



UNIVERSITÀ
DEGLI STUDI
DI UDINE

Università degli studi di Udine

Nursing students' knowledge, attitudes and learning occasions about pressure injuries at the time of graduation: A multi-method pre-post pandemic study

Original

Availability:

This version is available <http://hdl.handle.net/11390/1283804> since 2024-09-04T07:25:32Z

Publisher:

Published

DOI:10.1016/j.jtv.2024.08.012

Terms of use:

The institutional repository of the University of Udine (<http://air.uniud.it>) is provided by ARIC services. The aim is to enable open access to all the world.

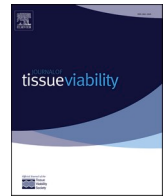
Publisher copyright

(Article begins on next page)



Contents lists available at ScienceDirect

Journal of Tissue Viability

journal homepage: www.elsevier.com/locate/jtv

Nursing students' knowledge, attitudes and learning occasions about pressure injuries at the time of graduation: A multi-method pre-post pandemic study

Margherita Zito, Stefania Chiappinotto^{*}, Alessandro Galazzi, Illarj Achil, Davide Caruzzo, Stefano Fabris, Gaia Dussi, Alvisa Palese

Department of Medicine, University of Udine, via Colugna 50, Udine, 33100, Italy

ARTICLE INFO

Keywords:

Pressure injury
Nursing students
Attitude
Knowledge
Clinical internship
COVID-19
Nursing education

ABSTRACT

Introduction: Pressure injuries (PIs) are a significant issue in healthcare system: nursing students are recommended to be prepared to assess the risk, prevent and manage them. However, despite the coronavirus disease-2019 (COVID-19) pandemic significantly affected nursing students' learning opportunities no data regarding their impact of PIs knowledge, attitudes and learning occasions have been documented to date.

Aims: To describe the post-pandemic knowledge and attitudes regarding PI prevention and management and to compare clinical learning opportunities in the field of PIs before and after the COVID-19 pandemic.

Method: A descriptive multi-method study involving students at the time of their graduation in the before ($n = 114$) and after the pandemic ($n = 113$). The Italian versions of the Pressure Ulcer Knowledge Assessment Tool (PUKAT-IT) and Attitude Toward Pressure Ulcer Prevention (APuP-IT) scales were used. Data regarding pre- and post-pandemic learning opportunities were retrospectively collected from the Student Portfolio of Skills.

Results: The average PUKAT-IT score was 57.92 % (cut-off 60 %), which indicates insufficient knowledge; the average APuP-IT score was 78.19 % (cut-off 75 %), which shows positive attitudes towards PI. Comparing the pre- and the post-pandemic groups, learning opportunities in PI risk assessment and prevention significantly decreased (overall 38.90 vs 32.27 and 35.26 vs 25.97, respectively) while those regarding the PI management remained stable.

Conclusion: In the post-pandemic times, nursing students' knowledge about PIs remains insufficient while their attitudes are adequate; the pandemic significantly reduced students' exposure to prevention and assessment learning opportunities during their internship, which suggests a need to update educational strategies to ensure appropriate knowledge and learning experiences in this field.

1. Background

Despite efforts to prevent pressure injuries (PIs) [1], their occurrence is still high among patients which raises concerns regarding the quality of care delivered [2]. A recent systematic review has reported that between 2008 and 2018, the PIs prevalence was 12.8 % worldwide, 14.5 % in Europe, 13.6 % in North America, 12.7 % in South America, 3 % in Asia, 12.6 % in the Middle East, and 9 % in Australia whereas in the Eastern Mediterranean Region has varied between 7 % and 44.4 % [3,4]. If not properly treated, PIs can lead to life-threatening conditions such as

sepsis, osteomyelitis and necrotising fasciitis and, ultimately, extended hospitalisation and significant healthcare costs [5–7]. Nurses play a crucial role in the prevention and management of PIs and are required to possess competencies to recognise patients at risk for developing PIs and to apply preventive strategies. Moreover, nursing care is essential for patients who have been diagnosed with PI to promote healing and prevent further complications [8,9]. Therefore, providing future nurses with sufficient knowledge in the field of PIs prevention and management is an education priority [10,11]. Monitoring nursing students' attitudes towards PIs has also been recommended to identify early on the

^{*} Corresponding author. Via Colugna, 50, Udine, 33100, Italy

E-mail addresses: zito.margherita@spes.uniud.it (M. Zito), stefania.chiappinotto@uniud.it (S. Chiappinotto), alessandro.galazzi@uniud.it (A. Galazzi), illarj.achil@uniud.it (I. Achil), davide.caruzzo@uniud.it (D. Caruzzo), stefano.fabris@uniud.it (S. Fabris), gaia.dussi@gmail.com (G. Dussi), alvisa.palese@uniud.it (A. Palese).

<https://doi.org/10.1016/j.jtv.2024.08.012>

Received 23 July 2024; Received in revised form 22 August 2024; Accepted 29 August 2024

Available online 30 August 2024

0965-206X/© 2024 The Authors. Published by Elsevier Ltd on behalf of Tissue Viability Society / Society of Tissue Viability. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

facilitating or hindering factors that may affect the quality of care [12].

A recent meta-analysis has reported that the knowledge of nurses and nursing students about PIs prevention is often insufficient [9]. Nursing students possess less knowledge about PIs prevention than practicing nurses, potentially due to their limited clinical exposure [9,13] which suggests the need to continue monitoring their preparedness [9,14]. Studies have also documented, however, that both nurses and students have positive attitudes regarding PIs prevention [9,15,16], which is higher among the later although they do not possess the same level of knowledge [9]. However, students' knowledge and attitudes are influenced by various factors, including the academic year attended (as for example the 1st or the final year), the clinical experience progressively gained and the direct experience with patients with PIs [13,17].

During the coronavirus disease-2019 (COVID-19) pandemic, students' learning opportunities have been transformed significantly due to restrictive social distancing policies and public health measures [18]; for many months, clinical internships were suspended, and in-person theoretical courses switched to remote online classes to ensure continued learning [19,20]. Students have reported fewer learning opportunities and more concerns regarding what they may have missed in their education [21,22]. However, despite the importance of PIs as both clinical and public health concern, no studies examining the implications of the COVID-19 pandemic on students' knowledge and attitudes, as well on concrete clinical learning opportunities regarding PIs prevention and management, have been reported to date. Producing new evidence may inform nurse educators regarding strategies for effective training during future pandemics, as well as suggesting how healthcare services can shape the transition from the bachelor's degree to the workplace for newly post-pandemic graduated nurses. Overall, expanding the knowledge available may contribute to understand trends in attitudes and knowledge about PIs among the future workforce and, ultimately, may increase the quality of care.

