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Nurse-Sensitive Quality Indicators: A Multicenter Analysis

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ABSTRACT

Purpose: The quality of nursing care is strongly related to patient safety and satisfaction. Although previous studies have reported various nurse-sensitive quality indicators, a gap still exists for some countries such as Türkiye, regarding the definition and determination of the nurse-sensitive indicators, selecting the appropriate monitoring tools, the results, and using the results to enhance nursing practice. This study aimed to evaluate nurse-sensitive quality indicators and to explore the association between these indicators and nurse-staffing characteristics.

Methods: This multicenter retrospective study presents data from 528 hospital-month units by investigating digital nursing reports across 15 hospitals in Türkiye. Variables related to nurse-staffing and nurse-sensitive quality indicators including falls, thrombophlebitis, pressure ulcers, and patient satisfaction, were examined with descriptive analysis.

Results: This study reveals that during the months with documented falls there were more patients, and longer hospital stays but lower patient satisfaction. Conversely, during the months without thrombophlebitis there were more nurses with higher education levels and higher patient satisfaction. Increased incidence of patients with thrombophlebitis was correlated with higher nurse-to-patient ratios. During the months with documented pressure ulcers, there were more patients and longer hospital stays.

Conclusion: The findings of this study suggest that certain nurse-sensitive quality indicators such as falls, pressure ulcers, and thrombophlebitis are associated with the profile of the nurse workforce.

Keywords: Nursing Care, Quality Indicators, Health Care, Patient Outcome Assessment

ÖZET

Amaç: Hemşirelik bakımının kalitesi, hasta güvenliği ve memnuniyetiyle doğrudan ve güçlü bir şekilde ilişkilidir. Literatürde hemşirelik bakımına duyarlı kalite göstergelerine yönelik bulgular çeşitli şekillerde yer almış olsa da, Türkiye gibi bazı ülkelerde hemşirelik bakımına duyarlı göstergelerin tanımı ve belirlenmesi, uygun izleme araçlarının seçilmesi, sonuçlar ve hemşirelik uygulamalarını geliştirmek için bu sonuçların nasıl kullanılacağı konusunda hala bir belirsizlik bulunmaktadır. Bu çalışma, hemşirelik bakımına duyarlı kalite göstergelerini değerlendirmeyi ve bu göstergeler ile hemşire kadrosunun özellikleri arasındaki ilişkiyi araştırmayı amaçlamaktadır.

Yöntem: Bu çok merkezli retrospektif çalışmada, Türkiye'deki 15 hastanenin dijital hemşirelik raporlarının incelenmesiyle elde edilen veriler sunulmaktadır. Hasta düşmeleri, tromboflebit gelişimi, basınç ülserleri ve hasta memnuniyeti gibi hemşirelik bakımına duyarlı kalite göstergelerinin; hemşire kadrosuna yönelik değişkenlerle ilişkisi incelenmiştir.

Bulgular: Çalışmada hasta sayısının yüksek ve hastaların ortalama hastanede kalış sürelerinin daha uzun olduğu aylarda hasta düşmelerinin ve basınç ülseri gelişen hastaların olduğu, diğer taraftan hasta memnuniyetinin daha düşük olduğu görüldü. Yüksek eğitim düzeyine sahip hemşire sayısının daha fazla olduğu aylarda, tromboflebit gelişen hasta bulunmadığı, hasta memnuniyetinin de daha yüksek olduğu belirlendi. Tromboflebit gelişen hasta oranındaki artış, daha yüksek hemşire-hasta oranlarıyla ilişkiliydi.

Sonuç: Bu çalışmanın bulguları, hasta düşmeleri, basınç ülserleri ve tromboflebit gibi hemşirelik bakımına duyarlı kalite göstergelerinin; hemşire iş gücünün profiliyle ilişkili olduğunu düşündürmektedir.

Anahtar Kelimeler: Hemşirelik bakım kalitesi, kalite göstergeleri, hasta sonuçları

Nursing care is one of the most significant determinants of the healthcare system owing to the nature of the profession and its role and responsibilities. In the last few decades, whenever individuals talk about the safety, quality, and effectiveness of healthcare, nurses have been strongly encouraged or reminded about the significance of measuring the impact of nursing care and monitoring patient outcome metrics. As a means of monitoring nursing care quality, nurse-sensitive quality indicators are described as the change in a person's health status that can be attributed to nursing care (1). Nurse-sensitive quality indicators are integral to healthcare quality improvement, requiring nurses' active participation in developing and consensus-building at the practice level, rigorous validation through standardized research across diverse settings, and ongoing education to foster understanding of their role in measuring and enhancing nursing care and patient outcomes (2). These indicators can be used in monitoring, benchmarking and comparing health care performance, sharing best practices for quality improvement, and designing nurse staffing models (3).

