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Nursing-Sensitive Quality Indicators and Related Factors for Patients at Intensive Care Units in Port Said City, Egypt

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ABSTRACT

Background: Nursing-sensitive quality indicators (NSQIs) are critical in evaluating the quality of care specific to nursing practice aligned with Egypt's health sector vision 2030. Research on NSQIs potentially improves nursing practice, either directly or indirectly. This study aimed to explore the prevalence of nursing-sensitive quality indicators and related factors for patients at intensive care units in Port Said City, Egypt. **Methods:** A cross-sectional design was used. Utilising two samples: the first was a convenience sample of 150 patients, while the second was all nurses (150), which provided care for adult intensive care patients at hospitals affiliated with the Egypt Health Care Authority Hospitals in Port Said City. Using two tools, the modified nursing sensitive quality indicators questionnaire was used to assess nurses' awareness of quality-sensitive nursing indicators. The second tool was the physical examination tool, which was used to assess patients for signs and symptoms of several quality-sensitive indicators by nurses. **Results:** The most common sensitive nursing quality indicator was falls (45.3%), followed by peripheral infiltration (28.7%) and urinary infection (26.9%). However, the mean total nurses' awareness score for the sensitive nursing quality indicators was 222.33±40.66. There is a significant relationship between total nurses' level of awareness about sensitive nursing quality indicators and urinary catheter-related urinary tract infection manifestations. However, patient gender was significantly related to restraint prevalence, and fall occurrence was significantly related to patient income. **Conclusion:** Falls was the greatest known sensitive nursing quality indicator followed by peripheral infiltration and urinary infection. However, a regular follow-up regarding nursing-sensitive quality indicators, the employment of updated awareness sessions for nurses about quality indicators and considering the high prevalence of patient outcome indicators are recommended.

Keywords: Intensive Care Unit; Nursing Sensitive Quality Indicators; Patient; Prevalence

INTRODUCTION

The nursing profession entered a new era with the start of the twenty-first century. In addition, there is a need to raise public expectations, keep up with the aging population, improve healthcare quality and safety, and keep up with the rising costs of healthcare and modern medicine. Afaneh, Abu-Moghli, & Ahmad (2021) stated that clinical and nurse executives are becoming more preoccupied with measuring the results of care provided in their workplace and obtaining data to support their resource allocation decisions. There should be a focus on outcomes and evidence due to the increasing complexity of healthcare systems worldwide. It is no longer a goal to provide outcome-oriented, economically sound healthcare (Tang & Wen, 2024). It is necessary to reevaluate the connection between the processes involved in providing care and its costs, quality, and intended results (Hakami *et al*., 2023).

Nursing-sensitive quality indicators are those that reflect nursing care or are most impacted by it, according to the American Nurses Association. To demonstrate the intricate relationships between nursing interventions, staffing levels, and favourable patient outcomes, intensive care units (ICUs) have been using nurse-sensitive quality indicators. Patient outcomes influenced by nursing care, either directly or indirectly, are referred to as nursing-sensitive quality indicators (NSQIs) (Maier *et al.*, 2024). Most a hospital's financial resources are allocated to care in intensive care units (ICUs), which accounts for many health care costs. Adverse events and human errors pose significant risks to the morbidity and mortality of critically ill patients in the intensive care unit (ICU), particularly due to understaffing. Quality indicators (QIs) are important tools for quality improvement programs (Secanell *et al.*, 2014; Oliveira *et al.*, 2020). Additionally, premature discharge from intensive care units can occur due to a lack of available beds for critically ill patients. This situation, however, poses a significant challenge forward to nurses (Ludin, 2018).

Measures of in-hospital programs' systematic effectiveness are not thought to exist; instead, measurements pertaining to structure or processes are made more frequently (Oner *et al.*, 2021). A desirable or undesirable change attributed to the health care received is referred to as an indicator of outcomes or effectiveness (Abdelmoaty *et al.*, 2020; Xu *et al.*, 2024). Even though a variety of factors can affect outcome indicators, they remain essential and tangible components for assessing the effectiveness of health care (Evangelou *et al.*, 2018). The fact that nurses make up most of the healthcare workforce, provide most of the hospital care, and actively participate in the development, application, and assessment of patient safety improvement initiatives is noteworthy (Seiffert *et al.*, 2020; Gormley, Connolly & Ryder, 2024). Consequently, there is a possibility to establish a correlation between nursing care effectiveness indicators and primary quality dimensions, like patient-centred care and safety. Therefore, it is necessary to explore the prevalence of quality-sensitive nursing indicators and associated factors for patients in intensive care units.