2. Aims

This study sought to (a) describe the post-pandemic knowledge and attitudes regarding PIs prevention and management and (b) compare clinical learning opportunities in the field of PIs before and after the COVID-19 pandemic among nursing students. The secondary aim was to explore the relationship, if any, between knowledge and attitudes, the learning opportunities and the perceived preparedness as reported by nursing students at the time of graduation.

3. Methods

3.1. Study design and setting

A descriptive multi-method study design [23] consisting of a cross-sectional and a retrospective study is reported here according to the Strengthening the Reporting of Observational Studies in Epidemiology Statement [24] (Supplementary Table 1).

The study was conducted in a Bachelor of Nursing Science (BNS) degree course on two campuses of the public University of Udine in north-east of Italy enrolling 180 students in the 1st year. The programme duration is three years, and it provides around 2800 theoretical and 1850 clinical hours, with on average nine clinical rotations, all attended in person. The standardised education delivered on PIs prevention and management is summarised in Table 1 and in Supplementary Table 2. However, during the pandemic, students received their theoretical education online in the 1st year, mixed (online and in person) during the 2nd year and in person during the 3rd year. Clinical rotations were rationed: only 4 weeks were allowed out of the 12 expected for the 1st year students; only 8 weeks out of 16 for the 2nd year; and only 11 weeks out of 24 for the 3rd year [25] (Table 1).

Table 1
Pressure injuries prevention and management nursing education pathway before and during the pandemic.

Setting	BNS year	Main contents	Outcome measurement	Before COVID-19	During COVID-19
Classroom PIs prevention and management: general contents	1st	Fundamentals of nursing care 12 h	Written evaluation at the end of the course	Mandatory in presence	Online
Classroom PIs prevention and management: in specific conditions	2nd	Dermatology 12 h	Written evaluation at the end of the course	Mandatory in presence	Mixed online/in presence
	3rd	Nursing in critical care 24 h	Written evaluation at the end of the course	Mandatory in presence	
Skill lab	1st	Management of I and II stages PIs with a wound care expert nurse 2 h	Practical evaluation in a simulated setting	Mandatory in presence	Rationed (reduced in the number of hours) In presence
	2nd	Management of complex PIs (III and IV stages) with a wound care expert nurse 4 h			
Clinical rotations	1st	2 rotations, medical and surgical settings 480 h	When students are exposed to a learning occasion, this must be reported in the "Student Portfolio of Skills" in the following sections: - "Assessing the risk of PIs by using validated tools". - "Implementing interventions to prevent PIs". - "Assessing the stage and managing PIs". The Clinical Nurse provides his/her signature to certify the occurred learning occasion.	Mandatory in presence	Mandatory in presence but rationed ^a Mandatory in presence but rationed ^a Mandatory in presence
	2nd	3 rotations, specialized settings, 600 h		Mandatory in presence	
	3rd	on average 4 rotations in: intensive care, general or specialized hospital units, long-term/community care; additional rotations in maternal/child and psychiatric units 720 h		Mandatory in presence	

Legend: BNS, Bachelor of Nursing Science; COVID-19, Coronavirus-19; PI, Pressure Injury.

^a In the number of hours expected.

3.2. Data sources and inclusion criteria

For the cross-sectional study, all students enrolled in 2020 and graduated in 2023 ($n = 113$) – thus attending their education during the pandemic period (hereafter, post-pandemic group) – were eligible. Those (a) who filled in the *Student Portfolio of Skills*, (b) completed their education and were approaching their graduation at the time of the study (2023) and (c) agreed to participate, were involved in the cross-sectional design.

For the retrospective study, the *Student Portfolio of Skills* of 114 students who ended their degree in the pre-pandemic period were eligible; those portfolios archived at the university level and in which all sections had been completed by students who graduated in the academic year 2018/2019 were considered (hereafter, pre-pandemic group).

3.3. Instruments

Several tools [26] have been developed to allow comparable measures in the field of PIs knowledge and attitudes: among them, the Pressure Ulcer Knowledge Assessment Tool (PUKAT) and the Attitude Toward Pressure Ulcer Prevention (APuP) have been largely validated [10,11] and were therefore considered in our study. Specifically, the PUKAT, developed in 2010 by Beekman et al. [10], in its Italian version (PUKAT-IT) [27] was used after having obtained formal authorisation. The tool consists of 26 multiple choice questions related to PIs prevention with multiple answers categorised in six themes (or dimensions): (a) aetiology and development, (b) classification and observation, (c) risk assessment, (d) nutrition, (e) reduction of the magnitude of pressure and shearing and (f) reduction of the duration of pressure and shearing. A mean knowledge score $\geq 60\%$ is considered satisfactory [10].

The APuP developed by Beekman et al. [11] in its validated and reliable Italian version (APuP-IT) [27] was also used after having obtained the formal authorisation. The tool consists of 13 items measuring subjective attitudes towards PIs through five factors: 0.714 concerning (a) personal competency to prevent PIs, (b) priority of PIs prevention, (c) impact of PIs, (d) responsibility for PIs prevention and (e) confidence in the effectiveness of prevention. Students were asked to express their answers using a 4-point Likert scale (from 1 = *strongly disagree* to 4 = *strongly agree*); high scores show positive attitudes, and a mean of $\geq 75\%$ is considered satisfactory [11]. The internal consistency of the tool as measured with Cronbach alpha in our data was 0.714.

The *Student Portfolio of Skills* as the standardised tool approved by the University council was also used in this study. According to the internal guidelines, students are recommended to report in the Portfolio each learning occasion as experienced in each clinical internship under the supervision of the Clinical Nurse. Students receive this tool at the beginning of the 1st academic year, with appropriate information regarding its aims, how to fill it in during the clinical rotations and how to keep it in a safe manner. At the end of their daily clinical internship, students are required to record each learning occasion in the tool by selecting those appropriate in the list provided and containing all those expected in the entire nursing programme: for example, there are specific items on the list concerning PIs, and students are required to flag that they experienced them during the shift (e.g. assessed PIs with the Braden scale) by reporting the date. Afterwards, the Clinical Nurse certifies the learning occasion by signing it; before graduation, students are required to return the Portfolio to the nursing programme.

In the context of our study, data regarding the following aspects were considered and extracted: learning experience in 'Assessing the risk of PIs by using validated tools', 'Implementing interventions to prevent PIs', and 'Assessing the stage and managing PIs (I, II, III and IV stages [26])'.

