

**Instrument validation for assessing critically ill patients on mechanical ventilation according to the ABCDE\*****Validação de instrumento para avaliação de pacientes graves em ventilação mecânica, segundo o ABCDE**Percival Vitorino Guimarães<sup>1</sup>, Maria do Carmo Lourenço Haddad<sup>2</sup>, Eleine Aparecida Penha Martins<sup>3</sup>

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**ABSTRACT**

The objective of this study was to validate the content of an instrument aimed at guiding the nursing care provided to patients on artificial respiration. An instrument was created with five indicators, inspired on the mnemonic ABCDE method, used in the Advanced Trauma Life Support course, namely: A – Airway maintenance, with 38 items; B – Breathing and ventilation, 11 items; C – Circulation with hemorrhage control, 16 items; D – Disability/neurologic assessment, 08 items; and E – Exposure and environmental control, 08 items. The Content Validity Index (CVI) was used to calculate the degree of agreement among the experts for the general analysis of the instrument and the analysis of the set of items. In conclusion, this instrument works as an assessment tool for patients on artificial respiration, especially when they are in adapted environments to intensive care, as it guides the nurse to observe aspects that may cause harm to the patient.

**Descriptors:** Intensive Care; Respiration, Artificial; Validation Studies; Patient Care; Nursing Care.

**RESUMO**

O objetivo do estudo foi validar o conteúdo de um instrumento destinado a direcionar a assistência de enfermagem a pacientes em ventilação mecânica. Elaborou-se um instrumento com cinco indicadores, inspirado no método mnemônico do ABCDE do trauma, utilizado no curso Advanced Trauma Life Support, nominados: letra A – Assistência Ventilatória, composto de 38 itens; B – Bomba Infusora, 11 itens; C – Cabos e conexões, 16 itens; D- Débitos, 08 itens; e letra E – Exploração Neurológica, 08 itens. Foi utilizado o Índice de Validade de Conteúdo (CVI) para calcular o grau de concordância entre os experts para a análise geral do instrumento e para a análise do conjunto de itens. Conclui-se que este instrumento é uma ferramenta de avaliação do paciente em assistência ventilatória, principalmente quando ele se encontra em ambientes adaptados ao da terapia intensiva, porque direciona o enfermeiro para uma observação dos aspectos que podem causar danos ao paciente.

**Descritores:** Terapia Intensiva; Respiração Artificial; Estudos de Validação; Assistência ao Paciente; Cuidados de Enfermagem.

## INTRODUCTION

Artificial ventilation is an intervention widely used in Intensive Care Units (ICUs), but its current use broke the geographical barriers of the ICU and became a common practice in inpatient units and emergency rooms, especially in public hospitals<sup>(1)</sup>. In order to provide these patients with safer care, it became necessary to standardize procedures and actions.

In the quest for this standardization and systematization of care with greater safety and quality and aiming at what is best for the patient, assessment tools are created, guided by indicators that measure and attribute to different professionals the conditions of the provided care. Thus, indicators are tools that evaluate endpoints between the real and the ideal in providing care<sup>(1-2)</sup>.

Indicators can be used through instruments, which, to be considered calibrated and reliable, must have their content validated<sup>(3)</sup>. The validation process originates with knowledge about the best technique in the researcher's reach, scientifically evidenced with expert approval and, by relating the assessment results, the set of items is evaluated as comprehensive and representative of the subject in focus<sup>(4-7)</sup>.

In the context of patient evaluation, there are several instruments and assessment methods using indicators with the mnemonic ABCDE method, which began with care service in heart arrest situations<sup>(8)</sup>, and, since then, has shown to be useful and applicable in various situations such as trauma care<sup>(9)</sup>, postoperative evaluation<sup>(10)</sup> and resistant hypertension research<sup>(11)</sup>.