Measuring the impact of nursing care on patient outcomes is not a new concept. Florence Nightingale recognised the need to evaluate the quality of nursing practice and began to measure patient outcomes using statistical methods in the 1850s (Montalvo, 2007). Identifying indicators that are sensitive to nursing has not been straightforward. The term NSI originated in 1996 to signify patient-related outcomes that are affected by nursing care (Maas *et al.*, 1996). Defining potential indicators, demonstrating an association between the indicator and nursing care and the collection and analysis of the data all compound the complexity. To assist in identifying potential indicators, Donabedian's (1988) framework of quality assessment has consistently been used. This framework explicates the relationship between the attributes of nurses providing the care (structure), the interventions of those nurses (process), and the outcomes for their patients (Burston, Chaboyer, & Gillespie, 2014; Donabedian, 1988). The American Nurses Association has grounded its work on developing NSI on this framework (Gallagher & Rowell 2003), as have others (Doran, 2011).

Quality indicators and screening tools for the purpose of identifying potential areas of concern regarding the quality of clinical care. For the purpose of this report, we focus on indicators that reflect the quality of care inside hospitals AHRQ, 2003. Quality indicators may assess any of the following as peripheral venous infiltration, pulmonary infection manifestations, presence of pressure ulcer, central line catheter infection manifestations, and urinary catheter infection manifestations, restraint and fall.

METHODOLOGY

Research Design

The current study used a cross-sectional, descriptive design.

Setting and Samples

A convenience sample of 150 adult patients in both genders admitted to intensive care units during the period of conducting the study and willing to participate in the study. The second sample included all 150 nurses who directly cared for patients in intensive care units, and their experience in intensive care was one year or more. Additionally, nurses have different levels of education such as diploma, technical institute, and/or bachelor. In Port Said City, four hospitals affiliated with the Egypt Health Care Authority Hospitals hosted the current study, which were named Elsam, Eltadamon, Elmabarra and El Nasr.

Study Preparation

This study involved reviewing the relevant and recent literature related to the research topic, various studies, and theoretical knowledge of various aspects of the problems using all official websites, including the Egyptian Knowledge Bank (EKB), PUBMED, GOOGLE SCHOLAR, MEDLINE, CINAHL, EBSCO Cochrane Database, and Scopus databases.

Data Collection

A period of four months was used to collect the data, beginning in October 2021 and ending in February 2022. Nurses and patients were given the assurance prior to the study's execution that all information gathered would be kept private. Nurses were also told that they would not be penalised if they left the study at any point. The directors of the hospitals run by the Egypt Health Care Authority and the individuals in charge of the settings where the researcher conducted the study gave their official approval before the study could begin. The nature of the current research study and the goal were thoroughly clarified to the studied nurses and patients to begin collecting data. The researchers interviewed the patient within 25 minutes and the nurse within four to five days of week.

Measurement and Data Collection

The following instruments were used to gather the data for this study: The first instrument measures nurses' awareness of quality-sensitive nursing indicators. It is a modified version of the nursing sensitive indicators (NSIs) rating scale, which was created and tested by (Ali *et al.*, 2020; Oner & Karadağ, 2023) for validity and reliability. It consists of part (a): the demographic profile to assess nurses' age, gender, experience, educational level, type of ICUs, and training workshop about quality indicators, while part (b) comprised 40 items, each of which was rated from 1-7 (7 represented strong agreement and 1 represented strong disagreement). The structure, process, and outcome dimensions of a single quality model served as the foundation for the development of this scale. Four of the forty NSI items had to do with process, twenty-two with outcome, and fourteen with structure.

