

Nursing outcome “airway permeability” in postoperative patients

Resultado de enfermagem “permeabilidade das vias aéreas” em pacientes no pós-operatório

Resultado de enfermería “permeabilidad de las vías aéreas” en pacientes en el posoperatorio

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ABSTRACT

Objectives: to evaluate the evolution of clinical indicators that characterize airway permeability in patients in the postoperative period of thoracoabdominal surgeries and to analyze their relationship with the occurrence of the diagnosis “ineffective airway clearance”. **Methods:** descriptive, quantitative, longitudinal research with 60 patients who were followed for five consecutive days. Eleven indicators of the nursing outcome “respiratory status: airway permeability” were used. **Results:** on the first day of evaluation, the most compromised indicators were: respiratory rate, cough, depth of breath and use of accessory muscles. During follow-up, most of the indicators presented a slight deviation from normal variation and, in the last evaluation, there was a predominance of indicators with some degree of impairment. **Conclusions:** with the aid of the Nursing Outcomes Classification, it was observed that patients submitted to thoracoabdominal surgeries may present compromised airway permeability even days after surgery. **Descriptors:** Respiratory System; Post-Operative Period; Post-Operative Care; Nursing Evaluation; Medical-Surgical Nursing.

RESUMO

Objetivos: avaliar a evolução dos indicadores clínicos que caracterizam a permeabilidade das vias aéreas em pacientes no pós-operatório de cirurgias toracoabdominais e analisar sua relação com a ocorrência do diagnóstico “desobstrução ineficaz das vias aéreas”. **Métodos:** pesquisa descritiva, quantitativa, longitudinal realizada com 60 pacientes que foram acompanhados por cinco dias consecutivos. Foram utilizados 11 indicadores do resultado de enfermagem “estado respiratório: permeabilidade das vias aéreas”. **Resultados:** no primeiro dia de avaliação os indicadores mais comprometidos foram: frequência respiratória, tosse, profundidade da respiração e uso de músculos acessórios. Durante o acompanhamento, verificou-se que a maior parte dos indicadores apresentou desvio leve da variação normal e, na última avaliação, houve predomínio de indicadores com algum grau de comprometimento. **Conclusões:** com auxílio da Classificação dos resultados de enfermagem, observou-se que pacientes submetidos a cirurgias toracoabdominais podem apresentar comprometimento da permeabilidade das vias aéreas mesmo após dias da realização do procedimento cirúrgico. **Descritores:** Sistema Respiratório; Período Pós-Operatório; Cuidados Pós-Operatórios; Avaliação em Enfermagem; Enfermagem Médico-Cirúrgica.

RESUMEN

Objetivos: valorar la evolución de los indicadores clínicos que caracterizan la permeabilidad de las vías aéreas en pacientes en el posoperatorio de cirugías toracoabdominales y evaluar su relación con la ocurrencia del diagnóstico “desobstrucción ineficaz de las vías aéreas”. **Métodos:** investigación descriptiva, cuantitativa, longitudinal en la cual participaron 60 pacientes que recibieron seguimiento por cinco días. Se utilizaron 11 indicadores del resultado de enfermería “estado respiratorio: permeabilidad de las vías aéreas”. **Resultados:** en el primer día de evaluación, los indicadores más comprometidos fueron: frecuencia respiratoria, tos, profundidad de la respiración y utilización de músculos accesorios. Durante el seguimiento, se verificó que la mayor parte de los indicadores presentó una leve desviación de la variación normal y, en la última evaluación, hubo un predominio de indicadores con algún grado de comprometimiento. **Conclusiones:** con la ayuda de la *Clasificación de los resultados de enfermería*, se observó que los pacientes sometidos a cirugías toracoabdominales pueden presentar comprometimiento de la permeabilidad de las vías aéreas incluso después de algunos días de realizar el procedimiento quirúrgico. **Descriptorios:** Sistema Respiratorio; Período Posoperatorio; Cuidados Posoperatorios; Evaluación en Enfermería; Enfermería Médico-Quirúrgica.