Questions concerning the self-perceived preparedness to identify risk and to manage PIs effectively (from not at all, to greatly) were included in the final brief socio-demographic form collecting additional data (e.g. age, gender).

3.4. Data collection procedures and rigour

For the cross-sectional design, two experienced researchers were responsible for informing students about the aims of the study and ensuring their involvement and that they signed their informed consent forms; data collection tools were then sent via the EUSurvey platform [28] at the time of graduation. For the retrospective design, data reported in the *Student Portfolio of Skills* for both the pre- and post-pandemic groups were accessed and extracted into Microsoft Excel and secured with a password to ensure confidentiality. Two researchers were involved in the process to check accuracy. Moreover, no missed data were detected, given that recording was mandatory in all tools.

3.5. Data analysis

Data was summarised as numbers and percentages or means and 95 % confidence intervals (CIs). Differences in the number of learning occasions between the pre- and post-pandemic groups were explored with the Mann–Whitney *U* test according to the non-normal distribution of the continuous variables. Pearson correlations between individual variables, the overall scores on the PUKAT-IT and APuP-IT, the number of learning occasions and the perceived preparedness were also explored and values < 0.3 were considered low, $0.3–0.5$ moderate and > 0.5 high [29]. Statistical significance was set at $p < 0.05$ and analyses were performed using Statistical Package for Social Science (SPSS) Version 25.

3.6. Ethical consideration

The study was approved by the Internal Review Board of the University of Udine, Italy (Prot. N 241/2023, CL13 5/2023). In the cross-sectional study, participation was voluntary, and anonymity was guaranteed; no rewards were offered, and students were allowed to withdraw from the study at any time without any consequence. For the retrospective study, the *Student Portfolio of Skills* were accessed after having anonymised them according to the study protocol.

4. Results

4.1. Cross-sectional study: post-pandemic knowledge and attitudes regarding PIs

A total of 97 students out of 113 eligible (85.8 %) participated, with 77 (79.4 %) being female and having an average age of 24.9 years (CI 95 % 23.73–26.07). Most (69; 71.1 %) were living with their families, and only seven (7.2 %) reported having a child. A total of 64 (66 %) students underwent secondary education at a high school reporting an average grade score of 78.61 (95 % CI: 76.06–81.01) out of 100. Most participants had not reported previous university experience before attending the BNS (79; 81.5 %). However, 44 (45.4 %) had previous working experience, and 39 (40.2 %) were still working while attending the nursing programme. Nearly all students (89; 91.8 %) successfully completed the BNS in 3 years. Overall, 86 (88.7 %) students reported that they were sufficiently or greatly prepared to identify the risk of PIs, whereas 70 (72.2 %) reported feeling sufficiently or greatly prepared to manage them (Table 2).

Regarding the knowledge, students achieved a mean score of 57.92

Table 2
Characteristics of participants (n = 97).

Variables	N (%) or mean (CI 95 %)
Age	24.9 (23.73–26.07)
Gender	
Male	20 (20.6)
Female	77 (79.4)
Living	
Alone	5 (5.2)
With the family	69 (71.1)
With other students	10 (10.3)
With my boyfriend/girlfriend	10 (10.3)
Other (husband/wife/mother/father)	3 (3.1)
Children	
Yes	7 (7.2)
Number	
One	5 (71.4)
Two	2 (28.6)
Secondary school type	
High school	64 (66.0)
Technical school	18 (18.5)
Professional school	15 (15.5)
Secondary school final grade out of 100	78.61 (76.06–81.01)
Previous university experiences	
No	79 (81.5)
Previous university experience concluded	4 (4.1)
Previous university experience interrupted	11 (11.3)
Other	3 (3.1)
Previous working experiences	
Yes	44 (45.4)
Working experiences during bachelor	
Yes	39 (40.2)
In the clinical care field	11 (28.2)
Not in the clinical care field	28 (71.8)
Nursing education attendance	
Regular	89 (91.8)
Interrupted	8 (8.2)
Do you feel prepared to identify the risk of PIs?	2.98 (2.87–3.07)
Greatly	12 (12.4)
Enough	74 (76.3)
Not much	9 (9.2)
Not at all	2 (2.1)
Do you feel prepared to manage PIs?	2.71 (2.59–2.81)
Greatly	2 (2.1)
Enough	68 (70.1)
Not much	24 (24.7)
Not at all	3 (3.1)

Legend: N, number; CI, confidence interval; PIs, pressure injuries.

% (95 % CI: 55.90–59.87) correct answers (15.06/26) on the PUKAT-IT scale (Table 3); none of them obtained a score of 100 %. The lowest scores were reported in the preventive measure to reduce the amount of pressure/shear (44.63 %) and in aetiology and development (54.98 %) dimensions, while the highest scores were in the nutrition section (88.65 %).

Regarding attitudes, students reported an average score of 78.19 % (95 % CI: 76.69–79.68) on the APuP-IT scale (Table 3). The highest scores were reported in responsibility for pressure ulcer prevention (86.21 %) and in priority of pressure ulcer prevention (84.53 %), while the lowest appeared in personal competency to prevent pressure ulcers (68.55 %).

4.2. Retrospective study: clinical learning opportunities in the pre- and post-pandemic groups

The PIs learning occasions experienced as documented in the *Student Portfolio of Skills* for pre- (n = 114) and post-pandemic (n = 113) students were compared (Table 4). Overall, the average number of

opportunities to assess the risk of PIs using validated tools significantly decreased (pre-pandemic 38.90 [95 % CI: 29.83–36.70] vs post-pandemic 32.27 [95 % CI: 29.83–36.70], $p = 0.011$). This difference was significantly greater within the first of 2nd years of the BNS, and in the last clinical rotation of the 3rd year. Similarly, the opportunity to apply interventions to prevent PIs also significantly decreased (pre-pandemic 35.26 [95 % CI: 32.43–38.10] vs post-pandemic 25.97 [95 % CI: 22.44–29.51], $p < 0.001$), with significant differences in the 1st and 2nd years, but not in the 3rd year.

No significant overall differences emerged regarding the number of learning opportunities in assessing the stage and managing PIs, for each PI stage, when comparing the pre- and post-pandemic groups. However, the average number of occasions significantly increased during the final internship during the 3rd year (Stage I pre-pandemic 0.32 [95 % CI: 0.7–0.58] vs post-pandemic 1.19 [95 % CI: 0.69–1.70], $p = 0.003$; Stage II 0.13 [95 % CI: 0.01–0.28] vs 1.09 [95 % CI: 0.61–1.56], $p < 0.001$; Stage III 0.03 [95 % CI: 0.00–0.06] vs 0.96 [95 % CI: 0.47–1.45], $p < 0.001$; Stage IV 0.00 [95 % CI: 0.00–0.00] vs 0.65 [95 % CI: 0.25–1.06], $p = 0.001$).