Adopted by the researcher from Alshammari *et al.* (2023) and retested for applicability and feasibility was the second tool, the patient assessment tool. The physical examination tool: it consists of part (a): the demographic data to assess patients' age, gender, working, educational level, income, and patient with devices, while part (b) it used for the patient's physical assessment included palpation and observation techniques. This method was used to assess for signs and symptoms of several quality-sensitive indicators, including the degree of peripheral venous infiltration, pulmonary infection manifestations, presence of pressure ulcer, central line catheter infection manifestations, and urinary catheter infection manifestations. Restraint was also discovered through observation and patient records, but some indicators like falls and deep vein thrombosis were found in the patient records in addition to the patient asking.

The indicator was examined using standard scales, such as the European Pressure Ulcer Advisory Panel's (EPUAP) grading system for detecting pressure ulcers grad. This grading system ranged from 1 to 4, 1 was given for pressure ulcer grade 1, and 4 was given for grade 4. Each pressure ulcer grade was identified according to the EPUAP description (Driscoll et al. 2016). A panel of 44 experts classified digital photos of pressure ulcers to test the system's internal reliability and observer agreement. The results showed that the system was suitable for grading pressure ulcers (Jeon *et al.*, 2023). However, the Infusion Nurses Society Infiltration Scale, which was psychometrically tested by Groll *et al.* (2010), was used to determine the peripheral venous infiltration levels.

Data Analysis

Using SPSS version 23, the data were analysed. The ratio of patients who had at least one urinary catheter infection symptom to all patients was used to explore the prevalence of infection-related urinary catheters. A central line catheter infection's prevalence was determined by dividing the total number of patients connected to a central line catheter by the number of patients who had at least one central line catheter infection manifestation. The frequency of other quality indicators, like falls, restraint, intravenous infiltration, and deep vein thrombosis, was determined by dividing the number of patients with quality indicator issues by the total number of patients.

Tool Validity and Reliability

A board of seven medical-surgical and nursing administration departments' expertise Clarity, applicability, comprehensiveness, and understanding were the criteria by which professors assessed the tools, and the modifications were made. Cronbach's alpha test was utilised to assess the tool's reliability which was 0.81 and 0.78 consecutively. A pilot study involving 10% of the sample chosen from the previously described setting was conducted before the main study commenced. Participants were dropped from the initial sample and appropriate modifications were comprised based on the study's pilot findings.

Ethical Consideration

The Ethical approval for this study was obtained from Research Ethics Committee, Faculty of Nursing at Port Said University, Egypt with reference number NUR (1)/2021 on 4th April 2021.

RESULT

The study hospitals' managers received an official letter from the dean of Port-Said University's Faculty of Nursing outlining the goal to conduct the current study. Participants were informed of the study's purpose; code numbers and their identities were disclosed to reassure that all information collected would be kept strictly confidential and only for the study's objectives. It was made clear that participants could leave the study at any time.

Patients' Socio-Demographic Characteristics	N (%)
Gender	
Male	73.9 (49.3%)
Female	76.10 (50.7%
Age (Mean±SD, Min, Max)	61.3±14.73 (Min 22, Max 95)
Education	
Illiterate	34(22.6%)
Primary	55(37.3%)
Secondary	31(20.7%)
University	28(18.7%)
Working	
Yes	58(38.7%)
No	92(61.3%)
Smoking	
Yes	44 (29.3%)
No	106(70.7%)
Income	
Enough	77(51.3%)
Not enough	73 (48.7%)
Patients Related to Mechanical Ventilators*	
Yes	32 (21.3%)
No	118(78.7%)
Patients admitted with pneumonia	14(43.75%)
Patients related to urinary catheter.	126 (84%)

A total of 74 intensive care patients were male, and 76 were female. The ages of the study patients ranged from 22 to 95 years, and their mean age was 61.3±14.73 years. Overall, 32 (21.3%) patients were connected to mechanical ventilators, and 14 of these patients were admitted with pneumonia (Table 1).

On the other hand, 150 nurses were involved in the current study; 79.3% of the participants were females, and 60.7% were married. Additionally, the mean age of the nurses who participated was 30±6.41 years. However, the mean nurses' experience in the nursing profession was 8.54 ± 6.62 years, and that in the intensive care unit was 4.15 ± 4.24 years (Table 2).

