Clinical indicators to monitor patients with risk for ineffective cerebral tissue perfusion

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Objective. Select and validate the clinical indicators to monitor patients on risk for ineffective cerebral tissue perfusion, according to the Nursing Outcomes Classification (NOC). **Methodology.** Validation study carried out between November 2012 and August 2013, in a Brazilian hospital. Seventeen judges nurses evaluated the clinical indicators of Nursing Outcomes, according to NOC for patients on risk for ineffective cerebral tissue perfusion. In the first stage, were selected the nursing results for the assessment of the studied diagnosis and, in the second nurses assessment the importance of the indicators of the validated results in the previous step through a five points Likert scale (1 = not important to 5 = extremely important). Were used the content validity index (CVI) that corresponds to the calculation of weighted averages of them marks awarded for each indicator, as it considered the following weights: 1=0.00, 2=0.25, 3=0.50; 4=0.75; 5=1.00. For categorization, the CVI considered as *critical* = ≥0.80; *supplementary* =≥0.50 to 0.79 and were *disposed* results <0.50. **Results.** Of the 9 nursing results, only the cerebral tissue perfusion obtained a 100% consensus. The CVI of the 18 indicators of this result showed that *five* were validated as *critical* (impaired neurological reflexes, systolic blood pressure, diastolic blood pressure, reduced level of consciousness and mean arterial pressure), 12 were validated as *supplementary* (Agitation, Impaired cognition, Intracranial pressure, Syncope, Vomiting, Findings of cerebral angiography, Headache, Restlessness, Fever, Unexplained anxiety, listlessness and Hiccughs) and *one* was *disposed* (carotid bruit). **Conclusions.** The validation of information about the conditions of risk may allow early intervention to minimize the consequences of ineffective cerebral tissue perfusion.

Key words: outcome assessment (health care); / classification; validation study; critical care; neurology.

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Indicadores clínicos para el monitoreo de pacientes con riesgo de perfusión tisular cerebral ineficaz

Objetivo. Seleccionar y validar los indicadores clínicos para monitorear los pacientes con riesgo de perfusión tisular cerebral ineficaz según la Clasificación de los Resultados de Enfermería (Nursing Outcomes Classification –NOC). **Metodología.** Estudio de validación realizado entre noviembre de 2012 y agosto de 2013 en un hospital brasilero. 17 enfermeros expertos evaluaron los indicadores clínicos de los NOC con riesgo de perfusión tisular cerebral ineficaz. En la primera etapa señalaron si lo recomendaban o no para la evaluación del diagnóstico estudiado y en la segunda etapa los enfermeros evaluaron la importancia de los indicadores de los resultados validados en la etapa anterior por medio de una escala *Likert* de cinco puntos (1 = no importante a 5 = extremadamente importante). Se utilizó el Índice de validación de contenido (IVC) que corresponde al cálculo de las medias ponderadas de las notas atribuidas para cada indicador con los pesos: 1 = 0.00; 2 = 0.25; 3 = 0.50; 4 = 0.75; 5 = 1.00. La categorización del IVC fue: *crítica* = ≥0.80; *secundarios* ≥0.50 a 0.79 y los <0.50 fueron *descartados*. **Resultados.** De los 9 resultados de enfermería solo el de Perfusión tisular: cerebral tuvo un consenso del 100%. El IVC de los 18 indicadores de este resultado mostró que 5 fueron *críticos* (reflejos neurológicos deteriorada, presión arterial sistólica, presión arterial diastólica, nivel reducido de consciencia y presión arterial media), 12 fueron *secundarios* (agitación, cognición deteriorada, presión intracraneal, síncope, vómito, resultados de la angiografía cerebral, dolor de cabeza, falta de atención, hipo, agitación, fiebre, y ansiedad sin explicación*)* y 1 fue *descartado* (soplo en la carótida). **Conclusión.** La información de la validación de las condiciones de riesgo es importante para la detección precoz con el fin para reducir las consecuencias de la perfusión tisular cerebral ineficaz.

Palabras clave: evaluación de resultado (atención de salud); / clasificación; estudios de validación; cuidados críticos; neurología.

Indicadores clínicos para monitorar pacientes em Risco de Perfusão Tissular Cerebral Ineficaz

