.3.3. Social/professional role and identity

Professional role was identified as barriers as well as facilitators for pressure injury prevention in different studies. Understanding of the role that nurses and other health professionals play in pressure injury prevention varies. Both nurses and therapists hold disagreement over who is responsible for the prevention of pressure injuries. When health professionals perceived that pressure injury prevention is not one of their primary roles, especially when they have competing priorities, they would refer the pressure injury prevention task to others [19,45,84,91]. When they believed pressure injury care as part of their daily job, and believed that the incidence of pressure injuries is an indication of poor care, they were concerned about pressure injury prevention in their practice [64,75]. Others reported the presence of tissue viability nurses or contact nurses on a unit or ward was identified as a facilitator [47,77,83].

Leadership support was identified as a facilitator for pressure injury prevention in three studies [43,47,58], while lack of leadership support was identified as a barrier in one study [91]. Leadership was described by nurses as either provided by nurse manager [43] or first-line manger [47] or someone described as needing to be persistent, dedicated, having time to implement the intervention and probably being internal to the organization so as to have some influence on staff [58]. The leaders' engagement and attitude are crucial to enable the personnel to implement pressure injury prevention.

3.3.4. Optimism

Acceptable or positive attitude towards pressure injury prevention [16,18,24,25,32,35,44,52,56,59,61,63,64,67,73,74,77,80,82,85,89,90] was identified as a facilitator to implementing pressure injury prevention, whereas unsatisfied or negative attitude towards pressure injury prevention was regarded as a barrier [28,29,33,37,60,72,88].

3.3.5. Environmental context and resources

There are a range of "Environmental context and resources" factors that inhibit performing pressure injury prevention. Barriers identified include poor staffing, time constraints, shortage of resources, and uncooperative patients. Staffing limitations both in numbers [15,18,19,30,34–37,40,41,48,49,52,54,55,66,71,73,84,90–92] and expertise [76,84] were frequently reported as barriers in undertaking pressure injury prevention. Un-cooperative patients including those with hearing problems, language barriers, dementia, and medically unstable condition were also seen as a barrier [15,44,48,52,54–56,58,71,75,90,92]. Time constraints included a general lack of time to perform pressure injury prevention [44,48,49,52,54,73,80] and competing demands [54,56]. Shortage of resources was a common obstacle to pressure injury prevention. The resources could be the equipment/products used to prevent pressure injuries (such as pressure relieving devices) [15,18,30,36–38,40,54,66,71,84,91,92], the decision support tools (such as prevention protocol, pressure ulcer staging tool, risk assessment scale, guidelines, literature, and policy) [16,19,30,35,37,70,80,91], and logistical issues (the hospital ordering system) [84]. On the other hand, access to resources was regarded as a facilitator. The resources that were mentioned in several studies included equipment/products [43,44,47,56,73,76], decision support tools (such as care bundle, practice guideline, care protocol) [23,41,55,58,83], and network to communicate information [43]. The commonly reported formats of care bundle included a video, brochure and poster [55]. Organizational culture of promoting active patient participation was reported as a facilitator in four studies [43,54,55,58]. Patient characteristics, such as at high age, at higher risk of developing pressure injury (Braden <17), and being cooperative, were reported as facilitators for performing pressure injury prevention [41,46].

3.3.6. Social influences

Social norms hindered implementation of pressure injury prevention. When patients had a negative attitude towards their health care, and thought nurses should do everything for them, or when patients did not realize the importance of pressure injury prevention, and did not acknowledge they were at risk of developing a pressure injury, they didn't participate in implementing pressure injury prevention care [54,55,58].

Social support is an important factor for the provision of pressure injury prevention. Lack of multidisciplinary working was reported as a

Table 2
Barriers and facilitators to implementing PIP mapped to TDF domains for each included study.

