



## SYSTEMATIC REVIEW

# A systematic review of clinical practice guidelines and other best practice recommendations for pressure injury risk assessment in the United States

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## Abstract

Preventing pressure injuries (PIs) remains the most effective way to reduce their burden. A key element of prevention is the assessment of PI risk. The study aimed to investigate whether guidance documents relevant to the United States (US) advocated for specific risk assessment recommendations. We conducted a systematic review of guidance documents published between 2010 and 2024. Embase, Medline, Cinahl, and four key organisational websites were systematically searched to retrieve relevant articles. Two independent reviewers screened the articles for inclusion. One reviewer extracted the data, and a second reviewer checked all extracted data. Three reviewers assessed the guidance documents quality using the Appraisal of Guidelines for Research & Evaluation (AGREE II) tool. A narrative

**Abbreviations:** AAWC, The Association for the Advancement of Wound Care; ACP, American College of Physicians; AGREE II, Appraisal of Guidelines for Research and Evaluation; AHRQ, the Agency for Healthcare Research and Quality; AMDA, The Society for Post-Acute and Long-Term Care Medicine; AORN, the Association of periOperative Registered Nurses; CPG, clinical practice guidelines; CRD, Cochrane and the Centre for Reviews and Dissemination; ED, emergency department; ELPO, Risk Assessment Scale for the Development of Injuries due to Surgical Position; EVARUCI, Current Risk Assessment Scale for Pressure injury in Intensive Care; GRADE, Grading of Recommendations Assessment, Development and Evaluation; HAPI, hospital-acquired pressure injury; HCP, health care professionals; ICU, intensive care unit; MDRPI, medical device-related pressure injury; PI, pressure injury; PICAR, Population, Intervention, Comparator, Attributes, Recommendations; PRAMS, Perioperative Risk Assessment Measure for Skin; PRISMA, Preferred Reporting Items For Systematic Review And Meta-Analysis; PURS, InterRAI Pressure Ulcer Risk Scale; SCIPUS, Spinal Cord Injury Pressure Ulcer Scale; SR, systematic review; US, United States; WOCN, Wound, Ostomy and Continence Nurses Society.

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synthesis was used to describe and summarise findings. Six clinical practice guidelines (CPGs) and eight other best practice recommendations were included. The median scores of most AGREE II domains were higher for CPGs compared to other best practice recommendations. Risk assessment was consistently positioned as a critical first step in the prevention of PIs, emphasising its role in identifying at-risk individuals and informing targeted interventions. Although risk assessment was presented as a crucial step in PI risk prevention, there was no clear and unanimous recommendation for a specific risk assessment strategy across all guidance documents, either for the general population or for specific subgroups of patients in US healthcare settings. These findings suggest a need for national consensus on concepts, implementation, and language addressing PI risk assessment.

#### KEYWORDS

best practice recommendation, clinical practice guideline, evidence-based practice, pressure injury, preventive health services, risk assessment

## 1 | INTRODUCTION

Pressure injuries (PIs) are localised damages to skin and/or underlying tissues due to prolonged pressure, or pressure in combination with shear.<sup>1</sup> If a PI develops during patients' hospital stay, it is described as a hospital-acquired pressure injury (HAPI).<sup>2</sup> PIs might occur in patients across all settings but are most common in hospital wards where patients have limited mobility or are bedridden for long periods. These include intensive care units (ICUs), surgical wards, geriatric and long-term care facilities, rehabilitation centres, and oncology units.<sup>3,4</sup> Additionally, in the hospital environment, patients are at risk of medical device-related pressure injury (MDRPI) from prolonged skin or soft tissue contact with a medical device, particularly in operating theatres, ICUs, and emergency departments (EDs).<sup>5</sup> All types of PIs impose a substantial burden on patients, their relatives, caregivers, and national health-care systems.<sup>6,7</sup> They can affect patients of all ages, from neonates to older people,<sup>8,9</sup> although they are more frequent in individuals over the age of 75.<sup>10</sup> PIs decrease health-related quality of life,<sup>11</sup> cause anxiety,<sup>12</sup> discomfort, and pain.<sup>10</sup> Increasing severity of PIs has been associated with higher mortality.<sup>3</sup> Indeed, a higher risk of bacteremia was observed to be associated with infected ulcers<sup>13</sup> and might contribute to the higher hospital risk-adjusted length of stay of approximately 6 days.<sup>10</sup> The severity of PIs also seems associated with increased mortality in ICUs.<sup>3</sup> Treatment of PIs can be complex, particularly in later-stage full-thickness wounds, and can be associated with high recurrence rates.<sup>14</sup>

The impact of the disease on the health system and the patient population is influenced by its high prevalence. The global prevalence of PIs and HAPIs between 2008 and 2018 was 12.8% and 8.5%, respectively.<sup>15</sup> When assessed by region, the prevalence of PI in Europe, North America, the Middle East, South America, and Australia was 14.5%, 13.6%, 12.6%, 12.7%, and 9.0%, respectively.<sup>15</sup> In the United States (US), 2.5 million individuals develop a PI in acute care facilities each year<sup>16</sup> with a cost of \$10,708 per patient, exceeding a total cost of \$26.8 billion based on 2.5 million reported cases.<sup>17</sup> Although HAPI is considered the most common preventable adverse

event in hospitals, and according to US Centers for Medicare & Medicaid Services value programmes, severe HAPI is classified as a "never event" defined as a medical error that should never occur,<sup>2</sup> it nevertheless leads to 60,000 patient deaths annually.<sup>18</sup> In the last 10 years, the incidence of HAPI has varied between 12% and 33%, with more severe PIs (Stage 3, stage 4, deep tissue PI, unstageable) four times less likely than superficial PIs (stage 1 or stage 2).<sup>3,19</sup> Since HAPIs are preventable, they can be considered an indicator of quality of care<sup>20,21</sup> and result in significant financial consequences to US hospitals through the direct penalties, non-payment policies, and personal injury litigation. In the US, many governmental programs and initiatives have been set up to incentivise high-quality care and penalise poor clinical practice.<sup>22–24</sup> Over 17,000 lawsuits related to PIs are filed annually, and PI is the second most common claim after wrongful death.<sup>18</sup> A single lawsuit has an average settlement of \$250,000, with some awards exceeding \$312 million.<sup>25</sup>

Assessing PI risk (i.e. measuring individual susceptibility to developing a PI) and detecting PI early (i.e. the identification of early (sub) clinical signs and symptoms) are two distinct but crucial steps in the PI identification pathway to decrease the incidence of PI and the impact of PI on patients' health, respectively.<sup>26</sup> Risk assessment helps identify patients who are at high risk of developing PIs and should guide health care professionals (HCPs) to take preventive measures. A number of standardised risk assessment scales have been developed to support clinical decision making with easy-to-use and standardised approaches to decrease the subjectivity of patient assessment, particularly for less experienced HCPs.<sup>27</sup> Risk assessment scales are commonly used, especially in the US.<sup>28</sup> For example, a certain level of risk according to the Braden scale can trigger specific actions in hospitals, such as involving a skin care team instead of a general nurse in the further care of the patient, as well as additional and more expensive preventive measures.

