

# Status of Nursing Students About Identifying Pressure Injury Risk Factors

## Hemşirelik Öğrencilerinin Basınç Yaralanması Risk Faktörlerini Belirleyebilme Durumları

Seher ÜNVER<sup>a</sup>, Ümmühan ARSLAN<sup>b</sup>, Sibel DEMİRÇİ<sup>c</sup>, Hüsna CEBECİ<sup>d</sup>

<sup>a</sup>Trakya University Faculty of Health Sciences, Department of Surgical Nursing, Edirne, TURKEY

<sup>b</sup>Koç University Hospital, 2B Service, İstanbul, TURKEY

<sup>c</sup>Trakya University Faculty of Health Sciences, Department of Nursing, Edirne, TURKEY

<sup>d</sup>Koç University Hospital, Emergency Service, İstanbul, TURKEY

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**ABSTRACT Objective:** To explore the status of nursing students about identifying the pressure injury risk factors in a case scenario. **Material and Methods:** This descriptive study was carried out with 489 volunteered nursing students of a university between 5-26 May, 2017. For data collection, student information form including a case scenario was used. Students were instructed to read the case scenario carefully and write down the case-related pressure injury risk factors that they noticed. The data were evaluated using the mean, percentage, standard deviation, Mann-Whitney U, Kruskal-Wallis H and Chi-square tests. **Results:** The rate of students who wrote case-related risk factors was 97.75% and the mean number of case-related risk factors written by nursing students was 7.40±3.83 among 20 risk factors. Students who had additional education and training experience on pressure injury care had written significantly more case-related risk factors than who had not (p<0.05). **Conclusion:** Although the rate of students who wrote risk factors was high, number of case-related risk factors identified by students was found to be insufficient. Taking additional education and training about pressure injury care helped students to identify pressure injury risk factors. It is recommended to reinforce the theoretical knowledge of especially 1<sup>st</sup> and 2<sup>nd</sup> years nursing students about pressure injury risk factors with clinical practices.

**ÖZET Amaç:** Bu çalışma, hemşirelik öğrencilerinin vaka senaryosundaki basınç yaralanması risk faktörlerini belirleyebilme durumlarını değerlendirmeyi amaçlamıştır. **Gereç ve Yöntemler:** Bu tanımlayıcı çalışma, 5-6 Mayıs 2017 tarihleri arasında bir üniversitenin hemşirelik bölümündeki gönüllü 489 öğrenciyle yürütüldü. Veri toplama, vaka senaryosu içeren bir öğrenci bilgi formu kullanıldı. Öğrencilerden, vaka senaryosunu dikkatlice okumaları ve tespit ettikleri vaka-ilişkili basınç yaralanması risk faktörlerini forma yazmaları istendi. Veriler ortalama, yüzde, standart sapma, Mann-Whitney U, Kruskal-Wallis H ve Ki-kare testleri kullanılarak değerlendirildi. **Bulgular:** Vaka-ilişkili basınç yaralanması risk faktörü yazan öğrencilerin oranı %97,75 idi ve vakada verilen 20 farklı basınç yaralanması risk faktöründen öğrenciler tarafından yazılanların ortalaması 7,40±3,83 idi. Basınç yaralanması bakımı konusunda ders alan ve bakım deneyimi olan öğrencilerin, ders almayan ve deneyimi olmayan öğrencilerden istatistiksel olarak anlamlı derecede daha fazla vaka-ilişkili basınç yaralanması risk faktörü yazdığı belirlendi (p<0,05). **Sonuç:** Her ne kadar vaka-ilişkili risk faktörleri yazan öğrencilerin oranı yüksek olsa da, öğrencilerin belirlediği risk faktörlerinin sayısı yetersiz bulundu. Basınç yaralanması konusunda ek eğitim almanın ve bakım vermenin öğrencilerin basınç yaralanması risk faktörlerini belirlemelerine yardımcı olduğu görüldü. Özellikle 1. ve 2. sınıf hemşirelik öğrencilerinin basınç yaralanması risk faktörleri hakkındaki teorik bilgilerin klinik uygulamalarla pekiştirilmesi önerilir.