TDF domain	Barriers sub-themes	Facilitators sub-themes
1. knowledge	Lack of sufficient knowledge (Acosta-Hernández et al., 2022; Al Kharabsheh et al., 2014; Aydin et al., 2010; Aydogan et al., 2019; Barakat-Johnson et al., 2019; Beeckman et al., 2011; Berihu et al., 2020; Cebeci et al., 2022; Charalambous et al., 2019; Chianca et al., 2010; Claudia et al., 2010; De Meyer et al., 2019; Dirgar et al., 2022; Ebi et al., 2019; El Enein et al., 2011; Erbay Dalli et al., 2021; Fulbrook et al., 2019; Getie et al., 2020; Gul et al., 2017; Gunningberg et al., 2015; Halasz et al., 2021; Hu et al., 2021; Ilesanmi et al., 2012; Iranmanesh et al., 2011; Iranmanesh et al., 2013; Jiang et al., 2020; Khojastehfar et al., 2020; Khong et al., 2020; Li J et al., 2022; Li Z et al., 2022; Lotfi et al., 2019; Miller et al., 2017; Malinga et al., 2020; Miyazak et al., 2010; Muhammed et al., 2020; Mwebaza et al., 2014; Nuru et al., 2015; Parisod et al., 2021; Qaddumi et al., 2014; Rafiei et al., 2014; Ravindra et al., 2022; Rodrigues et al., 2016; Saleh et al., 2019; Sengul et al., 2020; Tallier et al., 2017; Tayyib et al., 2016; Tirgari et al., 2018; Tubaishat et al., 2014; Uba et al., 2015; Worsley et al., 2017)	Acceptable or satisfactory level of knowledge (Coyer et al., 2019; Dilie et al., 2015; Esan et al., 2018; Ghazanfari et al., 2022; Kaddourah et al., 2016; Saleh et al., 2013; Strand et al., 2010; Tesfa Mengist et al., 2022; Zhang et al., 2021)
2. Skills	Lack of training on PU prevention (Acosta-Hernández et al., 2022; Aslan et al., 2016; Aydin et al., 2010; Aydogan et al., 2019; De Meyer et al., 2019; Dirgar et al., 2022; Ebi et al., 2019; El Enein et al., 2011; Etafa et al., 2018; Gul et al., 2017; Jiang et al., 2020; Lotfi et al., 2019; Mirshekari et al., 2017; Muhammed et al., 2020; Qaddumi et al., 2014; Ravindra et al., 2022; Rodrigue et al., 2016; Sengul et al., 2020; Tallier et al., 2017; Tan et al., 2020; Tirgari et al., 2018; Tubaishat et al., 2013; Uba et al., 2015; Unver et al., 2017;Worsley et al., 2017)	Receiving special training on pressure ulcer prevention (Barakat-Johnson et al., 2019; Beeckman et al., 2011; Cebeci et al., 2022; Claudia et al., 2010; Coyer et al., 2019; Esan et al., 2018; Hu et al., 2021; Hommel et al., 2017; Li Z et al., 2022; Roberts et al., 2016; Sving et al., 2017; Teo et al., 2019)
	Lack of higher level of education (Aydin et al., 2010; De Meyer et al., 2019; Dirgar et al., 2022; Erbay Dalli et al., 2021; Parisod et al., 2021)	Higher level of education (Beeckman et al., 2011; Cebeci et al., 2022; Getie et al., 2020; Hu et al., 2021; Tesfa Mengist et al., 2022)
	Not reading articles or guidelines (Aslan et al., 2016; Cebeci et al., 2022; Etafa et al., 2018; Ebi et al., 2019; Fulbrook et al., 2019; Tallier et al., 2017; Tubaishat et al., 2013)	Reading articles/books/ guideline about PUs (Gul et al., 2017)
	Lack of communication (Acosta-Hernández et al., 2022; Gaspar et al., 2022; Tallier et al., 2017; Worsley et al., 2017)	Good communication about PU prevention (Sving et al., 2012; Teo et al., 2019)
	Clinical experience with patients (Chianca et al., 2010)	Clinical experience with patients or PU patients (Aydin et al., 2010; Chianca et al., 2010; Coyer et al., 2019; Dirgar et al., 2022; Ghazanfari et al., 2022; Gul et al., 2017; Halasz et al., 2021; Khojastehfar et al., 2020; Khong et al., 2020; Malinga et al., 2020; Muhammed et al., 2020; Parisod et al., 2021; Tayebi Myaneh et al., 2020; Tubaishat et al., 2013; Zhang et al., 2021)
3. Social/ Professional role and identity	Not within the scopes of their responsibilities (Cebeci et al., 2022; Gaspar et al.,2022; Sving et al., 2012; Worsley et al., 2017)	Part of their job (Esan, 2018; Tan, 2020)
	Lack of leadership support (Gaspar et al., 2022)	The presence of tissue viability nurses or contact nurse (Beeckman et al., 2011; Kim et al., 2019; Sving et al., 2017)
		Leadership support (Hommel et al., 2017; Roberts et al., 2016; Sving et al., 2017)
4. Beliefs about capabilities	No information	
5. Optimism	Unsatisfied attitudes towards PU prevention (Etafa et al., 2018; Halasz et al., 2021; Jiang et al., 2020; Kaddourah et al., 2016; Khojastehfar et al., 2020; Lotfi et al., 2019; Tirgari et al., 2018)	Acceptable or positive attitude towards PU prevention (Acosta-Hernández et al., 2022; Aslan et al., 2016; Aydogan et al., 2019; Beeckman et al., 2011; Charalambous et al., 2019; Coyer et al., 2019; Dilie et al., 2015; Esan et al., 2018; Ghazanfari et al., 2022; Hu et al., 2021; Khong et al., 2020; Li J et al., 2022; Malinga et al., 2020; Parisod et al., 2021; Strand et al., 2010; Tallier et al., 2017; Tayyib et al., 2016; Tayebi Myaneh et al., 2020; Tubaishat et al., 2013; Uba et al., 2015; Unver et al., 2017; Zhang et al., 2021)
6. Beliefs about consequences	No information	
7. Reinforcement	No information	The care bundle acting as a prompt to patients, nurses and families, reminding them to undertake PU prevention activities (Chaboyer et al., 2014)
8. Intentions	Low interest in PU care (Gaspar et al., 2022)	Wish to receive training on the prevention of PUs (Parisod et al., 2021; Sengul et al., 2020; Teo et al., 2019)
		Interest in PU care (Kim et al., 2019)

(*continued on next page*)

Table 2 (*continued*)

