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The role of psychological distress in the relationship between the severity of pressure injury and pain intensity in hospitalized adults

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Abstract

Aims: To examine the effect of psychological distress in mediating the relationship between the severity of pressure injury and pain intensity in hospitalized adults.

Background: Despite the prevalence of pressure injury (previously known as pressure ulcers) in hospitalized adults, the current knowledge of pain associated with pressure injury is limited and findings are inconsistent. There is also a lack of understanding of the relationship between psychological distress and pain from pressure injury.

Design: Retrospective cross-sectional secondary analysis of data from electronic health records.

Methods: The data were retrieved from the third day of admission in the period between 2013 – 2016 through the Integrated Data Repository (IDR). Electronic health records were reviewed to collect data as needed. The mediation effect was tested by using path analysis implemented through Mplus.

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AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE [<http://www.icmje.org/recommendations/>]):

- Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- Drafting the article or revising it critically for important intellectual content.
- Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content.
- Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

All authors have no conflicts with this manuscripts.

Results: Path analysis revealed that the severity of pressure injuries and psychological distress have significant direct effects on pain intensity in hospitalized adults. However, the relationship between the severity of pressure injury and pain intensity was not significantly mediated by psychological distress.

Conclusion: Hospitalized adults who have more severe pressure injury and more treatments for psychological distress experienced greater pain intensity. Healthcare providers must pay attention to treating psychological distress among hospitalized adults to manage pain. Further study is needed to validate these findings and it should incorporate more appropriate measures of psychological distress. The lack of standardized nursing documentation in electronic health records severely limits the usefulness of data from electronic health records for nursing research.

Keywords

electronic health records; hospitalized adults; nursing research; pain intensity; pressure injury; psychological distress; secondary analysis

1 | INTRODUCTION

Pressure injuries (previously known as pressure ulcers) cause pain and are estimated to affect more than 2.5 million people in the USA (Agency for Healthcare Research and Quality, 2014). Although the Centers for Medicare & Medicaid Services (CMS) introduced a non-payment policy in 2008 to reduce the incidences of preventable hospital-acquired conditions, pressure injury remains highly prevalent (Mattie & Webster, 2008). Current knowledge regarding pain associated with pressure injury is limited to qualitative studies and only a few quantitative studies exist. Furthermore, little is known about the experience of pain caused by pressure injury or about how psychological distress influences the pain experience of hospitalized patients with pressure injury.

Pain management of hospitalized patients is a factor in evaluating hospital care from the patient's perspective (Centers for Medicare & Medicaid Services, 2018), along with the incidence rate for pressure injury being used as a quality indicator by the Agency for Healthcare Research and Quality, 2015. Therefore, providing appropriate pain management for hospitalized patients with pressure injury would not only benefit patient care outcomes but also improve hospitals' quality measures and patient satisfaction ratings.

1.1 | Background

Although pressure injury is highly prevalent, studies regarding pain caused by pressure injury are scarce. Qualitative studies have described pain characteristics caused by pressure injuries, with pain described as stabbing, hot, burning (Spilsbury et al., 2007), sharp, burning, throbbing, and aching (Rastinehad, 2006). There are few quantitative studies, with most focused on associations between the severity of pain and stages of pressure injury. However, findings are inconsistent among those studies: some show that pressure injuries cause pain regardless of their severity (Briggs et al., 2013; McGinnis et al., 2014), whereas others show that pain is more severe in those who have deeper stages of pressure injuries (Ahn, Stechmiller, Fillingim, Lyon, & Garvan, 2015; Ahn, Stechmiller, & Horgas, 2013; Gunes, 2008). Among the quantitative studies found, those in hospital settings had small

sample sizes (Briggs et al., 2013; Gunes, 2008) and most of the reported studies used nursing home (Ahn et al., 2013, 2015) or community settings (McGinnis et al., 2014). No studies were found which used a large sample of hospitalized patients to examine pain caused by pressure injury.