**Keywords:** Nursing students; pressure injury; risk factors

**Anahtar Kelimeler:** Hemşirelik öğrencileri; basınç yaralanması; risk faktörleri

Pressure injuries (PIs) still remain a problem in contemporary healthcare systems and result in complications or prolong hospital stays with increasing

the healthcare costs.<sup>1,2</sup> As the prevalence rates of PIs vary according to patient populations, its prevalence in Turkey ranges from 2.1% to 10.4%.<sup>3,4</sup> According to

**Correspondence:** Seher ÜNVER

Trakya University Faculty of Health Sciences, Department of Surgical Nursing, Edirne, TURKEY/TÜRKİYE

**E-mail:** seher.unver@hotmail.com



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a study conducted in a surgical intensive care unit, the pressure injury (PI) prevalence was found as 20.5%.<sup>5</sup> In a study conducted in Boali, Iran, 45.7% of patients in a cardiac intensive care unit (ICU) had developed PI.<sup>6</sup> A recent study from Saudi Arabia reported the PI prevalence to be 35.7% for critical care unit.<sup>7</sup> According to a recently reported systematic review and meta-analysis, the PI prevalence was 16.9–23.8% among ICU patients and 12–18% among all hospitalized patients.<sup>8</sup> Although the prevalence and incidence of PIs in Turkey and abroad are still unacceptably high, PIs are avoidable when adequate preventive care is given. It is essential to determine the knowledge and attitude of nurses in prevention of PIs, as they have a key role in providing preventive care and PIs are accepted to influence the outcomes of nursing care.<sup>9–11</sup>

In the literature, knowledge of nurses about PI prevention was reported to be inadequate.<sup>12</sup> At Demarre et al.'s study, knowledge score of nurses about PI risk assessment was only 58%.<sup>13</sup> Studies conducted in Turkey also showed that there was a lack of sufficient knowledge among nurses about preventing PIs.<sup>14,15</sup> In addition, with the efforts about educating nurses, the incidence of PIs could be reduced.<sup>16</sup> In a study conducted in Belgium detected that nurses with postgraduate education had better PI prevention knowledge than undergraduate nurses.<sup>12</sup> Because some nurses believe that they did not take enough undergraduate nursing education about PI prevention, it is important to establish a strong baseline knowledge regarding PI prevention among nursing students. According to a literature review that examined what nurses were taught among their undergraduate nursing education about PIs, use of pressure redistribution cushions were seen to be taught to 61% of the respondents and important content was found as missing in the curricula of nursing faculties in the US.<sup>17</sup>

In Turkey, nursing students have to complete a 4-year bachelor degree at university to become a registered nurse. They gain theoretical knowledge among their undergraduate education and also put this knowledge into practice during their clinical trainings. At the university the present study was conducted, lectures about prevention and nursing care in PIs are given during the basic nursing lectures such as

fundamental nursing, medical-surgical nursing, child health nursing, women's health nursing, mental health nursing, public health nursing with based on lecturer's curricula. It is given lengthier in surgical nursing mandatory lecture among 2<sup>nd</sup> year and in stoma and wound care nursing optional lecture in 3<sup>rd</sup> year.

As known, knowledge about PI care is significantly correlated with attitudes towards PI prevention. It is mostly the responsibility of nursing educational institutions to provide the necessary knowledge of students as they are the future's nursing generation and raise their caring attitudes with practices among the undergraduate program.<sup>18–21</sup> So, nursing programs should ensure that nursing students receive sufficient knowledge for PI description and prevention. To examine this, it is important to evaluate nursing students' status of knowing the PI care and risk factors. However, in literature, few studies explored the knowledge of nursing students about PI prevention and no adequate research is available in Turkey.<sup>10,22–24</sup> According to Gunningberg et al.'s study, there was a knowledge deficit about PI prevention among nursing students in Sweden.<sup>10</sup> Two studies from Australia identified deficits and low scores in PI knowledge among nursing students and assistants.<sup>22,23</sup> In a qualitative study, it was found that nursing students had little interest in PI prevention.<sup>24</sup> Therefore there is a need to search the status of nursing students about prevention of PIs.

Considering the knowledge, the purpose of this study was to explore the status of nursing students about identifying the PI risk factors in a case scenario.