One of the main challenges of preventive programs has been encouraging healthcare institutions to implement clinical practice guidelines (CPGs) and other best practice recommendations to



improve their care.<sup>29</sup> Considering the specifics of the US healthcare system and the complex policies around PIs in US hospitals in general, assessing current guidance documents helps to understand the current challenges regarding effective PI risk assessment approaches.

The aim of this systematic review (SR) is to describe the risk assessment of PI included in the US and international guidance documents in recent years. A secondary aim of the review is to understand whether any particular risk assessment scales are considered or recommended in US-specific settings and patient populations.

## 2 | METHODS

### 2.1 | Eligibility criteria

This SR was conducted following Cochrane and the Centre for Reviews and Dissemination (CRD) guidelines, and two additional published methodological guides for conducting SRs of CPGs.<sup>30,31</sup> Reporting was aligned with the Preferred Reporting Items For Systematic Review And Meta-Analysis (PRISMA) Statement (Appendix S1). The study protocol was registered on Open Science Framework (<https://osf.io/dhnwt>). We used the inclusion and exclusion criteria in the Population, Intervention, Comparator, Attributes, Recommendations (PICAR) format presented in Table 1.<sup>30</sup>

### 2.2 | Search strategy

The electronic bibliographic databases MEDLINE, EMBASE, and CINAHL, and key organisation websites, such as the National Pressure Injury Advisory Panel, Guidelines International Network, Guidelines Central, and ECRI Guideline Trust, were searched. Search strategies

were developed and conducted by an experienced information specialist. The CADTH broad filter was used where appropriate.<sup>32</sup> A country filter was applied to limit the search to US records to target only the region of interest. No language filters were used. The search was conducted in September 2022 and updated in September 2024 in order to obtain the most current CPGs and other best practice recommendations (including consensus papers, position statements, white papers, evidence synthesis to guide care or input for guidelines, and toolkits) relevant to the US settings. We included CPGs and other secondary literature, in accordance with the approach presented by Mancin et al.,<sup>31</sup> to increase the richness of the evidence presented. The search strategy was integrated with “snowballing” approaches: the bibliography of relevant articles or guidelines was examined to identify records missed in the initial search. Details of the database and websites strategies are presented in Appendix S2.

### 2.3 | Selection process

All citations were imported into EndNote 21 and de-duplicated using the ‘remove duplicates’ function. A two-step screening approach was adopted: two reviewers independently screened titles and abstracts, and then full texts against the eligibility criteria (Table 1) using Rayyan. Any disagreements about inclusion were resolved through discussion between the reviewers.

### 2.4 | Data collection process

A predefined data extraction table (MS Office Excel) was used for data extraction. The data extraction process was conducted by one reviewer and quality-controlled by a second reviewer.

**TABLE 1** PICAR eligibility criteria for the SR.

PICAR framework	Inclusion criteria	Exclusion criteria
P: Population, clinical indication(s) and condition(s)	<ul style="list-style-type: none"> <li>Adult patients.</li> <li>Patients at risk of developing PI.</li> <li>Any care setting located in the US.</li> </ul>	<ul style="list-style-type: none"> <li>Paediatric population.</li> <li>Patients with other chronic wounds.</li> <li>Population from non-US care settings.</li> </ul>
I: Intervention(s)	<ul style="list-style-type: none"> <li>Use of risk assessment scales, strategies, approaches, methods, tools, and procedures, process, pathways, protocols for patients at risk of developing PIs.</li> </ul>	<ul style="list-style-type: none"> <li>PI prevention and management without risk assessment.</li> </ul>
C: Comparator(s) and content	<ul style="list-style-type: none"> <li>No or any comparator.</li> <li>Has to include scales or process for PI risk assessment.</li> </ul>	
A: Attributes of eligible CPGs	<ul style="list-style-type: none"> <li>Language: English.</li> <li>Year of publication: 2010 onwards.</li> <li>Publishing region: US and international.</li> <li>Version: latest version only.</li> <li>Status: published.</li> </ul>	<ul style="list-style-type: none"> <li>Non-English materials.</li> <li>Year of publication: before 2010.</li> <li>Publishing region: outside US</li> <li>Version: previous versions.</li> <li>Status: unpublished.</li> </ul>
R: Recommendation characteristics	<ul style="list-style-type: none"> <li>Guidelines, CPGs, other best practice recommendations, record and consensus papers and white papers.</li> <li>Evidence Synthesis to guide care/or input for guidelines.</li> <li>Guidelines addressing scales and procedures for risk assessment for PIs</li> </ul>	<ul style="list-style-type: none"> <li>Opinion papers, commentaries, editorials, narrative reviews, literature reviews, and any prospective or retrospective studies.</li> </ul>

## 2.5 | Data items

Characteristics of the guidance documents, such as the date of issue and geographic scope, risk assessment, including any scales mentioned along with their descriptions and recommendations for the implementation process in the care pathway were extracted, tabulated, and narratively described. Quantitative data aggregation was not performed.

## 2.6 | Methodological quality assessment of guidance documents

The Appraisal of Guidelines for Research and Evaluation version 2 (AGREE II) was used to evaluate the quality of the included guidance documents.<sup>33</sup> Two reviewers independently assessed the quality of guidance documents (0–100%, with 100% being the highest quality). We again aligned our methods to those described by Mancin et al.<sup>31</sup>: recommendations were considered lower quality if the score for any domain or the overall score fell below 50%. We included in the synthesis all eligible guidance documents regardless of their achieved score, but we presented a sensitivity analysis where we described only the recommendations of the higher quality guidance documents. This approach allowed us to compare recommendations from higher and lower quality sources and describe the differences, if any.