The Agency for Healthcare Research and Quality (4), Institute of Medicine (IOM) (5) and many researcher reached similar conclusions that insufficient nurse staffing and heavy workload threaten the quality of care and patient safety, better staffing is associated with lower in-hospital mortality and shorter hospitalization (6, 7). Some studies show the relationship between patient outcomes and nurses' working conditions and educational level. A balanced workload among health care providers improves nurses' health and job satisfaction which suggests improvements in hospitals' financial performance (5,8).

Although previous studies have reported various nurse-sensitive quality indicators around the world, a gap still exists for some countries (9) such as Türkiye, regarding the definition and determination of the nurse-sensitive indicators, selecting the appropriate monitoring tools, the results, and using the results to enhance nursing practice. It is needed to monitor nurse-sensitive indicators in a country-based approach to identify patients at risk, measure compliance with national, local or hospital policies, and evaluate the effectiveness of best nursing care practice initiatives.

To date, several studies on nurse-sensitive quality indicators were conducted on the United States population. In addition, studies conducted in Europe, the United Kingdom, Australia, Korea, and Chile have reported the association between nurse staffing level and mortality (10-13). On the other hand, significant information regarding the association between nurse staffing levels and some patient outcomes such as pressure ulcers and falls are still lacking (14,15), and nursing-sensitive indicators need to be researched and validated to ensure they are capturing nursing care sufficiently (16). A recent systematic review excluded measures frequently reported for hospital accreditation, authorization or recognition (i.e. patient falls, pressure sores/pressure ulcers and hospital-acquired infections), further emphasizing the need for multicenter studies (9).

In this study we aimed to evaluate nurse-sensitive quality indicators by analyzing monthly data from hospitals in Türkiye and explore the association between these indicators and organizational variables (work characteristics such as turn-over rate, patient satisfaction etc.) answering the question "What is the relationship between nurse-sensitive quality indicators, the nurses' profile and the work characteristics?"

Material and Methods

Design

This was a multicenter retrospective descriptive study.

Setting and Sample:

This study retrospectively examined the data of 15 Joint Commission International-accredited, full-fledged private hospitals within a healthcare company, over a 3-year period from 2015 to 2017. Hospital-level data related to nursing services and nurse-sensitive quality indicators were retrieved from the nursing digital administrative reports. These reports include data such as number of patients, educational level of the nurses, turn-over rate, nurse-sensitive quality indicators from all the nursing units in the hospital.

As the study was conducted within a health group comprising hospitals that were put into service on different dates, the date range was determined to cover the period during which most data from these hospitals could be accessed. As there were fewer hospitals in previous years, older data (before 2015) could not be included. Additionally, as newly opened (opened after 2017) hospitals have not yet been accredited, and their data reporting systems were not validated, sharing their data was not deemed appropriate by the hospital administrative.

Variables and Data Collection:

Between December 2019 and January 2022, we retrieved the following nurse-sensitive quality indicators from each of the hospitals' monthly reports belong to 2015-2017: The occurrence of patient-falls, thrombophlebitis, patient satisfaction level, and pressure ulcers. Data was collected monthly and as these incidents are referred to as *'never events'*, i.e. the aim is to have zero incidents, each month is categorized based on the presence or absence of reported incidents for each outcome. In our investigation, we deliberately concentrated on these most common and specific indicators due to their widespread monitoring across all hospitals involved in the study. Variables were the educational level of the nurses, average working time (duration of employment/experience in the institution), nurse turnover rate (the ratio of nurses leaving work during the month to the total number of nurses working at the institution), total number of patients, time spent per patient (duration of patient care in the patient room based on the nurse call system registries), number of patients per nurse, and total hospitalization days (total hospitalization days of all patients). Moreover, data on "overall patient satisfaction" and "patient satisfaction with care" were retrieved from a questionnaire administered to all patients by hospital client affairs departments, encompassing satisfaction levels throughout the hospitalization process, including administration, discharge, and post discharge services. The institutional survey, designed for corporate purposes rather than academic validation, comprises a Likert scale providing scores for both overall satisfaction and care-related satisfaction.