## MATERIAL AND METHODS

### STUDY DESIGN AND SAMPLE

A descriptive study design was performed with nursing students from the bachelor nursing program of a university at Eastern Thrace of Turkey. A total of 567 nursing students from 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> education years were enrolled in the study in the spring term of the 2016–2017 academic year. No sampling was performed and 489 students completed the data collection tool, for an overall response rate of 86.2%. Students who were volunteer and at their class at-

tending to their lecture on the day of data collection were included in this study.

### DATA COLLECTING FORMS

For data collection, a student information form including a case scenario was used. This form comprised 7 questions, 3 were about introductory features of the students and 4 were related to PI experiences (whether students received stoma and wound care nursing lecture at school, received a PI education outside the school, encountered a patient with PI and had the experience of PI care during clinical trainings) of the nursing students. At the bottom of these questions, a box was created as shown in Table 1 and the case-related PI risk factors block was left blank for students to write down the risk factors they find.

The case scenario was prepared on the basis of knowledge obtained from two different nursing diagnosis books and “Prevention and Treatment of Pressure Ulcers: Quick Reference Guide”.<sup>25-28</sup> Afterwards, it was controlled via an expert on wound care from surgical nursing field. Among this case scenario, a complicated patient sample that has 20 PI risk factors

was created. If the risk factors were written by the students, they were evaluated as “case-related PI risk factors”. An example of this case scenario including the list of case-related PI risk factors is depicted in Table 1. The scenario was reviewed several times and pre-tried out on 5 nursing students (not included in the sample) in order to find out if there were any complex sentences or misunderstandings. After the corrections had been completed, data were collected at the end of the spring term between 5 and 26 May, 2017 in order to enable all students to complete their education year with acquiring their knowledge and skills in their basic nursing lectures such as fundamental nursing, medical-surgical nursing, child health nursing etc.

### INTERVENTIONS

All the students who were at their class attending to their lecture on the day of data collection were invited to participate in this study. The student information form including the case scenario was given to the students by the researchers. Students were instructed to complete the data collection tool individually, read

**TABLE 1:** Case scenario with the list of case-related pressure injury risk factors.

Case scenario	Case-related pressure injury risk factors
M.Y., 75 years old male patient with type I diabetes mellitus weighed 117 kg, had a height of 1.72 m was operated for brain tumor 3 days ago. He did not stop smoking before the surgery. His operation lasted approximately 8 hours in the same position and blood pressure dropped to 70/40 mmHg twice during the operation. After the surgery, he was transferred to the neurosurgery intensive care unit and stayed one day. During this day, he was kept in the 60° tilted lying position and it was changed once. His back was observed as wet during the position change. There were urinary and fecal incontinence and Glasgow coma scale score was 6. On the second postoperative day, he was admitted to the neurosurgery service and laid on a foam mattress with using a ring cushion under the coccyx. His body temperature was 38.3 °C and he was unable to clear secretions. Physicians allowed him to be mobilized on the morning of 3 <sup>rd</sup> postoperative day but he was mobilized in the evening. At this time, it was observed that bed sheets were wrinkled and wet. There was also a syringe lid forgotten in the bed. Blood values were as follows: albumin 0.90 g/dl, hemoglobin 7.2%, hematocrit 28%, C-reactive protein 0.20 mg/l, magnesium 1.8 mg/dl.	<ol style="list-style-type: none"> <li>1. Advanced age</li> <li>2. High body mass index</li> <li>3. Type 1 diabetes mellitus</li> <li>4. Long surgery duration</li> <li>5. Smoking</li> <li>6. Hypotensive attack during the surgery-hypoxia</li> <li>7. 60° tilted lying position with poor position change</li> <li>8. Over skin moisture</li> <li>9. Low Glasgow coma scale score</li> <li>10. Urinary and fecal incontinence</li> <li>11. Foam mattress</li> <li>12. Usage of ring cushion</li> <li>13. Late mobilization</li> <li>14. Hyperthermia</li> <li>15. Inadequate airway clearance</li> <li>16. Wrinkled bed sheet</li> <li>17. Wet bad sheet</li> <li>18. Syringe lid in the bed</li> <li>19. Hypoalbuminemia</li> <li>20. Decreased hemoglobin and hematocrit levels</li> </ol>

the case scenario carefully and write down the PI risk factors that they noticed. Time to complete the data collection took approximately 20-30 minutes.