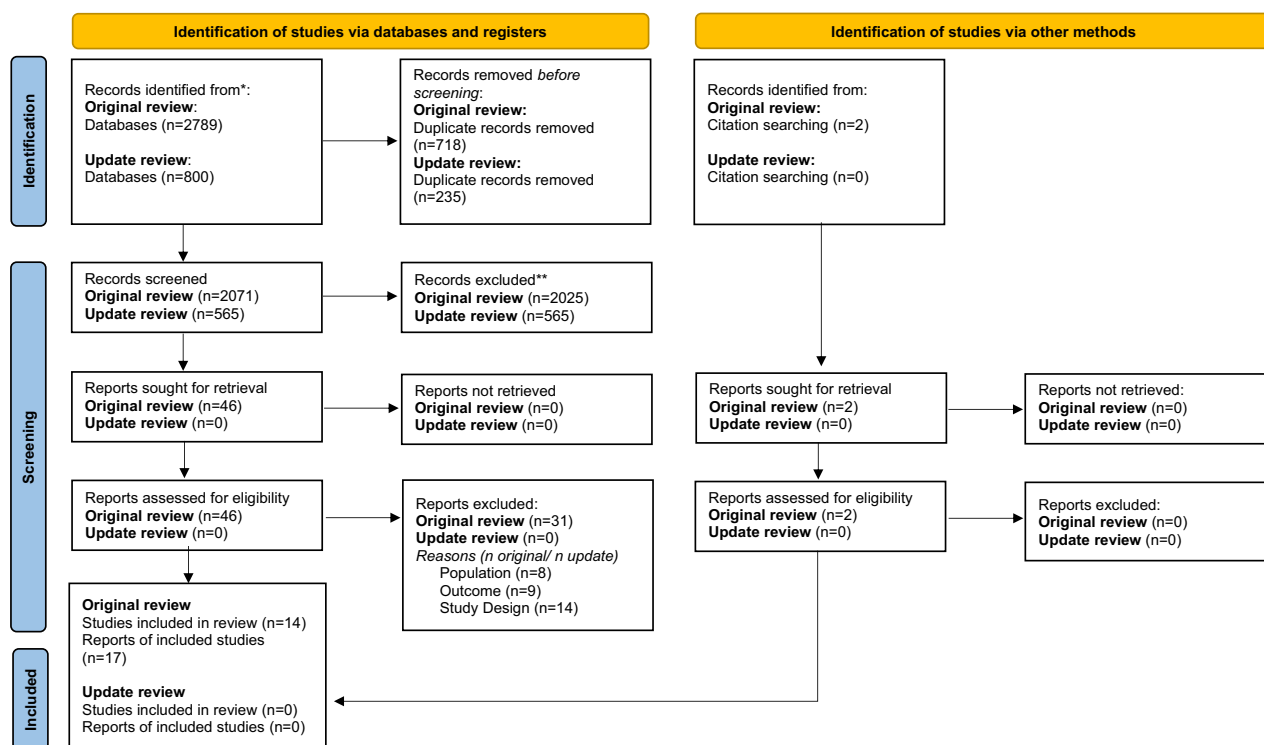
## 3 | RESULTS

### 3.1 | CPGs and other best practice recommendations selection

The screening process is summarised in the PRISMA flow diagram (Figure 1). A total of 3579 records were identified and, after screening, 17 articles were considered eligible. The articles included six CPGs (presented in nine articles),<sup>34–42</sup> and eight other best practice recommendations, of which four were best practice,<sup>43–46</sup> one consensus statement,<sup>47</sup> and three evidence-based recommendations to guide care.<sup>48–50</sup> More specific information on the reasons for excluding the 2619 studies is presented in Appendix S3.

### 3.2 | Characteristics of guidance documents

Characteristics of the guidance documents are reported in Table 2. Only one best practice recommendation was published more than 10 years ago,<sup>50</sup> while all other guidance documents were published between 2014 and 2024.<sup>34–39,43–49</sup> More than half of the guidance documents were developed in the United States<sup>35–37,39,43,44,46,48–50</sup> and four were developed by international groups of experts but relevant to the US.<sup>34,38,45,47</sup> All six CPGs and two other best practice recommendations used the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach or



\*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

\*\*If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

FIGURE 1 The PRISMA flow diagram.

TABLE 2 Characteristics of guidance documents.

Title	Type	Year	Geographic scope	Author/organisation	Strength of recommendation assessment	Guideline development methods	AGREE II score
CPGs							
The Association for the Advancement of Wound Care (AAWC) venous and pressure ulcer guidelines <sup>36</sup>	CPG	2014	USA	AAWC	Each recommendation has a content validity $\geq 0.75$ (based on ratings by the 32 multidisciplinary independent wound care experts completing the survey) and/or A-level evidence.	Systematic review (searches April 2002–2013) in three electronic databases.	2/6 items <50% Overall score 67%
Guideline for prevention of perioperative pressure injury <sup>35,40,42</sup>	CPG	2024	USA	AORN	AORN Evidence Rating Model	Systematic review (searches between January 2000–2021) in four electronic databases	All items >50% Overall score 92%
Pressure ulcers and other wounds in the post-acute and long-term care setting <sup>37</sup>	CPG	2013	USA	AMDA	GRADE system	Not specified	All items >50% Overall score 85%
Prevention and treatment of pressure ulcers/injuries: clinical practice guideline <sup>38</sup>	CPG	2019	International	EPUAP, NPIAP and PPPIA	GRADE system	Systematic review (updated searches between 1 July 2013 and 31 August 2018.) in seven electronic databases.	All items >50% Overall score 99%
Risk assessment and prevention of pressure ulcers: a clinical practice guideline from the American College of Physicians <sup>39</sup>	CPG	2015	USA	ACP	GRADE system	Systematic review (searches between 2000 and September 2012)	All items >50% Overall score 82%
WOCN 2016 guideline for prevention and management of pressure injuries (ulcers) <sup>34</sup>	CPG	2017	International	WOCN	Wound, Ostomy and Continence Nurses Society rating system	Systematic review (searches between January 2010 and July 2015)	1/6 item <50% Overall score 71%
Other best practice recommendations							
AHRQ pressure ulcer prevention recommendations <sup>44</sup>	Best practice	2014	USA	U.S. AHRQ	Not included	Not included	4/6 < 50% Overall score 28%
Best practice in pressure injury prevention among critical care patients <sup>45</sup>	Best practice	2020	International	Alderden JG, Shibily F, Cowan L	Not included	Not included	3/6 < 50% Overall score 48%
Best practices for pressure ulcer prevention in the burn center <sup>46</sup>	Best practice	2017	USA	Warner J, Raible MA, Hajduk G, Collavo J.	Not included	Not included	5/6 < 50% Overall score 33%

(Continues)

TABLE 2 (Continued)

Title	Type	Year	Geographic scope	Author/organisation	Strength of recommendation assessment	Guideline development methods	AGREE II score
Device-related pressure ulcers: SECURE prevention. Second edition <sup>47</sup>	Consensus statement	2022	International	Gefen A, Alves P, Ciprandi G, Coyer F, Milne CT, Ousey K, Ohura N, Waters N, Worsley P, Black J, Barakat-Johnson M, Beekman D, Fletcher J, Kirkland-Kyhn H, Lahmann NA, Moore Z, Payan Y, Schluer AB	Not included	Not included	3/6 < 50% Overall score 47%
Pressure injury prevention and wound management for the patient who is actively dying <sup>48</sup>	Evidence-based recommendations to guide care	2020	USA	Vickery J, Compton L, Allard J, Beeson T, Howard J, Pittman J	Not included	Systematic review (searches between January 2008 and March 2018)	1/6 < 50% Overall score 77%
Pressure ulcers in the ICU patient: an update on prevention and treatment <sup>49</sup>	Evidence-based recommendations to guide care (literature review)	2015	USA	Krupp AE, Monfre J	Not included	Not included	4/6 < 50% Overall score 44%
Preventing pressure ulcers in hospitals – a toolkit for improving quality of care <sup>43</sup>	Best practice	2013	USA	AHRQ	Not included	Not included	1/6 < 50% Overall score 80%
Pressure ulcer risk assessment and prevention: comparative effectiveness <sup>50</sup>	Evidence-based recommendations to guide care (systematic review)	2013	USA	Chou R, Dana T, Bougatsos C, Blazina I, Starmer A, Reitel K, Buckley D.	Not included	Not included	1/6 < 50% Overall score 78%

Abbreviations: AAWC, The Association for the Advancement of Wound Care; ACP, American College of Physicians; AHRQ, Agency for Healthcare Research and Quality; AMDA, The Society for Post-Acute and Long-Term Care Medicine; AORN, Association of periOperative Registered Nurses; CPG, Clinical Practice Guideline; EPUAP, European Pressure Ulcer Advisory Panel; GRADE, Grading of Recommendations, Assessment, Development, and Evaluations; ICU, Intensive Care Unit; NPIAP, National Pressure Injury Advisory Panel; PPPA, Pan Pacific Pressure Injury Alliance; WOCN, Wound, Ostomy and Continence Nurses Society.

modifications<sup>34–39,44,50</sup> to assess the quality of evidence and/or to develop the strengths of recommendations. The criteria for rating the evidence and grading the recommendations varied among CPGs, and are reported in Appendices S4 and S5, respectively.

