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The effect of internet addiction on surgical nurses' malpractice tendencies: Turkish sample

Elif Gezginci Akpinar^{1*}, Busra Nur Orhan² and Sonay Goktas¹

Abstract

Background This study aimed to determine the effect of surgical nurses' internet addiction on their malpractice tendencies.

Methods The descriptive cross-sectional study included 1051 nurses working in the surgical awards of 10 hospitals in Istanbul. Data were collected using a descriptive characteristics form, the Internet Addiction Scale, and the Malpractice Tendency Scale. An increase in the score on the internet addiction scale indicates that internet addiction increases. In contrast, an increase in the score on the malpractice tendency scale indicates that malpractice tendency decreases. Data were analyzed using independent groups t-test, one-way ANOVA test, Pearson correlation and linear regression analyzes with IBM SPSS Statistics version 22.0 software.

Results A weak negative correlation was found between the surgical nurses' total scores on the Internet Addiction Scale and Malpractice Tendency Scale ($r=-0.422$ $p < 0.001$). Internet addiction total score was also negatively correlated with malpractice tendency subscale scores for medication and transfusion administration safety ($r=-0.450$ $p < 0.001$); infection prevention ($r=-0.416$ $p < 0.001$); patient monitoring, device, and material safety ($r=-0.321$ $p < 0.001$); fall prevention ($r=-0.325$ $p < 0.001$), and communication ($r=-0.332$ $p \leq 0.001$). In linear regression analysis, an increase in internet addiction overall and in the lack of control subscale was associated with greater malpractice tendency ($\beta=-0.422$ and $\beta=-0.243$, respectively). Internet addiction explained a total of 17.7% of the total change in malpractice tendency ($R^2=0.177$).

Conclusion Surgical nurses showed increased malpractice tendency as their internet addiction level increased. This relationship was seen in all domains of malpractice, including medication and transfusion administration safety, infection and fall prevention, communication, and patient monitoring, device, and material safety. It is recommended that in-service training be planned for conscious internet use to limit the time nurses spend on the internet during working hours.

Keywords Addiction, Internet, Malpractice, Nurse, Surgery

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Background

With the introduction of electronic health records, telemedicine, and other online resources, the internet has essential roles in modern healthcare [1]. Nurses are known to frequently use the internet for professional development and to improve patient care [2]. However, although internet-based technologies offer many personal and professional advantages, they can lead to undesirable consequences and internet addiction in some people [3]. These undesirable effects include factors such as spending too much time on the internet, performing poorly, reducing productivity, and reducing face-to-face interaction [4].

The World Health Organization recognizes internet addiction as a significant public health threat [5]. Internet addiction is defined as the uncontrollable desire to use the internet excessively, the feeling that time spent disconnected from the internet is meaningless, excessive irritability when not connected, and the gradual deterioration of professional, social, and family life. It can also be referred to as “pathological internet use” or “problematic internet use” [6]. The negative effects of internet addiction are especially important for health professionals who require manual dexterity and work in stressful environments [7].

Malpractice or medical error refers to harm to the patient resulting from unethical or inappropriate behavior, ignorance, inexperience, carelessness, indifference, or improper treatment during the provision of health services. Malpractice can occur in situations such as disruptions in medical procedures and service delivery, lack of knowledge, and inexperience, and the results can be fatal [8, 9]. Malpractice is a serious issue for all health professionals. The diversity of nurses’ areas of work and their direct involvement in patient care increase their malpractice risk compared to other health professionals [10]. The most common nurse-related malpractices are due to insufficient nursing staff, communication problems, ignoring the advocacy roles of nurses, incomplete patient records, and negligence and failures in implementing care standards [11]. The high workload and difficult working conditions in high-volume surgical units in particular can increase the risk of malpractice by causing stress and fatigue [12, 13]. Surgical clinics are complex and stressful environments where patients are vulnerable and need special attention, high-tech equipment is present, and constant attention is required, so there is a high probability of medical errors in these units. Surgical nurses working in these clinics are expected to think quickly, make quick decisions and work patient-centered within an intense work tempo. The stress and fatigue caused by the intense work tempo and workload increase the risk of surgical nurses making medical errors. Since it is known that surgical nurses play a key role in ensuring

patient safety in the perioperative period, they need to be more careful in terms of malpractice [14, 15].

Although the literature includes various studies on nurses’ internet use [2, 7, 16], we are aware of no study that examines internet addiction and malpractice tendency in surgical nurses and the possible link between them. Therefore, this study aimed to evaluate the relationship between internet addiction and malpractice tendencies in surgical nurses.

Methods

Study design

This research was conducted as a descriptive cross-sectional study in 10 hospitals in Istanbul, Turkey between June 2022 and February 2023. The results are reported in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) directive.

