

RESEARCH ARTICLE (ORIGINAL) 

Outcome indicators obtained from the nursing process: Prospective cohort study with critically ill patients

Indicadores de resultados com pacientes críticos obtidos com o processo de enfermagem: Estudo de coorte prospectivo

Indicadores de resultados con pacientes críticos obtenidos con el proceso de enfermería: estudio de cohorte prospectivo

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Abstract

Background: The implementation of the nursing process contributes to obtaining outcome indicators that demonstrate changes in nursing diagnoses.

Objective: To analyze outcome indicators obtained from the implementation of the nursing process with critically ill patients.

Methodology: Prospective cohort study with a convenience sample of 109 critically ill patients. Rates of diagnostic prevalence and incidence, risk diagnostic effectiveness, effectiveness in preventing complications, and positive changes in the status of actual diagnoses were calculated.

Results: The diagnosis of risk for infection was prevalent in 100% of patients and the diagnosis of risk for imbalanced body temperature had the highest incidence (33.9%). The diagnoses of risk for infection, risk for vascular trauma, risk for bleeding, and risk for impaired religiosity obtained a diagnostic effectiveness rate of 100%. The rate of effectiveness in preventing falls was 100%. The rate of positive changes in the diagnosis of hypothermia was 93.4%.

Conclusion: Indicators obtained from the nursing process show nursing-sensitive outcomes.

Keywords: nursing process; health status indicators; intensive care units; adult; nursing

Resumo

Enquadramento: A implementação do processo de enfermagem contribui para a obtenção de indicadores de resultados que demonstram mudanças nos diagnósticos de enfermagem.

Objetivo: Analisar indicadores de resultados obtidos a partir da implementação do processo de enfermagem com pacientes críticos.

Metodologia: Coorte prospectivo com 109 pacientes críticos em amostra de conveniência. Foram calculadas taxas de prevalência e incidência diagnóstica, de efetividade diagnóstica do risco, efetividade na prevenção de complicações e de modificações positivas no estado dos diagnósticos reais.

Resultados: O diagnóstico risco de infecção foi prevalente em 100% dos pacientes e o risco de desequilíbrio na temperatura corporal foi o mais incidente (33,9%). Os diagnósticos risco de infecção, risco de trauma vascular, risco de sangramento e risco de religiosidade prejudicada obtiveram a taxa de efetividade diagnóstica do risco de 100%. A taxa de efetividade na prevenção de quedas foi de 100%. A taxa de modificações positivas no estado do diagnóstico de hipotermia foi de 93,4%.

Conclusão: Indicadores obtidos a partir do processo de enfermagem evidenciam resultados sensíveis à prática de enfermagem.

Palavras-chave: processo de enfermagem; indicadores básicos de saúde; unidades de terapia intensiva; adulto; enfermagem

Resumen

Marco contextual: La aplicación del proceso de enfermería contribuye a la obtención de indicadores de resultados que demuestran cambios en los diagnósticos de enfermería.

Objetivo: Analizar los indicadores de resultados obtenidos a partir de la aplicación del proceso de enfermería con pacientes críticos.

Metodología: Cohorte prospectivo con 109 pacientes críticos en una muestra de conveniencia. Se calcularon las tasas de prevalencia e incidencia de los diagnósticos, de la eficacia de los diagnósticos de riesgo, de la eficacia en la prevención de complicaciones y de los cambios positivos en el estado de los diagnósticos reales.

Resultados: El diagnóstico de riesgo de infección prevaleció en el 100% de los pacientes y el riesgo de desequilibrio de la temperatura corporal fue el más incidente (33,9%). Los diagnósticos de riesgo de infección, riesgo de traumatismo vascular, riesgo de sangrado y riesgo de deterioro de la religiosidad obtuvieron una tasa de eficacia diagnóstica del 100%. La tasa de eficacia en la prevención de caídas fue del 100%. La tasa de cambios positivos en el diagnóstico del estado de hipotermia fue del 93,4%.