Since pain associated with pressure injuries is understudied, it is no surprise that there is also little knowledge regarding the influence of psychological distress on pain among patients with pressure injuries. Psychological distress is characterized by symptoms of depression, anxiety and is tied with somatic symptoms such as insomnia and lack of energy (Drapeau, Marchand, & Beaulieu-Prévo, 2011). Psychological distress plays a significant role in the pain experience and is an experiential factor in the population with chronic pain (Finan & Smith, 2013; Yalcin & Barrot, 2014). Indeed, pain is associated with depression (Kroenke et al., 2009; Ligthart et al., 2014; Zakoscielna & Parmelee, 2013), is prevalent in depressed people (Failde et al., 2013; Nicholl et al., 2014) and, in fact, has a non-recursive (reciprocal) relationship with depression (Chou, 2007; Kroenke et al., 2011; Meyer, Cooper, & Raspe, 2007). Similarly, pain has been associated with anxiety (Beesdo et al., 2009; El-Gabalawy, Mackenzie, Shooshtari, & Sareen, 2011; Smeijers et al., 2014) and sleep disturbance (Schrimpf et al., 2015; Schuh-Hofer et al., 2013; Sivertsen et al., 2015; Smith, Edwards, McCann, & Haythornthwaite, 2007).

A few models are presented regarding relationships among physiological factors (wounds or tissue damages), psychological factors (depression, anxiety, or sleep), and pain experienced. For instance, pain intensity may be higher due to depression, anxiety, and characteristics of the wound (Gardner, Abbott, Fiala, & Rakel, 2017); Individual pain intensity may be influenced by tissue damages and psychological factors (Fillingim, 2005). Using the above models and known relationships between psychological factors and pain, we designed a study that address gaps in our understanding of pain caused by pressure injury and the role of psychological distress as a mediator between pressure injuries and pain. Specifically, we used a path model to examine the direct and indirect effects among the severity of pressure injury, psychological distress, and pain intensity in hospitalized adults.

2 | THE STUDY

2.1 | Aim

The aim of the study was to examine the effect of psychological distress in mediating the relationship between the severity of pressure injury and pain intensity in hospitalized adults. The hypothesis of the study was that psychological distress partially mediates the relationship between severity of pressure injury and pain intensity. Our findings will provide insight and recommendations that will improve pain management for this particular population.

2.2 | Study design

The study is a retrospective cross-sectional secondary analysis of data retrieved from electronic health records (EHRs).

2.3 | Participants

Subjects meeting inclusion criteria were identified from the Integrated Data Repository (IDR), a secure, clinical data warehouse that aggregates data from the university's various clinical and administrative information systems, including the EpicCare electronic health record system. Inclusion criteria were: (a) Patients were over the age of 18 and had pressure injury (L89.000–L89.95 [ICD-10], 707.00–707.09 and 707.20–707.25 [ICD-9]) at admission or were newly diagnosed during hospitalization; (b) Patients had stayed at the hospital for at least 4 days between 2/5/2013 and 12/31/2016. The exclusion criteria were following: (a) Patients had been diagnosed with wounds other than pressure injury; (b) Patients had received any type of surgery in an operating room before the third day of admission; and (c) Patients had verbal response below 4 on Glasgow coma scale (GCS), if GCS was recorded in EHRs.

Figure 1 shows a sampling flow diagram of how the final sample ($N = 454$) was selected. Among the preliminary sample of 886 cases identified by IDR, the principle investigator excluded 177 cases of consecutive admission to maintain an independent sample, 159 cases where relevant data elements were not retrievable and 96 cases where pain scores and severity of pressure injury were not recorded. A final sample of 454 cases were analysed. The sample size met suggested minimum for ratio of number of participants to number of estimated parameters (20:1) for path analysis using a structural equation modelling approach (Pituch & Stevens, 2016).

2.4 | Data collection

The preliminary data were extracted through the Integrated Data Repository (IDR) by single trial of data collection procedure in March 2017 when the retrievable amount of data were at the maximum. Collecting data through the IDR has been available since EpicCare launched on 2 May 2013 and from only a single location in the university health system. Data were collected especially from the third day of admission to minimize missing data elements. The IDR team extracted age, gender, race, and diagnosis codes applied during hospitalization (primary and secondary diagnoses); along with the names of antidepressants, anxiolytic agents, and hypnotics prescribed and administered to the patient; and pain scores on the third day of admission from the identified sample. The researcher generated the final dataset of a total sample of 454, which included all variables to be analysed from the preliminary data, along with review of EHRs as needed to obtain unidentified severity of pressure injury.