Ethical Consideration

The study protocol was approved by the Bahcesehir University Scientific Research and Publication Ethics Committee (Approval Date: November 27, 2019; session: 2019/10; approval number: 20021704-604.02) and the Nursing Services Directorate of the hospitals where the research was conducted.

The study was conducted in accordance with the principles outlined in the Declaration of Helsinki. Since the research was conducted with records in the digital database, not with the patients themselves, obtaining informed consent was not required.

Data Analysis

Data analysis was performed using MedCalc Statistical Software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium). Descriptive data were presented as means and standard deviations. The Shapiro–Wilk test was used to examine the normality of continuous variables. For the between-group comparison of continuous variables, Student's t-test for independent samples or the Mann–Whitney U test was used, depending on the data distribution. Pearson's correlation test was used for the correlation analysis. p value of >0.05 was considered statistically significant.

Results

During the study period, data from 528 hospital-month units across 15 individual hospitals were included in the analysis. The mean total numbers of patients and hospitalization days were 2,031.0 ± 940.6 and 1,999.2 ± 1,049.6 days for hospital-months, respectively. The average nurse experience time in the hospitals was 41.4 ± 12.0 months, and the mean time spent per patient per day was 357.4 ± 169.8 min.

Factors Affecting Patient Outcomes

Patient and nursing-related potential factors affecting nurse-sensitive quality indicators (falls, thrombophlebitis, pressure ulcers, and patient satisfaction) are presented in **Table 1**. Data were presented in groups according to educational level of the nurses (numbers in specific hospital-months), work environment variables of the nurses, and patient-related variables. (The category of the education level of the nurses includes "vocational high school" as the laws and regulations in Türkiye allow graduates of nursing high schools that provide vocational education to practice nursing.)

Table 1: Factors affecting the presence of at least one case each of fall, thrombophlebitis, or pressure ulcer during hospital-months.

Variables	No falls n = 267[a]	Fall exists n = 261[a]	*p*	No TP n = 428[a]	TP exists n = 100[a]	*p*	No PU n = 230[a]	PU exists n = 298[a]	*p*
Educational level of the nurses (numbers in specific hospital-months)									
Vocational high school, n	69.6 ± 34.1	88.7 ± 40.5	**<.001**	78.9 ± 39.3	79.5 ± 35.5	.891	66.3 ± 27.5	88.8 ± 42.9	**<.001**
Associate degree, n	19.4 ± 12.6	22.4 ± 12.9	**.007**	21.4 ± 13.0	18.7 ± 11.7	.059	18.5 ± 11.2	22.7 ± 13.7	**<.001**
Bachelor's degree	42.4 ± 23.8	52.1 ± 26.9	**<.001**	48.5 ± 26.5	41.4 ± 22.1	**.006**	39.9 ± 19.8	52.8 ± 28.4	**<.001**
Postgraduate, n	8.1 ± 5.8	9.2 ± 6.8	**.034**	8.9 ± 6.5	7.5 ± 5.3	**.038**	7.5 ± 5.3	9.5 ± 6.9	**<.001**
Nurse work environment Variables									
Average nurse working time (experience) (months)[b]	42.3 ± 12.2	40.5 ± 11.8	.082	41.2 ± 11.9	42.5 ± 12.4	.345	42.2 ± 11.1	40.8 ± 12.7	.173
Nurse turnover rate, %	30.1 ± 10.7	33.2 ± 10.8	.289	31.3 ± 11.4	32.5 ± 7.9	.427	30.9 ± 11.7	32.7 ± 11.4	.777
Total number of patients (n)	1,827.3 ± 883.5	2,239.3 ± 953.1	**<.001**	2,000.5 ± 945.8	2,161.5 ± 910.7	.123	1,791.8 ± 774.3	2,215.5 ± 1014.4	**<.001**
Time spent per patient (h)	380.0 ± 185.4	334.8 ± 154.0	.461	352.4 ± 161.9	381.3 ± 216.6	.651	429.4 ± 178.7	377.3 ± 171.7	.987
No. of patients per nurse	13.6 ± 5.2	13.7 ± 4.6	**.697**	13.3 ± 4.8	15.2 ± 4.8	**<.001**	14.0 ± 5.6	13.3 ± 4.3	**.113**
Patient-related variables									
Overall patient satisfaction	96.3 ± 2.2	95.5 ± 6.4	.081	96.0 ± 5.1	95.4 ± 2.7	0279	95.8 ± 6.6	96.0 ± 2.6	.624
Overall patient satisfaction with care	96.5 ± 2.2	96.0 ± 2.7	**.028**	96.4 ± 2.4	95.7 ± 2.9	**.016**	96.4 ± 2.3	96.2 ± 2.6	.574
Total hospitalization days	1,764.2 ± 932.5	2,239.6 ± 1108.4	**<.001**	1,985.1 ± 1066.0	2,059.4 ± 978.3	.389	1,768.9 ± 790.1	2,319.3 ± 1263.8	**<.001**