Participants and setting

Participants were selected by snowball sampling method. The snowball sampling method is usually used in individuals with a certain characteristic. Still, in this method, a small number of participants determined at the beginning are encouraged to suggest other suitable individuals. Thus, the sample gradually grows and expands with the growth of a snowball. The data collection phase of the research is completed when data saturation is reached [17]. The sample included 1051 surgical nurses working in the operating rooms ($n=11$) and neurosurgery ($n=115$), surgical intensive care ($n=91$), pediatric surgery ($n=87$), general surgery ($n=271$), thoracic surgery ($n=88$), ophthalmology ($n=39$), gynecological oncology surgery ($n=27$), cardiovascular surgery ($n=105$), otolaryngology ($n=34$), orthopedics and traumatology ($n=65$), plastic and reconstructive surgery ($n=26$), and urology ($n=92$) clinics of 10 hospitals in Istanbul, Turkey between June 2022 and February 2023.

Inclusion criteria were working as a nurse in a surgical unit, having a smartphone, using the internet, and providing informed consent to participate. The nurse managers of the participating hospitals were contacted for support in recruiting nurses working in the surgical units for the study. QR-coded posters containing the research invitation and directing to the online survey were hung on the notice boards of the surgical departments of the hospitals. Surgical nurses interested in participating in the study were able to scan the QR code on the poster. The head nurses of the surgical units were reminded weekly to encourage participation. The research invitation poster also included the researchers’ contact information, and participants were asked to contact the researchers if they had any questions or concerns about the study. In addition, the purpose of the study and the survey link were shared in WhatsApp groups consisting

of surgical nurses of hospitals in Istanbul, and volunteer participants provided support for the study. Participants filled out an online consent form before answering the survey questions. No incentive or compensation was offered for participation.

Data collection tools

A descriptive characteristics form, the Internet Addiction Scale, and the Malpractice Tendency Scale were used for the collection of the study data.

Descriptive characteristics form

This form was prepared by the researchers after reviewing the literature and included 13 questions on sociodemographic characteristics (date of birth, gender, marital status, education level), occupational factors (duration of nursing experience, duration working in current institution and unit, job description of current position) and internet use (duration of internet use per session, total duration of internet use per day and week, device used to connect to the internet, and purpose of internet use) [6, 18].

Internet addiction scale

This scale was developed by Nichols and Nicki [19]. The Turkish validity and reliability study of the scale was conducted by Kayri and Gunuc. The 35-item, 5-point Likert-type scale has four subscales: deprivation, lack of control, impaired functioning, and social withdrawal. Items are scored from 1 to 5, and the total scores ranges from 35 to 175. Higher total scores indicate higher levels of internet addiction. The Cronbach's alpha reliability coefficient of the scale was found to be 0.94 by Kayri and Gunuc [20]. In this study, the Cronbach alpha reliability coefficient was calculated as 0.96. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy value of the Internet Addiction Scale in the current sample was 0.973 and the Bartlett's Test of Sphericity value was significant ($\sim X^2: 44156.188, p=0.000$). When the factor structure of the scale was examined, it was seen that it had four sub-dimensions as in the Turkish validity and reliability study and the total variance of the factors was 74.721%. The model fit indices for Internet Addiction Scale in the current sample were Chi Square:3071.418, df:651, CMIN:4.718, RMSEA:0.071, CFI:0.844, NFI:0.833, GFI:0.786, AGFI:0.887.

Malpractice tendency scale

This scale was developed by Ozata and Altunkan to measure the malpractice tendency levels of nurses and was found to be a valid and reliable scale for the Turkish population. It is a 5-point Likert-type scale consisting of 49 items in five subscales: medication and transfusion administration safety; infection prevention; patient monitoring, device, and material safety; fall prevention; and

communication. The total score is between 49 and 245, with a higher score indicating better practices and thus lower malpractice tendency. The Cronbach alpha reliability coefficient of the scale was found to be 0.95 by Ozata and Altunkan [21]. In this study, the Cronbach alpha reliability coefficient was calculated as 0.97. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy value of the Malpractice Tendency Scale in the current sample was 0.973 and the Bartlett's Test of Sphericity value was significant ($\sim X^2: 55774.434, p=0.000$). When the factor structure of the scale was examined, it was seen that it had five sub-dimensions as in the Turkish validity and reliability study and the total variance of the factors was 70.024%. The model fit indices for Malpractice Tendency Scale in the current sample were Chi Square:4322.79, df:117, CMIN:3.870, RMSEA:0.066, CFI:0.882, NFI:0.877, GFI:0.845, AGFI:0.822.

Data collection

Data were collected from the participants using a survey created on Google Forms. After following the survey link, the first page of the survey informed participants about the study and that all collected information would remain confidential. Those who volunteered to participate in the study could continue to the rest of the survey by ticking the informed consent checkbox on this page. The "required" feature of Google Forms was activated to ensure participants answered all of the questions completely, while the "send another response link" feature was disabled in order to prevent respondents from entering the survey multiple times. Completing the form took an average of 10–15 min.