The presence of critically ill patients on mechanical ventilation in medical-surgical wards and emergency rooms of public teaching hospitals is already part of their daily routine; however, in clinical practice, many professionals and residents who provide care to these patients have no experience in their treatment. The lack of intensive care beds is reflected throughout the country, being an emerging problem in the current hospital care setting<sup>(12)</sup>. In Brazil, there are 17,940 accredited ICU beds

up to this date, of which 11,615 are intended for adult patients<sup>(12)</sup>, which is still not enough to meet the demand.

This public health problem breaks down geographical barriers and can be seen internationally, in so called "first world" countries, such as the United States of America and Turkey, where patients who should be allocated in the ICU receive care outside of it<sup>(13-14)</sup>.

Efforts to build instruments that contribute to the assessment of critical patients can be seen in international literature, but as severity and prognosis predictors, besides being exclusively focused on the intensive care units<sup>(15-16)</sup>. There are, therefore, no references of instruments that meet the need to assess patients and the environment where they are inserted in order to promote safe and qualified care. Thence, a team of nurses, resident nurses and physiotherapists was brought together and elaborated an instrument with five assessment indicators, which include environment, materials, equipment and devices that ensure quality care and minimum safety for the patient on mechanical ventilation, mainly directed to those assisted out of the ICU environment, where physical, human and material resources are not always the most appropriate.

The instrument had the mnemonic ABCDE sequence as reference, wherein A refers to mechanical ventilation, B to infusion pumps, C to cables and connections (monitors, pulse oximeters, etc.), D to debts and E to the neurological status. Such indicators are clear in intensive care environments, but can go unnoticed outside the ICU. Based on these considerations, the following question arises: is the content of the instrument elaborated for systematic assessment of critically ill patients on mechanical ventilation valid? The aim of this study was to guide the assessment of patients on mechanical ventilation, especially for nurses who have their daily practice outside of the intensive care, but eventually care for patients with these needs. In order to be recognized and accredited, the instrument needs to go through a validation process.

Thus, it was the objective of this study to validate the content of an instrument elaborated to assess patients on mechanical ventilation.

## METHOD

Methodological study of quantitative approach to validate the content of an instrument to assess patients on mechanical ventilation, developed in a public teaching hospital, from June to November, 2011. Content validation is a methodological process, defined as the capacity of accuracy an instrument has to check the fact under study<sup>(3)</sup>. Therefore, when a protocol or instrument is prepared, it is necessary that the content is validated, to be safely applied, which is the focus of the study in evidence.

An instrument based on 05 indicators was created, with letter A being: ventilatory assistance; letter B: infusion pump; letter C: cables and connections; letter D: debts; and letter E: neurological exploration, which evaluates the results obtained in the Glasgow coma scale and Ramsay scale.

Since there is no consensus in literature about the number of experts to compose the panel<sup>(17)</sup>, seven experts were chosen by intentional nonprobability convenience sampling. Inclusion criteria were: being a professional who works in intensive care units, medical-surgical wards or nursing professor with experience in instrument construction method and/or knowledge about critically ill patients on mechanical ventilation; having professional experience between 11 and 35 years and to have been in contact with patients on mechanical ventilation for five to 30 years. These criteria were established due to the belief that professionals with these requirements gather theoretical and practical knowledge that contributes to the validation process. Participants were four nursing professors and three nurses, all of whom had a master's or doctor's degree, and two of them participated for the first time as experts, meeting the adopted requirements<sup>(18)</sup>. These experts were asked to sign an informed consent form.

The participation of experts in content validation processes shows to be effective, as they have a broad knowledge of the subject matter and are able to properly and safely analyze the theme<sup>(17)</sup>. Therefore, the use of experts for instrument content validation was opted for this study.

To analyze data for both the general content validation of the instrument, which evaluated the indicator's name, description, purpose and bibliographic reference, and to the set of items that makes up each indicator, that is, for each specific item of each ABCDE step, the content validity index (CVI) was applied<sup>(5,19)</sup>.

