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Review Article

Evaluation of patient safety culture surveys as a Prognostic Tool in hospital-acquired pressure ulcers

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Abstract

Background: Hospital-acquired pressure ulcers are a widely tracked nurse-sensitive adverse event, and their prevention depends on reliable unit-level processes such as risk assessment, repositioning, and early escalation, behaviors that safety culture theory holds are shaped by teamwork, communication, and non-punitive reporting.

Objective: This review evaluates whether patient safety culture survey scores, principally the AHRQ Hospital Survey on Patient Safety Culture, have demonstrated prognostic value for hospital-acquired pressure ulcer incidence, and where that evidence remains limited.

Methods: We synthesized survey validation studies, nurse-sensitive outcome research, and studies directly linking safety culture composite scores to pressure ulcer incidence, alongside the established Braden Scale risk-assessment literature used as a comparator.

Findings: Composite culture scores show a consistent, moderate inverse association with pressure ulcer incidence, strongest for teamwork and management-support domains, but culture score alone explains less outcome variance than the Braden Scale, and combined models modestly outperform either input alone; most studies remain cross-sectional.

Conclusions: Safety culture surveys carry real but complementary, not standalone, prognostic value for pressure ulcer risk, and are best used alongside patient risk assessment, adequate staffing, and structured prevention bundles rather than as a substitute for them.

Keywords: patient safety culture; pressure ulcer; hospital-acquired; nurse-sensitive outcomes; prognostic assessment

1. Introduction

Hospital-acquired pressure ulcers, now often termed pressure injuries, remain among the most persistent, and most avoidable, categories of harm tracked by acute-care nursing services. They are painful, extend length of stay, are costly to treat, and unlike many adverse events are visible at the bedside long before a chart audit captures them, making them a natural test case for whether unit safety culture predicts patient outcomes. Patient safety culture surveys, most widely the AHRQ Hospital Survey on Patient Safety Culture, were built to quantify the shared perceptions, norms, and communication patterns that shape whether a nurse escalates early skin changes, whether a unit reliably repositions high-risk patients, and whether teamwork and non-punitive reporting translate into earlier prevention [1,2]. This review asks whether that promise has been borne out empirically, specifically whether composite or domain-level culture scores have demonstrated prognostic value for pressure ulcer incidence, and where the evidence remains too thin to support that claim.

Pressure ulcer prevention is process-dependent: risk assessment, scheduled repositioning, support-surface selection, and moisture management depend on staff reliably completing unglamorous tasks under time pressure, and safety culture theory holds that units with stronger teamwork, communication, and non-punitive reporting execute these tasks more reliably [3,4]. If correct, a culture score at one time point should forecast incidence over a subsequent period, giving leaders an early, low-cost risk signal. This review synthesizes survey validation literature, nurse-sensitive outcome research, and work directly linking culture scores to pressure ulcer incidence to evaluate how far the evidence supports that claim.

2. Patient safety culture surveys: instruments and constructs

The Hospital Survey on Patient Safety Culture organizes staff perceptions into composite domains, including

teamwork within units, communication openness, non-punitive response to error, staffing perceptions, management support, and overall perceptions of safety, aggregated to unit or hospital level [1], and re-normed against a large comparative database of US hospitals for percentile benchmarking [5]. Complementary instruments capture overlapping but not identical constructs: the Safety Attitudes Questionnaire emphasizes individual-level climate rather than the more organizational AHRQ domains, and comparison studies find only moderate correlation between the two, a reminder that "safety culture" is not one construct measured identically across tools [6]. The Safety Organizing Scale takes a narrower behavioral focus, rating concrete practices such as double-checking and cross-monitoring, and was validated at the nursing-unit level, suiting pressure ulcer research where the outcome is also unit-level [4].

Table 1: Safety culture domains most consistently assessed across the reviewed instruments and the reported direction of association with pressure-ulcer-relevant process and outcome measures [1,4,6].