Data analysis

The study data were analyzed using the IBM SPSS Statistics version 22.0 software. The participating nurses' descriptive characteristics were summarized using frequency and percentage, while scale scores were analyzed on the basis of mean and standard deviation values. Kurtosis and skewness values confirmed normal distribution of the data, and parametric methods were used for analysis. Exploratory and Confirmatory Factor Analyses were performed to determine the validity and reliability of the scales used in the study. Differences in the nurses' scale scores according to their descriptive characteristics were analyzed using t-tests and one-way ANOVA with post hoc Tukey and LSD tests. Relationships between scale scores were examined using Pearson correlation and linear regression analyses. The correlation coefficient ranges from -1 to $+1$. Generally, the interpretation of the correlation coefficient is as follows: $r < 0.20$ and values close to zero indicate no relationship or very weak, $r = 0.20-0.39$ indicates a weak relationship, $r = 0.40-0.59$ indicates a moderate relationship, $r = 0.60-0.79$ indicates a high level

of relationship, and $r = 0.80\text{--}1.0$ indicates a very high relationship [22, 23]. Statistical significance was accepted as $p < 0.05$.

Ethical considerations

Ethical approval for the study was obtained from the scientific research ethics committee of the university (date: 27.05.2022, decision no: 14/1), and permission to use the Internet Addiction Scale and Malpractice Tendency Scale was obtained from the researchers who conducted the validity and reliability studies. Participants were given detailed information about the study on the first page of the survey conducted via Google Forms. Participants who agreed to participate voluntarily were included in the study by ticking the informed consent checkbox on the first page of the survey. All study procedures were carried out in accordance with the Declaration of Helsinki.

Results

The surgical nurses in our study had a mean age of 30.05 ± 5.72 years, 75.6% were female, 54.2% were single, and 71.2% held a bachelor's degree. Approximately 42% of the nurses had 5–10 years of nursing experience, 47.3% worked in a training and research hospital, 25.8% of them worked in a general surgery unit, and 88.1% were staff nurses (as opposed to charge nurses). Nearly half of the nurses reported using the internet for an average of 16–30 min at a time, 54.0% reported 3–4 h of usage per day, 45.4% reported 11–20 h of usage per week, and 94.5% preferred smartphones or tablets to connect to the internet rather than a computer. They most commonly used the internet for following social media (79.3%), obtaining information (73.6%), shopping (71.9%), and listening to music (70.3%).

The mean durations of internet use reported by the nurses were 22.14 ± 14.88 min per session and 3.20 ± 1.70 h per day. Their mean total internet addiction score was 88.00 ± 31.91 , and their scores in the deprivation, lack of control, impaired functioning, and social withdrawal subscales were 32.42 ± 9.54 , 25.11 ± 10.38 , 15.60 ± 7.30 , and 14.88 ± 7.40 , respectively. Their mean total malpractice tendency score was 228.43 ± 22.09 , while mean subscale scores were 84.39 ± 8.66 for medication and transfusion administration safety, 55.83 ± 5.89 for infection prevention, 41.48 ± 4.36 for patient monitoring, device, and material safety, 23.22 ± 2.22 for fall prevention, and 23.50 ± 2.53 for communication.

The comparison of internet addiction scores by descriptive characteristics is shown in Table 1. The total internet addiction scores of the surgical nurses differed significantly according to education level, with higher scores in those with associate's and bachelor's degrees compared to those with high school and postgraduate

degrees ($p < 0.05$). Total internet addiction scores also differed significantly according to duration working in their current institution, with higher scores among surgical nurses who worked in the same institution for 10 years or less compared to those working for 11 years or more ($p < 0.05$). When evaluated according to internet usage, we observed that total internet addiction scores were significantly higher in surgical nurses who used the internet for 16 min or more per session compared to those using it for 15 min or less ($p < 0.05$), those with 3 h or more of internet use per day versus those with 2 h or less ($p < 0.05$), and in those with more than 20 h of weekly internet use compared to those with 20 h or less ($p < 0.05$) (Table 1).

The comparison of malpractice tendency scores by descriptive characteristics is given in Table 2. Female nurses' malpractice tendency total score was higher than male nurses ($p = 0.015$). Like internet addiction scores, the surgical nurses' total malpractice tendency score differed significantly according to duration of internet use per session, per day, and per week. Total malpractice tendency scores were higher for nurses who used the internet for 15 min or less at a time compared to those who used the internet for 16–30 min ($p < 0.05$), for those with 2 h or less of daily internet use compared to those with 3 h or more ($p < 0.05$), and those who had at least 11 h of internet use per week compared to those with 10 h or less ($p < 0.05$). Additionally, the total malpractice tendency score of the nurses who used smartphones and tablets to connect to the internet was found to be higher than the total score of those who used computers ($p = 0.037$).