4.3. Correlations

No significant correlations with PUKAT-IT and APuP-IT scale global scores were found for any of the individual variables. A low correlation emerged between the PUKAT-IT and the APuP-IT global scores (0.173, $p = 0.05$), whereas among the learning opportunities for assessing risks, applying prevention strategies and managing PIs, as recorded in the *Student Portfolio of Skills*, from low to high correlations have emerged (ranges between 0.291 and 0.663). A moderate correlation has emerged between the perception of being prepared to assess and to manage PIs (0.418, $p = 0.01$) and a low between the perceived preparedness to assess the risk of PIs and the APuP-IT total scores (0.231, $p = 0.01$) (Table 5).

5. Discussion

The COVID-19 pandemic created unprecedented challenges for nursing students. This included changes to the theoretical courses, which were delivered online, and the suspension or rationing of clinical learning experiences, all of which has led to possible implications for the knowledge and attitudes achieved [30]. Several studies examined how the clinical learning opportunities of nursing students changed during the COVID-19 pandemic [21,25]. However, to the best of our knowledge, this is the first study to examine PIs knowledge and attitudes among the first generation of post-pandemic nursing students and the changes in the clinical learning opportunities compared to pre-pandemic cohorts, for which evidence is available [31].

The students involved at the time of their graduation revealed individual characteristics similar to those reported in previous studies at the European level [e.g., Refs. [32,33]]. Although they self-reported feeling either sufficiently or greatly prepared to prevent and manage PIs, the global average score on the PUKAT-IT tool, which measures such knowledge objectively, was 57.92 %, which indicates an insufficient level of knowledge. First, this gap between the perceived knowledge and that objectively reported suggest the need to increase students' reliability in self-assessing their professional growth, given the large use of self-reported competencies [34,35]. Second, comparing post-pandemic findings, our PUKAT-IT global score are in line with pre-pandemic data from Italian (51.1 %) [27], Australian (51.1 %) [13], Irish (58.5 %) [36] and other studies [9,37,38]. This seems to suggest that the actual level of knowledge possessed by nursing students has not changed over the periods. Analytically, knowledge about preventive measures to reduce the quantity of PIs (44.63 %), as well as regarding PIs aetiology and development (54.98 %), is insufficient, as documented in previous research [9,38], whereas knowledge about nutritional aspects reported the highest score (88.65 %), as in pre-pandemic data [13,27,36]. The

Table 3

Knowledge and attitudes regarding pressure injuries among students (n = 97).

PUKAT-IT scale (number of items)	Mean (CI 95 %) ^a	Mean (CI 95 %) ^b
Theme 1: Aetiology and development (6)	54.98 (50.69–59.10)	3.29 (3.04–3.54)
Theme 2: Classification and observation (5)	63.71 (58.96–68.04)	3.18 (2.94–3.43)
Theme 3: Risk assessment (2)	61.85 (55.15–68.04)	1.23 (1.10–1.37)
Theme 4: Nutrition (1)	88.65 (81.44–94.81)	0.88 (0.82–0.93)
Theme 5: Preventive measure to reduce the amount of pressure/shear (7)	44.63 (41.09–47.86)	3.12 (2.85–3.36)
Theme 6: Preventive measure to reduce the duration of pressure/shear (5)	66.59 (62.88–70.51)	3.32 (3.13–3.51)
PUKAT-IT scale total scores (26)	57.92 (55.90–59.87)	15.06 (14.56–15.56)
APuP-IT scale (number of items)	Mean (CI 95 %) ^a	Mean (CI 95 %) ^c
Factor 1: Personal competency to prevent pressure ulcers (3)	68.55 (66.47–70.63)	8.22 (7.97–8.47)
Factor 2: Priority of pressure ulcer prevention (3)	84.53 (82.22–86.84)	10.14 (9.86–10.42)
Factor 3: Impact of pressure ulcers (3)	75.25 (73.11–77.40)	9.03 (8.77–9.28)
Factor 4: Responsibility for pressure ulcer prevention (2)	86.21 (83.84–88.58)	6.89 (6.70–7.08)
Factor 5: Confidence in the effectiveness of prevention (2)	79.51 (77.23–81.78)	6.36 (6.17–6.54)
APuP-IT scale total scores (13)	78.19 (76.69–79.68)	40.65 (39.88–41.53)

Legend: PUKAT-IT, Pressure Ulcer Knowledge Assessment Tool – Italian version; APuP-IT, Attitude Toward Pressure Ulcer Prevention – Italian version.^a Values standardised to 100.^b Right answers level of agreement/total for each item.^c Number of answers indicating an agreement.

scores for risk assessment (61.85 %), classification and observation (63.71 %) and preventative measures to reduce the duration of pressure (66.59 %) were adequate and higher than previously reported [13,14,38].

Students had high APuP-IT global scores (78.19 %), thus high attitudes regarding PIs, which is consistent with previous studies [9,15,16]. The only critical issue was the personal competency to prevent PIs (68.55 %), which considered one of reason contributing to professional behaviour that does not comply with PIs prevention guidelines [9]. Overall, students seem to have an appropriate attitude towards the willingness to assume responsibility and prevent PIs; however, low self-confidence and competency in their ability or education to prevent PIs emerged, as has been reported in pre-pandemic data [13,14,27]. This suggests the need to better integrate theoretical knowledge with clinical experiences.

The opportunities to learn about PI risk assessment and use measures to prevent PIs significantly declined between the pre- and the post-pandemic groups. The limitations imposed by the COVID-19 pandemic during the first two years of BNS limited the number of internships. Illness and quarantine-related absences and internship interruptions were also problematic, and appropriate attention was not devoted to the topic during the clinical rotations as other clinical issues were prioritised (e.g., preventing the spread of COVID-19 infections). These may all have reduced the learning occasions. The changes in service delivery for other clinical issues may also have played a role [39]. However, in both groups, the pattern of learning opportunities seems to be similar: more experience is gained in the 1st year, and a few or very limited opportunities occur in the 2nd and in the 3rd years, which suggests that PIs are widely considered a learning aim pertinent at the beginning of the nursing education. There was also an increase in clinical learning opportunities recorded in the 3rd year, and this may reflect that students recognised the lack of previous opportunities and were attempting to maximise their exposure before graduation [40,41]. Overall, post-pandemic students had seen and managed fewer PIs than the pre-pandemic group according to their self-reported perceived preparedness to recognise and handle PIs.