TDF domain	Barriers sub-themes	Facilitators sub-themes
9. Goals	Goal priority: not considering PI prevention to be a priority of care (Barakat-Johnson et al., 2019; Cebeci et al., 2022; Etafa et al., 2018; Gaspar et al., 2022; Worsley et al., 2017)	Goal priority: considering PI prevention to be a priority of care (Coyer et al., 2019) Target setting (Barakat-Johnson et al., 2019; Chaboyer et al., 2014)
10. Memory, attention, and decision processes	No information	
11. Environmental context and resources	Un-cooperative patient (Acosta-Hernández et al., 2022; Adibelli et al., 2022; Al-Ghamdi et al., 2017; Al Kharabsheh et al., 2014; Barakat-Johnson et al., 2019; Chaboyer et al., 2014; Coyer et al., 2019; Mwebaza et al., 2014; Roberts et al., 2016; Strand et al., 2010; Tan et al., 2020; Tubaishat et al., 2013)	Patient characteristics: Patients at higher age and lower Braden score, Patient cooperativeness (Sving et al., 2014; Tesfa Mengist et al., 2022)
	Lack of time (Al Kharabsheh et al., 2014; Barakat-Johnson et al., 2019; Qaddumi et al., 2014; Strand et al., 2010; Tallier et al., 2017; Tayyib et al., 2016; Tubaishat et al., 2013)	Organizational culture: Promoting active patient participation (Barakat-Johnson et al., 2019; Chaboyer et al., 2014; Hommel et al., 2017; Roberts, 2016)
	Competing demands (Barakat-Johnson et al., 2019; Coyer et al., 2019)	Available to use decision support tools such as a video, brochure and poster, practical guidelines, protocol (Chaboyer et al., 2014; Kim et al., 2019; Roberts et al., 2016; Sengul et al., 2020; Tesfa Mengist et al., 2022)
	Lack of staffing in numbering (Acosta-Hernández et al., 2022; Adibelli et al., 2022; Al-Ghamdi et al., 2017; Al Kharabsheh et al., 2014; Aydogan et al., 2019; Barakat-Johnson et al., 2019; Berihu et al., 2020; Cebeci et al., 2022; Chaboyer et al., 2014; Dilie et al., 2015; Ebi et al., 2019; Etafa et al., 2018; Gaspar et al., 2022; Ilesanmi et al., 2014; Mirshekari et al., 2017; Mwebaza et al., 2014; Nuru et al., 2015; Qaddumi et al., 2014; Tayyib et al., 2016; Tesfa Mengist et al., 2022; Tubaishat et al., 2013; Worsley et al., 2017)	Access to equipment/ products (Hommel et al., 2017; Strand et al., 2010; Sving et al., 2017; Tayyib et al., 2016; Teo et al., 2019)
	Lack of staffing in expertise (Teo et al., 2019; Worsley et al., 2017)	Access to products (Coyer et al., 2019)
	Lack of equipment/products provision, such as pressure relieving devices, linens, disposable materials (Adibelli et al., 2022; Al-Ghamdi et al., 2017; Aydogan et al., 2019; Barakat-Johnson et al., 2019; Ebi et al., 2019; Etafa et al., 2018; Gaspar et al., 2022; Getie et al., 2020; Ilesanmi et al., 2014; Mirshekari et al., 2017; Mwebaza et al., 2014; Nuru et al., 2015; Worsley et al., 2017)	Having a well-functioning network to communicate information and a good IT system (Hommel et al., 2017)
	Poor access to literature/ guideline/policy (Aslan et al., 2016; Dilie et al., 2015; Etafa et al., 2018; Gaspar et al., 2022; Mirshekari et al., 2017)	
	Lack of PI prevention protocol/PI staging tool/risk assessment scales (Cebeci et al., 2022; Rodrigue et al., 2016; Tallier et al., 2017)	
	Lack of access to the hospital ordering system (Worsley et al., 2017)	
12. Social influences	Patients' passive approach or negative attitude towards their health care (Barakat-Johnson et al., 2019; Chaboyer et al., 2014; Roberts et al., 2016)	Multi-disciplinary team working (Adibelli et al., 2022; Gaspar et al., 2022; Hommel et al., 2017; Sving et al., 2012; Tan et al., 2020; Tayyib et al., 2016; Teo, 2019)
	Lack of multidisciplinary working (Ebi et al., 2019; Worsley et al., 2017)	Support from an team nurse/wound nurses (Gaspar et al., 2022; Sving et al., 2017; Teo et al., 2019)
13.Emotion	Lack of job satisfaction (Dilie et al., 2015; Getie et al., 2020)	Satisfied with nursing leadership (Nuru et al., 2015)
14.Behavioral regulation	No information	Performing regular quality measurement (Hommel et al., 2017; Sving et al., 2014; Sving et al., 2017) Feedback on the quality measurement (Hommel et al., 2017; Sving, 2017 et al.) Establishing action plans (Hommel et al., 2017; Sving et al., 2012)

PIP: pressure injury prevention; PU: pressure ulcer; PI: pressure injury.

barrier in one study [36,84]. While social support provided from multi-disciplinary team [15,43,45,73,75,76,91], team nurse [47] and wound nurse [76,91] was perceived as facilitators which would assist the uptake of pressure injury prevention.

4. Discussion

Using TDF as a guiding framework in this review has allowed a comprehensive conceptual understanding of the facilitators and barriers for pressure injury prevention in practice in hospital settings.