The correlation analysis between internet addiction and malpractice tendency scores is given in Table 3. A weak negative correlation was found between surgical nurses' total internet addiction score and total malpractice tendency score ($r = -0.422$, $p < 0.001$). There were also weak negative correlations between total malpractice tendency score and deprivation ($r = -0.348$, $p < 0.001$), lack of control ($r = -0.419$, $p < 0.001$), impaired functioning ($r = -0.403$, $p < 0.001$), and social withdrawal ($r = -0.385$, $p < 0.001$) subscale scores. Conversely, weak negative correlations were observed between nurses' internet addiction total score and medication and transfusion administration safety ($r = -0.450$, $p < 0.001$), infection prevention ($r = -0.416$, $p < 0.001$), patient monitoring, device, and material safety ($r = -0.321$, $p < 0.001$), fall prevention ($r = -0.325$, $p < 0.001$), and communication ($r = -0.332$, $p < 0.001$).

The results of linear regression analysis of the relationship between internet addiction and the malpractice tendencies of surgical nurses are presented in Table 4. The linear regression model was highly significant ($F = 226,874$; $p < 0.001$), with 17.7% of the total change in the level of malpractice tendency explained by internet addiction ($R^2 = 0.177$). An increase in internet addiction

Table 1 Comparison of internet addiction scores according to descriptive characteristics (N=1051)

Demographic characteristics	n	Internet addiction total (Mean ± SD)	Deprivation (Mean ± SD)	Lack of control (Mean ± SD)	Impaired functioning (Mean ± SD)	Social withdrawal (Mean ± SD)
Gender						
Female	795	87.299 ± 31.194	32.458 ± 9.397	24.820 ± 10.211	15.408 ± 7.163	14.614 ± 7.267
Male	256	90.184 ± 34.042	32.289 ± 9.982	26.023 ± 10.852	16.207 ± 7.677	15.664 ± 7.762
t		-1.258	0.246	-1.615	-1.526	-1.977
p		0.230	0.806	0.107	0.142	0.048
Marital status						
Married	481	87.395 ± 30.756	32.092 ± 9.084	25.027 ± 10.052	15.447 ± 7.001	14.830 ± 7.272
Single	570	88.514 ± 32.886	32.691 ± 9.905	25.186 ± 10.654	15.733 ± 7.540	14.904 ± 7.514
t		-0.566	-1.016	-0.247	-0.634	-0.161
p		0.571	0.310	0.805	0.526	0.872
Education						
High school ¹	36	75.083 ± 29.320	28.639 ± 11.445	20.806 ± 8.783	12.833 ± 5.940	12.806 ± 5.554
Associate degree ²	112	92.152 ± 33.129	33.536 ± 9.220	26.295 ± 10.553	16.607 ± 7.810	15.714 ± 8.029
Bachelor's degree ³	748	89.019 ± 32.768	32.533 ± 9.596	25.433 ± 10.679	15.888 ± 7.493	15.164 ± 7.614
Postgraduate ⁴	155	83.097 ± 25.901	31.923 ± 8.837	23.716 ± 8.695	14.142 ± 5.791	13.316 ± 5.865
F		4.106	2.584	3.753	4.943	4.129
p		0.007	0.052	0.011	0.002	0.006
Post hoc		2, 3 > 1, 4 (p < 0.05)		2, 3 > 1 2 > 4 (p < 0.05)	2, 3 > 1, 4 (p < 0.05)	2 > 1, 4 3 > 4 (p < 0.05)
Total nursing experience						
< 5 years ¹	423	89.218 ± 32.614	32.811 ± 9.625	25.444 ± 10.721	15.846 ± 7.613	15.116 ± 7.449
5–10 years ²	440	87.543 ± 30.566	32.561 ± 9.169	25.000 ± 9.938	15.398 ± 6.854	14.584 ± 7.163
≥ 11 years ³	188	86.340 ± 33.469	31.192 ± 10.124	24.633 ± 10.634	15.532 ± 7.588	14.984 ± 7.844
F		0.606	1.966	0.442	0.418	0.584
p		0.545	0.140	0.643	0.659	0.558
Experience in current institution						
< 5 years ¹	560	89.866 ± 34.244	32.743 ± 9.757	25.448 ± 11.110	16.241 ± 7.967	15.434 ± 7.962
5–10 years ²	369	88.350 ± 27.573	33.146 ± 8.652	25.442 ± 9.057	15.168 ± 6.212	14.594 ± 6.532
≥ 11 years ³	122	78.393 ± 31.651	28.713 ± 10.298	22.582 ± 10.378	13.984 ± 6.801	13.115 ± 6.914
F		6.574	10.802	4.130	5.856	5.359
p		0.001	< 0.001	0.016	0.003	0.005
Post hoc		1, 2 > 3 (p < 0.05)	1, 2 > 3 (p < 0.05)	1, 2 > 3 (p < 0.05)	1 > 2, 3 (p < 0.05)	1 > 3 (p < 0.05)
Role						
Staff nurse ¹	926	88.636 ± 32.027	32.583 ± 9.571	25.340 ± 10.383	15.734 ± 7.318	14.978 ± 7.423
Charge nurse ²	125	83.304 ± 30.825	31.184 ± 9.234	23.432 ± 10.229	14.624 ± 7.087	14.064 ± 7.214
t		1.755	1.540	1.932	1.598	1.297
p		0.080	0.124	0.054	0.110	0.195
Duration of internet use per session						
≤ 15 minutes ¹	441	79.705 ± 30.029	29.955 ± 9.174	22.513 ± 10.001	13.921 ± 6.756	13.318 ± 6.944
16–30 minutes ²	500	93.268 ± 30.031	33.984 ± 8.921	26.880 ± 9.685	16.518 ± 6.914	15.886 ± 7.027
> 30 minutes ³	110	97.327 ± 39.394	35.164 ± 11.353	27.509 ± 12.528	18.182 ± 9.364	16.473 ± 9.481
F		27.742	27.305	25.126	23.492	17.530
p		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Post hoc		2, 3 > 1 (p < 0.05)	2, 3 > 1 (p < 0.05)	2, 3 > 1 (p < 0.05)	2 > 1 3 > 1, 2 (p < 0.05)	2, 3 > 1 (p < 0.05)
Daily internet use						
≤ 2 hours ¹	342	80.073 ± 31.123	30.097 ± 9.284	22.711 ± 10.167	13.944 ± 7.133	13.322 ± 7.268
3–4 hours ²	568	91.864 ± 31.316	33.579 ± 9.412	26.409 ± 10.277	16.361 ± 7.197	15.516 ± 7.270
≥ 5 hours ³	141	91.674 ± 32.899	33.362 ± 9.701	25.723 ± 10.348	16.567 ± 7.453	16.021 ± 7.693
F		16.093	15.442	14.179	13.444	11.583