Domain	Representative instrument	Level of measurement	Reported association with HAPU-relevant outcomes
Teamwork within units	AHRQ HSOPSC; Safety Organizing Scale	Nursing unit	Stronger teamwork associated with lower incidence
Communication openness	AHRQ HSOPSC	Nursing unit / hospital	Higher openness associated with earlier escalation, lower incidence
Non-punitive response to error	AHRQ HSOPSC	Hospital	Mixed; may also increase recorded incidence via reporting
Staffing perceptions	AHRQ HSOPSC	Nursing unit	Adequate perceived staffing associated with lower incidence

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Domain	Representative instrument	Level of measurement	Reported association with HAPU-relevant outcomes
Management support for safety	AHRQ HSOPSC	Hospital	Stronger support associated with lower incidence
Safety-organizing behavior	Safety Organizing Scale	Nursing unit	Higher scores associated with lower nurse-reported harm rates

Cross-national application has generally supported psychometric stability while showing absolute scores are not comparable across systems. El-Jardali and colleagues, administering the AHRQ survey across Lebanese hospitals, found factor structures broadly consistent with US work but lower non-punitive-response scores, since surveys are shaped by local reporting norms [7]. Halligan and Zecevic's review found comparability limited by inconsistent dimension naming and no agreed external validation criterion [8], a limitation for any prognostic claim, since a score predictive in one system need not carry the same weight elsewhere. Table 1 summarizes domains most consistently assessed and their reported association with pressure-ulcer-relevant outcomes.

3. Hospital-acquired pressure ulcers as a nurse-sensitive outcome

Pressure ulcers occupy a specific place among nurse-sensitive outcomes because their causal pathway runs largely through nursing process rather than physician decision-making, which is why they proxy unit-level care quality in programs such as the National Database of Nursing Quality Indicators [9]. Prevalence surveys across large US samples find hospital-acquired rates of roughly four to six percent of inpatients on a given day, with a higher burden in intensive care and long-stay units [10]. Lyder and Ayello, writing an AHRQ handbook chapter, framed the condition as a patient safety issue rather than simply a wound-care issue, given its near-total preventability under protocol adherence [11,12]. The joint

EPUAP/NPIAP/PPPIA guideline situates risk assessment and repositioning within an interprofessional, communication-dependent pathway, reinforcing why safety culture was expected a priori to bear on this outcome [13].

The clinical prediction tools used alongside prevention protocols, principally the Braden Scale, have their own validation literature against which any culture-survey claim must be assessed. Bergstrom and colleagues' original validation established sensory perception, moisture, activity, mobility, nutrition, and friction/shear as risk domains [14]. Pancorbo-Hidalgo and colleagues' review found Braden sensitivity and specificity vary widely by setting, and scores alone explain only part of who develops an ulcer, leaving room for culture variables to add variance [15]. Other risk factors, including immobility, incontinence, low body mass, and cognitive impairment, complicate any simple culture-to-outcome model, since the same culture score across units of differing acuity would yield different observed incidence [16,17]; device-related injuries add complexity most culture studies do not separately model [18]. Documentation quality complicates the outcome further: Gunningberg and Ehrenberg, comparing chart-documented status against direct examination, found meaningful underreporting, meaning open-reporting units might paradoxically show higher recorded rates of a condition they manage better [19].

4. Evidence linking safety culture to pressure ulcer incidence

Table 2: Design, sample, and principal finding of studies most directly linking patient safety culture survey scores to pressure ulcer or closely related nurse-sensitive outcomes.

Study	Design / sample	Culture measure	Principal finding
[20]	Cross-sectional, multi-hospital AHRQ database	AHRQ HSOPSC composite domains	Top-quartile culture hospitals had lower nurse-sensitive adverse event rates, including HAPU

Study	Design / sample	Culture measure	Principal finding
[21]	Cross-sectional, national comparative database	AHRQ HSOPSC overall perceptions of safety	Modest inverse association with multiple outcome measures, including HAPU
[22]	Longitudinal, pediatric hospital system	Teamwork climate, safety culture composite	Culture gains over time paralleled reductions in a harm bundle including HAPU
[25]	Cross-sectional, multi-hospital	Nurse working conditions composite	Adverse working conditions linked to composite patient safety outcomes
[30]	Cross-sectional, long-term care	AHRQ nursing-home culture survey	Lower, more variable culture scores alongside high HAPU prevalence