Objetivo. Selecionar e validar os indicadores clínicos, para monitorar pacientes em Risco de perfusão tissular cerebral ineficaz, segundo a Classificação dos Resultados de Enfermagem (NOC),. **Metodologia.** Estudo de validação realizado entre novembro de 2012 e agosto de 2013, em um hospital brasileiro. Dezessete enfermeiros juízes avaliaram os indicadores clínicos de Resultados de Enfermagem, segundo a NOC, para pacientes em Risco de perfusão tissular cerebral ineficaz. Na primeira etapa foram selecionados os Resultados de Enfermagem para a avaliação do diagnóstico estudado, e na segunda os enfermeiros avaliaram a importância dos indicadores dos Resultados validados na etapa anterior por meio de uma escala *Likert* de cinco puntos (1 = não importante a 5 = extremamente importante). Foi utilizado o Índice de validação de conteúdo (IVC) que corresponde ao cálculo das médias ponderadas de las notas atribuídas para cada indicador, em que se consideraram os seguintes pesos: 1 = 0; 2 = 0.25; 3 = 0.50; 4 = 0.75; 5 = 1. Para a categorização, o IVC considerou como *críticos* = ≥0.80; *suplementares* ≥0.50 a 0.79 e os <0.50 foram *descartados*. **Resultados.** Dos 9 resultados de enfermagem, somente o Perfusão tissular: cerebral obteve um consenso de 100%. O IVC dos 18 indicadores deste resultado mostrou que *cinco* foram validados como *críticos* (Reflexos neurológicos prejudicados, Pressão arterial sistólica, Pressão arterial diastólica, Nível reduzido de consciência e Pressão arterial média), 12 foram validados como *suplementares* (Agitação, Cognição prejudicada, Pressão intracraniana, Síncope, Vômito, Achados da angiografia cerebral, dor de cabeça, Inquietação, Febre, Ansiedade sem explicação, Desatenção e Soluços) e *um* foi *descartado* (Sopro na carótida). **Conclusões.** A validação das informações acerca das condições de risco pode possibilitar a intervenção precoce para minimizar as consequências da perfusão tissular cerebral ineficaz.

Palavras chave: avaliação de resultados (cuidados de saúde); / classificação; estudos de validação; cuidados críticos; neurologia.

Introduction

The documentation of care plans that foster care and patient safety, and that demonstrate the nursing contribution in the obtained results is essential to systematize the practice of nurses in different aspects of assistance in health.[1]In high complexity units, such as in the case of emergency services and intensive care, direct care, taken quick and safe decisions are frequent. The Nursing Diagnosis (ND)[2] (00201) Risk for Ineffective Cerebral Tissue Perfusion, defined as "Risk of reduction in the brain tissue circulation that may impair health"[2], is present in the Brazilian reality, in view of the increase in hospitalizations by cerebrovascular diseases in Brazil.[3] Different clinical situations place neurological patients in Risk for Ineffective Cerebral Tissue Perfusion. This ND has as risk factors presence of cerebral aneurysm, aortic atherosclerosis, dilated cardiomyopathy, encephalic traumatic brain injury, brain tumor, thrombolytic therapy, hypertension, among others.[2]

The neurological deficits that may occur, according to these risk factors, make these patients dependent of nursing interventions. It is noteworthy that the higher needs, the greater the urgency to plan their interventions.[4] To obtain desired results it is necessary to establish accurate diagnoses, objectives to be achieved and effective interventions.[5] The Nursing Outcomes Classification – NOC was developed to measure, using Likert scales, Nursing Outcomes (NO) that include health status, behaviors, reactions and feelings of the patient, family or comunity.[6] Are clinical indicators that help nurses in planning and assessment, that stages are fundamentals for the conduct of clinical best practices.

In Brazil, in recent years several studies have been conducted to validate NO to adult patients with ND[2] Acute Pain[7], Selfcare Deficit: Bathing/Hygiene[8], Excess fluid volume[9] and children with Ineffective breathing pattern[10] and Deficient diversional activity.[11] It is evidenced a gap as regards the validation studies for nursing results to patients in Risk for Ineffective Cerebral Tissue Perfusion. The relevance of this study is founded on the contributions that brings nursing, to infer that the NO may help in determining the priority interventions, enabling monitoring of patients with this diagnosis. Thus, the aim of this study was to validate clinical indicators, according to the Nursing Outcomes Classification (NOC)[6], to monitor patients on Risk for ineffective cerebral tissue perfusion.

Methodology

This is a study of content validation, carried out in two stages. At first there was a Consensus[12] on essentials nursing outcomes for assessment of patients with Risk of ineffective cerebral tissue perfusion. In the second stage, was done the content validation of NO indicators, based on the model Fehring.[13] The research was conducted in a university hospital in south of Brazil, recognized as an academic center of excellence in quality and patient safety by Joint Commission International. Actually has 865 beds, distributed in more than 60 specialties.

The Emergency Service is part of the Emergency Care Network, of the Brazilian Ministry of Health. The humanized care is provided by the host environment with risk assessment and classification according to the Manchester Triage System. It is composed of units of observation and hospitalization, with a unit specializing in vascular care. The Intensive Care Service has the capacity for 39 adult patients of different specialties. Among the therapeutic procedures performed, we highlight the postoperative period of several specialties, such as neurosurgery and vascular surgery.