Table 1 (continued)

Demographic characteristics	<i>n</i>	Internet addiction total (Mean ± SD)	Deprivation (Mean ± SD)	Lack of control (Mean ± SD)	Impaired functioning (Mean ± SD)	Social withdrawal (Mean ± SD)
<i>p</i>		<0.001	<0.001	<0.001	<0.001	<0.001
Post hoc		2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)
Weekly internet use						
≤ 10 hours ¹	196	83.740 ± 37.899	30.770 ± 10.421	23.056 ± 11.996	15.143 ± 8.789	14.770 ± 8.948
11–20 hours ²	477	85.686 ± 29.250	31.759 ± 8.895	24.447 ± 9.656	15.094 ± 6.620	14.386 ± 6.728
> 20 hours ³	378	93.135 ± 31.172	34.101 ± 9.619	27.021 ± 10.071	16.482 ± 7.195	15.532 ± 7.296
<i>F</i>		7.996	10.116	11.445	4.316	2.558
<i>p</i>		<0.001	<0.001	<0.001	0.014	0.078
Post hoc		3 > 1, 2 (<i>p</i> < 0.05)	3 > 1, 2 (<i>p</i> < 0.05)	3 > 1, 2 (<i>p</i> < 0.05)	3 > 1, 2 (<i>p</i> < 0.05)	
Device used to connect to the internet						
Computer ¹	58	83.121 ± 39.194	30.879 ± 12.624	23.207 ± 12.172	14.362 ± 8.267	14.672 ± 8.523
Smartphone/tablet ²	993	88.287 ± 31.443	32.507 ± 9.327	25.225 ± 10.260	15.675 ± 7.233	14.881 ± 7.335
<i>t</i>		-1.198	-1.263	-1.440	-1.332	-0.209
<i>p</i>		0.328	0.338	0.221	0.183	0.856

F: ANOVA; *t*: Independent-groups *t*-test; Post hoc: Tukey, LSD, Bold values indicate statistical significance (*p* < 0.05)

total score was associated with a reduction in total malpractice tendency score ($\beta = -0.422$), indicating that internet addiction increases the level of malpractice tendency. A higher score in the lack of control subscale was also found to be associated with lower total malpractice tendency score ($\beta = -0.243$), suggesting that lack of control increases malpractice tendencies. The deprivation, impaired functioning, and social withdrawal subscales did not affect the level of malpractice tendency (*p* > 0.05).

Discussion

Internet use has many personal and professional advantages for health workers but can also lead to addiction and negatively impact work performance [2, 7]. Malpractice, which can occur as a result of numerous factors, including ignorance, inexperience, or misuse of technology, poses a significant threat to patient safety and is thus a critical issue for nurses directly involved in patient care [18, 24, 25]. In our study, surgical nurses had a moderate level of internet addiction and a low level of malpractice tendency. These results are similar to other studies in the literature on nurses' internet addiction [6, 26] and malpractice tendency [18, 27].

Nurses often use their smartphones during work for various reasons, which can cause distraction and threaten patient safety [28]. Smartphones are a stimulus that can distract a person from their priority activities and eliminate the cognitive resources useful to perform these activities [29]. In our study, surgical nurses who used computers to connect to the internet had higher malpractice tendency overall and in the areas of medication and transfusion safety and infection prevention when compared with those who used smartphones and tablets. Other studies have indicated that malpractice

tendency increased as a result of smartphone misuse and that nurses frequently use smartphones to obtain information about drug applications [30–33]. In our study, the higher level of malpractice tendency among nurses who used computers to connect to the internet compared to nurses who used smartphones and tablets may be due to the distracting effects of computers being different from smartphones and tablets. The reason why computers have a higher distracting effect is thought to be due to factors such as nurses sitting in front of computers more often and spending longer hours due to professional requirements in clinical settings, easier and faster access to the internet on computers, and larger and more comfortable computer screens.