### ETHICAL CONSIDERATION

The study was approved by the Ethics Committee of the Faculty of Medicine at Trakya University (08/16-131/2017) and by the directory of nursing department (03.05.17/15). Verbal consents of the volunteer nursing students were obtained before the data collection form was delivered and this study was carried out in accordance with the Helsinki Declaration Principles. All nursing students were free to drop from this study and no more academic points were given them for attending this study.

### DATA ANALYSIS

The data were analyzed with SPSS 21.0 package program (IBM, Inc., Armonk, NY, USA). The introductory features and PI experiences of the students were evaluated using the mean, standard deviation and percentage. The data of this study was not normally distributed and non-parametric analyses were performed. The introductory features of the students and the mean number of case-related PI risk factors were compared by using the Kruskal-Wallis H and Mann-Whitney U tests. The Tamhane's 2 post-hoc test was used to evaluate the difference of mean case-related PI risk factors between education years. A p value of <0.05 was accepted as statistically significant.

### RESULTS

Mean age of the students was  $20.78 \pm 1.73$  years, 86.5% were female and 26% were at 4<sup>th</sup> education years. Of them, 69.1% had not received any stoma and wound care nursing lecture, and 27 students had received PI education outside their school. Three hundred and five of the students had encountered a patient with PI among observations or practices during the clinical trainings and 275 students had no experience of PI care. The introductory features of students are summarized in Table 2.

The number of the students who wrote case-related PI risk factors was 478 (97.75%) and wrote 10 and lower case-related PI risk factors were 406

(83%). The median number of case-related PI risk factors written by the students was 7 (min-max 0-20) and the mean number was  $7.40 \pm 3.83$  (Table 2). The mean number of case-related PI risk factors was statistically higher among the 3<sup>rd</sup> year students than the other students at 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> education years ( $p < 0.05$ ). Students who had additional education and training experience on PI care had written more case-related PI risk factors than who had not and this difference was statistically significant ( $p < 0.05$ ) (Table 2). There were significant differences for the mean case-related PI risk factors between education years and the results of post-hoc tests were presented in Table 3.

According to education years, the most written case-related PI risk factor was wrinkled bed sheet among 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> years and poor position change among 3<sup>rd</sup> years. Wrinkled bed sheet was the most written case-related PI risk factor among all students with the rate of 71.4% and the least written one was insufficient airway with the rate of 4.5% (Table 4).

### DISCUSSION

In this study, the status of nursing students about identifying the PI risk factors was described. According to the study findings, the rate of the students who wrote case-related PI risk factors was 97.75% and students wrote mean  $7.40 \pm 3.83$  case-related PI risk factors. Similarly in a study conducted by Simonetti to assess the knowledge of student nurses on PI prevention, 52.8% of them were able to perform PI risk assessment.<sup>21</sup> Fullbrook et al. searched nursing students' and nursing assistants' knowledge of PI prevention and found it as 65% reflecting an unsatisfactory level.<sup>22</sup> Usher et al. also reported that only 23% of nursing students had a mean PI prevention knowledge score above 60%.<sup>23</sup> In their study, Rafiei et al. searched the knowledge level of nursing students and found it insufficient.<sup>29</sup> These results show that nursing students' knowledge about PI risk assessment and prevention is inadequate. For the present study, the reason may be the case-scenario was complicated and students were not informed about the amount of the risk factors hint in the scenario. So that, they wrote only the risk-factors they realized and did not force themselves to

**TABLE 2:** The introductive features of students with the relations between mean number of case-related PI risk factors.