### 3.3 | Quality of included guidance documents: AGREE II assessments

The median scores of most AGREE II domains were significantly higher for CPGs compared to other best practice recommendations (Figure 2). Four out of six CPGs in each domain had a higher than 50% score.<sup>35,37–39</sup> The highest scores for each domain were achieved by the CPGs issued by the Association of periOperative Registered Nurses (AORN)<sup>49</sup> and European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel, and Pan Pacific Pressure Injury Alliance.<sup>52</sup> Across the CPGs, domain one (scope and purpose), four (clarity of presentation) and six (editorial independence) were the highest-scoring domains, with a median of 86% (range 61%–100%), 97% (range 83%–100%), and 89% (range 58%–100%), respectively. Domain five (applicability) was the poorest-scoring domain, with a median score of 63%, ranging between 24% and 97%.

Most of the scores in other best practice recommendations were below 50% in each domain. Domain one (scope and purpose) and four (clarity of presentation) were the highest-scoring domains with a median score of 91% (range 69%–100%) and 67% (range 33%–93%). Domain three (rigour of development) and five (applicability) were the poorest-scoring domains with a median score of 34% (range 3%–79%) and 31% (range 18%–50%), respectively. No other best practice recommendation achieved a score above 50% for each domain. Detailed AGREE II scores for each are provided in Appendix S6. Conflicts of interest reported for each CPG and other best practice recommendation are provided in Appendix S7.

### 3.4 | Target population and setting

One CPG was developed for a specific population, that is, surgical patients, or patients undergoing operative and other invasive

procedures.<sup>35</sup> All other CPGs provided recommendations for adults being at risk for PIs.<sup>34,36–39</sup> Two CPGs targeted their recommendations to a specific setting: one CPG to post-acute and long-term care settings<sup>37</sup> and the other to perioperative practice settings.<sup>35</sup> Four CPGs did not specify the type of care setting.<sup>34,36,38,39</sup> In other best practice recommendations, the population and the setting were more specific: older people,<sup>44</sup> ICU patients,<sup>45,49</sup> patients with burns,<sup>46</sup> patients in contact with or implanted with a medical device,<sup>47</sup> adults who are actively dying with goals of care that are not curative.<sup>48</sup> Only one other best practice recommendation refers to the adult population,<sup>50</sup> and one to all hospitalised patients.<sup>43</sup> Most of the other best practice recommendations also referred to specific settings: ICU or critical care,<sup>45,49</sup> burn centres,<sup>46</sup> acute care facilities<sup>43</sup> and hospitals.<sup>47</sup> Two did not specify any setting,<sup>44,48</sup> while one indicated all settings.<sup>50</sup>

### 3.5 | Risk assessment in the care pathway

Five CPGs<sup>34–36,38,39</sup> and five other best practice recommendations<sup>43,45–48</sup> reported that HCPs should perform the risk assessment: mostly nurses,<sup>34,35,39,43,48</sup> but also physicians, dietitians, and physical therapists.<sup>34,35,39</sup> One CPG indicated that a patient representative should be included in the interdisciplinary team that would design and develop procedures related to the risk prevention of PI.<sup>35</sup> One other best practice recommendation indicated that patients or their caregivers should take action to minimise the risk of MDRPI development, informing the HCP of any discomfort or pain at the device site and moving or adjusting the device.<sup>47</sup>

Three CPGs<sup>34,36,38</sup> and five other best practice recommendations<sup>43,45–48</sup> provided indications about the optimal timing and frequency for the assessment. Most of them indicated that the risk assessment should be performed every day,<sup>43</sup> at admission (up to 72 h),<sup>34,36,45,46</sup> and if patient status or any PI risk factor changes.<sup>34,45</sup> One best practice recommendation mentioned that there is no pre-defined frequency for the assessment because it depends on the patient condition and clinical judgement. The frequency of assessments should be higher for higher risk patients.<sup>47</sup>

Most guidance documents included and described specific risk assessment scales in the text (Table 3 and Appendix S8). Additionally,

**FIGURE 2** Median AGREE II domain scores and ranges for CPGs and other best practice recommendations. The red horizontal line at 50% indicates the cut-off score at or above which each domain was considered 'properly addressed'. A grey dot indicates the score for the higher-quality CPGs, while a black dot refers to the score for the lower-quality CPGs and other best practice recommendations.

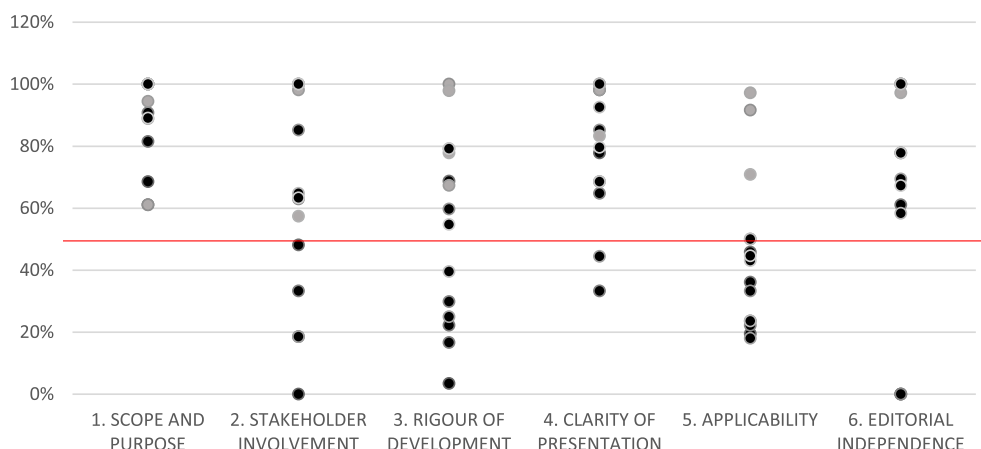




TABLE 3 Description of risk assessment presented in the eligible guidance documents identified in the SR.