Table 2: Sociodemographic Characteristics of Nurses Participated in The Study Setting

| Nurses' Demographic Characteristics	N (%)
Gender	
Male	31 (20.7%)
Female	119 (79.3%)
Age (Mean±SD, Min, Max)	30±6.41 (Min 20, Max 47)
Marital Status	
Single	49 (32.7%)
Married	91 (60.7%)
Divorced	7 (4.7%)
Widow	3 (2%)
Education	
Nursing school	23 (15.3%)
Technical health school	58 (38.7%)
Bachelor nursing	58 (38.7%)
Specialized diploma	6 (4%)
Master's degrees	5 (3.3%)
Nurses' Years of Experience	
Years in nursing profession (mean ±SD)	8.54 ± 6.62
Years in ICU (mean ±SD)	4.15 ± 4.24
Training Workshop about Quality Indicators	
Yes	120 (80%)
No	30 (20%)
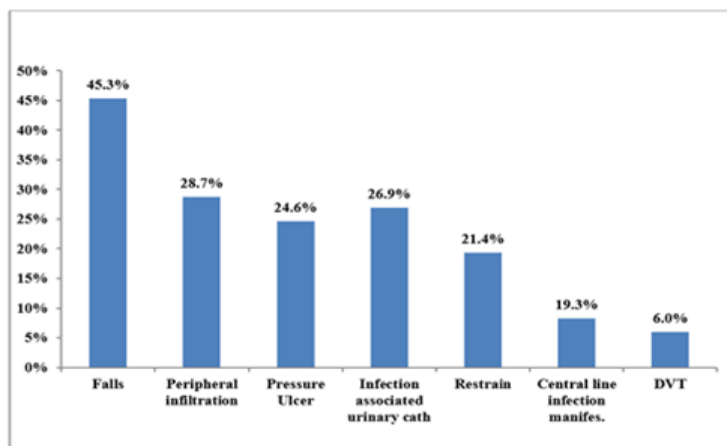
Figure 1: Prevalence of Quality Sensitive Nursing Indicators in Adults at The Study Setting

Figure 1 shows that the most common quality-sensitive nursing indicator was falls (45.3%), followed by peripheral infiltration, urinary tract infection and pressure ulcers (28.7%, 26.9% and 24.6% respectively). However, the minimum prevalence of central line infection was 8.3%, and the prevalence of deep vein thrombosis was 6%.

Table 3. Nurses' Awareness Regarding Quality Sensitive Nursing Indicators Using (NSIS) Rating Scale at The Study Setting

Items	Total Awareness of all Dimensions (280)	Structure Dimension of NSIs Total (98)	Process Dimension of NSIs Total (28)	Outcome Dimension of NSIs Total (154)
Mean± SD	222.33 ± 40.66	79.71±14.39	22.94 ± 4.092	119.68 ± 26.06
Minimum	59	14	4	33
Maximum	280	98	28	154

Furthermore, the mean values of the structure, process and outcome dimensions of the nurses related to the quality-sensitive nursing indicators were 79.71±14.39, 22.94±4.092 and 119.68±26.06 respectively. However, the mean total awareness score was 222.33±40.66 (Table 3).

Table 4: Correlation between Factors Associated with Prevalence Related Patients' Nursing Sensitive Quality Indicators at The Study Setting

Factors	Restraints	Falls	Deep Venous Thrombosis	IV Infiltration	Pressure ulcer	Central Venous line related infection manifestations	Urinary catheter related infection manifestation
Gender	X=5.543 P=0.019*	X=0.648 P=0.512	X=0.148 P=0.700	X=1.221 P=0.660	X=0.080 P=0.851	X=0.640 P=0.681	X=1.170 P=0.331
Age	X=2.870 P=0.754	X=9.411 P=0.094	X=5.859 P=0.272	X=8.984 P=0.448	X=10.266 P=0.072	X=3.179 P=0.687	X=10.939 P=0.05*
Smoking	X=1.282 P=0.362	X=0.144 P=0.722	X=1.055 P=0.303	X=3.484 P=0.149	X=0.798 P=0.408	X=0.048 P=1.000	X=0.714 P=0.521
Education	X=1.694 P=0.901	X=10.704 P=0.047*	X=2.241 P=0.698	X=10.752 P=0.225	X=1.200 P=0.955	X=5.453 P=0.264	X=4.881 P=0.460
Working	X=1.400 P=0,290	X=0.330 P=0.615	X=0.115 P=1.000	X=0.644 P=1.000	X=0.805 P=0.439	X=0.339 P=0.977	X=0.003 P=1.000
Income	X=0.609 P=0.536	X=13.251 P=0.000*	X=0.182 P=0.741	X=4.050 P=0.109	X=0.000 P=1.000	X=0.588 P=0.682	X=0.031 P=1.000
Nurses' awareness about nursing indicators	t=1.81 p=0.253	t=1.512 p=0.133	t=0.811 p=0.419	t=2.357 p=0.020*	t=0.626 p=0.532	t=0.071 p=0.943	t=2.490 p=0.014*
X= Chi square.		t=Independent sample t-test.		*Significant with *p* value≤0.05			