In addition to using the internet for professional needs, nurses can spend a lot of time on social networking sites even in their working lives. This situation negatively affects nurses' performance, productivity, quality of care and time management. Especially due to the increase in time spent on the internet, nurses experience stress related to procrastination and inappropriate use of time. Ineffective use of time and increased stress levels affect the quality of nursing services and may also pose a threat to patient safety [34]. We observed a positive relationship between levels of malpractice tendency and internet addiction in surgical nurses. Linear regression analysis of the relationship between internet addiction and malpractice tendency demonstrated that the increase in nurses' scores for internet addiction overall and in the lack of control subscale was related to an increased level of malpractice tendency. When the literature was examined, we found no study directly examining the effect of nurses' internet addiction on malpractice tendency, but there were studies showing indirect effects [27, 30, 35]. In

Table 2 Comparison of malpractice tendency scores by descriptive characteristics (N= 1051)

Demographic characteristics	n	Malpractice tendency total	Medication and transfusion administration safety	Infection prevention	Patient monitoring, material, and device safety	Fall prevention	Communication
		(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)
Gender							
Female	795	229.453 ± 21.064	84.761 ± 8.222	56.120 ± 5.571	41.650 ± 4.270	23.303 ± 2.184	23.619 ± 2.422
Male	256	225.258 ± 24.779	83.250 ± 9.837	54.941 ± 6.737	40.949 ± 4.581	22.973 ± 2.300	23.145 ± 2.823
t		2.650	2.433	2.790	2.244	2.078	2.614
p		0.015	0.027	0.012	0.031	0.038	0.016
Marital status							
Married	481	228.064 ± 21.524	84.333 ± 8.791	55.759 ± 5.775	41.314 ± 4.243	23.156 ± 2.180	23.503 ± 2.438
Single	570	228.740 ± 22.567	84.444 ± 8.561	55.895 ± 5.998	41.619 ± 4.448	23.279 ± 2.247	23.504 ± 2.611
t		-0.494	-0.207	-0.372	-1.132	-0.896	-0.002
p		0.621	0.836	0.710	0.258	0.370	0.998
Education							
High school ¹	36	233.000 ± 14.726	86.417 ± 5.033	56.750 ± 4.430	42.167 ± 3.167	23.667 ± 1.604	24.000 ± 1.586
Associate degree ²	112	227.125 ± 25.157	83.696 ± 10.081	55.411 ± 6.887	41.491 ± 4.432	23.134 ± 2.377	23.393 ± 3.029
Bachelor's degree ³	748	227.670 ± 22.825	84.054 ± 9.022	55.626 ± 6.013	41.352 ± 4.504	23.182 ± 2.260	23.457 ± 2.564
Postgraduate ⁴	155	231.987 ± 16.495	86.065 ± 5.757	56.923 ± 4.600	41.929 ± 3.763	23.381 ± 1.994	23.690 ± 2.128
F		2.288	3.223	2.567	1.064	0.888	0.897
p		0.077	0.022	0.053	0.363	0.447	0.442
Post hoc			4 > 2, 3 (p < 0.05)				
Total nursing experience							
< 5 years ¹	423	227.312 ± 22.627	83.927 ± 8.895	55.582 ± 5.988	41.279 ± 4.477	23.090 ± 2.327	23.435 ± 2.529
5–10 years ²	440	229.125 ± 21.408	84.775 ± 8.374	55.964 ± 5.644	41.548 ± 4.321	23.318 ± 2.114	23.521 ± 2.562
≥ 11 years ³	188	229.325 ± 22.435	84.548 ± 8.792	56.090 ± 6.257	41.771 ± 4.161	23.298 ± 2.193	23.617 ± 2.476
F		0.914	1.071	0.672	0.924	1.277	0.353
p		0.401	0.343	0.511	0.397	0.279	0.703
Experience in current institution							
< 5 years ¹	560	227.525 ± 23.312	83.971 ± 9.542	55.555 ± 6.275	41.409 ± 4.344	23.111 ± 2.329	23.479 ± 2.545
5–10 years ²	369	229.466 ± 20.750	84.824 ± 7.639	56.068 ± 5.401	41.550 ± 4.451	23.426 ± 1.997	23.599 ± 2.550
≥ 11 years ³	122	229.459 ± 20.131	85.025 ± 7.162	56.393 ± 5.480	41.590 ± 4.146	23.123 ± 2.288	23.328 ± 2.424
F		1.008	1.445	1.467	0.161	2.389	0.582
p		0.365	0.236	0.231	0.851	0.092	0.559
Role							
Staff nurse	926	228.618 ± 21.992	84.405 ± 8.695	55.907 ± 5.883	41.515 ± 4.323	23.248 ± 2.187	23.542 ± 2.498
Charge nurse	125	227.048 ± 22.827	84.304 ± 8.453	55.280 ± 5.971	41.216 ± 4.606	23.032 ± 2.426	23.216 ± 2.770
t		0.746	0.122	1.117	0.720	1.025	1.352
p		0.456	0.903	0.264	0.471	0.306	0.177
Duration of internet use per session							
≤ 15 minutes ¹	441	230.708 ± 22.236	85.052 ± 9.221	56.578 ± 5.977	42.018 ± 4.154	23.374 ± 2.235	23.685 ± 2.461
16–30 minutes ²	500	226.792 ± 21.997	83.880 ± 8.352	55.304 ± 5.840	41.072 ± 4.440	23.106 ± 2.252	23.430 ± 2.545
> 30 minutes ³	110	226.755 ± 21.273	84.082 ± 7.569	55.246 ± 5.521	41.173 ± 4.569	23.146 ± 1.943	23.109 ± 2.710
F		4.059	2.230	6.144	5.886	1.792	2.684
p		0.018	0.108	0.002	0.003	0.167	0.069
Post hoc		1 > 2 (p < 0.05)		1 > 2, 3 (p < 0.05)	1 > 2 (p < 0.05)		
Daily internet use							
≤ 2 hours ¹	342	232.006 ± 18.340	86.050 ± 7.093	56.678 ± 4.956	42.114 ± 3.599	23.342 ± 2.131	23.822 ± 2.127
3–4 hours ²	568	226.609 ± 23.468	83.690 ± 8.843	55.366 ± 6.373	41.074 ± 4.695	23.150 ± 2.256	23.329 ± 2.750
≥ 5 hours ³	141	227.099 ± 23.721	83.206 ± 10.651	55.660 ± 5.796	41.575 ± 4.455	23.227 ± 2.259	23.433 ± 2.462
F		6.741	9.603	5.404	6.184	0.805	4.124
p		0.001	< 0.001	0.005	0.002	0.447	0.016