INTRODUCTION

The postoperative period (PO) represents a critical phase in which the patient needs complex care, with a focus on the prevention and detection of complications from the anesthetic and surgical procedures, aimed at a safe recovery⁽¹⁾. This criticality is due to physiological alterations resulting from the surgical process, mainly those of respiratory origin, especially when the procedure is performed in the thoracic and upper abdominal regions, since this type of surgery interferes directly with pulmonary mechanics, leading to ventilatory disorders⁽²⁻³⁾.

The changes that occur in pulmonary physiology can result in respiratory complications in the postoperative period, evidenced as one of the main problems that affect patients submitted to thoracoabdominal procedures⁽⁴⁾. The literature indicates that pulmonary complications affect approximately 10% to 40% of these patients, and the values vary according to the presence of risk factors⁽⁵⁾. Therefore, because the surgical act is an agent that causes respiratory physiological changes, it is considered important to adopt strategies that aim at the reestablishment of the pulmonary function as a way to prevent respiratory complications postoperatively.

One strategy that can be used to improve the effectiveness of care is the systematization of nursing care, which can be implemented through the application of the nursing process⁽⁶⁾. From among its stages, we highlight the identification of nursing diagnoses, which serves as a basis for directing nursing interventions and assessing the care implemented⁽⁷⁾.

NANDA International, Inc. (NANDA-I) is one of the most widespread nursing diagnosis classification systems in the world and allows qualifying care and providing visibility to nursing work⁽⁸⁾. This system is linked to two other taxonomies, the Nursing Interventions Classification (NIC), which groups interventions and nursing activities, and the Nursing Outcomes Classification (NOC), which evaluates nursing outcomes. These terminologies complement each other and are used in the stages of the nursing process, providing a standardized language and consistency in care delivery⁽⁹⁾.

NOC can be used by nursing professionals to monitor and supervise the care implemented to ensure quality patient care⁽¹⁰⁾. Its use facilitates the identification of changes in the actual or potential health of the person, family or community by the variation of a score throughout the period of care, which makes it possible to monitor the improvement, worsening or stagnation of the patient's state through the actions of nursing performed⁽¹¹⁾.

In the implementation of the nursing process, the results are closely linked to NANDA-I nursing diagnoses. The link between NANDA-I and NOC taxonomies suggests a relationship between the problems identified as real or potential in the patient and the responses that are expected to be achieved through care actions⁽¹²⁾. Thus, the NOC taxonomy can be used in conjunction with NANDA-I diagnoses in nursing care planning so that the process of caring for the patients in the postoperative period is based on their needs.

Some conditions associated with the postoperative period of thoracic and upper abdominal surgeries may interfere with the patient's ability to maintain the airway unobstructed and these situations favor the occurrence of nursing diagnoses related to the respiratory system, among which the diagnosis "ineffective airway clearance" (IAC)⁽¹³⁾. As a way of assessing the individual's

compromise and health status in the presence of IAC, NOC can be used, which presents as a suggested result "respiratory status: airway permeability"⁽¹¹⁾.

In view of the above, we emphasize the importance of seeking strategies that help in the assessment of the individuals' health status, through the relationship between nursing diagnosis and evaluation of outcomes and indicators, so that the care process is directed to their real needs and, in the case of patients submitted to thoracoabdominal procedures, actions to restore pulmonary function.

OBJECTIVES

To evaluate the evolution of the clinical indicators that characterize airway permeability in patients in the postoperative period of thoracoabdominal surgeries and to analyze the relationship with the occurrence of the diagnosis "ineffective airway clearance".

METHODS

Ethical aspects

The present study was approved by the Ethics Committee for Research with Human Beings of the Federal University of Maranhão (UFMA).

Design, sample and inclusion and exclusion criteria

This is a descriptive, longitudinally designed research with a quantitative approach performed with 60 patients in the postoperative period, who were evaluated for a period of five consecutive days.

