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Predictive validity of the INTEGRARE scale in identifying the risk of hospital-acquired pressure ulcers in acute care hospital settings

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ABSTRACT

Background: Hospital-acquired pressure ulcers (HAPUs) are prevalent around the world and are an indicator of care quality. Numerous instruments are available to predict their appearance, but few evaluate predictive validity. No instruments based on Nursing Outcomes Classification indicators have been found, despite these indicators reflecting the patient's condition. The aim of the study was to analyse the predictive validity of the INTEGRARE scale in preventing the risk of HAPUs.

Methods: A multicentre prospective observational cohort study design was used. 1,004 patients from 11 public hospitals in Andalusia (Spain) were recruited between February 2015 and October 2017. Participants were aged over 18 and had been admitted to medical and surgical units, with a predicted stay exceeding 48 h. Predictive validity was checked using a multivariate logistic regression model and a receiver operating characteristic curve, with development of pressure ulcers during the hospital stay as the dependent variable.

Results: The INTEGRARE scale obtained an area under the curve of 0.886 (95% CI = 0.85–0.923). Within the 30-point range, the optimal cut-off value is 23 points with a sensitivity of 80.8% and a specificity of 80%. The odds ratio was 16.86 (95% CI = 8.54–33.28). Among the patient variables, age was significant, while among the hospital variables, the type of unit and the Nurse Staffing Level (NSL) were significant.

Conclusions: The INTEGRARE scale has robust predictive validity when patients are admitted to medical and surgical inpatient units. Patients with a higher risk of developing HAPUs are in surgical units, are elderly, and have an NSL exceeding 10.4.

1. Introduction

Hospital-acquired pressure ulcers (HAPUs) are an adverse event linked to nursing care in contexts of excessive workload [1,2], as well as an indicator of the quality of care provided [3].

They are prevalent in community and hospital care settings around the world. In the USA and Canada, prevalence rates vary between 8.5% and 13.4%. In Europe, prevalence may be up to 18% in acute inpatient units and up to 26% in community care settings [4]. In Spain more specifically, prevalence is around 8% [5]. In both the USA and Europe, incidence is around 5.4% [6], and 8.89% in Spain [7].

HAPUs can lead to complications, prolonging hospital stays by approximately 4.3 days [8] and leading to additional treatment costs. They are also associated with superinfections and/or greater home care needs after hospital discharge, which can lead to additional costs of up to €10,000 per patient in European Union countries [9], up to £10,551 per patient in the United Kingdom [10], and up to $40,000 per patient in Australia [11], and ranging between $1200 to 4000$ per day in the USA [12].

Incidence of HAPUs is associated with two types of variables: 1) characteristics relating to the patient (sex, age, and risk of developing HAPUs) and 2) characteristics relating to the hospital (type of hospital and nurse staffing level, or NSL) [13,14]. With regard to patient characteristics, men have a 40% higher chance of developing HAPUs ($p < 0.001$) than women. Moreover, for every 10 extra years of age, the risk of developing HAPUs rises by almost 20% ($p < 0.001$) [15], and for every extra point on the Braden scale measuring risk, the probability of pressure ulcers appearing rises by 27% (OR = 0.73; 95% CI [0.67; 0.8]) [13]. With regard to hospital characteristics, research has shown that the likelihood of HAPUs is linked to the level of care provided at each

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hospital. The risk of HAPUs decreases by 5%–29% ($p < 0.001$) if patients are admitted to a top-level hospital [15]. Similarly, for every additional patient in the NSL (ratio of patients to nurses during a shift), the probability of HAPUs increases by 1% (OR = 1.01; 95% CI [1.007; 1.016]) [16].

The development of instruments to predict changes in patients' condition is highly relevant in clinical practice [17]. The first step in preventing HAPUs is to identify the patients at the highest risk upon their admission to hospital. To do this, a range of instruments for clinical use are available, including the Gosnell, Norton, Waterloo, Ramstadius, Braden, and INTEGRARE scales (assessing skin integrity using the Nursing Outcomes Classification, or NOC) [18–20]. The Braden scale is the most commonly used detection tool, as it has optimal psychometric properties and has been widely validated [21]. However, the scale does not facilitate the identification of specific nursing interventions in response to risk [22,23].

