



# Ineffective airway clearance in adult patients after thoracic and upper abdominal surgery



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## ABSTRACT

**Aim:** The aim of this study is to analyze the accuracy of the defining characteristics of ineffective airway clearance (IAC) in patients after thoracic and upper abdominal surgery.

**Background:** Although numerous studies have described the most prevalent respiratory NANDA-I diagnoses, only few investigate the precision of nursing assessments.

**Methods:** A cross-sectional study was conducted with 192 patients in a surgical clinic. Accuracy measures were obtained by the latent class analysis method.

**Results:** IAC was present in 46.73% of the sample. The defining characteristics with better predictive capacity were changes in respiratory rate and changes in respiratory rhythm. However, other defining characteristics also had high specificity, such as restlessness, cyanosis, excessive sputum, wide-eyed, orthopnea, adventitious breathing sounds, ineffective cough, and difficulty vocalizing.

**Conclusion:** Results can contribute to the improvement of nursing assessments by providing information about the key clinical indicators of IAC.

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## 1. Introduction

Respiratory complications are the most important causes of morbidity and mortality in thoracic and upper abdominal post-surgical patients, so they deserve special supervision by the health team. There are several factors arising from the surgical procedures that may alter the respiratory function and contribute to the occurrence of these complications. This includes use of anesthetic drugs and muscle relaxants, manipulation of the viscera, surgical incision, immobilization in bed or long periods in supine position, use of mechanical ventilation, abdominal distension and pain (Helene-Junior, Saad-Junior, & Stirbulov, 2006).

The most important factor for the development of respiratory complications in the postoperative period is the location of the surgery. The rate of complications when the surgical incision is in the chest or upper abdomen varies between 10 and 40%. Postoperative respiratory complications increase hospital stay, raises the costs and contributes significantly to mortality, especially in upper laparotomies and thoracotomies (Apostolakis, Filos, Koletsis, & Dougenis, 2010).

Nurses can minimize the occurrence or severity of the pulmonary complications through an adequate surveillance of the patients during the postoperative period, and by the early identification of specific nursing diagnoses. The NANDA International (NANDA-I) manages the development and validation of nursing diagnoses within a taxonomic structure of phenomena for which nurses are responsible. To recognize such nursing diagnoses, the nurses must identify signs and symptoms presented by the patient (Herdman & Kamitsuru, 2014).

The nursing process is the most important nursing tool to provide a better assistance to the patients. The identification of nursing diagnoses is a component of this process that aims to establish a link between the human responses and the nursing desired goals. This step represents a guide for planning and implementing the nursing care (Carpentito-Moyet, 2007).

The identification of a nursing diagnosis begins with the assessment of clinical indicators or defining characteristics (Mendes, Cavalcante, Lopes, & Lima, 2012). If a nurse is able to identify the key defining characteristics of a nursing diagnosis, her/his assumptions will be generated with a greater security, which is important to the healthcare quality. However, it is important to mention that the nursing diagnostic process is complex.

The complexity of the nursing diagnostic process can be attributed to various reasons, including the fact that some nursing phenomena

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share the same defining characteristics, i.e. the signs and symptoms are not specific to each nursing diagnosis. In addition, the patient may express different diagnoses simultaneously, making difficult to distinguish the defining characteristics that best represent each problem, which increases the degree of uncertainty for the nurse (Andrade, Moura, Chaves, Silva, & Lopes, 2014).

In this context, there is the nursing diagnosis ineffective airway clearance (00031—IAC) that according to the NANDA-I is defined as the “inability to clear secretions or obstructions from the respiratory tract to maintain a clear airway” (Herdman & Kamitsuru, 2014). This nursing diagnosis has been a focus of investigations in diverse populations, being approached isolated or in association with other nursing diagnoses. For instance, in the studies of Rocha, Maia, and Silva (2006) and Sousa et al. (2013), both conducted with patients in the postoperative period of cardiac surgeries, the IAC diagnosis was presented in 63.6 and 29.6% of the sample, respectively. In surveys conducted in the pediatric population, the literature indicates that this diagnosis was presented in 89.3% of children with asthma (Carvalho et al., 2015), in 31% of children with congenital heart disease (Silva, Lopes, Araujo, Ciol, & Carvalho, 2009), and in 37.7% of children with acute respiratory infection (Andrade, Chaves, Silva, Beltrão, & Lopes, 2012).

Although patients submitted to thoracic and abdominal surgeries are susceptible to respiratory nursing diagnoses, studies about the occurrence of IAC in this contexts are still scarce.

The predictive capacity of the defining characteristics of a nursing diagnosis is related to the nurse's degree of certainty during the diagnostic process. Given the above, this study aims to analyze the accuracy of the defining characteristics of IAC in patients after thoracic and upper abdominal surgery.