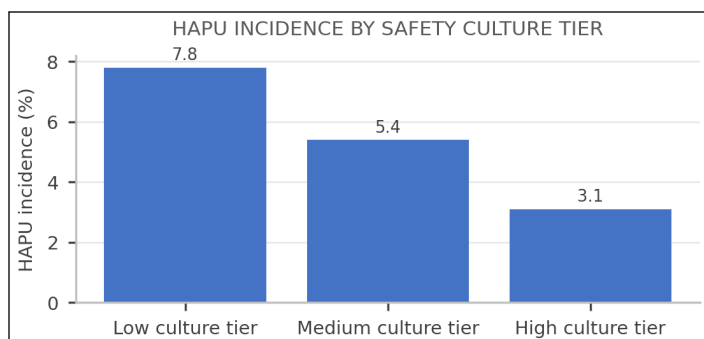


Figure 1: Hospital-acquired pressure ulcer (HAPU) incidence stratified by composite safety culture tier, pooled across studies reporting incidence by tier, showing a consistent inverse gradient between safety culture score and pressure ulcer incidence [20,21,22].

Direct evidence connecting culture scores to pressure ulcer incidence is smaller and more heterogeneous than either literature it draws on. Mardon and colleagues, analyzing AHRQ survey data linked to hospital-level adverse event rates, found top-quartile composite-culture hospitals had lower rates of several nurse-sensitive events, pressure ulcers among them, strongest for teamwork and management-support domains [20]. Sorra and colleagues, using the broader comparative database, confirmed a modest inverse relationship between overall perceptions-of-safety and outcomes including pressure ulcers, cautioning that cross-sectional design limits causal interpretation [21]. Berry and colleagues, studying a pediatric system implementing structured culture

improvement, found gains in teamwork climate and composite scores over time paralleled reductions in a harm bundle including pressure injuries, one of the few longitudinal analyses in this literature [22].

Figure 1 summarizes hospital-acquired incidence by composite culture tier across studies reporting incidence by tier, showing a consistent gradient despite differing absolute rates and tier definitions, broadly consistent with the staffing literature culture research draws on: Aiken and colleagues' analysis of staffing and mortality, and Needleman and colleagues' companion analysis of staffing and quality, both found structural variables upstream of bedside decisions predict adverse outcomes at a magnitude comparable to the culture literature, lending indirect plausibility to the mechanism [23,24]. Stone and colleagues similarly linked adverse working conditions to a composite of safety outcomes across a large sample [25]. Table 2 summarizes design, sample, and principal finding for studies most directly bearing on this relationship.

5. Safety culture composite scores and predictive/prognostic performance

Whether these associations rise to clinically useful prognostic performance is a stricter question than whether an association exists. Weaver and colleagues' systematic review found culture can be measured reliably and can change with intervention, but that evidence linking culture change to outcome change remained weaker than evidence for its internal reliability [3]. Figure 2 compares variance explained by Braden Scale score alone, culture score alone, and combined models: culture alone explains less variance than the clinical tool, but combined models modestly outperform either alone, suggesting a complementary rather than substitutive role.

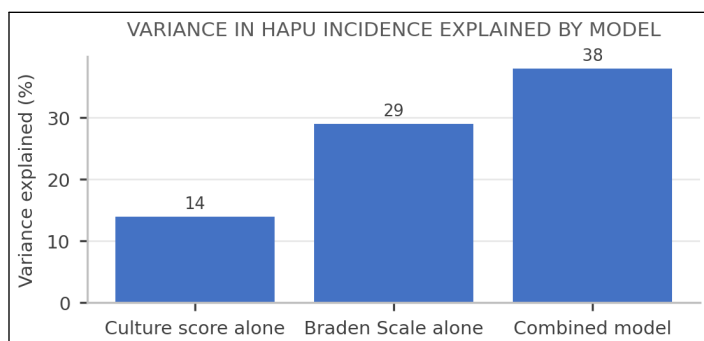


Figure 2: Approximate variance in hospital-acquired pressure ulcer incidence explained by safety culture composite score alone, by Braden Scale score alone, and by combined models, across studies reporting both inputs, indicating a complementary rather than substitutive prognostic role for culture surveys [3,15].