Recent studies have validated scales based on indicators from the NOC [18,24,25], which, according to the Outcome-Present State Test (OPT) Model of Clinical Reasoning, reflect the patient's condition and facilitate the development of nurses' clinical judgement [26], as well as the identification of specific nursing interventions in response to the NOC indicators that make up the items on these scales [27].

Therefore, nurses' clinical judgement combined with the use of instruments based on NOC indicators appears to be the best option for preventing HAPUs during the process of patient evaluation in hospitals. The predictive capacity of a scale must be accompanied by clinical judgement to predict and evaluate the phenomenon [20,28,29]. Clinical judgement involves the use of cognitive and critical reasoning processes to analyse specific health situations with the aim of reaching a precise diagnosis enabling the most suitable intervention strategies to be implemented [30]. It is a rigorous decision-making process based on disciplinary principles, ensuring that nursing interventions (Nursing Interventions Classification, NIC) [27] whose effectiveness can be measured using NOC outcome criteria indicators [31–33] are implemented.

Based on this premise, our research team validated an instrument, the INTEGRARE scale, which is made up of a series of NOC outcome indicators. As well as measuring the current condition of patients at risk of developing HAPUs, these indicators also assist with decision-making and clinical judgement, facilitating the subsequent identification of specific NIC nursing interventions [19].

Scales for predicting HAPUs that evaluate nursing practice-sensitive results based on NOC indicators [19] are the cornerstone of prevention strategies, but the predictive capability of these instruments is not yet sufficiently robust [34].

Therefore, our study aims to analyse the predictive validity of the INTEGRARE scale as an instrument to assist nurses' clinical judgement in preventing HAPUs, as well as to provide further evidence of the variables associated with the appearance of these ulcers in medical and surgical acute inpatient units.

2. Materials and methods

2.1. Study design and settings

A multicentre prospective observational cohort study design was used. The study was carried out between February 2015 and October 2017 at 11 hospitals in the XXXX Public Health System.

2.2. Participants

The study population includes 8 million people living in the Autonomous Community of Andalusia, which has 26 public hospitals [35]. These hospitals are classified into three categories depending on their level of specialisation and the population they cater to: primary hospitals (>500 beds and large metropolitan areas), specialty hospitals (between 200 and 500 beds and small metropolitan areas), and tertiary hospitals (<200 beds and rural areas) [35].

The required sample was calculated on the basis of the prevalence of HAPUs which, according to the guidelines in the *Estrategia de Cuidados de Andalucía* [Andalusian Care Strategy] [36], stood at 7.87%. With a 95% confidence level and a 2% level of accuracy, the necessary sample size was estimated to be 707 patients. Regarding the sample required for the design of the regression model, it is worth mentioning that at least 10 events per variable (EPV) must be obtained with a minimum of 100 events in the sample [37]. Finally, data were obtained from 1,004 users.

The inclusion criteria were 1) patients aged 16 and older, 2) admitted to medical and surgical inpatient units, and 3) length of stay greater than 48 h [38]. Patients with HAPUs upon admission were excluded from the study. Participants were required to give their explicit informed consent after receiving the details of the study.

2.3. Data collection

Recruitment was carried out in three phases:

1) The research team invited the 26 public hospitals in the Autonomous Community of Andalusia to join the study. Only 11 hospitals accepted. These included medical units (Internal Medicine, Cardiology, and Pulmonology) and surgical units (General Surgery, Trauma).
2) The principal investigator and the Nursing Department at each of the 11 hospitals worked together to recruit nurses from the units participating in the study. The number of nurses varied according to the hospital size and the number of participating units. A training workshop covering the use of the instruments and the data collection method was held for participants at each hospital. A total of 157 registered nurses participated voluntarily and joined the funded research project team.
3) The data collection process then took place. Patients were evaluated by the nurses during their shifts. These evaluations took place upon admission and every 48 h until discharge. Weekly follow-up reviews of the data collection process were carried out by unit. The nurses' coordinator recorded the data collected by the nurses on the encrypted web platform Limesurvey© to ensure correct processing of the data. This process was assessed on a monthly basis during the data collection periods.