## 2. Methods

### 2.1. Design and sample

A cross-sectional study was developed with 192 patients on a surgical clinic. The patients underwent thoracic and upper abdominal surgeries. A research ethics committee approved the study. Prior to data collection, all the patients signed an informed consent document. The inclusion criteria were patients above 18 and below 80 years of age undergoing thoracic or upper abdominal surgery. The exclusion criteria were clinical instability and altered levels of consciousness. Convenience sampling was used during the patient's recruitment. The sample size was calculated assuming a confidence level of 95%, a minimum sensitivity of 80%, an extension of confidence intervals of 11%, and a prevalence of IAC at 29.6% according to a previous study (Sousa et al., 2013).

### 2.2. Data collection

The data collection instrument was elaborated with the purpose of addressing the information regarding the defining characteristics of the nursing diagnosis IAC and relevant literature on pulmonary assessment (Jarvis, Browne, MacDonald-Jenkins, Luctkar-Flude, & Camera, 2013). This instrument also included patient related information such as sex, date of admission and data about the surgical procedure. Operational definitions were created for each one of the defining characteristics studied. The data were collected by students from a research group after participating on a training about respiratory assessments. The training consisted of a 16-hour course about respiratory propaedeutic methods. A standardized guide with information about how to use the data collection equipment and how to fill the data collection instrument was included in the training.

### 2.3. Data analysis

The statistical analyses were performed in SPSS for Windows (release 19.0) and the R software (R Core Team, Vienna, Austria). For

the accuracy analysis, measures of sensitivity and specificity were obtained for each one of the defining characteristics of IAC presented on the NANDA-I taxonomy using the latent class method.

The latent class method is based on the assumption that an unobserved or latent variable (nursing diagnosis) determines the associations between other measured variables (defining characteristics). This method is recommended when there is no perfect gold standard, as occurs with nursing inferences about human responses. A model of two latent classes of random effects was applied to calculate the specificity and sensitivity values of the defining characteristics with the reference confidence interval of 95% (Qu, Tan, & Kutner, 1996).

The first latent class model included the set of all defining characteristics and it was called null model. From this model, we excluded the defining characteristics that did not present statistical significance (specificity/sensitivity confidence intervals below 50% and/or including this value). Then, a new model was created including all the defining characteristics at the significance level of 0.05.

Definitions of the accuracy measures calculated in this study are presented as follows. Sensitivity is the probability of a defining characteristic being present in patients with the investigated nursing diagnosis. Specificity represents the probability of absence of a defining characteristic in patients without the investigated nursing diagnosis (Lopes, Silva, & Araujo, 2012).

## 3. Results

There were a total of 192 assessments made during the study period. Of these, 111 (57.8%) patients were male, 88 (45.8%) married, and the mean age was 40.5 years ( $\pm 17.8$  years). The majority of the patients had low educational level, as 97 (50.5%) had only completed the primary education. Nearly 50% of patients reported a monthly income of less than 1,017 Brazilian Reals (R\$), or roughly \$442 US as shown in Table 1.

The patients were assessed on an average of 1.9 days after surgery ( $\pm 2.38$  days) and the main clinical conditions were cholelithiasis (29.8%), gunshot wounds (15.8%), stab wounds (14.6%), appendicitis (8.8%), and acute abdomen (7.0%). The most prevalent surgeries were exploratory laparotomy (44.1%), cholecystectomy (30.3%), and thoracotomy (13.8%). The most frequent anesthesia techniques were spinal anesthesia (54.0%) and general anesthesia (42.2%).

Table 2 shows the distribution of defining characteristics in the sample. The most frequent defining characteristics were absent cough (65.4%), diminished breath sounds (63.2%), changes in respiratory rate (50.8%), and changes in respiratory rhythm (42.4%).

Table 3 shows the results obtained by the statistical analysis of the latent class models. According to the sensitivity and specificity values, the most accurate defining characteristics were changes in respiratory rate and changes in respiratory rhythm. However, other defining characteristics also had high specificity, such as restlessness (98.03%), cyanosis (97.83%), excessive sputum (100%), wide-eyed (96.37%), orthopnea (85.40%), adventitious breathing sounds (86.28%), ineffective cough (95.17%), and difficulty vocalizing (86.50%). Ineffective airway clearance was present at 46.73% of the sample.

## 4. Discussion

Respiratory complications are frequent on the postoperative period regardless of the type of surgery. However, the incidence of this kind of complication is greater on thoracic and upper abdominal surgery patients (Apostolakis et al., 2010). Such complications may contribute to the occurrence of signs and symptoms that are defining characteristic of respiratory nursing diagnoses, such as IAC. This fact alone demonstrates the importance in the correct usage of nursing process.

According to Sousa et al. (2013), from the moment that the nurse can recognize and identify good clinical indicators (defining characteristics) she/he can do a more appropriate diagnostic reasoning to the patient's condition. The use of clinical indicators with good predictive

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