Knowledge and attitudes had a moderate correlation each other, as previously reported [13,14,27,42], which indicates that these dimensions are interconnected and that increasing knowledge may

improve attitudes and vice versa. Moreover, the increased number of learning occasions experienced for assessing and preventing PIs showed moderate correlations with the number of opportunities to manage PIs. Students well trained in prevention and assessment are also more often involved in managing PIs, which may also be due to their progressive awareness of this issue for the entire care process. Similarly, when students felt themselves prepared for prevention, they reported being more prepared for PIs management, which suggests that these two care phases are strictly connected also in the learning process. The emerged interconnections should be carefully considered while designing innovative teaching methodologies to overcome lacks in the students' preparedness that may have future negative impact on the quality of care [43].

5.1. Limitations

This study as a single centre study design, and although this has allowed the collection of data from students exposed to homogeneous education pathways [44], future multicentre studies are suggested. Second, we considered nursing students at the time of their graduation, when they were required preparation to face the graduation examination, which may have influenced the findings both positively on the knowledge possessed and negatively, on the perceived preparedness to undertake the future professional role. Future longitudinal studies may provide more accurate data.

6. Conclusions

Students at the point of their graduation after attending three years of nursing education during the pandemic self-reported sufficient to great preparedness in preventing and managing PIs; however, their actual knowledge as measured with a validated tool was, on average, insufficient. First, students must be coached to provide more reliable self-assessments and awareness of their competencies. Second, the changes in nursing education during the pandemic seem to have resulted in the same lack of knowledge regarding PIs as documented before the pandemic. The positive attitudes regarding PIs are an important resource, but the low self-confidence and competency that may prevent practical actions should be carefully considered for their potential

Table 4

Learning opportunities about pressure injuries during the clinical rotations as documented for each academic year attended in the *Student Portfolio of Skills* by pre- and post-pandemic students.

Learning opportunities	Pre-pandemic (n = 114) Mean (CI 95 %)	Post-pandemic (n = 113) Mean (CI 95 %)	p-value
Assessing the risk of PIs using validated tools	38.90 (29.83–36.70)	32.27 (29.83–36.70)	0.011
1st year, 1st clinical rotation	5.61 (5.02–6.19)	4.34 (3.82–4.97)	0.004
1st year, 2nd clinical rotation	5.82 (5.21–6.44)	4.46 (3.86–5.07)	0.002
2nd year, 1st clinical rotation	5.59 (4.90–6.28)	4.10 (3.42–4.78)	0.003
2nd year, 2nd clinical rotation	5.29 (4.57–6.01)	3.87 (3.19–4.54)	0.005
2nd year, 3rd clinical rotation	5.37 (4.67–6.07)	4.16 (3.42–4.90)	0.020
3rd year, 1st clinical rotation	3.87 (3.13–4.60)	3.88 (3.14–4.63)	0.975
3rd year, 2nd clinical rotation	3.67 (2.91–4.43)	3.78 (3.06–4.50)	0.832
3rd year, 3rd clinical rotation	3.03 (2.33–3.72)	2.60 (1.93–3.27)	0.387
3rd year, 4th clinical rotation	0.71 (0.26–1.16)	2.08 (1.42–2.72)	0.001
Implementing interventions to prevent PIs	35.26 (32.43–38.10)	25.97 (22.44–29.51)	0.000
1st year, 1st clinical rotation	4.90 (4.26–5.54)	3.50 (2.81–4.20)	0.004
1st year, 2nd clinical rotation	4.68 (4.02–5.33)	3.93 (3.26–4.60)	0.114
2nd year, 1st clinical rotation	4.78 (4.08–5.49)	2.66 (2.00–3.32)	0.000
2nd year, 2nd clinical rotation	4.43 (3.72–5.13)	2.84 (2.16–3.52)	0.002
2nd year, 3rd clinical rotation	4.64 (3.79–5.49)	3.13 (2.41–3.85)	0.008
3rd year, 1st clinical rotation	4.12 (3.44–4.81)	3.04 (2.33–3.74)	0.29
3rd year, 2nd clinical rotation	4.32 (3.55–5.10)	3.03 (2.31–3.75)	0.16
3rd year, 3rd clinical rotation	2.92 (2.22–3.62)	2.06 (1.43–2.69)	0.72
3rd year, 4th clinical rotation	0.46 (0.10–0.83)	1.78 (1.16–2.40)	0.000
Assessing the stage and managing PIs – I stage	18.12 (16.19–20.06)	15.20 (12.90–17.51)	0.056
1st year, 1st clinical rotation	2.80 (2.26–3.34)	1.47 (1.04–1.90)	0.000
1st year, 2nd clinical rotation	2.79 (2.22–3.36)	1.85 (1.39–2.31)	0.012
2nd year, 1st clinical rotation	2.17 (1.65–2.69)	1.78 (1.25–2.31)	0.301
2nd year, 2nd clinical rotation	2.07 (1.57–2.57)	1.69 (1.16–2.22)	0.304
2nd year, 3rd clinical rotation	1.95 (1.45–2.45)	1.86 (1.31–2.41)	0.813
3rd year, 1st clinical rotation	2.43 (1.88–2.98)	1.60 (1.06–2.14)	0.033
3rd year, 2nd clinical rotation	2.11 (1.53–2.68)	2.12 (1.50–2.73)	0.982
3rd year, 3rd clinical rotation	1.49 (0.96–2.03)	1.65 (1.06–2.23)	0.699
3rd year, 4th clinical rotation	0.32 (0.7–0.58)	1.19 (0.69–1.70)	0.003
Assessing the stage and managing PIs – II stage	12.89 (11.33–14.44)	12.38 (10.51–14.25)	0.680
1st year, 1st clinical rotation	2.00 (1.512–2.48)	1.25 (0.84–1.66)	0.019
1st year, 2nd clinical rotation	1.73 (1.29–2.17)	1.73 (1.26–2.21)	0.984
2nd year, 1st clinical rotation	1.46 (1.06–1.85)	1.20 (0.77–1.64)	0.396
2nd year, 2nd clinical rotation	1.32 (0.96–1.67)	1.25 (0.85–1.65)	0.801
2nd year, 3rd clinical rotation	1.56 (1.09–2.03)	1.31 (0.82–1.80)	0.461
3rd year, 1st clinical rotation	1.82 (1.33–2.30)	1.38 (0.88–1.88)	0.217
3rd year, 2nd clinical rotation	1.67 (1.18–2.15)	1.90 (1.33–2.48)	0.533
3rd year, 3rd clinical rotation	1.21 (0.79–1.63)	1.27 (0.78–1.75)	0.866
3rd year, 4th clinical rotation	0.13 (0.01–0.28)	1.09 (0.61–1.56)	0.000
Assessing the stage and managing PIs – III stage	6.59 (5.97–7.06)	8.01 (6.59–9.42)	0.107
1st year, 1st clinical rotation	0.96 (0.64–1.29)	0.58 (0.31–0.84)	0.065
1st year, 2nd clinical rotation	0.84 (0.49–1.19)	0.85 (0.41–1.28)	0.983
2nd year, 1st clinical rotation	0.71 (0.45–0.97)	0.91 (0.51–1.31)	0.400
2nd year, 2nd clinical rotation	0.55 (0.31–0.79)	0.76 (0.41–1.11)	0.333
2nd year, 3rd clinical rotation	0.65 (0.33–0.97)	1.01 (0.59–1.42)	0.174
3rd year, 1st clinical rotation	1.06 (0.71–1.41)	1.04 (0.59–1.50)	0.953
3rd year, 2nd clinical rotation	0.98 (0.54–1.42)	0.95 (0.53–1.37)	0.908
3rd year, 3rd clinical rotation	0.80 (0.41–1.18)	0.96 (0.50–1.42)	0.603
3rd year, 4th clinical rotation	0.03 (0.00–0.06)	0.96 (0.47–1.45)	0.000
Assessing the stage and managing PIs – IV stage	3.63 (2.85–4.42)	4.65 (3.71–5.58)	0.101
1st year, 1st clinical rotation	0.47 (0.25–0.69)	0.55 (0.20–0.90)	0.718
1st year, 2nd clinical rotation	0.54 (0.26–0.83)	0.38 (0.19–0.57)	0.350
2nd year, 1st clinical rotation	0.23 (0.10–0.36)	0.44 (0.18–0.70)	0.148
2nd year, 2nd clinical rotation	0.26 (0.10–0.43)	0.35 (0.15–0.54)	0.529
2nd year, 3rd clinical rotation	0.59 (0.29–0.89)	0.59 (0.26–0.92)	0.982
3rd year, 1st clinical rotation	0.61 (0.35–0.86)	0.65 (0.29–1.00)	0.853
3rd year, 2nd clinical rotation	0.55 (0.20–0.91)	0.69 (0.35–1.03)	0.583
3rd year, 3rd clinical rotation	0.38 (0.12–0.63)	0.35 (0.16–0.53)	0.841
3rd year, 4th clinical rotation	0.00 (0.00–0.00)	0.65 (0.25–1.06)	0.001