Conclusión: Los indicadores obtenidos del proceso de enfermería muestran resultados sensibles a la práctica enfermera.

Palabras clave: proceso de enfermería; indicadores básicos de salud; unidades de cuidados intensivos; adulto; enfermería



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Introduction

Monitoring the quality of care provided to patients is the responsibility of all health professionals, including nurses (Gomes et al., 2020). This action is imperative in all areas, especially in intensive care units (ICUs), where patients are continuously exposed to a high risk for adverse events due to frequent invasive interventions (Roque et al., 2016).

The quality of care provided is influenced by the interaction between the structure, work processes, and outcomes achieved (Gomes et al., 2020), factors that directly impact patient safety.

The patient outcomes can be monitored through the implementation and recording of the nursing process (NP) steps (Estevam et al., 2016). Responding to nursing care by monitoring the changes in nursing diagnoses (Neto et al., 2020) allows verifying the effectiveness of the interventions and applying continuous improvement strategies focused on the excellence of care (Seiffert et al., 2020).

The application of the NP steps requires nurses to use critical thinking in identifying the needs presented by patients, establishing expected outcomes, and determining the care needed (Domingos et al., 2019).

The implementation of the NP, especially when using software designed for patient assessment documentation, with clinical data mapped into nursing diagnoses (NDs) and care prescriptions, where nurses are encouraged to employ clinical reasoning and critical thinking skills, facilitates measuring diagnostic prevalence and incidence, risk diagnostic effectiveness, effectiveness in preventing complications, and effectiveness in positive changes in the status of actual NDs (Tannure & Chianca, 2016).

The calculation of these rates allows analyzing nurses' effectiveness in predicting risks to which patients are exposed, determining actions that prevent a potential need from becoming real, as well as in solving existing problems. Thus, the analysis of these rates can demonstrate nurses' contribution to patient outcomes (Estevam et al., 2016), that is, nursing-sensitive outcomes (NSOs). NSOs are defined as desired or undesired changes that occur in the health status of individuals in relation to nursing interventions (Porcel-Gálvez, 2019). The monitoring of NSOs favors the implementation of improvement cycles, focusing on patient safety (Porcel-Gálvez, 2019). These NSOs need to be calculated and evaluated continuously, and software developed for this purpose can facilitate both data entry and processing for conducting analyses. Thus, this study aimed to analyze outcome indicators obtained from the implementation of the NP with critically ill patients.

Background

The quality of health care should be guaranteed to all individuals, and the assessment and monitoring of the care structure, processes, and outcomes proposed by Donabedian are considered as strategies to measure quality and verify the professionals' performance (Berwick &

Fox, 2016).

Structure assessment has become necessary since physical, material, budgetary, and human resources can impact the quality of care. In turn, processes implemented in the services, such as guidelines and flows, also affect the quality of care. The outcome indicators, on the other hand, demonstrate the effects obtained with the implemented care, that is, the changes in the health status, behavior, knowledge, as well as satisfaction of patients (Donabedian, 2003).

The International Council of Nurses (ICN) defines nursing outcome as any change that occurred in NDs resulting from nursing interventions (Neto et al., 2020). With the advance in the standardization of nursing languages, including diagnoses (Azevedo & Cruz, 2021), it is possible to assess indicators obtained from its monitoring (Estevam et al., 2016).

The *Ordem dos Enfermeiros de Portugal* (OEP; Portuguese nursing regulator) has published a set of nursing indicators for different levels of care, including rates of diagnostic prevalence and incidence, risk diagnostic effectiveness, effectiveness in preventing complications, and positive changes in the status of actual NDs (Leite, 2016).

These indicators can guide more effective decision-making processes, so they need to be monitored in professional practice.

Research question

What NSOs were obtained after implementing the NP with critically ill patients?

Methodology

A prospective cohort study was conducted in a postoperative ICU of a philanthropic hospital in a Brazilian capital, with 12 consultation offices for patients of the Single Health System (SUS).