2.4. Variables

The main outcome variable in the study was the presence of HAPUs, from grade I to grade IV, following the guidelines of the European Pressure Ulcer Advisory Panel for categorisation [39]. This variable could be answered 'yes' or 'no' and was evaluated by participating nurses during follow-up. The INTEGRARE scale was used to assess HAPU risk in inpatients [19]. This recently created scale has excellent psychometric properties (internal consistency was measured using Cronbach's $\alpha = 0.86$). It consists of 6 items rated on a five-point Likert scale (5 reflects the most desirable condition for the patient, while 1 reflects the least desirable) based on the standardised nursing language provided by the NOC. The elements of the INTEGRARE Scale are (110113) Skin integrity, (110102) Sensation, (110111) Tissue perfusion, (050312) Urinary incontinence, (210607) altered nutritional status, and (030012) Self-positions [19]. Scores range between 6 and 30 (the higher the score, the lower the risk of developing HAPUs). The confirmatory factor analysis verified the one-dimensional nature of the scale, with a good model fit (CMIN/DF = 4; GFI, CFI, NFI, IFI = 0.999; RMSEA = 0.028) [19].

The other study variables were classified into two categories:

- Patient characteristics: sex (male, female), age, length of stay, season of admission (winter, spring, summer, autumn).

- Hospital characteristics: type of hospital (regional, specialties, district), type of inpatient unit (IU) (Medical IU, Surgical IU), Nurse Staffing Level (NSL). The NSL was assessed using a simple self-report questionnaire. The participating registered nurses reported the total number of nurses working during their shifts and the number of patients admitted to their unit. The NSL was calculated by dividing the number of patients by the number of nurses on the shift.

An online survey was created using Limesurvey© to guarantee privacy and anonymity during the data collection process. The process was reviewed monthly during the data collection period.

2.5. Ethical considerations

The project was approved by the Ethics Committee for the Andalusian Healthcare System (CPMP/ICH/135/95). The fundamental principles established in the Declaration of Helsinki (2013, Brazilian revision) were observed at all times [40].

Participants were required to give their explicit informed consent after the details of the study had been explained to them. Their participation was voluntary and confidential, and it was necessary for the interviewer to provide both questions before agreeing to the survey questions. If their cognitive situation did not allow it, then consent had to be given by the accompanying person or legal guardian.

2.6. Data analysis

A univariate descriptive analysis was performed using absolute and relative frequencies for qualitative variables. Quantitative variables were analysed using measures of central tendency, such as the mean, and measures of dispersion, such as the standard deviation.

A bivariate analysis was performed in relation to the appearance of HAPUs using the chi-squared test for qualitative variables (sex, type of hospital, type of inpatient unit, season of admission). After assessing the normality of the quantitative variables, Mann-Whitney's *U* test was used as a non-parametric test (age, length of stay, the INTEGRARE scale, and the NSL).

Predictive validity was checked using two methods: a multivariate logistic regression model and a receiver operating characteristic (ROC) curve using the development of HAPUs as the dependent variable. The multivariate logistic regression model included all the variables relating to patient and hospital characteristics. Based on our small sample of EPV and following the recommendation of Steyerberg et al. [41] we obtained a full model that included a total of 8 variable predictors. The statistical significance threshold (alpha) was set at 0.05. The parameter estimates were interpreted as adjusted odds ratios (AORs), along with their corresponding 95% confidence intervals (CIs) and p-values (p). C-statistics were run to assess the goodness of fit. Variance inflation factors were calculated for all variables in the model to determine whether multicollinearity was a concern, with values under 10 indicating that it was not. Calibration was determined by means of the Hosmer-Lemeshow test, Cox and Snell's R^2, and Nagelkerke's R^2. Discrimination was determined according to the value of the area under the ROC curve.