Introductive features	n (%)	PI Risk factors	Medians	Test
		Mean $\pm$ SD	(min-max)	
<b>Gender</b>				
Female	423 (86.5)	7.07 $\pm$ 3.95	7 (0-20)	Z = -2.354
Male	66 (13.5)	6.06 $\pm$ 3.77	5 (0-16)	<b>p = 0.019<sup>a</sup></b>
<b>Education year</b>				
1 <sup>st</sup> year	124 (25.4)	3.66 $\pm$ 2.48	4 (0-14)	$\chi^2 = 140.173$ <b>p &lt; 0.001<sup>b</sup></b>
2 <sup>nd</sup> year	115 (23.5)	7.24 $\pm$ 2.75	7 (2-16)	
3 <sup>rd</sup> year	123 (25.2)	8.95 $\pm$ 4.71	8 (0-20)	
4 <sup>th</sup> year	127 (26.0)	7.89 $\pm$ 3.20	8 (0-15)	
<b>Receiving stoma and wound care nursing lecture</b>				
Yes	151 (30.9)	9.53 $\pm$ 3.92	9 (2-20)	Z = -9.187
No	338 (69.1)	5.77 $\pm$ 3.35	6 (0-16)	<b>p &lt; 0.001<sup>a</sup></b>
<b>Receiving PI education outside school</b>				
Yes	27 (5.5)	5.22 $\pm$ 3.12	6 (0-13)	Z = -2.385
No	462 (94.5)	7.03 $\pm$ 3.96	7 (0-20)	<b>p = 0.017<sup>a</sup></b>
<b>Encountering a patient with PI</b>				
Yes	305 (62.4)	8.13 $\pm$ 3.69	7 (0-20)	Z = -9.001
No	184 (37.6)	4.95 $\pm$ 3.51	4 (0-19)	<b>p &lt; 0.001<sup>a</sup></b>
<b>Experience of PI care</b>				
Yes	214 (43.8)	8.46 $\pm$ 3.66	8 (0-20)	Z = -7.757
No	275 (56.2)	5.75 $\pm$ 3.74	5 (0-19)	<b>p &lt; 0.001<sup>a</sup></b>
<b>Case-related PI risk factors</b>				
10 and lower	406 (83)	5.60 $\pm$ 2.72	6 (0-10)	Z = -14.416
More than 10	83 (17)	13.44 $\pm$ 2.05	13 (11-20)	<b>p &lt; 0.001<sup>a</sup></b>
<b>Total</b>	489 (100)	7.40 $\pm$ 3.83	6 (0-20)	

<sup>a</sup>: Mann-Whitney U test; <sup>b</sup>: Kruskal Wallis-H test; PI: Pressure injury.

find more. It may be useful to present case-scenarios to the students as relevant materials about lecture subjects.

Among data collection, nursing students in this study were at the last month of their education year in order to enable them acquiring their knowledge and skills in their basic nursing lectures. Although all students were undergoing education, it was not expected to have the same knowledge of PI care. The present findings showed that, 3<sup>rd</sup> year students wrote statistically more case-related PI risk factors than the other students in 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> education years. Similarly, in a study from Italy, 3<sup>rd</sup> year students were willing to provide higher attitude on PI prevention than the other students.<sup>21</sup> Another study from Belgium, Meyer et al. searched for the knowledge of nurses and nursing assistants' about PI prevention and

**TABLE 3:** Post-hoc test results of mean case-related pressure injury risk factors between education years.

Education years	Mean difference (I-J)	Standard error	p
1 <sup>st</sup> year-2 <sup>nd</sup> years	-3.57412	0.34008	<b>&lt; 0.001</b>
1 <sup>st</sup> year-3 <sup>rd</sup> years	-5.28999	0.47977	<b>&lt; 0.001</b>
1 <sup>st</sup> year-4 <sup>th</sup> years	-4.22828	0.36143	<b>&lt; 0.001</b>
2 <sup>nd</sup> years-3 <sup>rd</sup> years	-1.71587	0.49650	<b>0.004</b>
2 <sup>nd</sup> years-4 <sup>th</sup> years	-0.65416	0.38336	0.429
3 <sup>rd</sup> years-4 <sup>th</sup> years	1.06171	0.51135	0.213

reported that higher levels of education was associated with higher knowledge scores.<sup>30</sup> They also advised to search the nursing education curricula to expose the knowledge gaps. As known, education is an ongoing process; it is expected to develop students' knowledge and behaviors in time. In this study,