Table 2 (continued)

Demographic characteristics	<i>n</i>	Malpractice tendency total (Mean ± SD)	Medication and transfusion administration safety (Mean ± SD)	Infection prevention (Mean ± SD)	Patient monitoring, material, and device safety (Mean ± SD)	Fall prevention (Mean ± SD)	Communication (Mean ± SD)
Post hoc		1 > 2, 3 (<i>p</i> < 0.05)	1 > 2, 3 (<i>p</i> < 0.05)	1 > 2 (<i>p</i> < 0.05)	1 > 2 (<i>p</i> < 0.05)		1 > 2 (<i>p</i> < 0.05)
Weekly internet use							
≤ 10 hours ¹	196	220.444 ± 28.976	80.975 ± 12.800	53.750 ± 7.577	40.301 ± 4.756	22.526 ± 2.565	22.893 ± 3.179
11–20 hours ²	477	230.598 ± 19.455	85.304 ± 7.112	56.453 ± 5.109	41.786 ± 4.294	23.356 ± 2.136	23.698 ± 2.354
> 20 hours ³	378	229.839 ± 20.137	85.016 ± 7.272	56.130 ± 5.594	41.704 ± 4.120	23.415 ± 2.051	23.574 ± 2.321
<i>F</i>		16.341	19.542	15.786	8.990	12.250	7.342
<i>p</i>		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Post hoc		2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)	2, 3 > 1 (<i>p</i> < 0.05)
Device used to connect to the internet							
Computer	58	218.983 ± 35.270	78.741 ± 16.734	53.621 ± 8.580	40.897 ± 5.812	22.741 ± 2.794	22.983 ± 3.827
Smartphone/tablet	993	228.983 ± 20.962	84.723 ± 7.834	55.962 ± 5.678	41.514 ± 4.257	23.251 ± 2.176	23.534 ± 2.435
<i>t</i>		-3.368	-5.174	-2.951	-1.049	-1.703	-1.612
<i>p</i>		0.037	0.009	0.045	0.429	0.177	0.283

F: ANOVA; *t*: Independent-groups *t*-test; Post hoc: Tukey, LSD. Bold values indicate statistical significance (*p* < 0.05)

Table 3 Correlation analysis between internet addiction and malpractice tendency scores (*N* = 1051)