As our findings show, the most frequently identified barriers and facilitators were under the "Knowledge" and "Skills" domains. Knowledge and skills deficits, have been commonly identified as barriers in evidence-based practice in different settings [93,94]. Inadequate knowledge may lead to misconceptions about pressure injury prevention and subsequently to suboptimal care. Inadequate knowledge was unsurprising, as health professionals reported they had little opportunity to participate in continuing education activities. Interestingly, positive attitude towards pressure injury prevention was a frequently identified facilitator within the "Optimism" domain. A positive attitude toward an issue is an important influencing factor that determines an individual's likelihood of carrying out a positive behaviour. To address practitioner-level issues of knowledge, skills and attitudes, it is essential to continue training efforts in this area. Lin et al. [95], in a systematic review, reported that education strategies including seminars, posters, brochures, and PowerPoints, were commonly used in most of the

pressure injury prevention programs. Current literature suggests that if education is not targeted and tailored to the specific context, it will not contribute to behaviour change [96]. Educators should consider different educational methods, structures, or ways of presenting information on pressure injury prevention to meet diverse learning needs. In addition, educators should consider the quality of training, such as whether course content has been updated with the latest scientific evidence.

However, contrary to expectations, this positive attitude is not reflected in clinical practice [97]. Behaviour more often occurs due to the individual's interaction with environmental factors, which may be a greater influencing factor [98]. The "Environmental Context and Resources" domain was frequently identified as barriers and facilitators, which has been reported in other health professionals involved in delivering evidence-based care [99,100]. Within this domain, poor staffing, time constraints, shortage of resources, and un-cooperative patients were important barriers to implementing pressure injury prevention, which often sit outside practitioners' loci of control. If these barriers are not properly managed, nurses will persist in grappling with the attitude-behaviour gap [98]. To address these barriers, it requires organization level system changes. Increasing the number of nurses or nurse-to-patient ratio alone may not sufficient enough to enhance pressure injury prevention. Nurse leaders, administrators, and managers need to create a positive and supportive organizational culture by having multidisciplinary discussions for plans of care, fostering open communication among different team members, and sharing clear goals for patients [101].

Understanding of the role within the "Social/Professional Role and Identity" domain and social support from multi-disciplinary team within the "Social Influences" domain were important themes. It showed that the multi-disciplinary team where every single team member has a clear and explicit responsibility could facilitate the provision of pressure injury prevention. It has been reported that when the healthcare organizations have effective teams that has clearly defined roles, the incidence rates of pressure injuries can decrease [102]. Current literature suggests that multi-disciplinary collaboration could improve professional practice and healthcare outcomes [103]. It is necessary to explore the ways they collaborate and the role of different healthcare professionals in the multi-disciplinary team in preventing pressure injury.

Leadership support was another important theme for the "Social/Professional Role and Identity" domain. The presence of leadership has been reported as an issue for nurses' use of clinical practice guidelines [101], and leadership within the organizational context is increasingly recognized as a strong influencing factor on the acceptance and use of research evidence in practice [104]. A systematic literature review suggests that managers use a range of leadership practices involving change, relations and task-oriented behaviours to facilitate and support nursing and allied health staff to use research evidence in their clinical practice [105].

5. Limitations

This review has some limitations. We only included studies published in English, relevant studies in other language may have been missed. Quality assessment found that several included studies had potential biases that may influence the validity of the findings reported. The predominant study design of included studies was quantitative, including self-reported questionnaires and surveys, with most without a guiding theoretical framework, which may not be able to clearly identify the barriers and facilitators. Future research using qualitative approaches guided by theoretical frameworks may provide deeper understanding of barriers and facilitators.

6. Conclusions

The barriers and facilitators to pressure injury prevention in hospital settings identified and analyzed in this systematic review were diverse, and included issues at both individual and organizational level. Based on the TDF, the dominant themes were "Knowledge", "Skills", "Environmental Context and Resources", "Optimism", "Social/Professional Role and Identity", and "Social influences". Healthcare organizations can address the barriers and facilitators from the influential TDF domains. Future research is required to investigate the effectiveness of behaviour change interventions that specifically target these barriers and facilitators to pressure injury prevention.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jtv.2023.04.009.

References

[1] Edsberg LE, Black JM, Goldberg M, McNichol L, Moore L, Sieggreen M. Revised national pressure ulcer advisory panel pressure injury staging system: revised pressure injury staging system. J Wound, Ostomy Cont Nurs 2016;43(6):585–97.
[2] Li Z, Lin F, Thalib L, Chaboyer W. Global prevalence and incidence of pressure injuries in hospitalised adult patients: a systematic review and meta-analysis. Int J Nurs Stud 2020;105:103546.
[3] Padula WV, Delarmente BA. The national cost of hospital-acquired pressure injuries in the United States. Int Wound J 2019;16(3):634–40.
[4] Gorecki C, Brown JM, Nelson EA, et al. Impact of pressure ulcers on quality of life in older patients: a systematic review. J Am Geriatr Soc 2009;57(7):1175–83.
[5] European pressure ulcer advisory Panel, national pressure ulcer advisory Panel, and Pan pacific pressure injury alliance. Prevention and treatment of pressure ulcers/injuries: clinical practice guideline. third ed. 2019.
[6] Donovan EA, Manta CJ, Goldsack JC, Collins ML. Using a lean six sigma approach to yield sustained pressure ulcer prevention for complex critical care patients. J Nurs Adm 2016;46(1):43–8.
[7] Richardson A, Peart J, Wright SE, McCullagh IJ. Reducing the incidence of pressure ulcers in critical care units: a 4-year quality improvement. Int J Qual Health Care 2017;29(3):433–9.
[8] Hoviattalab K, Hashemizadeh H, D'Cruz G, Halfens RJ, Dassen T. Nursing practice in the prevention of pressure ulcers: an observational study of German Hospitals. J Clin Nurs 2015;24(11–12):1513–24.
[9] Chaboyer W, Bucknall T, Gillespie B, et al. Adherence to evidence-based pressure injury prevention guidelines in routine clinical practice: a longitudinal study. Int Wound J 2017;14(6):1290–8.
[10] Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. Lancet 2003;362(9391):1225–30.
[11] Dyson J, Lawton R, Jackson C, Cheater F. Development of a theory-based instrument to identify barriers and levers to best hand hygiene practice among healthcare practitioners. Implement Sci 2013;8:111.
[12] Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ 2009;339:b2700.
[13] Pluye P, Gagnon MP, Griffiths F, Johnson-Lafleur J. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. Int J Nurs Stud 2009;46(4):529–46.
[14] Atkins L, Francis J, Islam R, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. Implement Sci 2017;12(1):77.
[15] Adibelli S, Korkmaz F. Pressure injury prevention practices of intensive care unit nurses in Turkey: a descriptive multiple-methods qualitative study. J Tissue Viability 2022;31(2):319–25.
[16] Aslan A, Yavuz van Giersbergen M. Nurses' attitudes towards pressure ulcer prevention in Turkey. J Tissue Viability 2016;25(1):66–73.
[17] Aydin AK, Karadag A. Assessment of nurses' knowledge and practice in prevention and management of deep tissue injury and stage I pressure ulcer. J Wound, Ostomy Cont Nurs 2010;37(5):487–94.