**TABLE 4:** Case-related pressure injury risk factors written by students.

Risk factors	1 <sup>st</sup> year n (%)	2 <sup>nd</sup> year n (%)	3 <sup>rd</sup> year n (%)	4 <sup>th</sup> year n (%)	Total n (%)*	p**
Wrinkled bed sheet	62 (17.8)	88 (25.2)	91(26.1)	108 (30.9)	349 (71.4)	< 0.001
Poor position change	49 (15.1)	78 (24.0)	93 (28.6)	105 (32.3)	325 (66.5)	< 0.001
Type 1 DM	28 (10.7)	81 (30.9)	78 (29.8)	75 (28.6)	262 (53.7)	< 0.001
Over skin moisture	49 (18.8)	53 (20.4)	79 (30.4)	79 (30.4)	260 (53.2)	< 0.001
High body mass index	31 (12.9)	80 (33.2)	68 (28.2)	62 (25.7)	241 (49.3)	< 0.001
Wet bad sheet	32 (13.9)	60 (26.1)	61(26.5)	77 (33.5)	230 (47.0)	< 0.001
Syringe lid in the bed	47 (21.3)	53 (24.0)	53 (24.0)	68 (30.8)	221 (45.2)	0.090
Long surgery duration	15 (7.5)	56 (27.9)	68 (33.8)	62 (30.8)	201 (41.1)	< 0.001
Incontinence	24 (12.0)	43 (21.5)	73 (36.5)	60 (30.0)	200 (40.9)	< 0.001
Late mobilization	52 (28.0)	33 (17.7)	58 (31.2)	43 (23.1)	186 (38.0)	0.016
Smoking	11 (6.1)	37 (20.6)	73 (40.6)	59 (32.8)	180 (36.8)	< 0.001
Foam mattress	17 (9.7)	32 (18.2)	67 (38.1)	60 (34.1)	176 (36.0)	< 0.001
Advanced age	10 (8.7)	29 (25.2)	54 (47.0)	22 (19.1)	115 (23.5)	< 0.001
Decreased Hb, Htc	12 (12.2)	21 (21.4)	37 (37.8)	28 (28.6)	98 (20.0)	< 0.001
Hyperthermia	2 (2.4)	19 (22.6)	37 (44.0)	26 (31.0)	84 (17.2)	< 0.001
Hypoalbuminemia	2 (3.2)	25 (40.3)	11 (17.7)	24 (38.7)	62 (12.7)	< 0.001
Low GCS score	0 (0)	22 (37.9)	25 (43.1)	11 (19.0)	58 (11.9)	< 0.001
Hypoxia	3 (6.1)	8 (16.3)	29 (59.2)	9 (18.4)	49 (10)	< 0.001
Usage of ring cushion	3 (8.1)	4 (10.8)	26 (70.3)	4 (10.8)	37 (7.6)	< 0.001
Inadequate airway clearance	2 (9.1)	6 (27.3)	10 (45.5)	4 (18.2)	22 (4.5)	0.077

DM: Diabetes mellitus, Hb: Hemoglobin, Htc: Hematocrit; GCS: Glaskow coma scale.

\*: Among all students; \*\*: Chi-square test.

students took lectures about PI care during their education years, and the curricula included lengthier hours for PI and wound care subject in surgical nursing mandatory lecture. Additionally, optional lectures are presented for nurses to take such as stoma and wound care nursing lecture. Students are also trained in the clinics of university hospital according to their main lectures, find the chance to use their PI skills among their trainings on the patients with the guidance of nurses and lecturers. The findings of this study support that to achieve continuous improvement in students' knowledge, it is important to let students to use their educational skills during their education and clinical trainings.

In the study, it was determined that the students who took additional education in or out of school about PI care wrote statistically significantly more case-related PI risk factor than those who did not. According to Silva, students who attended more course periods about PI prevention had greater knowledge in both theoretical and practical training.<sup>31</sup> In a study conducted by Huff, it was determined that PI test re-

sults of the students who attend a 3-hour course with laboratory-assisted practice experience were significantly higher than those who did not receive such a course and training.<sup>32</sup> Tschannen et al. studied the effectiveness of a student-focused intervention on improving the PI staging at a local hospital and found that students who had a Skin Day including clinical experience to assist students about staging PI were better at staging.<sup>33</sup> Several studies also evaluated the effects of existing educational implementation on nurses' PI prevention knowledge and practice.<sup>34,35</sup> Gunningberg et al. also found that PI etiology and causes knowledge of registered nurses was higher than assistant nurses and authors recommended targeted education about PI for nurses in practice.<sup>10</sup> According to a study conducted in Turkey with intensive care unit nurses, the knowledge and practice test scores of nurses regarding PI were significantly increased after an additional education implementation.<sup>36</sup> Gaining additional educations about PI has a developer effect on the knowledge of nursing students. It is recommended to gain the knowledge of PI

care and prevention to the nursing students with adding additional lectures into the undergraduate educational curriculums.