[a] hospital-months, [b] nurse working time in the institution. Data are presented as means ± standard deviations; TP, thrombophlebitis; PU, pressure ulcer

The months that were documented with patient falls showed a notable increase in the number of nurses across all educational levels compared with the months without recorded falls. Concurrently, significantly higher total numbers of patients and hospitalization days were observed, with an associated decrease in overall patient satisfaction with care during months with documented patient falls.

Similarly, months with documented thrombophlebitis cases showed a significant increase in the nurse-to-patient ratio compared with months without such cases. Furthermore, nurses holding bachelor's and postgraduate degrees were more frequently present during months without documented cases of thrombophlebitis. This absence of thrombophlebitis cases was associated with higher levels of overall patient satisfaction with care.

Months with documented pressure ulcers showed a marked increase in the number of nurses across various educational levels compared with months without such cases. In addition, notable increases in total numbers of patients and hospitalization days were noted during months with documented pressure ulcers.

Notably, no significant associations were observed between patient outcomes and variables, such as average nursing experience in the institution, turnover rates, time spent per patient, or overall patient satisfaction.

Table 2: Correlations between certain nurse-sensitive quality indicators					
	Overall patient satisfaction	**Patient satisfaction with care**	**Nurse working time**	**Nurse turnover rate**	**Time spent per patient**
Overall patient satisfaction	-	**r = .461, *p* < .001**	r = .014, *p* = .764	r = .226, *p* = .140	r = –.130, *p* = .425
Patient satisfaction with care		-	**r = .200, *p* < .001**	r = .212, *p* = .167	r = –.168, *p* = .300
Nurse experience (working time in the institution)			-	**r = –.481, *p* < .001**	r = .166, *p* = .305
Nurse turnover rate				-	r = –.213, *p* = 187
Time spent per patient per day					-

Correlations Between Nurse-Sensitive Quality Indicators and Nurse Work Characteristics

The correlations between certain nurse-sensitive quality indicators are shown in **Table 2**. A significant positive low correlation was observed between overall patient satisfaction and patient satisfaction with care. Additionally, there was a significant positive low correlation between patient satisfaction with care and nurse working time within the institution (experience time). Conversely, a significant negative low correlation was found between nurse working time in the institution and the nurse turnover rate.

Discussion

This multicenter retrospective study evaluates nurse-sensitive quality indicators over a 3-year period from 2015 to 2017, within 15 hospitals of a Joint Commission International-accredited private health group. It reveals several significant correlations between nurses' educational level, total number of patients, patient satisfaction with care, nurse-to-patient ratio, and nurse-sensitive patient outcomes.

The data suggest that regardless of the nurses' educational level (vocational school, associate degree, bachelor's degree, or postgraduate), a higher number of nurses was observed during the months with documented falls compared with those without such cases. The practical implications of these findings could be related to various factors, including staffing levels, workload, experience, or training specific to each educational level. In summary, this finding suggests a noteworthy relationship between nurses' educational levels and the incidence of falls, emphasizing the significance of considering educational backgrounds when addressing patient safety and fall prevention measures within healthcare settings.

The findings of this study highlight the association between nurse educational levels and thrombophlebitis incidence. The number of nurses holding bachelor's and postgraduate degrees was fewer during months with documented thrombophlebitis cases. Besides, our study indicated a correlation between a higher nurse-to-patient ratio and increased thrombophlebitis cases. Although direct evidence linking nursing education to thrombophlebitis rates is lacking, there is a systematic review in the literature suggests that increased nursing care (closer monitoring, assessing patient-related factors etc.) is correlated with reduced peripheral vein thrombophlebitis risk (17). This suggests an indirect effect of educational attainment on patient outcomes.