The study population included critically ill patients admitted to four consultation offices that were pre-selected for the research because they were intended for the admission of patients undergoing more complex surgeries.

The inclusion criteria were: being admitted to the consultation offices selected for the study, being over 18 years of age, and consent or having the consent to participate in the study provided by a family member or guardian. Patients who did not meet the inclusion criteria and those who were discharged or eventually died before the first data collection were excluded.

The convenience sample consisted of 109 patients, followed in the period between 7 and 12 January 2015, from hospitalization until discharge, unit transfer, or death.

All patient records regarding anamnesis and physical examination, ND, planning, implementation, and evaluation of nursing care were kept exclusively by the research team, consisting of three nurses and four nursing students. The software *Sistema de Informação com o Processo de Enfermagem em Terapia Intensiva* (information system

for intensive care nursing process, SIPETi; Tannure & Chianca, 2016) was used.

The research team underwent training in which they prepared, with the help of SIPETi, NDs and nursing prescriptions. They were considered able to perform data collection because they obtained a concordance index above 80% in prioritizing diagnoses and determining care to solve them.

SIPETi was chosen because its database is fed with algorithms capable of calculating health indicators obtained from the NP. It maps defining characteristics and risk factors foreseen in the anamnesis and physical examination modules, with diagnostic probabilities established in NANDA-International (NANDA-I) and NDs with nursing prescriptions prepared from activities foreseen in the Nursing Interventions Classification (NIC; Tannure & Chianca, 2016).

The study subjects were examined daily by the researchers who recorded their information into SIPETi and identified, with the help of the software, NDs and prescriptions. After discussing the care with the ICU nurses, the prescribed actions were implemented by the unit professionals and followed up by the research team.

From the data entered in SIPETi, rates of diagnostic prevalence and incidence, risk diagnostic effectiveness, effectiveness in preventing complications, and positive changes in actual ND status were automatically calculated by the software. But for the purposes of this study, only the rates referring to diagnoses identified in at least 50% of the patients in the sample were considered.

It is important to highlight that, in the calculation of the incidence rate, a new case of a certain diagnosis was considered to be the one identified after the first evaluation of the patient. In determining the diagnostic effectiveness rate for risk, prior risk was considered as that documented at least 24 hours before the actual problem was observed. Regarding the effectiveness rate for preventing complications, the number of cases of patients who developed the real problem was determined through the identification of the actual NDs and the description of evidence pointing

to the occurrence of the problem, as follows: for risk for infection - fever, leukocytosis, and prescription of new antibiotics after ICU admission; for risk for impaired skin integrity - impaired skin integrity and/or impaired tissue integrity and development of skin injury in the ICU; for risk for vascular trauma - hematoma, ecchymosis, report of pain and infiltration at the catheter insertion site; for risk for bleeding - occurrence of bleeding; for risk for imbalanced body temperature - hypothermia, hyperthermia, and ineffective thermoregulation; for risk for loneliness - social isolation; for risk for impaired religiosity - impaired religiosity; for risk for unstable blood glucose level - glycemia below 80 mg/dl and above 180 mg/dl, glycemic correction with hypertonic glucose or insulin administration; and for risk for falls - occurrence of falls. The researchers recorded whether the identified NDs were maintained, disregarded, or resolved, and from this information, it was possible to monitor nursing actions prescribed for each diagnosis and to generate the effectiveness rates in preventing complications and positive changes in the status of each ND.

The study was approved by the Research Ethics Committee of the Federal University of Minas Gerais (CAAE 44836115.4.0000.5149).

Results

Among the 109 patients included in the study, 64 (58.7%) were male and 45 (41.3%) were female. Patients' age ranged from 18 to 97 years, with a mean age of 64 and a median of 63 years. The length of hospital stay ranged from 1 to 52 days, with a mean of 5.2 days and a median of 3 days. Regarding the outcome, 100 patients (91.7%) were discharged from the ICU and 9 (8.3%) eventually died. An average of 21 NDs were formulated per patient, using 101 different diagnostic titles (DT) in the system, of which 14 (13.9%) were identified in at least 50% of the patients. For these, prevalence and incidence rates were calculated, presented in Table 1.