Another ROC curve was created to determine the predictive validity and the optimal cut-off score for INTEGRARE with regard to the appearance of HAPUs. The area under the ROC curve, the standard error, and the 95% CI were calculated. The area under the ROC curve provided a measure of the accuracy of INTEGRARE in predicting HAPU risk. An area of 0.8–0.9 indicates excellent accuracy [42].

3. Results

3.1. Analysing patient and hospital characteristics in relation to the appearance of HAPUs measured using INTEGRARE

The total sample comprised 1,004 patients, 52.2% male and 47.8% female. The patients' mean age was 64.5 years and their mean length of stay was 10.7 days. The majority of the patients had been admitted to medical units (56.3%) in primary hospitals (66%) during the spring (44.8%). The NSL was 10.5 and the score on the INTEGRARE scale was 26.3 (SD = 4.6).

5.5% of patients developed an HAPU. There were statistically significant differences ($p < 0.001$) by age and by score on the INTEGRARE scale between patients who developed HAPUs and those who did not (Table 1). Patients with ulcers had a higher mean age (71.4 vs. 64.1) and a lower score on the INTEGRARE scale (18 vs. 26.5) (Table 1). The rest of the variables studied (sex, season, type of hospital, type of unit, and NSL) displayed no significant differences with regard to the appearance of HAPUs (Table 1).

To determine whether the INTEGRARE scale maintains differences in the development of HAPUs after controlling for patient and hospital characteristics, a multivariate logistic regression model was created (Table 2). The model obtained a good fit with optimal calibration (Hosmer-Lemeshow: chi-squared = 4.6, df = 8, p = 0.801) and discrimination (AUC = 0.9; 95% CI [0.87–0.93]).

The variables that were significant in the regression model were the INTEGRARE scale (AOR = 0.75, 95% CI = 0.71–0.8, $p < 0.01$), the surgical unit (AOR = 2.26, 95% CI = 1.19–4.56, p = 0.023), and the NSL (AOR = 1.14, 95% CI = 1.03–1.26, p = 0.009) (Table 2). However, no significant differences were found between men and women (AOR = 1.45, 95% CI = 0.76–2.79, p = 0.259), by age (AOR = 0.99, 95% CI =

Table 1
Patient and Hospital characteristics.

	All patients (n = 1004)	Patients with HAPU (n = 55)	Patients without HAPU (n = 949)	HAPU vs no HAPU patients
Patient characteristics				
Sex				0.191
Female	480 (47.8)	31 (56.4)	449 (47.3)	
Male	524 (52.2)	24 (43.6)	500 (52.7)	
Age				<0.001
Mean (SD)	64.5 (17.1)	71.4 (17.6)	64.1 (17)	
Lengh of stay				0.957
Mean (SD)	10.7 (10.7)	10.5 (9.5)	10.7 (11)	
Season of admission				0.237
Winter	383 (38)	26 (47.3)	357 (37.6)	
Spring	448 (44.8)	18 (32.7)	440 (46.4)	
Summer	101 (10)	6 (11)	95 (10)	
Autumm	62 (6.2)	5 (9)	57 (6)	
INTEGRARE				<0.001
Mean (SD)	26.3 (4.6)	18 (5.9)	26.5 (4.4)	
Hospital characteristics				
Type of hospital				0.285
Primary	664 (66)	31 (56.4)	633 (66.7)	
Specialty	165 (16.4)	12 (21.8)	153 (16.1)	
Tertiary	175 (17.4)	12 (21.8)	163 (17.2)	
Type of Inpatient Unit (IU)				0.769
Medical IU	565 (56.3)	32 (58.2)	533 (56.2)	
Surgical IU	439 (43.7)	21 (41.8)	416 (43.8)	
Nurse Staffing Level				0.081
Mean (DE)	10.5 (3.41)	11.1 (2.79)	10.4 (3.44)	

Table 2
Results of Multivariate Logistic Regression Model of hospital acquired pressure ulcer.