Title of document	Target population	Type of setting	Risk assessment recommendations	Process (who and how frequently the assessment is carried out)	Statements about risk assessment scales	AGREE II score
CPGs						
AAWC venous and pressure ulcer guidelines, 2014 <sup>36</sup>	Not specified	All settings	<ul style="list-style-type: none"> <li>“For all settings, a trained professional should assess and document PU risk within 72 hours of admission or on change of any PU risk factor, using a valid, reliable scale with good predictive validity for the setting and for patient age and cognition.” (LoE A)</li> <li>“Assess environmental/ physical/ medical/ psychosocial factors, patient end-of-life goals.” (LoE A)</li> </ul>	Trained HCP. Within 72 h of admission or if any PI risk factor has been changed.	“ <b>Braden scale</b> has highest inter-rater reliability and percent correct predictions. <b>Norton and Waterlow Scales</b> are also valid.” (LoE A)	2/ 6 items <50% Overall score 67%
Guideline for prevention of perioperative pressure injury, 2024 <sup>35</sup>	Surgical patients, patients undergoing operative and other invasive procedures	Peri-operative practice setting	<ul style="list-style-type: none"> <li>“Conduct a preoperative risk assessment of every patient's risk for PI.” (LoE IIA, IIB, IIA, VA, VC)</li> <li>“Perform a preoperative assessment of intrinsic factors related to the risk of PI.” (LoE IA, IIB, IIA, IVC, VA, VB)</li> <li>“Perform a preoperative risk assessment of additional factors that may increase the patient's risk for PIs.” (LoE IIB, IIA, VB)</li> <li>“Conduct a preoperative assessment.” (LoE IB, IIA, IIC, IIB, IIB, VA-C)</li> </ul>	Peri-operative team members. Details of assessment frequency not included.	“Preoperative risk assessment should be visual, comprehensive, and incorporate a structural risk assessment tool for use in the preoperative patients that is specific to the age and has been validated (e.g. Munro Scale, ELPO, PRAMS) or demonstrated to be reliable (e.g. Scott Triggers).” (recommendation; LoE IIB, IIA, IVC, VA, VB, VC). “The Braden scale is widely used for PI risk assessment, but it does not address risk factors specific to surgical patients”. “(...) the Braden Scale had a low predictive validity for assessing PI risk in surgical patients”.	All items >50% Overall score 92%
Pressure ulcers and other wounds in the post-acute and long-term care setting, 2017 <sup>37</sup>	Adult patients	Post-acute and long-term care setting	<ul style="list-style-type: none"> <li>“Select and consistently use one predictive scale to identify patients at high risk for the development of pressure ulcers or other wounds. Although predictive scales vary in their predictive value, the consistent use of one scale is the most reliable way to detect change over time.” (LoE Moderate/SoR Strong)</li> </ul>	Wound-care team. Details of assessment frequency not included.	“The <b>Braden Scale</b> for Predicting Pressure Sores (...) has been extensively studied; it is widely used in the United States and is the only assessment tool that has been validated in nonwhite populations. The <b>Norton Score</b> (...) is another tool for assessing pressure ulcer risk. A recently developed assessment tool, the <b>interRAI Pressure Ulcer Risk Scale (PURS)</b> , may also be considered; (...) this new tool eliminates the need for separate pressure ulcer risk scoring and can be performed at the bedside. Both the <b>Braden Scale</b> and the <b>Norton Score</b> have been shown to have good sensitivity and specificity but poor positive predictive value. (...) Although no single scale is recognised as best for predicting pressure ulcers, it is recommended that facilities use one tool consistently.”	All items >50% Overall score 85%
Prevention and treatment of pressure ulcers/injuries: clinical practice guideline, 2019 <sup>38</sup>	All population	All settings	<ul style="list-style-type: none"> <li>“When conducting a pressure injury risk assessment:</li> <li>Use a structured approach</li> <li>Include a comprehensive skin assessment</li> </ul>	Qualified health professionals. As soon as it possible after admission and	“There are generally high levels of reliability in terms of total scores for the <b>Modified Norton Scale</b> (...) and <b>Braden Scale</b> . ” The three most commonly used scales – the Norton Scale (1962), Waterlow Score (1985), and the Braden Scale for	All items >50% Overall score 99%



TABLE 3 (Continued)

Title of document	Target population	Type of setting	Risk assessment recommendations	Process (who and how frequently the assessment is carried out)	Statements about risk assessment scales	AGREE II score
Risk assessment and prevention of pressure ulcers: a clinical practice guideline from the American College of Physicians, 2015 <sup>39</sup>	All adults, patients at risk for pressure ulcers	Not included	<ul style="list-style-type: none"> <li>• Supplement use of a risk assessment tool with assessment of additional risk factors</li> <li>• Interpret the assessment outcomes using clinical judgement." (GPS)</li> <li>• "Conduct a comprehensive skin and tissue assessment for all individuals at risk of pressure injuries" (GPS)</li> </ul>	periodically after any change in status	<p>Predicting Pressure Sore Risk (...). Additionally, numerous lesser known risk tools, some of which are designed for use in specific clinical settings and/or patient populations, are available, including but not limited to, the Ramstadius Risk Screening Tool, Suriadi and Sanada Scale, 8 Risk Assessment Pressure Sore Scale, The Modified Norton Scale, the PURPOSE, EVARUCI Scale, COMHON, Perioperative Risk Assessment Measure for Skin (PRAMS), Spinal Cord Injury Pressure Ulcer Scale (SCIPUS), (...) and the Cubbin-Jackson Scale.</p> <p>"Low-quality evidence from 1 good-quality study showed no difference among the <b>Waterlow scale</b>, the <b>Ramstadius</b> tool (...), and nurses' clinical judgement alone in reducing the risk for pressure ulcers or length of stay in patients. A recent Cochrane review supported this conclusion, citing lack of evidence to conclusively show a difference between the risk assessment tools and clinical judgement in reducing pressure ulcer incidence. No study evaluated the effectiveness of risk assessment tools across care settings or patient subgroups."</p> <p>"Moderate-quality evidence showed that the <b>Braden</b>, <b>Cubbin and Jackson</b>, <b>Norton</b>, and <b>Waterlow</b> scales had low sensitivity and specificity to identify patients at risk for pressure ulcers. In addition, moderate quality evidence showed that diagnostic accuracy did not differ substantially among the scales. Low quality evidence showed no clear differences in diagnostic accuracy of the <b>Braden scale</b> according to patient characteristics or settings, with lower optimal cutoffs for surgical or acute care patients. Moderate quality evidence showed no clear differences in diagnostic accuracy of the <b>Braden scale</b> according to baseline pressure ulcer risk. Although the <b>Cubbin and Jackson scale</b> was initially developed for patients in intensive care units, low-quality evidence showed that it had a similar diagnostic accuracy to the <b>Braden</b> and <b>Waterlow scales</b> in this setting."</p> <p>"Low-quality evidence showed that risk assessment tools (the <b>Waterlow</b> and <b>Ramstadius scales</b>) were equivalent to clinical judgement alone for reducing pressure ulcer incidence."</p>	<p>All items &gt;50% Overall score 82%</p>

(Continues)

TABLE 3 (Continued)