Legend: PIs, pressure injuries.
I, II, III and IV stage [26].

patients' implications. Therefore, more efforts should be taken to provide appropriate knowledge in recommended treatments, as well as strategies to promote self-confidence.

The opportunities to learn about PI risk assessment and prevention declined during the pandemic from those experienced before COVID-19,

while opportunities to learn about pressures management remained stable. Considering the relevance of prevention, these findings are alarming, as students seem to focus on managing PIs rather than prevention. More studies are needed to corroborate the findings emerged and establishing underlying factors in order also to design tailored

Table 5

Correlation matrix: learning occasions as documented in the *Student Portfolio of Skills*, knowledge/attitudes as assessed with PUKAT-IT/APuP-IT and perceived preparedness as reported by students at the time of graduation.

Variables	Assessing the risk of PIs by using validated tools - total	Implementing interventions to prevent PIs - total	Assessing the stage and managing PIs I stage - total	Assessing the stage and managing PIs II stage - total	Assessing the stage and managing PIs III stage - total	Assessing the stage and managing PIs IV stage - total	Total PUKAT-IT	Total APuP-IT	Do you feel prepared to assess the risk of PIs?	Do you feel prepared to manage the risk of PIs?
Assessing the risk of PIs by using validated tools	1.000	0.539 ^b	0.411 ^b	0.482 ^b	0.403 ^b	0.389 ^b	-0.081	-0.055	0.023	-0.001
Implementing interventions to prevent PIs		1.000	0.402 ^b	0.459 ^b	0.312 ^b	0.291 ^b	-0.043	-0.019	0.034	-0.135
Assessing the stage and managing PIs – I stage			1.000	0.663 ^b	0.539 ^b	0.415 ^b	-0.114	-0.005	-0.069	-0.124
Assessing the stage and managing PIs – II stage				1.000	0.637 ^b	0.477 ^b	-0.057	-0.054	-0.047	-0.143
Assessing the stage and managing PIs – III stage					1.000	0.527 ^b	-0.059	0.046	0.041	-0.094
Assessing the stage and managing PIs – IV stage						1.000	-0.033	0.024	0.039	-0.038
Total PUKAT-IT							1.000	0.173 ^a	0.165	0.026
Total APuP-IT								1.000	0.231 ^b	0.035
Do you feel prepared to assess the risk of PIs?									1.000	0.418 ^b
Do you feel prepared to manage PIs?										1.000

Legend: PIs, pressure injuries; PUKAT-IT, Pressure Ulcer Knowledge Assessment Tool – Italian version; APuP-IT, Attitude Toward Pressure Ulcer Prevention – Italian version.

I, II, III and IV stage [26].

^a p = 0.05.

^b p = 0.01.

strategies. However, it is recommended that educators design new methodologies to compensate the lacks emerged by promoting PIs attractiveness among students (e.g., virtual reality, gaming) and shifting the focus from the management of PIs to their effective prevention.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jtv.2024.08.012>.