Variables	B	SE	Wald	df	P	AOR	95% C.I.
Constant	2.853	1.352	4.455	1	0.035[a]	17.35	
Gender							
Male						1	Reference
Female	0.375	0.332	1.273	1	0.259	1.46	0.76–2.79
Age	−0.010	0.011	0.742	1	0.389	0.99	0.97–1.01
Lengh of stay	−0.005	0.016	0.112	1	0.738	0.99	0.96–1.03
Season of admission							
Autumm						1	Reference
Winter	−0.112	0.640	0.030	1	0.862	0.89	0.25–3.14
Spring	−1.197	0.682	3.080	1	0.079	0.3	0.08–1.15
Summer	−0.055	0.787	0.005	1	0.944	0.95	0.2–4.42
INTEGRARE	−0.285	0.032	81.588	1	<0.001[a]	0.75	0.71–0.8
Type of hospital							
Primary						1	Reference
Specialty	0.004	0.484	0.000	1	0.993	1	0.39–2.59
Tertiary	0.093	0.429	0.047	1	0.829	1.1	0.47–2.55
Type of unit							
Medical UI						1	Reference
Surgical UI	0.815	0.358	5.175	1	0.023[a]	2.26	1.19–4.56
Nurse Staffing Level	0.133	0.051	6.751	1	0.009[a]	1.14	1.03–1.26

B, beta coefficient; SE, standard error; df, degrees of freedom; AOR, adjusted odds ratio; C.I., confidence interval.
Pressure ulcers model: $\chi2(3, n = 1004) = 117.941$, $p \leq 0.001$. Hosmer Lemeshow goodness of Fit: $\chi2(8) = 4.586$, $p = 0.801$. R^2 de Cos y Snell = 11.1%; R^2 de Nagelkerke = 32%; Sensitivity: 81.8%; Specificity: 81.8%; Receiver Operating Characteristic: 0.9 (95%CI: 0.87–0.93). Tolerance: 0.963–0.99; VIF: 1.01–1.038.
[a] Indicates statistical significance at $p \leq 0.05$.

0.97–1.01, p = 0.389), by length of stay (AOR = 0.99, 95% CI = 0.96–1.03, p = 0.738), between primary and specialities hospitals (AOR = 1, 95% CI = 0.39–2.59, p = 0.993) and tertiary hospitals (AOR = 1.1, 95% CI = 0.47–2.55, p = 0.829), or between the seasons of autumn and winter (AOR = 0.89, 95% CI = 0.25–3.14, p = 0.862), spring (AOR = 0.3, 95% CI = 0.08–1.15, p = 0.079) and summer (AOR = 0.95, 95% CI = 0.2–4.42, p = 0.944) (Table 2).

Table 2 presents a regression model that includes both significant and nonsignificant variables, with the understanding that the latter are of interest in the prediction of the event under study [13,14].

On the other hand, Table 3 presents a regression model run only with the significant variables, although the results observed do not differ from those provided in Table 2.

3.2. Studying the predictive validity of INTEGRARE

To study the predictive validity of the INTEGRARE scale with regard to the development of HAPUs, an AUC of 0.886 (95% CI = 0.85–0.923) was obtained. Within the 30-point range, the optimal cut-off value is 23 points with a sensitivity of 80.8% and a specificity of 80% (Fig. 1). According to INTEGRARE, patients at risk of HAPU upon admission have an odds ratio of developing an HAPU of 16.86 (95% CI = 8.54–33.28).