In relation to factors associated with sensitive nursing quality indicators at intensive care units, the study exposed a statistically significant relationship between patients' gender and restraint use, age, and urinary catheter-related urinary tract infection manifestations. Additionally, there is a statistically significant relationship between patients' education, income, and falls Table 4.

DISCUSSION

These findings align with those of Araújo *et al.*, (2023), who found patients in intensive care who were around sixty years old. Their study focused on the reliability of clinical indicators of the nursing diagnosis proposal. In addition, the current study found that almost half of the patients under investigation only completed their primary schooling. These findings disagreed with those of Abu-Moghli and Ahmad (2021), who found that over one-third of the patients in their study had only completed their primary education and investigated the accuracy of clinical indicators of the nursing diagnosis proposal in intensive care. This could be because of Egypt's mandatory elementary education.

In terms of smoking, the current study found that over two-thirds of the patients were not smokers. This finding contradicted that of Nisar *et al.* (2023), who examined the clinical and etiological aspects of ventilator-associated pneumonia in a developing nation's critical care unit and found that over one-third of the patients smoked. This might be because of hospital policies that prohibit smoking. Furthermore, over half of the patients in the study have enough income. This may be a reference to the regulations that hold the Health Insurance Organisation accountable for most patients' medical expenses.

According to the current study's findings, four out of five patients did not have a mechanical ventilator in place. These findings concur with those of Wunsch *et al.* (2010); Behrendt (2000) mentioned that over 300,000 patients in the US receive mechanical ventilation annually. Furthermore, most of the patients in this study had urinary catheters attached to them. This result is inconsistent with that of Katayama *et al.* (2022) who conducted a study on the indwelling urinary catheters' prevalence and appropriateness in Japanese and instituted that the

mean indwelling urinary catheter use's prevalence in participating wards was less than one-fifth of the admitted patients. In terms of the nurses' experience, the current study found that they had 4.15±4.24 years (mean ±SD) in the ICU and 8.54±6.62 years (mean ±SD) in the nursing profession. This result was in line with that of Beratiye and Karadağ (2023). According to the researcher, nurses need to have enough experience, particularly in the intensive care unit (ICU), as critically ill patients need clinical experience to ensure patient safety. Ultimately, most nurses attended workshops on quality indicators. According to the researcher, regular workshops regarding quality.

The present study's findings regarding nurses' awareness of sensitive quality indicators for nursing demonstrated that nurses had a solid foundation in terms of awareness dimensions pertaining to these indicators. This result was reliable with the conclusions of Driscol et al. (2018); Oner et al. (2021), who discovered a lower incidence of hospital-acquired pneumonia, decubitus ulcers, and mortality in medical inpatients when there is a higher nurse staffing level. Additionally, Doran et al. (2006) reported that patient outcomes prejudiced by the nursing care are commonly clarified as nursing-sensitive outcomes (NSOs). However, NSOs are well-defined as outcomes "that are appropriate, built on nursing scope, and area of skills. In addition, there is experimental indication connecting nursing efforts and practices to the outcomes.

Otherwise, nurses' awareness dimensions of sensitive quality indicators that named structure, process and outcome were (79.71±14.39, 22.94±4.092, and 119.68±26.06) respectively with a mean total awareness score of 222.33±40.66, according to the current study on nurses' awareness of quality-sensitive nursing indicators. In this respect the study by Chen, Liao and Zhou (2023) indicated that these indicators might be useful for comparing the quality of nursing in hospitals. Moreover, a study by Okello (2022) concluded that application of ICU-specific nurse-sensitive indicators could impact clinical nursing practices, direct advancements of the care provided. Accordingly, these results reflect the importance of nurses' awareness about quality-sensitive nursing indicators to enhance their nursing performance and improve patients' health outcomes.