Table 1*Incidence and prevalence of nursing diagnoses (ND)*

Nursing diagnoses	Cases with the ND (N)	Prevalence rate (%)	New cases with the ND (N)	Incidence rate (%)
Risk for infection	109	100	1	0.9
Bathing self-care deficit	108	99.1	1	0.9
Risk for impaired skin integrity	108	99.1	1	0.9
Risk for vascular trauma	106	97.2	1	0.9
Interrupted family processes	101	92.7	6	5.5
Risk for bleeding	95	87.2	6	5.5
Risk for imbalanced body temperature	82	75.2	37	33.9
Hypothermia	76	69.7	18	16.5
Risk for loneliness	74	67.9	12	11.0
Impaired tissue integrity	73	67	10	9.2
Imbalanced nutrition: less than body requirements	66	60.6	12	11.0
Risk for impaired religiosity	63	57.8	10	9.2
Risk for unstable blood glucose level	61	56	9	8.3
Risk for falls	59	54.1	12	11.0

Note. ND = nursing diagnosis; N = number.

Of the 14 NDs analyzed in the study, nine (64.3%) were at risk. For these, it was possible to obtain the risk diag-

nostic effectiveness rate (Table 2) and the effectiveness rate in preventing complications (Table 3).

Table 2*Rate of the effectiveness of risk diagnosis*

Nursing diagnoses	Developed actual problem (N)	Developed actual problem with documented previous risk (N)	Risk diagnostic effectiveness rate (%)
Risk for infection	06	06	100
Risk for impaired skin integrity	32	31	96.9
Risk for vascular trauma	20	20	100
Risk for bleeding	08	08	100
Risk for imbalanced body temperature	65	62	95.4
Risk for impaired religiosity	01	01	100
Risk for unstable blood glucose level	97	60	61.9
Risk for falls	00	00	-
Risk for loneliness	04	03	75

Note. N = number.

Table 3*Rate of the effectiveness in preventing complications*

Nursing diagnoses	Cases with risk of complication (N)	Cases with risk of complication not developed and with prescribed action (N)	Rate of effectiveness in preventing complications (%)
Risk for infection	109	103	94.5
Risk for impaired skin integrity	108	91	84.3
Risk for vascular trauma	106	80	75.5
Risk for bleeding	95	87	91.6
Risk for imbalanced body temperature	82	46	56.1
Risk for loneliness	74	70	94.6
Risk for impaired religiosity	63	62	98.4
Risk for unstable blood glucose level	61	36	59.0
Risk for falls	59	59	100

Note. N = number.

Of the 14 NDs analyzed, five (35.7%) were problem-focused diagnoses and, for them, the rate of positive changes in the status of the actual NDs was calculated (Table 4).

There were positive changes in the state of the actual ND (problem-focused diagnosis) when at least one nursing action was prescribed for the diagnosis and it was considered resolved by the researchers assessing the patients daily.

Table 4*Rate of positive changes in the status of actual NDs*

Nursing diagnoses	Diagnosis (N)	Resolution of diagnosis x implemented intervention (N)	Rate of positive changes in the actual diagnosis (%)
Bathing self-care deficit	108	25	23.1
Interrupted family processes	101	12	11.9
Hypothermia	76	71	93.4
Impaired tissue integrity	73	00	00
Imbalanced nutrition: less than body requirements.	66	53	80.3

Note. N = number.

Discussion

The most prevalent NDs (above 90%) were: risk for infection (100%), bathing self-care deficit (99.1%), risk for impaired skin integrity (99.1%), risk for vascular trauma (97.2%), and interrupted family processes (92.7%).

The high prevalence of the diagnosis risk for infection results from the ICU environment, where critically ill patients are exposed to a high number of pathogens and invasive procedures (Estevam et al., 2016).