The sample consisted of patients of both sexes, over the age of 18 years, who were in the first 48 hours following thoracic and/or upper abdominal surgeries and who were followed up for five consecutive days. The established exclusion criteria were: having an unstable clinical condition or alteration in the level of consciousness precluding active participation in the interview, be using a nasogastric tube, nasoenteral catheter and/or tracheostomy at the time of evaluation, and not completing the five evaluations.

Study Protocol

Data were collected from March to September 2016, through an interview and physical examination performed by members of a research project aimed at assisting patients in the postoperative period of thoracic and upper abdominal surgeries. Before starting to collect data, the participants took part in a 30-hour workshop that addressed the following topics: review of propaedeutic methods inherent to respiratory assessment, respiratory system physiology, postoperative respiratory complications, handling of collection equipment (such as pulse oximeter and stethoscope), and approach to administration of the data collection instrument.

To assist in data collection, we developed an instrument that covered pertinent data about the pulmonary evaluation related to the IAC diagnosis and the nursing result "respiratory status: airway permeability"^(7,11,14-15). Regarding the latter, we point out that in this study, other nursing diagnoses that supported the need for follow-up were not defined.

Eleven indicators were used in the nursing outcome in question, which is composed of a five-point Likert scale and is classified as follows: 1 – Severe deviation from normal variation; 2 – Substantial deviation from normal variation; 3 – Moderate deviation from normal variation; 4 – Mild deviation from normal variation; and 5 – No deviation from normal variation. From the bibliographic review, conceptual and operational definitions were developed for each indicator in order to establish what the variations from 1 to 5 represented in clinical practice. These definitions were evaluated by members of a research group that studies nursing taxonomies and the participants made their observations on their clarity and applicability. Suggestions considered pertinent were adopted and contributed to the final version of the definitions.

For inference of the IAC nursing diagnosis, the collected information was e-mailed to an experienced nurse with more than five years of clinical practice in post-surgical care, and also in the development and publication of research on nursing taxonomies. It should be emphasized that he participated only in this stage of the study.

Analysis of results and statistics

The data were organized in Excel spreadsheets (2010) and analyzed with the Statistical Package for Social Sciences (SPSS), version 24.0 for MacOS. For the univariate descriptive analysis, absolute frequency, percentage, central tendency and dispersion measures were considered. In order to verify if the numerical variables had a normal distribution, the Kolmogorov-Smirnov test was applied. In the analysis of non-normal numerical variables, the Mann-Whitney and Kruskal-Wallis tests were used. The Wilcoxon test was used to compare the difference in the values of the indicators between the first and fifth evaluation. The level of significance adopted was $p < 0.05$.

RESULTS

The obtained result showed that the majority of the sample was male (88.3%), single (51.7%), with mean age of 35.64 years ($\pm 11,52$). The prevalent surgical procedures were exploratory laparotomy (56.7%) and chest drainage (31.7%). The main reasons leading to surgeries included gunshot wound (25.9%) and knife wound (18.5%). Regarding the type of anesthesia used, 56.9% of the cases had locoregional anesthesia and 43.1% general anesthesia.

The frequency values obtained for the Likert scores of each indicator showed that, overall, there was an improvement in the degree of compromise along evaluations. By analyzing the degree of compromise on the first day, i.e., indicators scoring between 1 and 4 on the scale, we found that the sum of percentage values showed that the indicators "respiratory

rate" (100%), "cough" (76.9%), "depth of breath" (48.2%) and "use of accessory muscles" (44.1%) were the most affected. Between the first and last evaluation, "effort dyspnea" showed the highest percentage of severe deviation from the normal range (score 1), corresponding to 16.7% in the first evaluation and 8.3% in the fifth (Table 1).

The analysis of each indicator's mean showed that in the first evaluation, the majority presented some degree of impairment, with "cough" (3.65 ± 1.16) and "expel secretions" (3.46 ± 1.98) showing the lowest values. During the follow-up period, the indicators' means were generally between 4 and 5 on the Likert scale, corresponding to a slight deviation from normal variation (Table 2).

An additional analysis performed to compare the values obtained in the first and fifth evaluations showed that there was a statistically significant increase in the indicators "pulmonary secretion accumulation" and "expel secretions" ($p = 0.019$ and $p = 0.014$, respectively), according to the Wilcoxon test.