In contrast to a previous study, our study observed no significant association between patient outcomes and nursing time spent per patient per day. Garcia and colleagues (18) identified no statistically significant correlation between nursing time and indicators analyzed, whereas Al-Ghraiybah et al. (19) reported that, the evidence regarding the relationship between the nursing practice environment and medication administration errors, pressure injuries, and hospital-acquired infections was inconsistent. Studies on nurse staffing and patient outcomes have been inconclusive. These discrepancies may stem from varying patient demographics and institutional practices.

Although we could not identify a significant relationship between any of the nurse-sensitive quality indicator and nurse turnover rate in this study, Liu et al. (20) suggested that a positive work environment, which could reduce job dissatisfaction and burnout, can lead to lower nurse turnover and higher care quality.

Our study revealed a clear association between the nurse-to-patient ratio and the occurrence of patient falls. This finding aligns with the results of a previous study. Bowden et al. (21) reported that 47%, 30%, and 4.7% of falls occurred with nurse-to-patient ratios of 1:5, 1:4, and 1:3, respectively. Moreover, other studies have identified a significant relationship between nurse staffing levels and negative patient outcomes (8,11,22).

Wang et al. (23) and Zadvinskis et al (24) explored that, nurse staffing had variable effects on the rates of falls. The nurse-to-patient ratio and the proportion of nurses with five years or less of experience were significant predictors of fall rates. Additionally, a higher level of nurse staffing, characterized by a lower nurse-to-patient ratio and a greater number of beds per nurse, was positively associated with the rate of hospital-acquired pressure ulcers. Similarly, Gonçalves et al. (25) linked adverse outcomes to missed care episodes influenced by the nursing care organization. Our study corroborates these findings, showing that periods with higher total numbers of patients and hospitalization days align with an increase in pressure ulcer incidence. Additionally, findings related to lower educational levels of nurses, higher nurse-to-patient ratios, and lower patient satisfaction with care indicated the influence of staffing and organizational factors on patient outcomes.

While a significant consensus on the relationship and applicability of nursing quality indicators to nurse turnover and patient satisfaction with nursing care was identified by a study employing the Delphi method (26), our study showed no association between quality-indicators and organizational factors, such as nurse working hours, turnover rates, time allocated per patient, or overall patient satisfaction. This discrepancy is attributed to variations in the profiles of the patients and nurses as the hospitals are in different district. Therefore, they have the potential to serve patients with different profiles (such as accepting trauma cases, providing services to older patients, etc.) In addition, the educational status and experience of nurses working in these hospitals may differ.

A retrospective cohort study on medical–surgical units reported that patient falls predominantly occurred under the care of the least or most experienced nurses (21). Furthermore, Liu et al. (20) noted that higher proportions of nurses with baccalaureate or advanced degrees improved patients' perceptions of communication, responsiveness, pain management, and the physical environment, which also indirectly enhanced overall hospital ratings and recommendations. These findings suggest that increasing the educational level and workforce size of nurses could improve patients' care experiences. However, while our study results link patient satisfaction with care and nursing experience (measured as working time at the institution), no significant associations were observed between patient outcomes and nursing experience within the institution.

Another study demonstrated that nurse communication and care transition positively impact patient experience ratings (27). Correspondingly, our study identified a modest but significant correlation between patient overall satisfaction and satisfaction with care, despite no association with working time. Additionally, we observed that patient satisfaction decreased during months with increased falls, which coincided with an increase in the total numbers of patients and hospitalization days. These findings imply that managing higher patient volumes or acuity necessitates nurse managers to consider clinical data to uphold patient satisfaction and safety.

Reviewing previous studies on nurse-sensitive patient outcomes revealed frequent consideration of falls and pressure ulcers, with varied results linking these outcomes to institutions' structural indicators such as number of nurses, educational levels of nurses etc. (1,22,26,28). Using databases that allow national and international data sharing is essential to accurately reflect and compare findings. Such databases would promptly integrate inputs, such as patient numbers and acuity levels, with nursing skill mix, while simultaneously conducting risk analyses for patient safety threats based on patient or nurse profiles, providing immediate feedback to healthcare managers for incidents, including falls or pressure ulcers.