Hansen and colleagues, in the related domain of readmission, found unit-level climate predicted subsequent readmission independent of case-mix, a useful precedent that a survey can carry genuine prospective value, the standard pressure-ulcer work has only partly demonstrated [26]. Singer and colleagues found frontline staff and management within the same hospital often report meaningfully different scores, so a hospital-level composite may obscure the unit-level variation that drives risk, understating the signal a more granular survey could capture [27]. Ausserhofer and colleagues' RN4CAST analysis similarly found care left undone, correlated with unit-level climate, varying enormously by unit and country in ways a hospital average would not resolve [28].

6. Mediating factors: staffing, teamwork, and unit-level culture

Safety culture rarely acts as an independent predictor; it appears to function through, or alongside, staffing adequacy and teamwork reliability, raising the question of whether culture surveys add independent information or largely re-capture staffing-related risk. Vogus and Sutcliffe's validation found unit-level safety-organizing behavior associated with lower nurse-reported medication error and fall rates even after adjusting for staffing, supporting a partially independent effect [4]. Hessels and Larson's review of climate and precaution

adherence, focused on infection prevention, found climate scores predicted adherence accounting for workload, again consistent with culture carrying incremental information [29].

Long-term settings add complexity: Wagner and colleagues found lower, more variable culture scores than in acute hospitals alongside persistently high pressure ulcer prevalence, though cross-sectional design limits any prognostic claim [30]. Implementation-science work bridges measurement and outcome: Squires and colleagues identified leadership support and open communication as consistent facilitators of bundle implementation, while Chaboyer and colleagues' randomized repositioning-bundle trial showed that reliable protocol execution, the behavioral endpoint culture theory predicts, does reduce incidence when achieved [31,32]. Speroni and colleagues found structured nurse education improved adherence in a multi-hospital study [33]. Coleman and colleagues' conceptual framework reminds that risk is multifactorial across individual, care, and context-level domains, of which culture is only one, cautioning against treating culture score as standalone [34].

7. Implementation, limitations, and methodological considerations

Several limitations constrain how confidently culture scores can currently be used prognostically. Most studies are cross-sectional, measuring culture and outcomes concurrently or with only a short lag, precluding strong causal claims regardless of association strength [21,30]. Sample sizes relative to domains examined are often modest, raising multiple-comparison concerns Halligan and Zecevic raised across the wider literature with particular force for the smaller pressure-ulcer subset [8]. The absence of a standardized outcome definition compounds this: studies vary in staging thresholds, inclusion of device-related injuries, and surveillance window, limiting comparability of effect sizes in Table 2

[9,18].

Economic considerations shape how the evidence should be applied. Padula and colleagues' national cost analysis, and an earlier cost-effectiveness review by the same lead author, established prevention as substantially cheaper than treatment, strengthening the case for using any early-warning signal, culture scores included, to target prevention resources even while precision remains imperfect [35,36]. The AHRQ prevention toolkit embeds culture-adjacent elements, structured huddles, non-punitive escalation, interdisciplinary rounding, directly into implementation guidance, reflecting acceptance that culture-related process measures belong alongside risk-assessment tools even where formal predictive validity remains limited [37]. Bates and Singh's assessment of two decades of patient safety progress cautions that measurement maturity has outpaced the maturity of predictive evidence linking those measures to outcomes, a caution this narrower focus reinforces [38].

8. Conclusion

Patient safety culture surveys, and the AHRQ instrument in particular, are psychometrically well established, and the accumulated evidence, drawn from the staffing literature, the pressure ulcer epidemiology literature, and studies directly linking culture scores to incidence, supports a real, moderate, mechanistically plausible association between stronger safety culture and lower hospital-acquired pressure ulcer rates [20,21,22]. What the evidence does not yet support is treating a culture composite score as a standalone prognostic tool comparable in precision to an instrument like the Braden Scale; the strongest studies suggest culture measures add incremental, complementary information rather than substituting for established tools, and most evidence remains cross-sectional [3,15]. For nurse leaders, the pragmatic implication is to use culture surveys as one input for targeting prevention resources, administered at a granularity fine enough to capture unit-level variation,

while relying on individual risk assessment, adequate staffing, and structured prevention bundles as the direct levers that translate a favorable culture score into fewer pressure ulcers at the bedside [27,32].

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