An analysis of the relationship between nursing outcome indicators and IAC diagnosis identified that patients with said diagnosis had a greater tendency to present lower scores for the indicators Pulmonary secretion accumulation (134.81 vs. 165.80), Respiratory rate (141.79 vs. 160.59), Depth of breath (140.47 vs. 158.83), Adventitious respiratory sounds (127.06 vs. 174.63) and Cough (67.40 vs. 81, 89) (Table 3).

The data in Table 4 indicate that patients who underwent thoracic surgery had a greater tendency to show alterations in the indicators "effort dyspnea" (139.00 vs. 169.50 vs. 150.26), "respiratory rate" (127, 19 vs. 168.84 vs. 157.63), "adventitious respiratory sounds" (132.49 vs. 173.30 vs. 151.29) and "expel secretions" (51.09 vs. 66.00 vs. 59.51).

Table 1 – Frequency of indicators of nursing outcome "respiratory status: airway permeability" in postoperative patients of thoracic and upper abdominal surgeries, Imperatriz, Maranhão, Brazil, 2016

Indicators	Score	NOC Likert Scale									
		1 st EV*		2 nd EV		3 rd EV		4 th EV		5 th EV	
		N	%	N	%	N	%	N	%	N	%
Pulmonary secretion accumulation	1	1	1.7	-	-	1	1.7	-	-	-	-
	2	2	3.4	-	-	1	1.7	-	-	1	1.7
	3	4	6.8	4	6.7	1	1.7	4	6.7	-	-
	4	5	8.5	6	10.0	5	8.3	6	10.0	1	1.7
	5	47	79.7	50	83.3	52	86.7	50	83.3	57	96.6
Effort dyspnea	1	10	16.7	4	6.7	9	15.3	4	6.7	5	8.3
	2	-	-	-	-	-	-	-	-	1	1.7
	3	-	-	1	1.7	1	1.7	1	1.7	1	1.7
	4	-	-	-	-	-	-	-	-	-	-
	5	50	83.3	55	91.7	49	83.1	55	91.7	53	88.3
Rest dyspnea	1	2	3.3	-	-	2	3.4	-	-	-	-
	2	1	1.7	2	3.3	-	-	2	3.3	1	1.7
	3	1	1.7	-	-	2	3.4	-	-	1	1.7
	4	-	-	1	1.7	1	1.7	1	1.7	-	-
	5	56	93.3	57	95.0	54	91.5	57	95.0	58	96.7
Expel secretions	1	10	38.5	2	8.3	2	10.0	2	8.3	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	1	5.0	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	16	61.5	22	91.7	17	85.0	22	91.7	19	100

To be continued

Table 1 (concluded)