2.5 | Variables

The hypothesized model included the severity of pressure injury as an exogenous predictor, pain intensity as an endogenous outcome and psychological distress as a mediator. Severity of pressure injury was measured using the staging definition of National Pressure Ulcer Advisory Panel, 2016. Severity of pressure injury was derived by diagnosis code (ICD-9 or ICD-10 code), or, if a participant's diagnostic code indicated an "unspecified stage," researchers manually accessed progress notes written by a physician or wound care specialist in their EHR to obtain stages of pressure injury. It is important to note that ICD-9 and ICD-10 codes do not provide diagnostic codes for deep tissue pressure injury (DTPI).

For participants who had multiple sites of pressure injuries, the deepest stage was recorded as the staging classification.

Pain intensity was measured by the Defense and Veterans Pain Rating Scale (DVPRS) (Office of the Army Surgeon General, 2010) in EpicCare. DVPRS combines numeric values of numeric rating scale (NRS), colour clues, picture of facial expression, word descriptors and has an acceptable internal consistency reliability (Cronbach's $\alpha = 0.871$) and test–retest reliability ($r = 0.637$ – 0.774) (Buckenmaier et al., 2013). DVPRS ranges from 0 to 10, where 0 indicates no pain and 10 indicates worst pain. An additional option from EpicCare, “Asleep,” was also used and was treated as 0 in this study. Pain intensity was the mean pain intensity, computed using the 1–10 DVPRS scores measured over the 24 hours of the third day of admission in this study. Pain scores of “0” or “Asleep” were not included when computing the mean pain intensity.

Psychological distress was measured by a medication proxy consisting of the number of antidepressants, anxiolytic agents, and hypnotics prescribed and administered to the patient as classified by MICROMEDEX on the medication administration record. In this study, pain, depression, anxiety, and sleep disturbance are treated as symptoms or signs rather than diagnosed diseases, since diagnosis codes do not cover all of these symptoms. Therefore, psychological distress was the number of treated depression, anxiety, and sleep disturbance comorbidities on the third day of admission. Psychological distress was expressed as: 0 (no depression, anxiety, or sleep disturbance medication); 1 (One of either depression, anxiety, or sleep disturbance medication); 2 (Two of the three classes of medication); or 3 (all classes of medication conditions exist), based on existing medications to treat depression, anxiety, and sleep disturbance. Thus, psychological distress was treated as an ordered categorical variable.

2.6 | Ethical considerations

IRB approval was obtained from the University Institutional Review Board. Data in the final sample were deidentified and stored on REDCap, a network storage managed by the university and only accessible to allowed researchers with a password through an encrypted computer.

2.7 | Data analysis

The REDCap data were exported and imported into SAS 9.4 to be cleaned, recoded, and analysed. Mplus 7.4 was used for path analysis. The level of significance in analysis was $p < 0.05$ (two-sided) in this study. Missing mechanisms were checked with MCAR test (Little, 1998) using SAS. Since the missing data pattern was missing completely at random, deletion was applied to treat missing data for this study. The testing model contained continuous variables that were not normally distributed and categorical variables, so the weighted least square mean and variance adjusted (WLSMV) estimator was used to provide robust parameter estimates in Mplus (Muthén & Muthén, 2017).