Patients undergoing surgery often have restricted mobility, especially in the immediate postoperative period. In addition, these patients may present impaired sensitivity resulting from the use of anesthetics. These factors relate to bathing self-care deficit and risk for impaired skin integrity (Silva et al., 2016). Importantly, the use of invasive devices also limits some movements and increases the

risk for impaired skin integrity due to their securement (Braga et al., 2018).

Critically ill patients may need to receive an infusion of saline solution, plasma expanders, electrolytes, blood products, and intravenous medications. For this purpose, they need to undergo a venous puncture and, as a result, are at risk for vascular trauma (Braga et al., 2018).

Critically ill patients also experience the absence of the family in ICUs, which generates suffering caused by the separation of the family-patient binomial (Barreto et al., 2020), a condition that demonstrates interrupted family processes. And, because the change in the family relationship is maintained even after discharge from the ICU, with the patient remaining in the inpatient unit, this is considered to be the reason why the rate of change in the status of this actual ND was only 11.4%.

The results also point out that the nurses were 100%

effective in predicting the risk for infection and the risk for vascular trauma, and that the diagnostic effectiveness rate was 96.9% for the risk for impaired skin integrity. However, the effectiveness rate in preventing complications related to these NDs was greater than 90% only for the ND of risk for infection. For the diagnoses of risk for impaired skin integrity and risk for vascular trauma, the rate was 84.3% and 75.5%, respectively.

These results suggest that, in addition to monitoring the risk of patients developing vascular trauma and injuries in ICUs, nurses need to advance in the implementation of individualized care according to the specificities of each patient, especially because wounds are preventable adverse events, cause pain, and increase the chance of patients acquiring infections, which impacts the increased rate of stay in health services and deaths.

Moreover, since the effectiveness rate in preventing the vascular trauma complication was 75.5%, it can be inferred that nurses also need to manage this event better by improving scientific technical knowledge and becoming skilled in evaluating the length of stay and catheter insertion site, as well as selecting the appropriate type and gauge of the devices used, which should be in accordance with the characteristics of the vessel, nature, and speed of fluid infusion (Braga et al., 2018).

With regard to the ND of bathing self-care deficit, the rate of positive changes in the diagnosis status was also low (23.1%). This result may be related to the fact that, even at the time of discharge from the ICU, many patients still have limitations arising from surgery that can make them dependent, even if temporarily, to perform activities of daily living, such as bathing (Silva et al., 2016).

For the NDs of risk for bleeding and risk for impaired religiosity, prevalent in 95 (87.2%) and 63 (57.8%) patients, respectively, the diagnostic effectiveness rate was 100% (for both) and the effectiveness rate in preventing complications was 91.6% and 98.4%, respectively. In these cases, nurses were effective not only in predicting risk but also in preventing the outcomes of bleeding and impaired spirituality.

Regarding the ND of risk for loneliness, with a prevalence of 67.9% of the cases and with an incidence of 11%, although the diagnostic effectiveness rate was 75%, the effectiveness rate in preventing complications was 94.6%. This result was achieved because the ICU is a unit in which family members are encouraged to stay close to the patients, especially when they are awake, sad, agitated, and with a prolonged hospital stay. In addition, patients receive weekly spiritual support, which may also be associated with the high effectiveness rate in preventing complications for the ND of risk for impaired religiosity. It is known that loneliness has been considered a condition that enhances the development of mental disorders, especially in the population over 60 years old and with depression. In this phase of life, there are greater physical limitations and loss of social support, which worsen in environments such as ICUs where hospitalized patients often lose control of their health situation and have little contact with family members. Thus, ICU nurses need to be aware of the risk of critically ill patients feeling lonely

and needing spiritual support (Estevam et al., 2016).

The diagnosis with the highest incidence in the study population was the risk for imbalanced body temperature (33.9%). The non-identification of this diagnosis at the time of admission is related to the fact that 69.7% of patients arrived in the ICU hypothermic. Thus, they already presented the actual problem at that moment, not being possible to formulate the risk diagnosis. Furthermore, nurses were effective in predicting risk after temperature stabilization, since the diagnostic effectiveness rate for this ND was 95.4%.