Indicators	Score	NOC Likert Scale									
		1 st EV*		2 nd EV		3 rd EV		4 th EV		5 th EV	
		N	%	N	%	N	%	N	%	N	%
Respiratory rate	1	3	5.0	1	1.7	2	3.3	1	1.7	1	1.7
	2	11	18.3	2	3.3	1	1.7	2	3.3	2	3.3
	3	13	21.7	5	8.3	6	10.0	5	8.3	5	8.3
	4	33	55.0	23	38.3	19	31.7	23	38.3	15	25.0
	5	-	-	29	48.3	32	53.3	29	48.3	37	61.7
Nose wings movement	1	-	-	-	-	2	3.3	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	1	1.7	-	-	-	-	-	-	-	-
	5	58	98.3	60	100.0	58	96.7	60	100	60	100
Depth of breath	1	1	1.7	1	1.7	3	5.1	1	1.7	1	1.7
	2	-	-	-	-	-	-	-	-	-	-
	3	1	1.7	1	1.7	1	1.7	1	1.7	1	1.7
	4	26	44.8	30	50.0	21	35.6	30	50.0	21	35.0
	5	30	51.7	28	46.7	34	57.6	28	46.7	37	61.7
Respiratory rhythm	1	1	1.7	1	1.7	3	5	1	1.7	1	1.7
	2	-	-	-	-	-	-	-	-	-	-
	3	1	1.7	-	-	1	1.7	-	-	-	-
	4	2	3.4	5	8.3	5	8.3	5	8.3	3	5.0
	5	54	93.1	54	90.0	51	85.0	54	90.0	56	93.3
Adventitious respiratory sounds	1	1	1.7	-	-	2	3.3	-	-	-	-
	2	2	3.4	-	-	1	1.7	-	-	2	3.4
	3	6	10.3	6	10.0	3	5.0	6	10.0	2	3.4
	4	4	6.9	8	13.3	8	13.3	8	13.3	10	16.9
	5	45	77.6	46	76.7	46	76.7	46	76.7	45	76.3
Cough	1	1	3.8	1	3.1	-	-	1	3.1	1	3.4
	2	5	19.2	2	6.3	3	10.7	2	6.3	-	-
	3	2	7.7	4	12.5	1	3.6	4	12.5	1	3.4
	4	12	46.2	18	56.3	19	67.9	18	56.3	21	72.4
	5	6	23.1	7	21.9	5	17.9	7	21.9	6	20.7
Use of accessory muscles	1	4	6.8	-	-	1	1.7	-	-	-	-
	2	2	3.4	1	1.7	3	5.0	1	1.7	2	3.5
	3	2	3.4	4	6.8	2	3.3	4	6.8	4	7.0
	4	18	30.5	12	20.3	14	23.3	12	20.3	10	17.5
	5	33	55.9	42	71.2	40	66.7	42	71.2	41	71.9

Note: *EV: Evaluation.

Table 2 - Mean of indicators of the nursing outcome "respiratory status: airway permeability" in patients in the postoperative period of thoracic and upper abdominal surgeries, Imperatriz, Maranhão, Brazil, 2016

Indicators	Mean (SD*)				
	1 st EV**	2 nd EV	3 rd EV	4 th EV	5 th EV
Pulmonary secretion accumulation	4.61 (0.89)	4.73 (0.66)	4.77 (0.72)	4.77 (0.56)	4.93 (0.41)
Effort dyspnea	4.33 (1.50)	4.58 (1.17)	4.36 (1.45)	4.70 (1.00)	4.58 (1.18)
Rest dyspnea	4.78 (0.84)	4.88 (0.49)	4.78 (0.81)	4.88 (0.55)	4.92 (0.46)
Expel secretions	3.46 (1.98)	4.83 (0.81)	4.50 (1.27)	4.67 (1.12)	5.00 (0.00)
Respiratory rate	4.27 (0.93)	4.52 (0.72)	4.30 (0.96)	4.28 (0.88)	4.42 (0.90)
Nose wings movement	4.98 (0.13)	5.00 (0.00)	4.97 (0.18)	5.00 (0.00)	5.00 (0.00)
Depth of breath	4.45 (0.70)	4.53 (0.70)	4.41 (0.94)	4.40 (0.69)	4.55 (0.69)
Respiratory rhythm	4.86 (0.60)	4.83 (0.58)	4.68 (0.93)	4.85 (0.57)	4.88 (0.55)
Adventitious respiratory sounds	4.55 (0.94)	4.62 (0.73)	4.58 (0.92)	4.67 (0.65)	4.66 (0.71)
Cough	3.65 (1.16)	3.90 (0.93)	3.93 (0.81)	3.88 (0.94)	4.07 (0.75)
Use of accessory muscles	4.25 (1.13)	4.42 (1.04)	4.48 (0.91)	4.61 (0.69)	4.58 (0.77)

Note: *SD: Standard deviation; **EV: Evaluation.

DISCUSSION

Respiratory changes that occur in the postoperative period can result in severe complications, affecting about 25-50% of patients undergoing major surgical procedures. The literature indicates that the surgical site is the most important factor for determination of postoperative pulmonary complications (POPC), which occur in 10-40% of the cases of patients whose surgical incision is in the upper abdomen or in the thorax⁽⁵⁾. A study⁽¹⁶⁾ that investigated the occurrence of POPC identified that thoracic (28.9%), cardiac (28%) and upper abdominal (24.3%) surgery had the highest complication rates in the postoperative period.