For the CVI, the following answers were considered: totally agree (four points), partially agree (three points), totally disagree (two points) and partially disagree (one point). After filling out the answers, the values of three and four points are summed and divided by the number of experts<sup>(4-5)</sup>. In this study, the CVI adopted for the instrument or items to be considered valid was 80%<sup>(4,7)</sup>.

Individual validation of the items that make up the indicators was conducted with following the criteria: behavior (allows a clear and precise rating action), objectivity (ensures timely response), simplicity (expresses a single idea), clarity (specifies the methods clearly and simply), relevance (does not suggest a divergent attribute from what was set), accuracy (each assessment item is different from the others, not to be confused), range (the used terms may be similar, but are not repeated) and reliability (described in order not to seem pointless) according to study<sup>(20-21)</sup>.

For each item of the instrument, which was evaluated by the eight criteria above, it was possible to answer "yes" or "no". Suggestions, when the answer was negative, were also requested. After this step, the sum of all positive responses of each expert for each item was held, for the eight criteria evaluated and the agreement index was applied. Agreement of 80% or above was the criterion adopted, and so the items that failed to reach a reliable result were either excluded or revised.

The research project was approved by the research ethics committee of UEL-HU under the protocol number 016/2011 and registered in the human research ethics national information system, under CAAE No 0002.0.268.000-11.

The results will be distributed and shown in charts.

## RESULTS

Chart 1 shows the experts' agreement related to the overall rating of the instrument and Chart 2 shows the agreement on each indicator's set of items.

**Chart 1:** Experts' agreement related to the overall rating of the instrument. Londrina, PR, Brazil, 2011.

Totally disagree (No. experts x %)	Partially disagree (No. experts x %)	Partially agree (No. experts x %)	Totally agree (No. experts x %)	Total agreement (No. experts x %)
--	--	7 (100)	---	7 (100)

**Chart 2:** Agreement on each indicator's set of items. Londrina, PR, Brazil, 2011.

Indicator	Totally disagree (No. experts x %)	Partially disagree (No. experts x %)	Partially agree (No. experts x %)	Totally agree (No. experts x %)	Total agreement (No. experts x %)
Ventilatory assistance	1 (14)	--	3 (43)	3 (43)	6 (86)
Infusion pumps	1 (14)	--	2 (29)	4 (57)	6 (86)
Cables and connections	--	1 (14)	1 (14)	5 (72)	6 (86)
Debts	----	1 (14)	1 (14)	5 (72)	7 (86)
Neurological examination	1 (14.3)	---	3 (43)	3 (43)	7 (86)

As for the agreement on the content validity in the overall analysis of the instrument (Chart 1), when considering the description, purpose, bibliographic references of each indicator, 100% of agreement for all items was obtained, pointing out its validity.

The CVI for the set of items that evaluates indicators A, B, C, D and E achieved a 86% index (Chart 2), that is, most of the items had "totally agree" or "partially agree" as responses from the experts.

Chart 3 shows the main findings when applying the eight evaluation criteria to each item comprising the instrument indicators.

For indicator **A**, the items evaluated with higher expression of behavior, objectivity, simplicity, clarity, relevance and accuracy were: "endotracheal tube without noise in the oral cavity", "endotracheal tube without formation of saliva bubbles in the oral cavity", "endotracheal tube without folds", "clean tube fixation", "tracheostomy without residue fixation", "tracheostomy fixation in the neck midline", "firm fixation of the tube to prevent it from sliding" and "client presents respiratory comfort".

Of the 38 initial items, three were excluded because they had reached agreement below 80% in more than six evaluation criteria, which is considered inadequate by experts. Sixteen items were altered in writing, as they were considered appropriate by the experts, and five were condensed with other items. In these terms, the "ventilatory assistance" indicator obtained a total of 31 items considered to be valid.

Regarding indicator **B**, of the 11 evaluation items, 10 had  $\geq 88\%$  of agreement. Only the item "infusion pumps dripping properly (without crashing, whistling, etc.)" got a 75% agreement index in the "relevance" criterion, and so the condensation of this item with "alarms of the pumps without trigger" was suggested, and later accepted by the author. The indicator finished with 10 items considered to be valid.