References

- [1] Edsberg LE, Black JM, Goldberg M, McNichol L, Moore L, Sieggreen M. Revised national pressure ulcer advisory panel pressure injury staging system: revised pressure injury staging system. *J Wound, Ostomy Cont Nurs* 2016;43:585–97. <https://doi.org/10.1097/WON.0000000000000281>.
- [2] Gao MM, Wang LP, Zhang LL, Li YY. The effects of evidence-based nursing interventions on pressure ulcers in patients with stroke: a meta-analysis. *Int Wound J* 2023;20:4069–76. <https://doi.org/10.1111/iwj.14298>.
- [3] Li Z, Lin F, Thalib L, Chaboyer W. Global prevalence and incidence of pressure injuries in hospitalised adult patients: a systematic review and meta-analysis. *Int J Nurs Stud* 2020;1(105):103546. <https://doi.org/10.1016/j.jnurstu.2020.103546>.
- [4] Tayyib N, Coyer F, Lewis P. Saudi Arabian adult intensive care unit pressure ulcer incidence and risk factors: a prospective cohort study. *Int Wound J* 2016;13(5):912–9. <https://doi.org/10.1111/iwj.12406>.
- [5] Burston A, Miles SJ, Fulbrook P. Patient and carer experience of living with a pressure injury: a meta-synthesis of qualitative studies. *J Clin Nurs* 2023;32:3233–47. <https://doi.org/10.1111/jocn.16431>.
- [6] Kwok AC, Simpson AM, Willcockson J, Donato DP, Goodwin IA, Agarwal JP. Complications and their associations following the surgical repair of pressure ulcers. *Am J Surg* 2018;216:1177–81. <https://doi.org/10.1016/j.amjsurg.2018.01.012>.
- [7] Zarei E, Madarshahian E, Nikkhar A, Khodakarim S. Incidence of pressure ulcers in intensive care units and direct costs of treatment: evidence from Iran. *J Tissue Viability* 2019;28:70–4. <https://doi.org/10.1016/j.jtv.2019.02.001>.
- [8] Labeau SO, Afonso E, Benbenishty J, Blackwood B, Boulanger C, Brett SJ, Calvino-Gunther S, Chaboyer W, Coyer F, Deschepper M, François G, Honore PM, Jankovic R, Khanna AK, Llauro-Serra M, Lin F, Rose L, Rubulotta F, Saager L, Williams G, Blot SI, DecubICUs Study Team; European Society of Intensive Care Medicine (ESICM) Trials Group Collaborators. Correction to: prevalence, associated factors and outcomes of pressure injuries in adult intensive care unit patients: the DecubICUs study. *Intensive Care Med* 2021;47:503–20. <https://doi.org/10.1007/s00134-020-06327-5>.
- [9] Tian J, Liang XL, Wang HY, Peng SH, Cao J, Liu S, Tao YM, Zhang XG. Nurses' and nursing students' knowledge and attitudes to pressure injury prevention: a meta-analysis based on APUP and PUKAT. *Nurse Educ Today* 2023;128:105885. <https://doi.org/10.1016/j.nedt.2023.105885>.
- [10] Beeckman D, Vanderwee K, Demarré L, Paquay L, Van Hecke A, Defloor T. Pressure ulcer prevention: development and psychometric validation of a knowledge assessment instrument. *Int J Nurs Stud* 2010;47:399–410. <https://doi.org/10.1016/j.jnurstu.2009.08.010>.
- [11] Beeckman D, Defloor T, Demarré L, Van Hecke A, Vanderwee K. Pressure ulcers: development and psychometric evaluation of the attitude towards pressure ulcer prevention instrument (APuP). *Int J Nurs Stud* 2010;47:1432–41. <https://doi.org/10.1016/j.jnurstu.2010.04.004>.