In addition to the surgical procedure itself, pain and anesthesia affect the thoracic dynamics and compromise ventilation and the respiratory pattern, making it shallow. These factors, together with diaphragmatic dysfunction, result in alveolar hypoventilation, reduced ventilatory response and hypoxemia. The physiological and mechanical alterations add up, compromising pulmonary function and decreasing respiratory muscle strength, which may hinder the maintenance of unobstructed airways⁽¹⁷⁾.

In this study, the NOC taxonomy was used as a strategy to evaluate and monitor the evolution of indicators that characterize airway permeability in postoperative patients. Regarding the analysis of the indicators of the nursing outcome "respiratory state: airway permeability", the most affected in the first evaluation were respiratory rate, cough, depth of breath and use of accessory muscles.

The alteration in the "respiratory rate" indicator can be justified by abdominal rigidity and diaphragmatic dysfunction occurring in the postoperative period, altering ventilatory mechanics and conferring restrictive characteristics, with a reduction in vital capacity and tidal volume. As a way to compensate for lower ventilatory efficacy, carbon dioxide retention and lower tidal volume, respiratory rate increases⁽⁵⁾.

This result corroborates research⁽¹⁸⁾ performed with patients submitted to exploratory laparotomy which identified a significant increase in respiratory rate in the initial hours of the postoperative period. It should be noted that high values of respiratory rate contribute to an increase in respiratory work, since ventilation tends to be greater in places where airway resistance is smaller^(5,18).

Table 3 - Test to verify the relationship between the diagnosis "ineffective airway clearance" and indicators of the nursing outcome "respiratory state: airway permeability" in postoperative patients of thoracic and upper abdominal surgeries, Imperatriz, Maranhão, Brazil, 2016

Indicators	Nursing diagnosis		p value**
	Present*	Absent*	
Pulmonary secretion accumulation	134.81	165.80	<0.001
Effort dyspnea	147.11	152.31	0.380
Rest dyspnea	149.19	149.86	0.870
Expel secretions	54.78	61.99	0.068
Respiratory rate	141.79	160.59	0.036
Nose wings movement	149.64	150.42	0.655
Depth of breath	140.47	158.83	0.035
Respiratory rhythm	144.79	154.96	0.052
Adventitious respiratory sounds	127.06	174.63	<0.001
Cough	67.40	81.89	0.022
Use of accessory muscles	141.80	155.15	0.109

Note: *Mean ranks; **Mann-Whitney test.

Table 4 - Tests to verify the difference between type of surgery and indicators of the nursing outcome "respiratory state: airway permeability", Imperatriz, Maranhão, Brazil, 2016

Indicators	Type of surgery			p value**
	Thoracic	Abdominal*	Thoracoabdominal*	
Pulmonary secretion accumulation	145.41	166.45	146.82	0.078
Effort dyspnea	139.00	169.50	150.26	0.009
Rest dyspnea	147.75	154.76	149.21	0.592
Expel secretions	51.09	66.00	59.51	0.034
Respiratory rate	127.19	168.84	157.63	0.003
Moving the wings of the nose	151.50	147.76	149.78	0.408
Depth of breath	133.86	165.41	152.67	0.055
Respiratory rhythm	145.29	156.88	149.86	0.400
Adventitious respiratory sounds	132.49	173.30	151.29	0.003
Cough	68.44	79.75	74.73	0.495
Use of accessory muscles	143.66	149.96	149.71	0.802

Note: *Mean ranks; **Kruskal-Wallis test.

The type of surgery performed in the patients in this study may cause changes in the diaphragmatic respiratory pattern, which usually makes breathing shallower with thoracic predominance, which may explain the alteration in the "depth of breath" indicator identified in this sample. In this connection, a study of patients submitted to laparotomy showed changes in thoracic amplitude in the postoperative period, since 35% of the patients presented shallow amplitude and 9% deep amplitude⁽¹⁹⁾.