Sample characteristics were described using descriptive statistics, including frequencies and percentages for categorical variables and standard deviations and means for continuous variables. A path model was analysed using a structural equation modelling approach to test

the hypothesized model. Testing employed the following steps: 1. Examined overall model fit using the Chi square goodness of fit test, the Comparative fit Index ($CFI > 0.95$), the Root mean square error of approximation ($RMSEA < 0.05$) (Hoyle, 1995) and Tucker-Lewis Index ($TLI > 0.90$) (Pituch & Stevens, 2016). If the hypothesized model fit data, 2. Examined tests for: (a) the direct effect of severity of pressure injury on pain intensity; (b) the direct effect of severity of pressure injury on psychological distress; (c) the direct effect of psychological distress on pain intensity; and (d) the indirect effect of severity of pressure injury on pain intensity through psychological distress. Age, race, gender, and comorbidity were not included in analysing the hypothesized model.

2.8 | Validity, reliability, and rigour

Psychological distress was measured via medication proxy, since data elements representing psychological distress are not obtainable in current EHRs. Identification of administered antidepressants, anxiolytics, and hypnotics was used as an alternative way to capture data elements representing psychological distress regardless of an existing diagnosis reflecting psychological distress. This may introduce bias that affects the study findings as the effects of the medications are not captured. Although a proxy measure using medications introduces bias, the medication possession ratio (MPR) is currently used in pharmacy and pharmacology studies to characterize medication use and adherence to medication-based therapies (Sclar, Chin, et al., 1991; Sclar, Skaer, Chin, Okamoto, & Gill, 1991; Sikka, Xia, & Aubert, 2005). Notably, MPRs have been used to measure depression symptoms in multiple research studies (Fortney, Pyne, Edlund, & Mittal, 2010; Leggett, Ganoczy, Zivin, & Valenstein, 2016).

To improve the accuracy of pain scores measured by DVPRS, participants who had 1, 2, and 3 of verbal response of the Glasgow coma scale (GCS) were excluded from this study. GCS consists of 1–4 eye opening response, 1–5 verbal response, and 1–6 motor response; each highest score represents a normal response (Teasdale & Jennett, 1974). To select participants who were able to respond verbal stimuli, the exclusion criterion only accounted for verbal response rather than the total score of GCS. Ultimately, participants of the study were either “oriented” or “confused conversation, but able to answer question” (Teasdale & Jennett, 1974). This may have caused a bias that sample did not include patients who had intact cognition but could not respond verbally although pain score measured by DVPRS.

3 | RESULTS

The typical subject of the final sample ($N = 454$) was male (57.27%), white (77.09%), had a stage 2 pressure injury (40.31%) and took no medication related to psychological distress (49.56%). Other characteristics included an average age of 65.33 (SD 16.97), average number of comorbidities of 16.63 (SD 6.67), and average pain intensity of 3.94 (SD 3.27). Table 1 shows the attributes of the final sample ($N = 454$), while Table 2 presents the sample’s characteristics as sorted by the severity of the pressure injury.

Path analysis was performed to examine the model fit and path coefficients for each direct and indirect path. Path coefficients are presented in Figure 2. The model is just identified, which precludes testing the model fit.

3.1 | Direct effect of the severity of pressure injury on pain intensity

The path coefficient from the severity of pressure injury to pain intensity was statistically significant ($\gamma_{21} = 0.300$, $p = 0.048$). Therefore, patients who had deeper stages of pressure injuries experienced more pain intensity, even after controlling for psychological distress.

3.2 | Direct effect of severity of pressure injury on psychological distress

The path coefficient from the severity of pressure injury to psychological distress was not statistically significant ($\gamma_{11} = -0.071$, $p = 0.186$). The result showed that psychological distress may not be influenced by the severity of pressure injury.

3.3 | Direct effect of psychological distress on pain intensity

The path coefficient from psychological distress to pain intensity was statistically significant ($\beta_{21} = 0.517$, $p = 0.005$). This demonstrated that patients who had more psychological distress experienced more severe pain.

3.4 | Indirect effect of the severity of pressure injury on pain intensity through psychological distress

The path coefficient of the indirect effect from the severity of pressure injury to pain intensity through psychological distress was not statistically significant (-0.037 , $p = 0.230$). Therefore, psychological distress may not have a mediation effect in the relationship between the severity of pressure injury and pain intensity.