Of the 16 items that make up indicator **C**, 10 showed agreement of  $\geq 88\%$  and six items had 75% in one evaluation criterion. The only item pointed with 75% of agreement in the behavior, simplicity, clarity, relevance, variety and credibility criteria was "multiparameter

device with attached cables". The indicator finished with 16 validated items.

Indicator D had six items with agreement of  $\geq 88\%$ , one item ("safe attachment of chest tube") with 75% in behavior, objectivity, simplicity and clarity criteria. The item "presence of Penrose drain with good drainage in collection bag" was considered adequate, with the suggestion to remove the term "good drainage", which

was accepted. The term "chest tube attached correctly" was excluded. The indicator finished with six validated items.

Indicator E, referring to neurological examination and consisting of eight evaluation items, had a  $\geq 88\%$  agreement result, and for that reason it was not shown in the chart, with only the sequence of the item "sedation use" being changed, placed just before the Ramsey scale.

**Chart 3:** Main findings in the application of the eight criteria for evaluating the content of the instrument validation process. Londrina, PR, Brazil, 2011.

Indicators	Criteria	Behavior	Objectivity	Simplicity	Clarity	Relevance	Accuracy	Range	Reliability
<b>Ventilatory assistance</b>									
Endotracheal tube without noise in the oral cavity		75%	75%	75%	63%	75%	75%	75%	100%
Endotracheal tube without formation of saliva bubbles in the oral cavity		75%	88%	88%	88%	88%	88%	88%	88%
Endotracheal tube without folds		100%	100%	100%	63%	100%	63%	88%	88%
Firm fixation of the tube to prevent it from sliding		75%	75%	88%	75%	75%	75%	75%	88%
Clean tube fixation		75%	75%	75%	63%	75%	75%	88%	88%
Tracheostomy without residue fixation		63%	75%	75%	75%	75%	75%	88%	88%
Tracheostomy fixation in the neck midline		63%	75%	75%	75%	75%	75%	88%	88%
Client presents respiratory comfort		63%	63%	75%	63%	63%	75%	100%	88%
<b>Infusion pumps</b>									
Infusion pumps dripping properly (without crashing, whistling, etc.)		88%	88%	88%	88%	75%	88%	88%	88%
<b>Cables and connections</b>									
Multiparameter device with attached cables		75%	88%	75%	75%	75%	88%	75%	75%
<b>Debts</b>									
Presence of Penrose drain with good drainage in collection bag		75%	75%	75%	50%	88%	50%	100%	88%
Safe attachment of chest tube		75%	75%	75%	75%	88%	88%	100%	88%

The items evaluated by experts with a score inferior to 80% and considered inadequate were excluded from the instrument, and the ones that did not reach the minimum score but were considered adequate, with minor changes suggested, were kept in the instrument, without the need for a new round of assessments, as the experts' suggestions were very clear.

## DISCUSSION

The application of the CVI for each set of indicator items had 86% of agreement for the five indicators, which shows the content's validity. Some content validation

studies in different times and places obtained CVI 92%, 84%, 80%, 88.43% and 77% (21-25) and were considered valid.

This similarity in CVI for the set of indicator items happened because the evaluators attributed agreement values three and four ("totally agree" and "partially agree") on different items, however belonging to the same indicator. It is also worth reminding that each indicator has a different number of items and that the final result shows harmony between them.

This information confirms the results of a previous study<sup>(22)</sup> which reported that it is not because a certain

agreement degree is obtained that it is justified for experts to attribute the same score to all items, but, since it is a group, there is consonance in the final result.

Literature shows that there is no consensus among researchers about the values considered valid and about the steps taken in relation to the item evaluated. In the development study and validation of a nursing interview instrument<sup>(24)</sup>, there was a change in writing when the item evaluated obtained 50% in the objectivity criteria with suggested changes by the experts.