Referring to the impairment presented by the indicator "use of accessory muscles", factors such as anesthesia, bed rest, phrenic nerve dysfunction, surgical trauma and pain affect the function of respiratory muscles after surgery. Therefore, in the presence of respiratory discomfort, the use of accessory muscles⁽⁵⁾ may be observed. In cases of airway obstruction, pulmonary volumes are reduced and pulmonary complacency decreases. Such changes in respiratory mechanics require that the respiratory muscles generate more pressure for pulmonary expansion, and in order to contribute to this increase in pressure, the body recruits accessory muscles⁽²⁰⁾, which corroborates the results of the present study.

The "cough" indicator was highlighted both because it presented alteration in 76.9% of the patients in the first evaluation and because of a higher degree of impairment (score of 3.65). In this regard, studies indicate that the action of anesthetic drugs

and pain interfere with the act of coughing and compromise its effectiveness, since anesthesia depresses the cough reflex and pain reduces the amount of deep inspirations due to the surgical procedure⁽²¹⁾. Regarding this, a postoperative study of cardiac surgeries found that, when coughing, the patients presented pain of greater intensity⁽²²⁾. This fact may increase the patient's fear of coughing, which contributes to the accumulation of secretion in the respiratory tract, since coughing is a body reflex action of defense designed to remove foreign substances and accumulated secretions in the bronchial tree⁽²³⁾.

Since cough is associated with a secretion-eliminating mechanism, when it is altered, the individual's ability to expel secretions is therefore also impaired. Considering the above, we believed that this may explain that both the "expel secretions" and "cough" indicators presented the highest degree of impairment in the first evaluation. Postoperatively, ineffective defense mechanisms, such as coughing, and changes in the pulmonary ventilation mechanism culminate in the installation of pulmonary areas with secretion retention, and this accumulation leads to postoperative pulmonary infections⁽²⁴⁾. Therefore, nursing should evaluate the patient's ability to expel secretion and plan care that prevents this accumulation in the lung areas as a strategy to prevent aggravations.

"Effort dyspnea" was the indicator with the highest percentage of severe deviation from the normal range (score 1). Dyspnea is defined as respiratory distress that can be caused by the presence of secretion in the alveolocapillary membrane. In this situation, the organism triggers responses such as increased pulmonary ventilation to overcome deficiency in gas diffusion, by increasing the frequency and depth of breath, and also by triggering the accessory muscles of respiration. Thus, after these mechanisms of compensation of respiratory function are triggered, the individual presents a sensation of respiratory discomfort and such signs are representative of this respiratory difficulty⁽⁸⁾. Effort dyspnea occurs in the face of the onset or aggravation of the dyspnea sensation through normal physical exertion.

An analysis of the indicators during the follow-up period of the sample verified some degree of change until the fifth day of evaluation, when the values obtained were between four and five on the Likert scale, which corresponds to a slight deviation from normal variation. Corroborating this study, research^(20,25) that accompanied patients in the postoperative period during the entire hospital stay or for a minimum period of ten postoperative days indicated that the impairment in pulmonary function was maintained throughout the evaluated period.

Postoperatively, the peak of diaphragmatic dysfunction occurs in the period between two and eight hours after surgery, returning to preoperative values in roughly seven to ten days⁽⁵⁾. A study that

evaluated the behavior of pulmonary function and respiratory muscle strength in patients submitted to elective thoracotomies showed that forced vital capacity and forced expiratory volume in the first second only returned to preoperative values between days 15 and 30 and 10 and 15, respectively⁽²⁰⁾. Therefore, it can be inferred that the changes in respiratory function associated with the surgical procedure are maintained for a longer period than the one evaluated in this study, which was five days. This data may explain the fact that, except for "nose wings movement" and "expel secretions", the other indicators showed some degree of impairment in the fifth evaluation.

As mentioned above, procedures performed in the thoracic and upper abdominal regions compromise respiratory function and some conditions, such as positioning, immobility in bed, pain, secretion accumulation, and others, and favor the appearance of human responses that affect the maintenance of unobstructed airways⁽¹³⁾. This could explain the occurrence of the nursing diagnosis IAC in this sample.