[18] Aydogan S, Caliskan N. A descriptive study of Turkish intensive care nurses' pressure ulcer prevention knowledge, attitudes, and perceived barriers to care. Wound Manag Prev 2019;65(2):39–47.
[19] Cebeci F, Şenol Çelik S. Knowledge and practices of operating room nurses in the prevention of pressure injuries. J Tissue Viability 2022;31(1):38–45.
[20] Dirgar E, Tosun B, Dokumuş H, Bülbül T. Evaluating nurses' knowledge of pressure injury prevention: a descriptive study. Adv Skin Wound Care 2022;35 (4):1–6.
[21] Erbay Dalli O, Kelebek Girgin N. Knowledge, perception and prevention performance of intensive care unit nurses about medical device-related pressure injuries. J Clin Nurs 2021;31(11–12):1612–9.
[22] Gul A, Andsoy II, Ozkaya B, Zeydan A. A descriptive, cross-sectional survey of Turkish nurses' knowledge of pressure ulcer risk, prevention, and staging. Ostomy/Wound Manag 2017;63(6):40–6.
[23] Sengul T, Karadag A. Determination of nurses' level of knowledge on the prevention of pressure ulcers: the case of Turkey. J Tissue Viability 2020;29(4): 337–41.
[24] Unver S, Findik UY, Ozkan ZK, Surucu C. Attitudes of surgical nurses towards pressure ulcer prevention. J Tissue Viability 2017;26(4):277–81.
[25] Ghazanfari MJ, Karkhah S, Maroufizadeh S, et al. Knowledge, attitude, and practice of Iranian critical care nurses related to prevention of pressure ulcers: a multicenter cross-sectional study. J Tissue Viability 2022;31(2):326–31.
[26] Iranmanesh S, Rafiei H, Forough Ameri G. Critical care nurses' knowledge about pressure ulcer in southeast of Iran. Int Wound J 2011;8(5):459–64.
[27] Iranmanesh S, Tafti A, Rafiei H, Dehghan M, Razban F. Orthopaedic nurses' knowledge about pressure ulcers in Iran_ a cross-sectional study. J Wound Care 2013;22(3):138–43.
[28] Khojastehfar S, Najafi Ghezeljeh T, Haghani S. Factors related to knowledge, attitude, and practice of nurses in intensive care unit in the area of pressure ulcer prevention: a multicenter study. J Tissue Viability 2020;29(2):76–81.
[29] Lotfi M, Aghazadeh AM, Asgarpour H, Nobakht A. Iranian nurses' knowledge, attitude and behaviour on skin care, prevention and management of pressure injury: a descriptive cross-sectional study. Nurs Open 2019;6(4):1600–5.
[30] Mirshekari L, Tirgari B, Forouzi MA. Intensive care unit nurses' perceived barriers towards pressure ulcer prevention in south east Iran. J Wound Care 2017;26(3): 145–51.
[31] Rafiei H, Abdar ME, Iranmanesh S, Lalegani H, Safdari A, Dehkordi AH. Knowledge about pressure ulcer prevention, classification and management: a survey of registered nurses working with trauma patients in the emergency department. Int J Orthop Trauma Nurs 2014;18(3):135–42.
[32] Tayebi Myaneh Z, Rafiei H, Hosseinigolafshani SZ, Rashvand F. Relationship between practice and attitude regarding pressure injury among intensive care nurses in Iran: a descriptive, correlational study. Wound Manag Prev 2020;66(6): 27–34.
[33] Tirgari B, Mirshekari L, Forouzi MA. Pressure injury prevention: knowledge and attitudes of Iranian intensive care nurses. Adv Skin Wound Care 2018;31(4):1–8.
[34] Berihu H, Wubayehu T, Teklu T, Zeru T, Gerensea H. Practice on pressure ulcer prevention among nurses in selected public hospitals, Tigray, Ethiopia. BMC Res Notes 2020;13(1):207.
[35] Dilie A, Mengistu D. Assessment of nurses' knowledge, attitude, and perceived barriers to expressed pressure ulcer prevention practice in addis ababa government hospitals, addis ababa, Ethiopia, 2015. Adv Nurs 2015;2015:796927.
[36] Ebi WE, Hirko GF, Mijena DA. Nurses' knowledge to pressure ulcer prevention in public hospitals in Wollega: a cross-sectional study design. BMC Nurs 2019;18:20.
[37] Etafa W, Argaw Z, Gemechu E, Melese B. Nurses' attitude and perceived barriers to pressure ulcer prevention. BMC Nurs 2018;17(1):14.