Title of document	Target population	Type of setting	Risk assessment recommendations	Process (who and how frequently the assessment is carried out)	Statements about risk assessment scales	AGREE II score
WOCN 2016 guideline for prevention and management of pressure injuries ulcers, 2017 <sup>34</sup>	Patients with/or at risk for PIs	Not included	<ul style="list-style-type: none"> <li>• "Assess for intrinsic/extrinsic risk factors." (LoE C/SoR Class I)</li> <li>• "Identify high-risk settings and groups to identify where to target prevention efforts to minimise risk."</li> <li>• "Assess and inspect skin regularly." (LoE C/SoR Class I)</li> <li>• "Monitor patients who have some degree of immobility frequently to minimise the risk of pressure ulcer formation." (LoE C/SoR Class I)</li> <li>• "Assess for incontinence." (LoE C/SoR Class I)</li> <li>• "Perform a nutritional assessment." (LoE C/SoR Class I)</li> <li>• "Utilise laboratory parameters as only one part of the nutritional assessment process, because they should not be considered in isolation." (LoE C/SoR Class I)</li> </ul>	Physicians, nurses, therapists, and other HCPs who work with adults with/or are at risk for PIs. <ul style="list-style-type: none"> <li>• At admission to a healthcare setting</li> <li>• Repeat the assessment on a regularly scheduled basis</li> </ul> Repeat if there is a significant change in the patient condition.	"Use a valid/reliable risk assessment tool in conjunction with the identification of additional risk factors (e.g., perfusion and oxygenation, increased body temperature, and advanced age), along with clinical judgement". (LoE C/SoR Class I)	1/6 item <50% Overall score 71%
Other best practice recommendations	Older people	Not included	"Assess skin daily."	Not included	Not applicable	4/6 < 50% Overall score 28%
AHRQ pressure ulcer prevention recommendations, 2016 <sup>44</sup>	ICU patients	Intensive care/critical care settings	<ul style="list-style-type: none"> <li>• "Use holistic pressure injury risk assessment to select appropriate preventive interventions."</li> <li>• "Head-to-toe skin and tissue assessment, with particular attention to bony prominences and skin under devices, is a critical aspect of pressure injury prevention aimed at detecting early signs."</li> </ul>	HCPs <ul style="list-style-type: none"> <li>• At admission</li> </ul> In case of any changes in patient status.	"(...) Braden Scale is the structured risk assessment most commonly used in the critical care settings". "Because (it) lacks the predictive validity needed to guide more intensive predictive efforts in the intensive care setting, some experts recommend using the <b>Braden Scale</b> subscale scores (moisture, activity, mobility, nutrition, friction and shear, and sensory perception)".	3/6 < 50% Overall score 48%
Best practice in pressure injury prevention among critical care patients, 2020 <sup>45</sup>	Burn patients	Burn centres	"Consistent monitoring and preventive measures are necessary to sustain a level of excellence in patient care outcomes."	HCPs At admission	"Pressure ulcer prevention begins with risk assessment using the <b>Braden Scale</b> ."	5/6 < 50% Overall score 33%
Best practices for pressure ulcer prevention in the burn center, 2017 <sup>46</sup>	All patients with a medical device in place	Hospitals	• "Risk assessment should be part of routine practice."	HCPs, patients, their families and other staff	"Risk assessment tools should be used to identify the likelihood of skin changes and the need for direct management".	3/6 < 50% Overall score 47%

TABLE 3 (Continued)

Title of document	Target population	Type of setting	Risk assessment recommendations	Process (who and how frequently the assessment is carried out)	Statements about risk assessment scales	AGREE II score
			<ul style="list-style-type: none"> <li>“Risk assessment tools should be used to identify the likelihood of skin changes and the need for direct management.”</li> <li>“Patients being managed with a medical device should be considered at high risk of DRPU formation.”</li> <li>“DRPU prevention requires a high level of cross functional collaboration and communication, which can be facilitated by documentation.”</li> <li>“Determined based on clinical judgement of the patient's condition and the level of risk associated with the device.”</li> </ul>	Regular assessment with no predetermined frequency.	<p>“The Braden, Waterlow and Norton scales are well known risk assessment tools that can be used for a broad spectrum of patients and settings, but they do not assess the risk of DRPU formation”.</p> <p>“The <b>CALCULATE</b> tool includes a section on mechanical ventilation, including CPAP masks and so takes some aspects of risk associated with medical devices into account. but its relevance is limited to critical care. The <b>Purpose-T</b> tool does include medical devices.”</p>	
Pressure injury prevention and wound management for the patient who is actively dying, 2020 <sup>48</sup>	Adult patients who are actively dying with goals of care that are not curative	Not included	“Perform routine, total skin assessments, consistent with the wishes and condition of the patient, with special attention to bony prominences and existing wounds.”	Nurses Details of assessment frequency not included	Not applicable.	1/6 < 50% Overall score 77%
Pressure ulcers in the ICU patient: an update on prevention and treatment, 2015 <sup>49</sup>	ICU patients	ICU	“The use of assessment instruments to predict individual patient risk factors for the development of PU is routinely recommended in PU prevention guidelines.”	Not included	<p>“Standardised assessment scales have demonstrated higher accuracy in predicting PU risk than clinical judgement alone, and their use has increased the effectiveness of PU prevention interventions”</p> <p>“Several PU risk assessment scales have been designed for ICU patients. Sixteen risk assessment scales developed for ICU use or validated with ICU populations were identified as part of a systematic review and meta-analysis. Only three of the ICU-developed scales were validated by more than one study. In addition, four scales designed for general hospitalised adult patients have been validated in ICUs. Of the seven scales that have been validated in critically ill patients, the <b>Braden Scale</b> for Predicting Pressure Sore Risk was recommended due a comprehensive validation process within the ICU population.”</p>	4/6 < 50% Overall score 44%
Preventing pressure ulcers in hospitals – a toolkit for improving quality of care, 2023 <sup>43</sup>	Hospitalised patients	Acute care facilities	Not included	RN Every 24 h	<p>“While some institutions have created their own tools, two risk assessment scales are widely used in the general adult population: the <b>Norton Scale</b> and the <b>Braden Scale</b>. Both the Norton and Braden scales have established reliability and validity. When used correctly, they provide valuable data to help plan care”</p>	1/6 < 50% Overall score 80%

(Continues)

TABLE 3 (Continued)

Title of document	Target population	Type of setting	Risk assessment recommendations	Process (who and how frequently the assessment is carried out)	Statements about risk assessment scales	AGREE II score
Pressure ulcer risk assessment and prevention: comparative effectiveness, 2013 <sup>50</sup>	All population	All settings	Not included	Not included	"The good quality trial found no difference in incidence of pressure ulcer development in patients assessed with the <i>Waterlow</i> scale, the <i>Ramstadius</i> tool, or clinical judgement alone. The two poor-quality studies evaluated the <i>modified Norton</i> scale and the <i>Braden</i> scale, with only a nonrandomised study of the <i>Norton</i> scale finding reduced risk of pressure ulcer compared with clinical judgement."	1/6 < 50% Overall score 78%

Abbreviations: AAWC, The Association for the Advancement of Wound Care; ACP, American College of Physicians; AHRQ, the Agency for Healthcare Research and Quality; AMDA, The Society for Post-Acute and Long-Term Care Medicine; AORN, Association of periOperative Registered Nurse; ELPO, Risk Assessment Scale for the Development of Injuries due to Surgical Position; GRADE, Grading of Recommendations, Assessment, Development, and Evaluations; HCP, health care professional; ICU, intensive care unit; PI, pressure injury; PRAMS, Perioperative Risk Assessment Measure for Skin; PURS, InterRAI Pressure Ulcer Risk Scale; RA, risk assessment; RN, registered nurse; SCIPUS, Spinal Cord Injury Pressure Ulcer Scale; WOCN, Wound, Ostomy and Continence Nurses Society.