Therefore, an analysis was performed to verify the relationship between the indicators studied and the IAC diagnosis. The data showed a tendency of patients with this diagnosis to score lower in the indicators "pulmonary secretion accumulation", "respiratory rate", "depth of breath", "adventitious respiratory sounds" and "cough" in the NOC scale. This result is expected, since such indicators are directly associated with impairment of airway permeability. Postoperatively, vital capacity and functional residual capacity are reduced and these changes may lead to the early closure of the airways of some portions of the lungs. As a consequence, imbalance of the ventilation-perfusion relationship, hypoxemia and secretion retention⁽¹⁶⁾ may occur, which could explain the alterations in said indicators.

The analysis of the relationship between indicators and type of surgery showed that the patients in this study who underwent thoracic surgery had a greater tendency to show changes in the indicators "effort dyspnea", "respiratory rate", "adventitious respiratory sounds", and "expel secretions". Patients undergoing thoracic surgeries have a significant reduction in lung volumes and capacities, as well as in respiratory muscle strength in the postoperative period, which may have caused the alterations in said indicators⁽²⁰⁾.

Surgeries with incisions near the diaphragm, such as thoracic and upper abdominal ones, are associated with an increased risk of complications, but a study that evaluated the predictors of postoperative pulmonary complications pointed thoracic surgery as a factor that increases the chance of these complications⁽¹⁶⁾. The reduction in pulmonary function that occurs in the postoperative period of thoracotomies may be associated with changes in the ventilatory pattern, retention of carbon dioxide, reduction of oxygen arterial pressure and impairment of pulmonary defense mechanisms, and may evolve to respiratory complications when there is deviation of the expected result for the surgical procedure⁽²⁶⁾.

Limitations of the study

As a limiting factor we highlight the shortage of studies with a similar methodology to ours, especially with the application of NOC in clinical practice in postoperative patients of thoracic and upper abdominal surgeries, which made it difficult to compare

results. In view of this, we recommend that further research should be carried out using NOC in different practical scenarios and with postoperative patients for a subsequent comparison of results. Another limitation to be pointed out is the reduced size of the sample, since the study was performed in only one hospital unit where many patients were discharged before completing the five evaluations, which restricted the sample size and also the time set for follow-up evaluation of the patients that could influence the results.

Contributions to the health area

By using the indicators contained in the nursing outcomes, the nurse can detect and establish the degree of impairment of clinical signs related to airway permeability presented by the patient, which, together with other parameters, will enable early diagnosis of acute respiratory failure, which constitutes an important condition for patient recovery in the postoperative period. Thus, we highlight the importance of the continuity of the nursing care implemented and the use of standardized taxonomies, such as NOC, which allow uniformity of evaluation and resolution of the health problems manifested by the patient.

CONCLUSIONS

From the results, it was verified that there are clinical indicators associated with the evaluation of airway permeability that present a greater degree of impairment in the first 48 postoperative hours of surgeries performed in the thoracic and/or abdominal regions to the detriment of others, namely: respiratory rate, cough, depth of breath and use of accessory muscles. However, it is important to note that even five days after the surgical procedure, it was still possible to observe impairment in some indicators, but to a lesser degree. This data reinforces the importance of performing a careful evaluation of the patient, not only in the immediate postoperative period, but also throughout the hospitalization time, to identify possible complications early.

Another point to be highlighted is that the IAC diagnosis was associated with a greater impairment in the indicators "pulmonary secretion accumulation", "respiratory rate", "depth of breath", "adventitious respiratory sounds" and "cough". In addition, the site of surgical incision also influenced in the impairment of some indicators, since patients undergoing thoracic surgery alone had a greater tendency to manifest changes in "effort dyspnea", "respiratory rate", "adventitious respiratory sounds", and "expel secretions".

In view of the above, it can be noted that NOC is an important tool for evaluating the individual's health status, since in this study it was possible to determine compromised airway permeability in postoperative patients of thoracic and upper abdominal surgeries, following the clinical evolution of these patients in the hospitalization period.

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