[38] Getie A, Baylie A, Bante A, Geda B, Mesfin F. Pressure ulcer prevention practices and associated factors among nurses in public hospitals of Harari regional state and Dire Dawa city administration, Eastern Ethiopia. PLoS One 2020;15(12): e0243875.
[39] Muhammed EM, Bifftu BB, Temachu YZ, Walle TA. Nurses' knowledge of pressure ulcer and its associated factors at Hawassa University comprehensive specialized hospital Hawassa, Ethiopia, 2018. BMC Nurs 2020;19:51.
[40] Nuru N, Zewdu F, Amsalu S, Mehretie Y. Knowledge and practice of nurses towards prevention of pressure ulcer and associated factors in Gondar University Hospital, Northwest Ethiopia. BMC Nurs 2015;14:34.
[41] Tesfa Mengist S, Abebe Geletie H, Zewudie BT, et al. In: Pressure ulcer prevention knowledge, practices, and their associated factors among nurses in Gurage Zone Hospitals, South Ethiopia, 2021, vol. 10. SAGE Open Med; 2022, 20503121221105571.
[42] Gunningberg L, Martensson G, Mamhidir AG, Florin J, Muntlin Athlin A, Baath C. Pressure ulcer knowledge of registered nurses, assistant nurses and student nurses: a descriptive, comparative multicentre study in Sweden. Int Wound J 2015;12(4):462–8.
[43] Hommel A, Gunningberg L, Idvall E, Bååth C. Successful factors to prevent pressure ulcers - an interview study. J Clin Nurs 2017;26(1–2):182–9.
[44] Strand T, Lindgren M. Knowledge, attitudes and barriers towards prevention of pressure ulcers in intensive care units: a descriptive cross-sectional study. Intensive Crit Care Nurs 2010;26(6):335–42.
[45] Sving E, Gunningberg L, Högman M, Mamhidir A-G. Registered nurses' attention to and perceptions of pressure ulcer prevention in hospital settings. J Clin Nurs 2012;21(9–10):1293–303.
[46] Sving E, Idvall E, Högberg H, Gunningberg L. Factors contributing to evidence-based pressure ulcer prevention. A cross-sectional study. Int J Nurs Stud 2014;51 (5):717–25.
[47] Sving E, Fredriksson L, Gunningberg L, Mamhidir AG. Getting evidence-based pressure ulcer prevention into practice: a process evaluation of a multifaceted intervention in a hospital setting. J Clin Nurs 2017;26(19–20):3200–11.
[48] Al Kharabsheh MSAR, Alrimawi RFAR, Al Assaf RM, Saleh MYN. Exploring nurses' knowledge and perceived barriers to carry out pressure ulcer prevention and treatment, documentation, and risk assessment. Am Int J Contemp Res 2014; 4(4):112–9.
[49] Qaddumi J, Khawaldeh A. Pressure ulcer prevention knowledge among Jordanian nurses: a cross- sectional study. BMC Nurs 2014;13(1). 6-6.
[50] Saleh MYN, Al-Hussami M, Anthony D. Pressure ulcer prevention and treatment knowledge of Jordanian nurses. J Tissue Viability 2013;22(1):1–11.
[51] Saleh MYN, Papanikolaou P, Nassar OS, Shahin A, Anthony D. Nurses' knowledge and practice of pressure ulcer prevention and treatment: an observational study. J Tissue Viability 2019;28(4):210–7.
[52] Tubaishat A, Aljezawi M, Qadire MA. Nurses' attitudes and perceived barriers to pressure ulcer prevention in Jordan. J Wound Care 2013;22(9):490–7.
[53] Tubaishat A, Aljezawi M. Exploring pressure ulcer care in Jordan: nurses' knowledge and practice. J Dermatol Nurses Assoc 2014;6(3):115–23.
[54] Barakat-Johnson M, Lai M, Wand T, White K. A qualitative study of the thoughts and experiences of hospital nurses providing pressure injury prevention and management. Collegian 2019;26(1):95–102.
[55] Chaboyer W, Gillespie BM. Understanding nurses' views on a pressure ulcer prevention care bundle: a first step towards successful implementation. J Clin Nurs 2014;23(23–24):3415–23.
[56] Coyer F, Cook J-L, Doubrovsky A, Campbell J, Vann A, McNamara G. Understanding contextual barriers and enablers to pressure injury prevention practice in an Australian intensive care unit: an exploratory study. Aust Crit Care 2019;32(2):122–30.