the HCPs should visually assess the skin and mucosa, especially bony prominences and existing wounds, to detect any skin lesions.<sup>35,38,44,48</sup> The assessment should be holistic, including consideration of key intrinsic and extrinsic factors unaccounted for in risk assessment scales or unique to a specific care setting or patient population.<sup>34,35,37–39,43,45–47</sup> The recommendation to develop a patient-specific risk assessment plan for each setting was also included in two CPGs<sup>34,38</sup> and two other best practice recommendations.<sup>44,47</sup> A final recommendation was that all risk assessments must be accurately documented.<sup>36,38</sup>

### 3.6 | Risk assessment scales

No guidance document recommends using a specific risk assessment scale (Table 3 and Appendix S8). Instead, four out of six CPGs recommend performing risk assessment using validated and reliable scales with good predictive validity for the setting, patient age, and cognition.<sup>34–37</sup> Most guidance documents (11 out of 14) reported that risk assessment scales can be practical tools to identify patients at risk of PI development.<sup>34–39,43,45–47,49,50</sup> The guidance documents variously recommended that risk assessment scales should be: standardised,<sup>49</sup> reliable,<sup>34–36</sup> valid,<sup>34,36,38</sup> or 'validated' in the target population.<sup>35,37,49</sup> The validity and reliability of the scales should have been demonstrated through validation studies.<sup>35,37,38,49</sup> Described advantages of using standardised risk assessment scales included increased consistency in reporting of risk<sup>37</sup> and communication among caregivers and clinicians,<sup>34</sup> higher accuracy in predicting PI risk than clinical judgement alone,<sup>49</sup> and improved effectiveness of PI prevention interventions.<sup>49</sup> However, four CPGs<sup>34–36,38</sup> and two other best practice recommendations<sup>47,48</sup> stated that risk assessment should be supplemented by clinical judgement and cannot replace a comprehensive patient assessment. Five CPGs<sup>34–38</sup> and three other best practice recommendations<sup>45,47,49</sup> provided specific indications about the intrinsic/extrinsic factors that should be considered in the risk assessment, for example, perfusion, oxygenation, body temperature, and age, that seem to play a significant role in predicting the risk of developing PI.<sup>34</sup> One CPG recommends that a scale should be selected and used consistently, not only for initial risk assessment but also for monitoring changes in risk over time.<sup>37</sup>

Although no individual scale was specifically recommended, a total of 16 risk assessment scales were discussed in the guidance documents. Braden scale was the most frequently mentioned scale for the general population, but it was also discussed in the context of surgical and pre-operative patients, ICU patients, and burn patients.<sup>36–39,43,45–47,49,50</sup> The Braden scale was considered a valid scale or the "most validated tool" by one CPG<sup>37</sup> and one best practice recommendation.<sup>49</sup> One CPG recommended against the use of the Braden scale in surgery patients, because it does not include risk factors specific to the target population.<sup>35</sup> In terms of accuracy, the Braden Scale was considered to have good sensitivity and specificity in one CPG,<sup>37</sup> but low in another,<sup>39</sup> poor positive predictive values<sup>37</sup> in one CPG and low predictive value for surgical patients in two other guidance



documents.<sup>35,45</sup> The other most frequently mentioned scales were Norton Scale or its modifications,<sup>36–39,43,47,50</sup> Waterlow Scale,<sup>38,39,50</sup> the Cubbin-Jackson Scale<sup>38,39</sup> and the Ramstadius Scale.<sup>38,39,50</sup> Similar to the Braden scale, the accuracy of the scales was again inconsistently reported in the guidance documents.<sup>37,39</sup> Ten additional scales were mentioned including: Munro Pressure Injury Risk Assessment Scale, Risk Assessment Scale for the Development of Injuries due to Surgical Position (ELPO), Perioperative Risk Assessment Measure for Skin (PRAMS), InterRAI Pressure Ulcer Risk Scale (PURS), Suriadi and Sanada Scale, Risk Assessment Pressure Sore Scale, Scott Triggers Tool, Spinal Cord Injury Pressure Ulcer Scale (SCIPUS), the Current Risk Assessment Scale for Pressure injury in Intensive Care scale (EVARUCI Scale), and COMHON Scale.<sup>35,37,38,47</sup> The scales which assess MDRPI development were CALCULATE (for the risk assessment of continuous positive airway pressure mask) and the Purpose-T tool.<sup>38,47</sup> Munro Scale, ELPO, PRAMS, and Scott Triggers were highlighted for pre-surgical patients in one CGP.<sup>35</sup>

### 3.7 | Recommendations

The recommendations derived from higher-quality CPGs, as assessed using the AGREE II evaluation tool, are presented separately. By focusing on higher-quality CPGs, this sensitivity analysis aims to provide a clearer and more reliable set of recommendations, minimising bias and enhancing confidence in the guidance documents offered. This approach allows us to assess if there is a significant different approach regarding risk assessments between higher and lower quality guidance documents. All recommendations presented in all eligible guidance documents are presented in Table 3. According to the higher quality CPGs, it is recommended by at least two out of four CPGs:

- to perform risk assessment as soon as possible and on a regular basis (two out of four),<sup>34,38</sup>
- to perform skin assessment (three out of four),<sup>34,35,38</sup>
- to assess intrinsic and extrinsic factors (three out of four),<sup>34,35,38</sup>
- to use reliable risk assessment scales (two out of four),<sup>34,35</sup>
- to use risk assessment along with clinical judgment (two out of four).<sup>34,38</sup>

Based on the sensitivity analysis of recommendations from higher-quality CPGs, it could be concluded that no significant difference between recommendations from higher and lower quality guidance documents is visible.

## 4 | DISCUSSION

To the best of the authors' knowledge, this is the first systematic review of guidance documents to summarise recommendations about PI risk assessment in the US. Risk assessment is widely regarded as a crucial initial step in preventing PIs, highlighting its importance in identifying at-risk individuals and guiding targeted interventions.