4 | DISCUSSION

4.1 | The findings

The findings from this study showed that: (a) there is an independent positive direct effect for the severity of pressure injury on pain intensity; (b) there may be no independent direct effect for the severity of pressure injury on psychological distress; (c) there is an independent positive direct effect for psychological distress on pain intensity; and (d) there may be no indirect effect for the severity of pressure injury on pain intensity through psychological distress. While the significant direct effect for the severity of pressure injury on psychological distress and indirect effect for the severity of pressure injury on pain intensity through psychological distress failed to be demonstrated, pressure injury, and psychological distress did exhibit independent positive direct effects on pain intensity. These findings support that hospitalized patients who have deeper stages of pressure injury experience more severe pain. This result is consistent with other studies (Ahn et al., 2013, 2015; Gunes, 2008) that show that pain is more severe in those who have deeper stages of pressure injury, while the result is inconsistent with some previous studies (Briggs et al., 2013; McGinnis et al., 2014) that show that pain is not associated with severity of pressure injury.

Possible explanations for inconsistent findings across studies about the relationship between pain and severity of pressure injury include: (a) the use of different measurements of pain and the severity of pressure injury, (b) the use of varying analytic methods including

different covariates in models and (c) the use of different definitions for a participant's "ability to communicate."

Quantitative studies have used several varying pain measurements, such as the numeric rating scale (NRS), Verbal Descriptor Scale (VDS), the MDS-Pain Severity Scale, the Leeds Assessment Neuropathic Symptoms and Signs (LANSS) Pain Scale and the McGill Pain Questionnaire and Faces Rating Scale (Ahn et al., 2013, 2015; Briggs et al., 2013; Gunes, 2008; McGinnis et al., 2014). In addition, they also used different classifications for the stages of pressure injury, such as those from the European Pressure Ulcer Advisory Panel and NPUAP.

In terms of differing analytical methods, most of the studies included demographics as covariates. Results were reported in several studies (Ahn et al., 2013, 2015) after controlling for activities of daily living (ADL) impairment, comorbidities, or cognition. Whereas, other studies (Briggs et al., 2013; Gunes, 2008; McGinnis et al., 2014) did not control covariates.

Different criteria defining the ability to communicate were applied to the eligibility of participants in previous studies. Some studies (Briggs et al., 2013; Gunes, 2008; McGinnis et al., 2014) excluded participants who were "unable to communicate verbally" through the use of a certain questions to assess eligibility or instruments that required intact communication ability. However, some studies (Ahn et al., 2013, 2015) did not clearly define "unable to communicate verbally" or included participants with cognitive impairment. Different criteria defining the inability to self-report pain and verbal communication may be confounded by patient cognitive status affecting the measurement of pain, which could cause inconsistent relationships between the severity of pressure injury and pain intensity.

To exclude confounding effect of patients' cognitive status, we limited our sample to patients who have GCS verbal scores of 4 and 5 only (includes only patients who respond to questions coherently) to increase accuracy of self-reported pain scores and provide objective sampling criteria in terms of having the ability to communicate verbally and self-report pain. Also, we selected patients who have pain scores assessed by the DVPRS, which includes a numeric pain rating scale, colour clues, pictures of facial expressions, and word descriptors. Use of the DVPRS may have afforded a better measurement of pain compared with previous studies. In addition, we used the staging definition of NPUAP for reliable operational definition of severity of pressure injury.

This study showed that the path coefficient from severity of pressure injury to psychological distress is not statistically significant. This shows that there may be no direct relationship between severity of pressure injury and psychological distress. No study has been conducted regarding this relationship among people with pressure injury. Considering the use of a proxy, rather than direct measure for psychological distress used in this study, we cannot rely on this result alone. Since the study is a secondary analysis, limited to available variables, psychological distress was measured by number of treatments for psychological distress comorbidities only and could not directly measure psychological distress actually being experienced during hospitalization.