[57] Fulbrook P, Lawrence P, Miles S. Australian nurses' knowledge of pressure injury prevention and management: a cross-sectional survey. J Wound, Ostomy Cont Nurs 2019;46(2):106–12.
[58] Roberts S, McInnes E, Wallis M, Bucknall T, Banks M, Chaboyer W. Nurses' perceptions of a pressure ulcer prevention care bundle: a qualitative descriptive study. BMC Nurs 2016;15:1–10.
[59] Hu L, Sae-Sia W, Kitrungrote L. Intensive care nurses' knowledge, attitude, and practice of pressure injury prevention in China: a cross-sectional study. Risk Manag Healthc Pol 2021;14:4257–67.
[60] Jiang L, Li L, Lommel L. Nurses' knowledge, attitudes, and behaviours related to pressure injury prevention: a large-scale cross-sectional survey in mainland China. J Clin Nurs 2020;29(17–18):3311–24.
[61] Li J, Zhu C, Liu Y, et al. Critical care nurses' knowledge, attitudes, and practices of pressure injury prevention in China: a multicentric cross-sectional survey. Int Wound J 2023;20(2):381-390.
[62] Li Z, Marshall AP, Lin F, Ding Y, Chaboyer W. Knowledge of pressure injury in medical and surgical nurses in a tertiary level hospital: a cross-sectional study. J Tissue Viability 2022;31(1):24–9.
[63] Zhang YB, He L, Gou L, et al. Knowledge, attitude, and practice of nurses in intensive care unit on preventing medical device-related pressure injury: a cross-sectional study in western China. Int Wound J 2021;18(6):777–86.
[64] Esan DT, Fasoro AA, Funmilayo Ojo E, Obialor B. A descriptive, cross-sectional study to assess pressure ulcer knowledge and pressure ulcer prevention attitudes of nurses in a tertiary health institution in Nigeria. Ostomy/Wound Manag 2018; 64(6):24–8.
[65] Ilesanmi RE, Ofi BA, Adejumo PO. Nurses' knowledge of pressure ulcer prevention in ogun state, Nigeria: results of a pilot survey. Ostomy/Wound Manag 2012;58(2):24–32.
[66] Ilesanmi RE, Olabisi P. Assessment of common interventions and perceived barriers to pressure ulcer prevention in southwest Nigeria. J Wound, Ostomy Cont Nurs 2014;41(3):242–6.
[67] Uba MN, Alih FI, Kever RT, Lola N. Knowledge, attitude and practice of nurses toward pressure ulcer prevention in university of maiduguri teaching hospital, Borno state, North-eastern, Nigeria. Int J Nurs Midwifery 2015;7(4):54–60.
[68] Chianca TCM, Rezende JFP, Borges EL, Nogueira VL, Caliri MHL. Pressure ulcer knowledge among nurses in a Brazilian university hospital. Ostomy/Wound Manag 2010;56(10):58–64.
[69] Miyazaki MY, Caliri MH, dos Santos CB. Knowledge on pressure ulcer prevention among nursing professionals. Rev Lat Am Enfermagem 2010;18(6):1203–11.
[70] Rodrigues GCA, Vasconcelos JdMB, Melo FMdAB, et al. Knowledge and opinions of nursing professionals about pressure ulcers prevention. Int Arch Med 2016;9 (101):1–13.
[71] Al-Ghamdi A. Factors affecting nurses' compliance in preventing pressure ulcer among hospitalized patients at king abdulaziz university hospital. Am J Nurs Sci 2017;6(5):387.
[72] Kaddourah B, Abu-Shaheen AK, Al-Tannir M. Knowledge and attitudes of health professionals towards pressure ulcers at a rehabilitation hospital: a cross-sectional study. BMC Nurs 2016;15:17.
[73] Tayyib N, Coyer F, Lewis P. Pressure injury prevention in a Saudi arabian intensive care unit: registered nurse attitudes toward prevention strategies and perceived facilitators and barriers to evidence implementation. J Wound, Ostomy Cont Nurs 2016;43(4):369–74.
[74] Khong BPC, Goh BC, Phang LY, David T. Operating room nurses' self-reported knowledge and attitude on perioperative pressure injury. Int Wound J 2020;17 (2):455–65.
[75] Tan JJM, Cheng MTM, Hassan NB, He H, Wang W. Nurses' perception and experiences towards medical device-related pressure injuries: a qualitative study. J Clin Nurs 2020;29(13/14):2455–65.