In most cases, the guidance documents recommended that risk assessment scales should be used in conjunction with clinical judgement, integrating additional information obtained from patient history and other characteristics not considered in the scale with the risk assessment score.<sup>34–36,38,47,48</sup> Existing risk assessment scales do not adequately account for critical medical comorbidities that may significantly contribute to PI development and, in some cases, unavoidability. Conditions such as respiratory failure, renal failure, cardiac failure, and severe anaemia are known to impact tissue perfusion and increase PI risk.<sup>51</sup> Similarly, the use of vasopressors, which can cause peripheral vasoconstriction,<sup>52</sup> and systemic conditions affecting perfusion, such as hyponatremia, malnutrition, and edema, as well as lymphatic obstruction should be considered in risk assessment strategies.<sup>53,54</sup> Additionally, inflammatory conditions, chronic diseases, and hemodynamic instability can further compromise skin integrity and healing capacity, exacerbating the risk of PI formation.<sup>55</sup> Furthermore, the interplay between polypharmacy, immobility, and cognitive impairments—common in critically ill and elderly patients—can influence PI risk in ways not fully captured by traditional scales.<sup>55</sup> This highlights the need for more comprehensive, dynamic assessment models that integrate individualised clinical factors beyond standard mobility and moisture considerations. Neither identical approaches nor specific risk assessment procedures or scales were recommended across all guidance documents. In terms of individual scales, the Braden Scale was the more commonly referred to for a general at-risk population.<sup>36–39,43,45–47,49,50</sup> Population-specific scales were also highlighted, for example, the Munro Scale, PRAMS, or Scott Triggers for pre-surgical patients.<sup>35</sup> This might also suggest the perceived need for population-specific scales in the presence of specific risk factors, such as surgical duration and position. Indeed, this was the major criticism identified in the CPGs to the Braden Scale. However, a significant limitation of risk assessment scales, particularly the Braden and Norton tools, is poor interrater reliability and agreement, which raises concerns about the consistency and reproducibility of risk assessment in clinical practice.<sup>56–58</sup> This variability can lead to discrepancies in patient care, as different healthcare providers may assign different risk scores to the same patient. Consequently, this inconsistency may impact the timely implementation of preventive measures, potentially leading to adverse patient outcomes. Moreover, factors such as assessor experience, training level, and subjective interpretation of scale criteria can further contribute to variations in risk assessment, underscoring the need for standardised training and objective assessment methods. On the other hand, it is unclear whether the development of ever-new scales solves fundamental methodological problems of complex predictive models.<sup>26</sup> However, it seems that there is a US hospital practice in which risk assessment scales are used beyond guideline recommendations.<sup>59</sup> Some of this usage can be due to specific policy pressures and value-based programs, but there is certainly a need for further research to understand their clinical value. In addition to the observed variability between guidance documents in terms of the risk assessment practice and scale use, and the required characteristics of the scales, we also noticed heterogeneity in the terminology used across guidance

documents. For example, terms such as “scale” or “scores” and “tool” were used; however, these are not interchangeable terms: scales are measurement instruments that quantify variables, score is the output of the scale, whereas tools might be regarded as broader instruments that may include scales, checklists, and other methods. Improved consistency and clarity of language among experts may increase certainty regarding the interpretation of guideline recommendations.

Of the six CPGs<sup>34–39</sup> published since 2010, only two were published in the last 5 years<sup>35,38</sup>; therefore, most of the CPGs are outdated without a specified revision timeframe. This may suggest that no significant changes in the clinical approach to PI risk assessment, prevention, and management have been developed recently and/or indicate a continued need for robust evidence about the utility of risk assessment strategies. Further research is needed to evaluate their effects on PI prevalence, incidence, healing outcomes, costs of management, and overall patient care, particularly in specific populations. On the other hand, it is an international standard that CPGs must be updated regularly and that outdated CPGs should no longer be used. A lack of high-quality and clinically relevant evidence limits the ability of guideline developers to develop evidence-based guideline recommendations. CPGs have the potential to play a pivotal role in guiding future research priorities by explicitly identifying gaps in the current evidence base and emphasising the need for well-designed studies to address these gaps. These clinical evaluations can be challenging to design. They should compare the standard of care (clinical judgement only) with the scale integrated with clinical judgement, as scales are not used in isolation in clinical practice. This will also ensure a clear link between the risk assessment scale and standardised prevention methods afterward. Both arms should have the same prevention methods, which have already been proven effective in PI prevention. Other elements influencing scale utility to consider when designing the clinical study are the training of the HCPs and the education and involvement of the patients and their families, as mentioned in the guidelines.<sup>34,35</sup>

Moreover, the variability in the quality of guidance documents highlights another significant challenge. While some CPGs demonstrate rigorous methodological approaches and adhere to high standards, other guidance documents fall short of established benchmarks for quality and should not be used. The development of better evidence is not only essential for improving the overall clinical relevance of guidance documents but is also likely to foster greater consistency between them. When robust and consistent evidence is available, guideline developers are more likely to reach concordant conclusions, reducing variability and enhancing trust in the recommendations provided. This underscores the importance of a dual focus: both improving the methodological rigor of CPGs and addressing the deficiencies in the evidence base on which they rely.

#### 4.1 | Strengths and limitations

To maximise the probability of identifying all relevant evidence, we used a systematic approach for searching, screening, and data

extraction. The searches were focused on recent guidance documents to increase the homogeneity of care pathways and relevance to the current clinical practice in the US. We performed quality appraisal using AGREE-II, a CPG quality assessment instrument, to identify the most robust guidance documents. This was particularly important as our review included not only CPGs but also other best practice recommendations. Even though we were expecting a lower quality in the latter, we decided to include them to identify additional, potentially more recent indications for more targeted populations. The searches were limited to the US where there is a high focus on reducing the incidence of HAPI. Since 2008, multiple government and social programs (the Centers for Medicare and Medicaid Services, the Veterans Health Administration and the Military Health System) have developed policies, such as stopping reimbursements for patients with severe PIs,<sup>22,23</sup> financial penalties for low-performing hospitals<sup>24</sup> and rewards for the reduction of PI rates.<sup>60</sup> Focusing on one country allowed for a more focused analysis of the care pathway and easier interpretation of the results. However, this affects the generalisability of results. We did not find any hospital guidelines publicly available in the databases we searched, which is common as these types of guidelines are usually available on internal channels. A limitation of this review is that it cannot describe clinical practice, but only what the CPGs recommend. There is an intermediate step between what guidelines recommend and their actuation; that is, the guideline implementation by the care providers.

## 5 | CONCLUSION

According to the guidance documents, a systematic approach to the assessment of individual risk of developing PI is advisable. Several approaches and scales have been developed, but no clinical pathway is preferred over the others. A comprehensive examination of risk factors is recommended, as well as regular visual skin assessment. The interpretation of any scale outputs should be integrated with clinical experience and judgement to identify appropriate measures of prevention, monitoring, and intervention for patients at risk of developing PIs. The development of an optimal process to support clinicians in identifying patients at higher risk of developing PIs is still needed. As electronic medical records become widely adopted in US hospitals, the automatised of this process might provide a promising opportunity.

#### AUTHOR CONTRIBUTIONS

Vladica Velickovic was the guarantor. Anna Serafin and Vladica Velickovic drafted the protocol. April Coombe developed the search codes for databases and conducted the database search. Vladica Velickovic and Sara Graziadio screened the titles and abstracts of all records using the search strategy to exclude those which did not meet the eligibility criteria and evaluated the potentially eligible articles with the full text and further excluded articles with justification for exclusion. Anna Serafin, Thirid-Christiane Milde, and Sara Graziadio contributed to the bias assessment strategy. Anna Serafin extracted





data from the included articles, and Sara Graziadio checked the data. Anna Serafin and Sara Graziadio drafted the manuscript, and all authors critically revised it for important intellectual content, edited it, and approved its final version.

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## CONFLICT OF INTEREST STATEMENT

Thurid-Christiane Milde, Anna Serafin, and Vladica Velickovic are employed by Paul Hartmann AG (part of HARTMANN GROUP). Sara Graziadio is an independent consultant contracted by Paul Hartmann AG (part of HARTMANN GROUP). The University of Birmingham received the grant from Paul Hartmann AG to develop the search codes for databases and conducted the database search. The remaining authors have no conflicts of interest to declare.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study is available from the corresponding author upon reasonable request.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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