The path coefficient from psychological distress to pain was 0.517, indicating presence of an independent positive direct relationship for treated psychological distress on pain intensity. Patients who were prescribed a greater number of treatments for psychological distress-related conditions during hospitalization experienced more severe pain. In other words, patients who received more psychological distress-related treatments experienced more severe pain during hospitalization. Accumulated literature supports a reciprocal relationship between depression and pain (Chou, 2007; Kroenke et al., 2011; Meyer et al., 2007), a positive relationship between anxiety and pain (Beesdo et al., 2009; El-Gabalawy et al., 2011; Smeijers et al., 2014) and directional relationships between pain and sleep (Covarrubias-Gomez & Mendoza-Reyes, 2013; Finan, Goodin, & Smith, 2013; Karaman et al., 2014; Schrimpf et al., 2015; Schuh-Hofer et al., 2013; Sivertsen et al., 2015; Smith et al., 2007).

As we defined psychological distress as treatment for existing depression, anxiety, and sleep disturbance, the study finding of the relationship between psychological distress and pain intensity is consistent with the current knowledge in our target population. However, we have to consider possible influences from the measurement method for psychological distress on this relationship in our study. Since we measure psychological distress by treated medications, the medication effect of psychological distress on pain intensity should be considered and requires cross-validation for those relationships in future studies. There also exists the aspect of not considering pain medication effect, which blunts the symptoms of psychological distress.

The estimated indirect effect for severity of pressure injury on pain intensity through psychological distress was not statistically significant. There may therefore be no mediation effect from the severity of pressure injury to pain intensity through psychological distress. No studies have examined the indirect effect of severity of pressure injury on pain intensity through psychological distress. Although the study failed to demonstrate indirect effect, this study is the first attempt at examining the mediation effect of treated psychological distress in the relationship between severity of pressure injury and pain intensity. To validate these results, further studies must use appropriate psychometrics to directly measure experienced distress and consider the effects of pain medication.

4.2 | Limitations

The study had the inherent limitations of a cross-sectional design and secondary analysis. The study could not directly test causal relationships among variables and its use of existing data precluded the assessment of reliability and also necessitated the use of an indirect, proxy measure for psychological distress rather than a direct measurement. Additionally, generalizability of the finding is limited, given the use of a single regional hospital system.

A lack of standardization of nursing documentation in the electronic health record (EHR) produced a major limitation of the study relating to the measurements of variables. Pressure injury was defined by diagnosis codes, of which the interrater reliability among healthcare providers has not been tested against the current stages of pressure injuries. The study only included pressure injuries in stages 1–4, since a small number of DTPI and cases having

unspecified stages of pressure injury were excluded to minimize reliability issues after obtaining the stage of pressure injury through reviewing EHRs.

The use of a medication proxy as a measure of psychological distress rather than directly measuring the level of psychological distress, due to information available to this secondary analysis introduces reliability and validity issues. Since the study was unable to measure the actual level of psychological distress, any distress that was untreated, and influences from other variables (e.g., types of comorbidities, pain medication, demographic factors, location, or the number of existing pressure injuries) not included in the model could have contributed to error variance, having an adverse impact on the external validity of the results.

Pain intensity is a censored variable which had a large proportion at 0 (34.88% of participants had 0 pain intensity). Censored variables tend to show inflated effects rather than the true effects (Rigobon & Stoker, 2007). However, methods for appropriately testing indirect effects involving censored dependent variables is not available in Mplus. It is a limitation of this study.

5 | CONCLUSION

The study is the first to examine the influence of psychological distress on pain from pressure injury with a large sample of hospitalized patients. The findings demonstrated that the severity of pressure injury and psychological distress play significant roles in individual pain experiences during hospitalization. Given this result, healthcare providers must pay attention to provide care to manage pain from pressure injury by not only focusing on patients' physical illnesses but also their psychological distress during hospitalization, regardless of their medical history of psychological illness.

Although the study has limitations (especially from the use of medications as a proxy for psychological distress) due to the nature of secondary analysis using data from current EHRs, the study helps overcome limitations of previous studies examining the relationship among severity of pressure injury and pain intensity by applying rigorous sampling criteria and using a valid measurement of pain. Further study incorporating more appropriate instruments to measure psychological distress and stages of pressure injury to reduce threats to internal and external validity is needed to validate these results.