[76] Teo CSM, Claire CA, Lopez V, Shorey S. Pressure injury prevention and management practices among nurses: a realist case study. Int Wound J 2019;16(1):153–63.
[77] Beeckman D, Defloor T, Schoonhoven L, Vanderwee K. Knowledge and attitudes of nurses on pressure ulcer prevention: a cross-sectional multicenter study in Belgian hospitals. Worldviews Evidence-Based Nurs 2011;8(3):166–76.
[78] De Meyer D, Verhaeghe S, Van Hecke A, Beeckman D. Knowledge of nurses and nursing assistants about pressure ulcer prevention: a survey in 16 Belgian hospitals using the PUKAT 2.0 tool. J Tissue Viability 2019;28(2):59–69.
[79] Miller DM, Neelon L, Kish-Smith K, Whitney L, Burant CJ. Pressure injury knowledge in critical care nurses. J Wound, Ostomy Cont Nurs 2017;44(5):455–7.
[80] Tallier PC, Reineke PR, Asadoorian K, Choonoo JG, Campo M, Malmgreen-Wallen C. Perioperative registered nurses knowledge, attitudes, behaviors, and barriers regarding pressure ulcer prevention in perioperative patients. Appl Nurs Res 2017;36:106–10.
[81] Claudia G, Diane M, Daphney S-G, Danièle D. Prevention and treatment of pressure ulcers in a university hospital centre: a correlational study examining nurses' knowledge and best practice. Int J Nurs Pract 2010;16(2):183–7.
[82] Parisod H, Holopainen A, Koivunen M, Puukka P, Haavisto E. Factors determining nurses' knowledge of evidence-based pressure ulcer prevention practices in Finland: a correlational cross-sectional study. Scand J Caring Sci 2022; 36(1):150-161.
[83] Kim JK, Yoo SH, Nho JH, Ju JK. Performance and influencing factors of evidence-based pressure ulcer care among acute care hospital nurses. Worldviews Evidence-Based Nurs 2019;16(1):29–35.
[84] Worsley PR, Clarkson P, Bader DL, Schoonhoven L. Identifying barriers and facilitators to participation in pressure ulcer prevention in allied healthcare professionals: a mixed methods evaluation. Physiotherapy 2017;103(3):304–10.
[85] Charalambous C, Koulouri A, Roupa Z, Vasilopoulos A, Kyriakou M, Vasiliou M. Knowledge and attitudes of nurses in a major public hospital in Cyprus towards pressure ulcer prevention. J Tissue Viability 2019;28(1):40–5.
[86] El Enein NY, Zaghloul AA. Nurses' knowledge of prevention and management of pressure ulcer at a health insurance hospital in Alexandria. Int J Nurs Pract 2011; 17(3):262–8.
[87] Ravindra HN, Kathaliya B. Pressure ulcer prevention in Bedridden patients: evaluation of nursing professional's knowledge and practice. NeuroQuantology 2022;20(9):5428–32.
[88] Halasz BG, Beresova A, Tkacova L, Magurova D, Lizakova L. Nurses' knowledge and attitudes towards prevention of pressure ulcers. Int J Environ Res Publ Health 2021;18(4):1–9.
[89] Malinga S, Dlungwane T. Nurses' knowledge, attitudes and practices regarding pressure ulcer prevention in the umgungundlovu District, South Africa. Afr J Nurs Midwifery 2020;22(2):1–17.
[90] Acosta-Hernández C, Fernández-Castillo R-J, Montes-Vázquez M, González-Caro M-D. Is caring for pressure ulcers in the intensive care unit in Spain still a challenge? A qualitative study on nurses' perceptions. J Tissue Viability 2023;32(1):114–9.
[91] Gaspar S, Botelho Guedes F, Vitoriano Budri AM, Ferreira C, Gaspar de Matos M. Hospital-acquired pressure ulcers prevention: what is needed for patient safety? The perceptions of nurse stakeholders. Scand J Caring Sci 2022;36(4):978–87.
[92] Mwebaza I, Katende G, Groves S, Nankumbi J. Nurses' knowledge, practices, and barriers in care of patients with pressure ulcers in a ugandan teaching hospital. Nurs Res Pract 2014;2014:973602.
[93] Lin F, Gillespie BM, Chaboyer W, et al. Preventing surgical site infections: facilitators and barriers to nurses' adherence to clinical practice guidelines-A qualitative study. J Clin Nurs 2019;28(9–10):1643–52.
[94] Goossens J, De Roose M, Van Hecke A, Goemaes R, Verhaeghe S, Beeckman D. Barriers and facilitators to the provision of preconception care by healthcare providers: a systematic review. Int J Nurs Stud 2018;87:113–30.
[95] Lin F, Wu Z, Song B, Coyer F, Chaboyer W. The effectiveness of multicomponent pressure injury prevention programs in adult intensive care patients: a systematic review. Int J Nurs Stud 2020;102:103483.
[96] Baker R, Camosso-Stefinovic J, Gillies C, et al. Tailored interventions to address determinants of practice. Cochrane Database Syst Rev 2015;2015(4):Cd005470.
[97] Moore Z, Price P. Nurses' attitudes, behaviours and perceived barriers towards pressure ulcer prevention. J Clin Nurs 2004;13(8):942–51.
[98] Avsar P, Patton D, O'Connor T, et al. Do we still need to assess nurses' attitudes towards pressure ulcer prevention? A systematic review. J Wound Care 2019;28(12):795–806.
[99] Atkins L, Sallis A, Chadborn T, et al. Reducing catheter-associated urinary tract infections: a systematic review of barriers and facilitators and strategic behavioural analysis of interventions. Implement Sci 2020;15(1):44.
[100] Waddell A, Lennox A, Spassova G, Bragge P. Barriers and facilitators to shared decision-making in hospitals from policy to practice: a systematic review. Implement Sci 2021;16(1):74.
[101] Jun J, Kovner CT, Stimpfel AW. Barriers and facilitators of nurses' use of clinical practice guidelines: an integrative review. Int J Nurs Stud 2016;60:54–68.
[102] Campbell K, Teague L, Hurd T, King J. Health policy and the delivery of evidence-based wound care using regional wound teams. Healthc Manag Forum 2006;19(2):16–21.
[103] Reeves S, Pelone F, Harrison R, Goldman J, Zwarenstein M. Interprofessional collaboration to improve professional practice and healthcare outcomes. Cochrane Database Syst Rev 2017;6(6):Cd000072.
[104] Aarons GA, Green AE, Trott E, et al. The roles of system and organizational leadership in system-Wide evidence-based intervention sustainment: a mixed-method study. Adm Policy Ment Health 2016;43(6):991–1008.
[105] Gifford WA, Squires JE, Angus DE, et al. Managerial leadership for research use in nursing and allied health care professions: a systematic review. Implement Sci 2018;13(1):127.