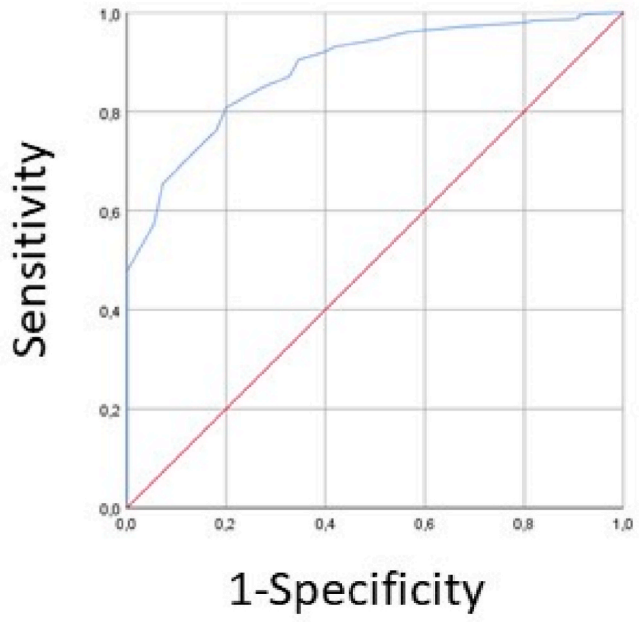

Fig. 1. Receiver operating characteristic Curve.

4. Discussion

The objective of this study was to determine the predictive validity of the INTEGRARE scale in preventing the risk of hospital-acquired

Table 3
Results of the second multivariate logistic regression model of hospitalized pressure ulcer.

Variables	B	SE	Wald	df	P	AOR	95% C.I.
Constant	2.894	0.988	8.58	1	0.003[a]	18.06	
INTEGRARE	−0.275	0.029	87.54	1	<0.001[a]	0.76	0.72–0.8
Type of unit							
Medical UI						1	Reference
Surgical UI	0.722	0.362	3.976	1	0.046[a]	2.06	1.01–4.19
Nurse Staffing Level	0.133	0.051	6.8	1	0.009[a]	1.14	1.03–1.26

B, beta coefficient; SE, standard error; df, degrees of freedom; AOR, adjusted odds ratio; C.I., confidence interval.
Pressure ulcers model: $\chi2(3, n = 1004) = 128.642$, $p \leq 0.001$. Hosmer Lemeshow goodness of Fit: $\chi2(8) = 3.746$, $p = 0.879$. R^2 de Cos y Snell = 12%; R^2 de Nagelkerke = 34.8%; Sensitivity: 81.8%; Specificity: 82.6%; Receiver Operating Characteristic: 0.9 (95%CI: 0.87–0.94). Tolerance: 0.949–0.99; VIF: 1.01–1.054.
[a] Indicates statistical significance at $p \leq 0.05$.

pressure ulcers (HAPUs) and provide further evidence of the variables associated with these ulcers during hospital stays in acute care hospital settings.

Regarding the regression models implemented, it is recommended that only significant variables are used to design the model. However, nonsignificant variables can be included in the model, provided that they are of clear interest for the study of the predictive model [43]. On the other hand, the small number of HAPU reported (n = 55) and the number of variables (8) included in the regression model in Table 2 should be taken into account. However, it seems that at present these assumptions are weak in relation to the significance of the results provided, and it is recommended that they be taken in a more relaxed way [43,44]. In this sense, the present study provides the design of a regression model with all the variables studied, and a second regression model only with the significant variables. The aim is to provide the most rigorous results possible, considering all possible assumptions; nevertheless, both models present the same results.

The INTEGRARE scale has robust predictive validity when patients are admitted (AUC = 0.886), improving on the values on the Braden scale (AUC = 0.84) [45,46]. Changes in the scale scores (Table 1) between patients with and without HAPUs were significant, as was the multivariate analysis (AOR = 0.75, 95% CI = 0.71–0.8, $p < 0.01$). This shows that patients evaluated using INTEGRARE and classified as being 'at risk of HAPU' upon admission to hospital were 16.86 times more likely to develop an HAPU during their hospital stay. Therefore, INTEGRARE should be used systematically in initial patient evaluations to identify patients at high risk of developing an HAPU, as prevention is one of the first measures to be implemented [47].

The appearance of HAPUs is associated with two types of variables: 1) characteristics relating to the patient and 2) characteristics relating to the hospital [13,14]. In this study, the only patient characteristic to prove significant was age, while the significant variables among the hospital characteristics were the type of unit (surgical or medical) and the NSL.