- [12] Alanazi FK, Sim J, Lapkin S. Systematic review: nurses' safety attitudes and their impact on patient outcomes in acute-care hospitals. *Nurs Open* 2022;9:30–43. <https://doi.org/10.1002/nop.2.1063>.
- [13] Usher K, Woods C, Brown J, Power T, Lea J, Hutchinson M, Mather C, Miller A, Saunders A, Mills J, Zhao L, Yates K, Bodak M, Southern J, Jackson D. Australian nursing students' knowledge and attitudes towards pressure injury prevention: a cross-sectional study. *Int J Nurs Stud* 2018;81:14–20. <https://doi.org/10.1016/j.ijnurstu.2018.01.015>.
- [14] Kısacık ÖG, Sönmez M. Pressure ulcers prevention: Turkish nursing students' knowledge and attitudes and influencing factors. *J Tissue Viability* 2020;29:24–31. <https://doi.org/10.1016/j.jtv.2019.11.003>.
- [15] Hermis AH, Mollaei A, Ghorbani Vajargah P, Karkhah S, Takasi P, Firooz M, Hosseini SJ, Alizadeh Otaghvar H, Raziani Y. A systematic review of nursing students' attitude and related factors towards pressure ulcer prevention. *Int Wound J* 2023;20:3404–16. <https://doi.org/10.1111/iwj.14191>.
- [16] Li J, Zhu C, Liu Y, Li Z, Sun X, Bai Y, Song B, Jin J, Liu Y, Wen X, Cheng S, Wu X. Critical care nurses' knowledge, attitudes, and practices of pressure injury prevention in China: a multicentric cross-sectional survey. *Int Wound J* 2023;20:381–90. <https://doi.org/10.1111/iwj.13886>.
- [17] Chuang ST, Liao PL, Lo SF, Chang YT, Hsu HT. Effectiveness of an E-book app on the knowledge, attitudes and confidence of nurses to prevent and care for pressure injury. *Int J Environ Res Publ Health* 2022;19:15826. <https://doi.org/10.3390/ijerph192315826>.
- [18] Decreto del Presidente del Consiglio dei Ministri 10 aprile 2020. Ulteriori disposizioni attuative del decreto legge 25 marzo 2020, n. 19, recante misure urgenti per fronteggiare l'emergenza epidemiologica da COVID 19, applicabili sull'intero territorio nazionale. <http://www.gazzettaufficiale.it/eli/id/2020/03/08/20A01522/sg>. [Accessed 14 July 2024].
- [19] Lee J, Choi J, Kim J, Lee K. The relationship between on-site clinical practice, nursing professional value, and nursing clinical self-efficacy during COVID-19: a cross-sectional study. *J Multidiscip Healthc* 2023;16:4163–72. <https://doi.org/10.2147/JMDH.S443247>.
- [20] Song MK, Kim JS. Achieving nursing students' clinical practice hours during the COVID-19 pandemic: effects of alternative and nonstandard practicum methods. *Int J Nurs Pract* 2023;29:e13142. <https://doi.org/10.1111/ijn.13142>.
- [21] Alexandraki I, Walsh KJ, Ratcliffe T, Onumah C, Szauter K, Curran C, Osman N, Lai CJ, DeWaay D, Duca NS, Weinstein A, Ismail N, Jacob J, Kisielski M, Pincavage AT. Innovation and missed opportunities in internal medicine undergraduate education during COVID-19: results from a national survey. *J Gen Intern Med* 2022;37:2149–55. <https://doi.org/10.1007/s11606-022-07490-9>.
- [22] Crismon D, Mansfield KJ, Hiatt SO, Christensen SS, Cloyes KG. COVID-19 pandemic impact on experiences and perceptions of nurse graduates. *J Prof Nurs* 2021;37:857–65. <https://doi.org/10.1016/j.profnurs.2021.06.008>.
- [23] Morse JM. Principles of mixed methods. *Handbook of mixed methods in social & behavioral research*. Newcastle upon Tyne: SAGE; 2003.
- [24] von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, Initiative STROBE. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol* 2008;61:344–9. <https://doi.org/10.1016/j.jclinepi.2007.11.008>.
- [25] Dentice S, Chiappinotto S, Kajander-Unkuri S, Grasseti L, Brugnolli A, Palese A. Perceived competences by graduated nurses before and during COVID-19 restrictions: a repeated cross-sectional study from 2019 to 2022. *Nurse Educ Pract* 2024;78:104019. <https://doi.org/10.1016/j.nepr.2024.104019>.
- [26] European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. In: Haesler Emily, editor. *Prevention and treatment of pressure ulcers/injuries: quick reference guide*. EPUAP/NPIAP/PPPIA; 2019.
- [27] Simonetti V, Comparcini D, Flacco ME, Di Giovanni P, Cicolini G. Nursing students' knowledge and attitude on pressure ulcer prevention evidence-based guidelines: a multicenter cross-sectional study. *Nurse Educ Today* 2015;35:573–9. <https://doi.org/10.1016/j.nedt.2014.12.020>.
- [28] European Commission. EUSurvey. <https://ec.europa.eu/eusurvey/home/welcome>. [Accessed 14 July 2024].
- [29] Sijtsma K, van der Ark LA. A tutorial on how to do a Mokken scale analysis on your test and questionnaire data. *Br J Math Stat Psychol* 2017;70:137–58. <https://doi.org/10.1111/bmsp.12078>.
- [30] Carolan C, Davies CL, Crookes P, McGhee S, Roxburgh M. Covid 19: disruptive impacts and transformative opportunities in undergraduate nurse education. *Nurse Educ Pract* 2020;46:102807. <https://doi.org/10.1016/j.nepr.2020.102807>.
- [31] Ursavaş FE, İşeri Ö. Effects of education about prevention of pressure ulcer on knowledge and attitudes of nursing students. *J Tissue Viability* 2020;29:331–6. <https://doi.org/10.1016/j.jtv.2020.06.006>.
- [32] Visiers-Jiménez L, Palese A, Brugnolli A, Cadorní L, Salminen L, Leino-Kilpi H, Löyttyniemi E, Nemcová J, Simão de Oliveira C, Rua M, Zeleníková R, Kajander-Unkuri S. COMPEUnurse-Consortium. Nursing students' self-directed learning abilities and related factors at graduation: a multi-country cross-sectional study. *Nurs Open* 2022;9:1688–99. <https://doi.org/10.1002/nop.2.1193>.
- [33] Kajander-Unkuri S, Koskinen S, Brugnolli A, Cerezuela Torre M, Elonen I, Kiele V, Lehwaldt D, Löyttyniemi E, Nemcová J, de Oliveira CS, Palese A, Rua M, Salminen L, Šateková L, Stubner J, Sveinsdóttir H, Visiers-Jiménez L, Leino-Kilpi H. The level of competence of graduating nursing students in 10 European countries-Comparison between countries. *Nurs Open* 2021;8(3):1048–62. <https://doi.org/10.1002/nop.2.712>.
- [34] Hertog RD, Boshuizen HPA. Learning professional knowledge: bachelor nursing students' experiences in learning and knowledge quality outcomes in a competence-based curriculum. *Vocat Learn* 2021;15:21–47. <https://doi.org/10.1007/s12186-021-09274-4>.
- [35] Purabdollah M, Zamanzadeh V, Ghahramanian A, Valizadeh L, Mousavi S, Ghasempour M. Competency gap among graduating nursing students: what they have achieved and what is expected of them. *BMC Med Educ* 2024;24:546. <https://doi.org/10.1186/s12909-024-05532-w>.
- [36] Cullen Gill E, Moore Z. An exploration of fourth-year undergraduate nurses' knowledge of and attitude towards pressure ulcer prevention. *J Wound Care* 2013;22:618–22. <https://doi.org/10.12968/jowc.2013.22.11.618>.
- [37] Dalvand S, Ebadi A, Gheshlagh RG. Nurses' knowledge on pressure injury prevention: a systematic review and meta-analysis based on the Pressure Ulcer Knowledge Assessment Tool. *Clin Cosmet Invest Dermatol* 2018;11:613–20. <https://doi.org/10.2147/CCID.S186381>.
- [38] Wu J, Wang B, Zhu L, Jia X. Nurses' knowledge on pressure ulcer prevention: an updated systematic review and meta-analysis based on the Pressure Ulcer Knowledge Assessment Tool. *Front Public Health* 2022;10:964680. <https://doi.org/10.3389/fpubh.2022.964680>.
- [39] Flynn S, Kirwan E, MacGilchrist C, McIntosh C. The impact of COVID-19 on the care of diabetic foot ulcers: a scoping review. *J Tissue Viability* 2024;S0965–206X (24). <https://doi.org/10.1016/j.jtv.2024.06.016>. 00091-3.
- [40] Sterner A, Eklund A, Nilsson MS. Prepared to learn but unprepared for work: a cross sectional survey study exploring the preparedness, challenges, and needs of newly graduated nurses entering a hospital-based transition program. *Nurse Educ Pract* 2023;72:103782. <https://doi.org/10.1016/j.nepr.2023.103782>.
- [41] Dziurka M, Machul M, Ozdoba P, Obuchowska A, Kotowski M, Grzegorzczak A, Pydys A, Dobrowolska B. Clinical training during the COVID-19 pandemic: experiences of nursing students and implications for education. *Int J Environ Res Publ Health* 2022;19:6352. <https://doi.org/10.3390/ijerph19106352>.
- [42] Beeckman D, Defloor T, Schoonhoven L, Vanderwee K. Knowledge and attitudes of nurses on pressure ulcer prevention: a cross-sectional multicenter study in Belgian hospitals. *Worldviews Evidence-Based Nurs* 2011;8:166–76. <https://doi.org/10.1111/j.1741-6787.2011.00217.x>.
- [43] Tognoni G. Opportunità-priorità di innovazione metodologica nel tempo dopo Covid [Methodological challenges for proactive post-Covid care strategies]. *Assist Inferm Ric AIR* 2023;42(1):33–5. <https://doi.org/10.1702/4023.39984>.
- [44] Bassi E, Dal Molin A, Brugnolli A, Canzan F, Clari M, De Marinis MG, Dimonte V, Ferri P, Fonda F, Lancia L, Latina R, Poli ZG, Rea T, Saiani L, Palese A. Transitare la formazione infermieristica italiana nel periodo post pandemico: le priorità alla luce delle lezioni apprese [Transitioning Italian nursing education in the post-pandemic period: priorities in the light of lessons learnt]. *Assist Inferm Ric AIR* 2023;42(1):4–11. <https://doi.org/10.1702/4023.39981>.