The results of this study showed that falls were the most prevalent sensitive nursing quality indicator, followed by pressure ulcers, urinary tract infections, and peripheral infiltration. The least severe forms of deep vein thrombosis and central line infections, however, were the lowest indicators. This result corroborated the findings of Hakami et al. (2023), showing that it gauges the nursing quality of care; the most often mentioned pointers were pressure ulcers, CRUTIs, and patient falls. Additionally, most indicators currently in use are pressure ulcers and urinary tract infections, according to a study by Alshammari (2023) on the establishment of standardized sensitive indicators of nursing quality.

Furthermore, Melleiro (2015), who experienced falls was over fifty-five years old. This research focused on pressure ulcer prevalence indicators and patient fall incidence in teaching hospitals in the city of São Paulo. Really described those patients with dry skin, advanced years of age or older are more susceptible to developing pressure ulcers. Furthermore, predisposing or risk factors for falls also include vision loss, muscle weakness, and balance issues. Furthermore, Koch et al. (2022) reported that the most mutual causes for hospital admission who experienced pressure ulcer during hospitalisation were urinary tract infection and non-ventilator hospital-acquired pneumonia. However, Hakami et al., (2023) conducted a study on nursing research priorities based on nurse-sensitive indicators and reported that the most frequently cited indicator of nursing care quality was patient deep vein thrombosis.

The current study found that patient gender was significantly correlated with the prevalence of restraints and that patient income and education were significantly correlated with the occurrence of falls. These results pertain to the factors associated with the prevalence of nursing-sensitive quality indicators for patients at the intensive care units. These findings aligned with Cui et al. (2023) demonstrated a statistically significant correlation between the use of restraints and gender. Moreover, there was a statistically significant relation between age and urinary catheter-related infection. This may be due to changes in bladder function throughout the patient's life. Additionally, changes in body functions may be particularly profound in clinical populations at high risk of urinary tract infection (UTI), such as patients who undergo catheterisation.

Additionally, a statistically significant correlation was found between the patients' income, education, and frequency of falls. According to the researcher, despite the patients' lack of knowledge about the factors that predispose them to falls, many of them were unaware that aging-related physical changes included muscle

weakness, poor vision, and issues with their feet and balance. Additionally, patients may be more susceptible to falls if their health status is not regularly monitored. On the other hand, there was a significant correlation between peripheral venous infiltration and urinary tract infection manifestations associated with urinary catheter use and nurses' general awareness of sensitive quality indicators.

Limitation

However, it is important to acknowledge this study's limitations, as not all intensive care patients were enrolled in the study because of the coronavirus pandemic. Additionally, the nature and environment of the intensive care unit limit the number of researchers in the intensive care unit during data collection. Furthermore, the lack of support from clinical instructors, who are essential as both clinical instructors and nurse educators. A change in practice requires a solid theoretical foundation, the development of new skills, practical experience, and motivating role models to lead the way.

CONCLUSION

Nurses' awareness of sensitive nursing quality indicators was significantly correlated with peripheral venous infiltration and catheter-related urinary tract infection manifestations. Falls were the greatest known sensitive nursing quality indicator, followed by peripheral infiltration. Sensitive nursing quality indicators should be routinely monitored, and nurses should participate in updated education regarding these indicators. This is especially important given the high frequency of patient outcome indicators like peripheral venous infiltration and falls. The implications of this study plan as the future scope are that the findings can be used to develop nurses' awareness about nursing-sensitive quality indicators as well as enhance the improvement quality indicators in the intensive care units that could be evaluated through patients' health outcomes. Also, care guidelines to comprehensively decrease or/and prevent the occurrence of medical limitation, fall, deep venous thrombosis, IV infiltration, pressure ulcer, central venous line-related infection manifestations, and urinary catheter-related infection manifestations and their consequences.

Recommendation

A regular follow-up regarding nursing sensitive quality indicators, the employment of updated awareness sessions for nurses about nursing sensitive quality indicators and considering the high prevalence of patient outcome indicators such as falls and peripheral venous infiltration. Conducting the same study in larger sample and different geographical area is recommended.

Conflict of Interest

The authors declare that they have no conflict of interests.

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