Finally, as limitations from the use of EHR data in this study revealed, standardized nursing documentation is imperative and essential to overcome the restricted availability, difficulty of identification, and extraction of pertinent elements for employing EHR data in nursing research to answering clinical questions.

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Why is this research or review needed?

- To improve care outcomes, providing appropriate pain management among patients with pressure injury is required.
- Understanding of the relationship between severity of pressure injury and pain intensity is unclear.
- No study has reported the influence of psychological distress on pain in the pressure injury population.

What are the key findings?

- Patients who have deeper stages of pressure injury experience more severe pain among hospitalized adults.
- Psychological distress of hospitalized patients may influence the intensity of pain experienced.
- Psychological distress may not mediate the effect of severity of pressure injury on pain intensity.

How should the findings be used to influence policy/practice/research/education?

- Healthcare providers should take psychological distress into consideration when treating patients with pressure injury during hospitalization, as psychological distress plays a role in pain experience.
- We suggest further studies to validate results using appropriate measurement of psychological distress to provide intervention for management of pain from pressure injury.
- To facilitate the use of electronic health record data in nursing research, standardization of nursing documentation is urgently needed to overcome the limited availability, difficulty in identification and extraction of pertinent elements.

FIGURE 1.

The procedure to select the final sample. †IDR: the Integrated Data Repository

FIGURE 2.

A mediation model. Path coefficient (standard error). * $p < 0.05$. Results from a saturated model with seven free parameters. The indirect effect measuring the mediation effect of psychological distress between the severity of pressure injury and pain intensity: -0.037 (0.031), $p = 0.230$

TABLE 1Characteristics of the sample (*N* = 454)

Characteristics	Class	<i>N</i> (%)	Mean (<i>SD</i>)	Range
Age			65.33 (16.97)	18–97
Gender	Male	260 (57.27)		
	Female	194 (42.73)		
Race	White	350 (77.09)		
	Other	104 (22.91)		
	0	225 (49.56)		
Psychological distress	1	134 (29.52)		
	2	95 (20.93)		
	Stage 1	90 (19.82)		
Severity of pressure injury	Stage 2	183 (40.31)		
	Stage 3	85 (18.72)		
	Stage 4	96 (21.15)		
Number of comorbidities			16.63 (6.67)	0–39
Pain intensity			3.94 (3.27)	0–10

Note. Psychological distress: The number of prescribed and administered medication types (anxiolytic, antidepressants, and/or hypnotics).

TABLE 2

Characteristics of the sample by the severity of pressure injury: N (%) or mean (SD)

	Stage 1 90 (19.8%)	Stage 2 183 (40.3%)	Stage 3 85 (18.7%)	Stage 4 96 (21.2%)	Total $N = 454$
Age	69.36 (16.5)	67.63 (15.3)	62.55 (18.1)	59.61 (17.7)	65.32 (17.0)
Gender					
M	52 (57.8%)	98 (53.6%)	48 (56.5%)	62 (64.6%)	260 (57.3%)
F	38 (42.2%)	85 (46.5%)	37 (43.5%)	34 (35.4%)	194 (42.7%)
Race					
White	80 (88.8%)	137 (74.9%)	62 (72.9%)	71 (74.0%)	350 (77.1%)
Other	10 (11.1%)	46 (25.1%)	23 (27.1%)	25 (26.0%)	104 (22.9%)
Comorbidity	17.43 (6.1)	18.8 (6.3)	16.91 (7.1)	15.30 (7.3)	16.63 (6.7)
Pain	3.37 (3.4)	3.81 (3.2)	4.16 (3.3)	4.33 (3.2)	3.94 (3.3)
Psychological distress					
0	41 (45.6%)	91 (49.7%)	44 (51.8%)	49 (51.0%)	225 (49.6%)
1	25 (27.8%)	55 (30.1%)	20 (23.5%)	34 (35.4%)	134 (29.5%)
2	24 (26.7%)	37 (20.2%)	21 (24.7%)	13 (13.5%)	95 (20.9%)

Note. Psychological distress: The number of prescribed and administered medication types (anxiolytic, antidepressants, and/or hypnotics).