		Internet addiction total	Deprivation	Lack of control	Impaired functioning	Social withdrawal
Malpractice tendency total	<i>r</i>	-0.422**	-0.348**	-0.419**	-0.403**	-0.385**
	<i>p</i>	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Medication and transfusion administration safety	<i>r</i>	-0.450**	-0.367**	-0.443**	-0.434**	-0.419**
	<i>p</i>	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Infection prevention	<i>r</i>	-0.416**	-0.343**	-0.420**	-0.392**	-0.379**
	<i>p</i>	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Patient monitoring, material, and device safety	<i>r</i>	-0.321**	-0.286**	-0.322**	-0.301**	-0.268**
	<i>p</i>	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Fall prevention	<i>r</i>	-0.325**	-0.280**	-0.312**	-0.300**	-0.307**
	<i>p</i>	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Communication	<i>r</i>	-0.332**	-0.247**	-0.330**	-0.339**	-0.315**
	<i>p</i>	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

p* < 0.05; *p* < 0.01; *r*: Pearson Correlation Analysis

Table 4 Results of linear regression analysis of the relationship between internet addiction and the malpractice tendencies of surgical nurses (*N* = 1051)

Dependent variable	Independent variable	β	<i>t</i>	<i>p</i>	<i>F</i>	Model (<i>p</i>)	<i>R</i> ²
Malpractice tendency total	Constant	254.110	140.125	< 0.001	226.874	< 0.001	0.177
	Internet addiction total	-0.422	-15.062	< 0.001			
	Constant	252.161	113.360	< 0.001			
	Deprivation	-0.047	-0.974	0.330			
	Lack of control	-0.243	-3.091	0.002			
	Impaired functioning	-0.089	-1.008	0.314			
	Social withdrawal	-0.069	-0.948	0.343			

Linear Regression Analysis, *Dependent variable = Malpractice Tendency Total Score, *R* = 0.425; *R*² = 0.177; *F* = 57.482; Durbin Watson Value = 0.709, Bold values indicate statistical significance (*p* < 0.05)

a study by Pucciarelli et al., 42% of nurses reported being distracted by smartphone use. The authors concluded that although smartphones are valuable tools to increase patient safety and facilitate communication between healthcare professionals when used correctly, they create a significant source of distraction and compromise patient safety when used otherwise [30]. In a study by Kaynak et al., an increase in time nurses spent on the internet was associated with greater internet addiction and impairment in their relationships [35]. Lin et al. determined that internet addiction may cause behavioral and mental problems in nurses due to high levels of perceived fatigue [27]. These results show that internet addiction may adversely affect nurses' cognitive functions (such as attention and focus), time management, stress levels and may lead to the risk of malpractice.

Timely recognition and appropriate management of internet addiction in health workers and its negative consequences will reduce the risks that may arise during practice [3]. Our study demonstrated that as the level of internet addiction among nurses increased, malpractice tendencies increased in all areas: communication, infection and fall prevention, medication and transfusion administration safety, and patient monitoring, device, and material safety. McBride et al. also determined that direct contact by healthcare professionals with contaminated surfaces, such as smartphones used for internet access, increases the risk of infection and causes healthcare-associated infections [36]. Another study reported that medication errors occur because of multiple factors, especially inattention [26]. We think that internet addiction, which is associated with more internet use, increases the risk of malpractice in nurses by causing disruptions in areas such as time management, care, and treatment.

Limitations

This study has certain limitations. Firstly, the sample was limited to nurses working in the surgical wards of 10 hospitals in Istanbul during the study period and the findings were limited to their responses to the Internet Addiction Scale and Malpractice Tendency Scale. Secondly, it was a cross-sectional study based on participants' self-reports, which may be a source of bias. Therefore, the results cannot be generalized to all surgical nurses, and further studies to examine the relationship between internet addiction and actual patient outcomes would be beneficial.

Conclusion

In conclusion, it was observed in this study that surgical nurses' malpractice tendencies increased as their levels of internet addiction increased. The relationship between internet addiction and malpractice tendency was seen in

the areas of communication, medication and transfusion administration safety, infection prevention, fall prevention, and patient monitoring, device, and material safety. Since these findings suggest that reducing internet addiction among nurses may help prevent malpractice, interventions such as using browser add-ons that provide warnings and limit internet usage time should be considered. It is also recommended that nurses limit the time they spend on the internet by determining certain hours for daily or weekly internet use, do a digital detox and stay away from the internet for certain periods of time, and reduce internet addiction by turning off notifications that may cause internet use during working hours. Measures such as regulating working hours, providing psychological counseling services and mindfulness training to cope with digital addiction, and conducting awareness campaigns (hanging posters etc.) can be taken to reduce internet addiction in hospitals. In addition, we recommend that in-service training be organized on conscious internet use, that these trainings be repeated at certain intervals, and that further research be conducted on this subject.

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Author contributions

EGA: Conceptualization, Methodology, Writing-original draft, Visualization, Investigation, Validation, Writing-review& editing. BNO: Conceptualization, Methodology, Data curation, Writing-original draft, Investigation, Writing-review& editing. SG: Conceptualization, Methodology, Visualization, Writing-review& editing.

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Data availability

The data supporting this study's findings are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the University of Health Sciences Hamidiye Scientific Research Ethics Committee in Istanbul, Turkey (date: 27.05.2022, number: 14/1). The research conforms to the Declaration of Helsinki in Brazil 2013 provisions. Informed consent was obtained from all participants involved in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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