In the study, it was determined that the students who had the experience of PI care among their clinical trainings had written more case-related PI risk factors than who had not. It was also detectable that the case-related PI risk factors were mostly written by the third-year students as because nursing care in PIs is given lengthier in surgical nursing mandatory lecture among 2<sup>nd</sup> year and in stoma and wound care nursing optional lecture in 3<sup>rd</sup> year. In Simonetti's study conducted in Italy, knowledge scores of nursing students about PI prevention was statistically significant when related to education year and training experience.<sup>21</sup> Garrigues et al. examined the attitudes of nursing students toward PI prevention and reported that developing positive attitude was associated with clinical experience of students.<sup>24</sup> Similarly, Dikken et al. searched the knowledge level of nursing students in relation to their education levels and reported that most of the first-year students had insufficient to extremely poor knowledge level.<sup>37</sup> Several studies also underline the importance of clinical experience on developing the competence of nursing students and integrating theory with practice.<sup>38,39</sup> These results show the important effect of observations or practices during the clinical training experiences of nursing students on their theoretical knowledge level. Studies conducted with nurses also found a similar correlation between having an educational background and PI prevention knowledge score.<sup>12,40</sup> At Rocha's study, a statistically significant difference was found between having longer time of service working year and in the increase in PI prevention knowledge among nurses.<sup>41</sup> Thus, the education of nursing students should be supplemented by clinical trainings at bedside with the observation of the lecturers and this may help them to increase their knowledge base.

In the present study, wrinkled bed sheet was the most written case-related PI risk factor among students followed by insufficient repositioning of the patient. In a study that searched nursing students' knowledge on predisposing factors of PIs,

they found that friction was the top response with 90.5% and students cited the importance of preventing the PIs was related with the use of unwrinkled sheets plus patient repositioning.<sup>31</sup> As ring cushions are not recommended for PI prevention, in Lawrence et al.'s study, 39% of the nurses had found it as an effective prevention method.<sup>42</sup> In the present study using ring cushion was also written down as a risk factor by 7.6% of the students. In another study, 18.9% of nursing students knew that "lack of oxygen in the tissue" as an etiological factor of pressure ulcers.<sup>10</sup> This finding was similar in this study and 7.6% of students wrote inadequate airway clearance as a case-related PI risk factor. Also in studies investigating the factors leading to PIs, these factors were stated as the most important PI risk factors.<sup>5,43</sup> Consequently, it is an important finding that nursing students were able to realize and write down the important risk factors related to PI.

#### LIMITATION

Data of this study were collected from a nursing department so findings cannot be generalized to larger nursing student population.

#### CONCLUSION

In conclusion, the number of risk factors identified by students was found to be insufficient. It was noteworthy that, participating additional lectures on stoma and wound care nursing and having clinical experience about PI care influenced the number of case-related PI risk factors written by student nurses.

Results suggested that the theoretical knowledge about PIs of especially 1<sup>st</sup> and 2<sup>nd</sup> year nursing students should be reinforced with clinical practices. Thus, nurse educators that involve both nursing education and clinical trainings of student nurses should play a pivotal role in improving the knowledge on PI prevention and give them opportunities to practice PI care. It is recommended to reinforce the theoretical knowledge of 1<sup>st</sup> and 2<sup>nd</sup> year nursing students about pressure injury risk factors with clinical practices.

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### Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the

potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

### Authorship Contributions

**Idea/Concept:** Seher Ünver, Ümmühan Arslan, Sibel Demirci, Hüsnâ Cebeci; **Design:** Seher Ünver, Ümmühan Arslan, Sibel Demirci, Hüsnâ Cebeci; **Control/Supervision:** Seher Ünver, Ümmühan Arslan; **Data Collection and/or Processing:** Seher Ünver, Ümmühan Arslan, Sibel Demirci, Hüsnâ Cebeci; **Analysis and/or Interpretation:** Seher Ünver, Ümmühan Arslan, Sibel Demirci, Hüsnâ Cebeci; **Literature Review:** Seher Ünver, Ümmühan Arslan, Sibel Demirci, Hüsnâ Cebeci; **Writing the Article:** Seher Ünver, Ümmühan Arslan, Sibel Demirci, Hüsnâ Cebeci; **Critical Review:** Seher Ünver, Ümmühan Arslan, Sibel Demirci, Hüsnâ Cebeci.

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