It is worth noting that the effectiveness rate in preventing complications for the risk for imbalanced body temperature was low (56.1%), which may be due to the influence of the reduced temperature in the ICU and the use of anesthetics and vasoactive drugs, which influences the temperature regulation of patients (Correa et al., 2019). Nevertheless, even with the identification of imbalanced temperatures, it is important to highlight that the ND of hypothermia had a rate of positive changes in the actual ND status of 93.4%, which demonstrates that nurses implemented care capable of solving this problem.

Of the group of NDs analyzed, the risk for unstable blood glucose level and the risk for falls were the least prevalent (56% and 54.1%) and had an incidence rate of 8.3% and 11%, respectively.

Patients who are in the immediate postoperative period are usually admitted to the ICU with postoperative fasting and, in some cases, when they develop hemodynamic or respiratory instability, they continue fasting. Therefore, they are at risk for unstable blood glucose levels and may have imbalanced nutrition: less than body requirements. Thus, nurses should be aware of the risk for unstable blood glucose level, especially since the diagnostic effectiveness rate for this problem was 61.9%. In addition, the results show that the effectiveness rate in preventing complications (hypoglycemia or hyperglycemia) was only 59%, which suggests a greater need for attention; the identification of the risk factors for unstable blood glucose levels and the implementation of preventive measures can contribute to positive results in the prognosis of patients since unstable blood glucose level can increase the rate of complications and mortality (Teixeira et al., 2017).

It was not possible to calculate the diagnostic effectiveness rate of the risk for falls because no falls occurred. For this same reason, the effectiveness rate in preventing this complication was 100%.

Regarding the ND of impaired tissue integrity, the prevalence rate was 67%. This ND was one of the most frequently identified by the researchers in patients, due to the fact that the study was conducted in a postoperative ICU and, consequently, the surgery itself was an associated factor. Because the median length of stay in the unit was 3 days, it was observed that these patients were eventually discharged without this diagnosis having been resolved, which explains the rate of change in the status of the actual diagnosis of 0%. Some patients were admitted to the ICU before the surgery was performed, which explains the incidence of 9.2% detected in this ND.

It is important to highlight that the indicators identified here were not, until then, monitored in the ICU under study, so obtaining these rates contributed to the identification of NSOs in the service.

It is known that the data collected here represented the reality of a sector of a hospital, which hinders its external validity, making it a limitation of this study. Future studies on these indicators should be conducted in other ICUs. It was observed that the personal background, length of stay, severity index, age, among others, may impact the results achieved, so new studies should verify the existence of an association between these variables and the rates obtained.

Conclusion

NDs prevalence and incidence, risk diagnostic effectiveness, effectiveness in preventing complications, and positive changes in the status of diagnoses identified in critically ill patients admitted to an adult ICU were analyzed.

The risk diagnostic effectiveness rate allows assessing nurses' accuracy in predicting the risk of adverse events, which is essential for the adoption of measures focused on patient safety. If the potential problem is not previously diagnosed, the patient will be more prone to developing an actual problem. The effectiveness rate in preventing complications contributes to the nursing's evaluation of how much the actions prescribed by nurses were able to prevent the occurrence of complications. The rate of positive changes in the state of the actual NDs allows nursing to evaluate how resolute the prescribed actions are, which demonstrates the effectiveness of the care implemented in the face of existing problems.

This study presents indicators that can be obtained from the NP, so it can hopefully encourage ND recording and monitoring, as well as the implemented interventions. With this, it is expected that nursing can adopt strategies to obtain NSOs and develop information systems, like SIPETi, whose database includes mappings and algorithms capable of generating diagnostic effectiveness rates and interventions. Studies of this nature should be carried out in other scenarios and, based on the results obtained, improvement cycles can be implemented with the adoption of safe actions focused on patients' specificities.

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