When interpreting the findings of this study, the characteristics of the national healthcare system, employment policies, and working conditions of nurses should be considered. Türkiye's nurse population significantly below the average of Organization for Economic Co-operation and Development (OECD) countries (29). In addition, deficiencies in nurse employment are observed in Türkiye, and the staff turnover rate is evidently high, as indicated by the relevant data from this study. National Social Security Institution requests data on indicators for the provision of health services from public and private hospitals. These data, which are periodically reported by institutions, quantitatively describe the services provided on a clinic/department basis. These data sets are not publicly available for intra- or inter-institutional comparison, nursing-specific care quality indicators are not tracked as a separate data set, and no specific database is available for tracking nursing care quality and patient outcomes. Some institutions (usually private hospitals) disclose some of their indicators to the public on their websites on a voluntary basis, covering only certain time periods. However, no mechanism is available for checking whether these data are current, accurate, or complete, or a system to provide information to patients in selecting the institutions from which they will receive service considering these indicators. It would be useful to note here that the public (Social Security Institution) or private institutions (insurance companies) that cover health expenses do not consider the quality of care in hospitals as a criterion.

Considering all these factors, it becomes even more imperative for hospitals particularly nursing managers to closely monitor the nurse profile and patient outcomes if they do not have such monitoring and benchmarking systems to do this for them.

Patient safety and care quality, which are integral to nursing, demand rigorous evaluation and action, especially by administrators. Expanding longitudinal studies across diverse hospitals and regions is critical to understand the full scope of nurse-sensitive outcomes.

Strengths and Limitations:

To our knowledge, this study is the first comprehensive analysis of nursing-sensitive quality indicators in Türkiye. Unlike previous studies which primarily focused on limited nurse-sensitive quality indicators, this study's significance lies in its comprehensive scope as it is the most extensive investigation into nurse-sensitive quality indicators conducted in Türkiye to date. The robustness of the data, attributed to the considerable sample size, enhances the study's credibility. Besides, as the international accreditation bodies provide obligations regarding the data collection method and frequency, accuracy, and reliability of the data, storage, and reporting of all data; being the accredited institution where the study was conducted, reinforced the reliability of the findings and high generalizability of the study.

This study had some limitations. First, there was variability across hospitals in patient and nurse demographics. Differing hospital profiles, such as specialty centers or high-volume surgical units, may have varying resources, staffing levels, and patient populations, which can influence patient outcomes and the incidence of adverse events. These differences may affect the comparability of results across hospitals and should be considered when interpreting the findings. Institutional constraints prevented the inclusion of financial and patient demographic data and the specific occurrence rate of adverse events each month. Second, the absence of detailed information on the occurrence rates of falls, thrombophlebitis, and pressure ulcers in certain months limited our ability to fully understand the nature of these adverse events. Analyzing root cause reports of adverse events could have provided valuable insights into potential contributing factors. Lastly, the lack of patient acuity metrics made assessing the influence of patient severity on the outcomes challenging. These limitations should be considered when interpreting the results of this study.

Conclusion

The findings of this study suggest that certain nurse-sensitive quality indicators such as falls, pressure ulcers, and thrombophlebitis are associated with the profile of the nurse workforce including the number of patients per nurse, educational level of nurses, experience of nurses, nurse turn-over rate. Further extensive studies are needed to fully elucidate these relationships, particularly in countries that lack a national database for nurse-sensitive patient outcomes or a system for objective and simultaneous quality of care monitoring. Clarifying the impact of nurse-sensitive quality indicators on healthcare can drive improvements in nursing services and ultimately enhance patient outcomes.

Declarations

Funding

Not applicable

Conflicts of interest/Competing interests

The authors declare that they have no financial, personal, or other affiliations that could be perceived as constituting a potential conflict of interest. The authors also declare that there are no additional disclosures to report.

Ethics Approval

The study protocol was approved by the Bahcesehir University Scientific Research and Publication Ethics Committee (Approval Date: November 27, 2019; session: 2019/10; approval number: 20021704-604.02)

Availability of Data and Material

Due to the administrative policy and restrictions of the hospitals where this study conducted, raw data would remain confidential and would not be shared publicly.

Authors' Contributions

NAPA-Conceptualization, data curation; formal analysis; methodology, writing original draft. FEA-Conceptualization, methodology, review & editing. All authors read and approved the final manuscript.

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