In another diagnosis and risk validation for vascular trauma study<sup>(21)</sup>, items with scores between 50% and 79% were maintained in the instrument and new validation studies were suggested. These studies corroborate with the present study.

The analysis of all criteria items shows their detailed distortions of clarity and representation, which confirms the experts' opinion on changing the items' content<sup>(21)</sup>. In the instrument of study, most of the items that had been adapted or grouped had agreement of 75%.

One of the difficulties found was the lack of specification to the experts about the definition of the terms used as evaluation criteria and the lack of validation studies, which were also reported as difficulties in another study<sup>(25)</sup>.

It was not possible to confront the validation instrument with other studies due to the lack of references on the subject, but, when analyzing the international literature, instruments used to evaluate the severity of patients hospitalized in ICU were found, such as the Acute Physiology and Chronic Health Evaluation II (APACHE), developed by Knaus et al., which is applied in the patient's first 24 hours of stay and calculates the risk of death<sup>(15)</sup>. This instrument is widely used, but not yet applied and validated in Brazilian patients<sup>(16)</sup>. This fact corroborates the importance of the instrument validated in this study, as the APACHE II, besides not being applied outside the ICU, does not direct nursing care or maintenance of critical patients outside the ICU.

The Logistic Organ Dysfunction System is another instrument used to assess and quantify organic dysfunction of patients in the ICU, providing intensive care results and calculating the probability of death<sup>(15)</sup>. This internationally recognized instrument does not consider needs for the evaluation of critically ill patients outside the ICU and its purpose is clinical, not care wise, which reinforces the importance of the study instrument, since its goal is care wise.

Besides the instruments cited above, the New Injury Severity Score can also be mentioned, used to assess the severity of trauma; the Sequential Organ Failure Assessment, severity and mortality predictor; the Therapeutic Intervention Scoring System, which classifies the severity of patients through the number of medical and nursing procedures the patient receives, regardless of the patient's diagnosis, and which is also a mortality predictor<sup>(16)</sup>. All these instruments, widely used in ICUs globally<sup>(15-16)</sup>, are useful for patient treatment, but none of them intend to meet or even contemplate what the instrument of study does, which is to ensure the quality of the correct, secure and optimized management of critical patients allocated out of the ICU.

The applicability of the instrument may be evaluated in daily practice in health services facing lack of ICU vacancy problems because the instrument works as a roadmap that guides nurses on the steps they should follow to ensure minimum patient safety and thus optimize nursing care. For example, when applying item C, nurses can learn, by looking at the patient and comparing it with the instrument, if the monitoring is appropriate and, if it is not and the suggested equipment is available, this "flaw" may be corrected, which makes it a more complete and adequate care environment.

At the end of the application of the five indicators that make up the instrument, the nurse can have an overview of what can be used or evaluated in the patient and is able to optimize the systematization of nursing care and implement a more reliable and safe prescription.

## CONCLUSION

This study found a wide variety of instruments used to assess the severity of ICU patients and which assist patient treatment, but when the subject is this patient allocated outside intensive care, the focus is different because there are no references, studies or tools to evaluate, treat or refer the adequate care or treatment to these lives that wait for an ICU bed. In this sense, a validated tool can help provide safe and dignified care for these patients outside the ICU and can also leverage discussions on the subject, contributing to the scientific community in the search for solutions and safety for these patients.

The content of this instrument was validated in three steps: indicator elaboration analysis, with CVI from 80 to 100%; analysis of each indicator's set of items, which had

a CVI of 86%, and analysis of each item by eight content evaluation criteria. At the end of the process, the instrument was considered validated and finished with a total of 71 valid items that can be adapted to different situations, according to each institution's needs.

This is a unique instrument, through which the aim is to help professionals with little or no experience in assisting patients on mechanical ventilation, academics and students who are interested or need to delve into the subject and managers who can empower their teams and reduce chances of iatrogenic complications, besides contributing to the demystification of a taboo chasing many professionals throughout their stories: the care of critically ill patients on mechanical ventilation out of the ICU.

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