The mean age of patients with HAPU (71.4 ± 17.6) was found to be higher than the mean age among patients without HAPU (64.5 ± 17.1), and it was more prevalent among women (56.4%) than men (43.6%). These results differ from other studies such as Cabrejo et al. (2019) in which men have a higher prevalence of HAPUs (56.6%) than women, and a mean age of 63.2 ± 15.2. Similar results are found among the USA population in the work of Kayser et al. (2019). Meanwhile, scholars such as Aloweni et al. (2019), who conducted research in Singapore, also find a higher average prevalence among female patients (55%) with 43.8% of patients aged over 75. Therefore, this study corroborates [49], confirming that age can be a risk factor for developing HAPUs.

Patients admitted to surgical units develop HAPUs 2.26 times more often than those admitted to medical units. Other studies described a mean OR of 1.3, which was also significant, with regard to the higher incidence of HAPUs in surgical units [13,48,50]. However, this study found no statistically significant differences between the appearance of HAPUs among patients admitted to medical units or surgical units.

Equally, when the NSL exceeds 10.4, HAPUs occur 1.14 times more often. This coincides with one of the study results, which shows that a lower number of patients assigned to a single nurse reduced the probability of HAPUs by 39% [16]. Other studies link a rise in the NSL to the appearance of adverse events, such as medication errors, falls, and even deaths during hospital stays [51,52].

The results of the study position INTEGRARE as a significant factor in preventing HAPUs and lend it predictive validity in nursing evaluations, confirming the importance of clinical judgement in evaluation processes [34]. An additional benefit of the use of the INTEGRARE scale to predict HAPUs is that it is based on the NOC outcome indicators, which are systematised and coded [19]. Standardised nursing languages to identify different conditions in patients or NOC outcome criteria are an innovative approach that establishes a common linguistic framework for nursing care. NOC outcome indicators are sensitive to changes in the user's condition and facilitate the evaluation and documentation of health outcomes [25]. The fact that the INTEGRARE scale is based on NOC indicators allows it to be incorporated into the IT software used in the health care system. It can be beneficial in enabling nursing evaluations to be systematised and synergies with clinical judgement, the critical reasoning process, and the identification of the most appropriate NIC interventions [53]to be established.

With regard to the study limitations, it is relevant to note that the participating hospitals were not selected at random, although the research subjects were. As a result, the selection may be considered quasi-random, as the researchers did not know which subjects were hospitalized and would agree to participate in the study. Interobserver bias should also be taken into consideration, although the INTEGRARE scale is based on NOC outcome indicators, allowing potential discrepancies to be reduced as much as possible. Future research should explore the applicability of the INTEGRARE scale once it has been incorporated into the IT systems used in health care settings.

5. Conclusion

The INTEGRARE scale has robust predictive validity with regard to the development of HAPUs if used as an assessment tool when patients are admitted. Moreover, there is a higher probability of developing HAPUs among patients admitted to surgical units, who are elderly, and who have a higher NSL.

Including this scale in patient evaluation upon admission would improve the processes for predicting HAPUs and establish a common linguistic framework for nursing care, as the scale is made up of NOC outcome indicators.

Relevance to clinical practice

This study reinforces the evidence on the use of the INTEGRARE scale as a way of measuring the risk of HAPUs. Clinical judgement among nurses combined with the INTEGRARE scale could improve identification of the risk of HAPUs, so nursing managers could use it as a tool to evaluate health outcomes to ensure early diagnosis of risks and reduce the annual costs to the public health system of treating HAPUs.

In addition, standardised nursing languages in the form of NOC outcome indicators are used to formulate the items on the scale, which represents an added value in terms of improved usability and easier implementation in electronic health records. The use of this language also allows the effectiveness of nursing interventions to be evaluated, so establishing systematic re-evaluations during the hospital stay would provide better evidence on the use of preventive measures to avoid HAPUs.

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Declaration of competing interest

The authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jtv.2022.01.001.

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