The convenience sample consisted of 17 nurses of Emergency and Intensive Care Service. Inclusion criteria were: judge's nurses with two or more years

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of experience in caring for patients with Risk for Ineffective Cerebral Tissue Perfusion. No exclusion criteria were provided. However, it was considered essential to include qualified professionals in clinical practice of surveyed fields and with knowledge in the application of the diagnosis. They also have scientific production related to Nursing process (NP) and classifications. Most of them have been participated in the Hospital Committee of Nursing Process, which since 2000 works with the NANDA-I and Nursing Interventions Classification (NIC).[2] This group includes nurses and teachers/researchers academically connected to a public university in the south of Brazil, who meet to discuss the implementation, update and assessment of nursing process, with emphasis on individualized care and in qualified and insurance record, also conducting clinical studies based on these taxonomy.[11]

Data collection was conducted between November 2012 and August 2013. In the first stage of the study, of the 23 results contained in the link NOC-NANDA-I[6] to the ND Risk for ineffective cerebral tissue perfusion[2], were selected the nine *Suggested* by NOC, because are results considered more approximate to the nursing diagnosis.[6] It is worth noting that in this edition of NOC[6], there is no link to Risk for Ineffective Cerebral Tissue Perfusion, because it is based on the NANDA-I published in 2008.[14] After an instrument containing these nine NO. Considering the title and the definition of each one of the outcomes, participants should be point out, *recommend* or *not recommend*, for the assessment of the studied diagnosis.

In the second stage the participants assessment indicators of the results validated the previous stage, through a five point Likert scale (1 = not important, 2 = slightly important, 3 = important, 4 = very important and 5 = extremely important). By filling these instruments, the judges attributed their clinical judgment as to the importance of each result (1st stage) and its indicators (2nd stage). Data analysis was performed using descriptive statistics, in Microsoft Excel 2010®. For the first stage of the study, it was considered a 100% consensus on concordant responses among nurses. Data from the second stage were analyzed using the Content Validity Index (CVI) by calculating the weighted averages of the scores assigned to each indicator, as it considered the following weights: 1=0.00; 2=0.25; 3=0.50; 4=0.75; 5=1.00. For the categorization of indicators were considered *critical* those ≥0.80; that with mean between 0.50 and 0.79 were considered *supplementary* and those with values less than 0.50 were *disposed*.[13]

The ethical aspects were respected and the project was approved by the Research Ethics Committee of the institution, with the report n° 08.184. Participants signed a consent form.

Results

The sample consisted of 17 *judges* nurses, among them *ten* (58.8%) had a specialization and *four* (23.5%) master degree. Regarding professional experience *seven* (41.17%) have been working between six to ten years in units included using the NP. Of the participants, *eight* (47%) are members of the Committee of the Nursing Process, which is responsible for the conduct of this methodology in the studied hospital; adding to this, *six* (35%) nurses have publications related to the NP and NANDA-I[2] ratings, and NOC.[6] Of the nine NO suggested by link NOC-NANDA-I[6], only the (0406) Cerebral Tissue Perfusion had 100% consensus according to the assessment of judges. This outcome is located in Domain II: Physiological Health and in the Class E - cardiopulmonary, measured by means of scales *Severe deviation from normal range* to *No deviation from the normal range* and *Severe to None*. These and other outcomes can be seen in Table 1.

The second stage of the study validated the content of the indicators of NO *Cerebral Tissue Perfusion*.[6] Of the 18 indicators, *five* (27.7%) were validated as *critical*, 12 (66.6%) *supplementary* and *one* (5.5%) was *disposed*. These data are shown in Table 2.

Table 1. Distribution of Concordance Index of Nursing Outcomes for diagnosis Risk for Ineffective Tissue Perfusion: Cerebral

Nursing outcomes	Concordance Index (%)
Tissue Perfusion: Cerebral	100.00
Cognition	85.71
Neurological Status	85.71
Neurological status: Consciousness	85.71
Level of agitation	85.71
Acute level of confusion	85.71
Seizure Control	71.42
Neurological status: Central motor control	71.42
Tissue perfusion: Cell	71.42

Table 2. Score distribution of indicators of Tissue Perfusion: Cerebral

	Score
Critical(CVI≥0.80)	
Impaired neurological reflexes	0.89
Systolic blood pressure	0.87
Diastolic blood pressure	0.85
Decreased level of consciousness	0.85
Mean blood pressure	0.81
Suplemmentary (CIV≥0.50 a 0.79)	
Agitation	0.77
Impaired Cognition	0.77
Intracranial pressure	0.75
Syncope	0.75
Vomiting	0.72
Cerebral angiography findings	0.68
Headache	0.68
Restlessness	0.68
Fever	0.62
Unexplained Anxiety	0.54
listlessness	0.52
Hiccoughs	0.50
Disposed	
Carotid bruit	0.45

Discussion

The NOC provides a professional language that can be used by nurses to identify and assessment the effects of nursing interventions in different environments of care.[6] The validation of these elements, according to the expertise of the nurses of clinical practice[15] may favor its applicability, once it helps to choose the most relevant clinical indicators, and facilitate rapid assessment of

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states of ineffective cerebral tissue perfusion risk. The consensus of the judges nurses as to NO Tissue Perfusion: Cerebral, defined as adequacy of blood flow through the cerebral vasculature to maintain cerebral function,[6] differed of a South Korean study in that the NO *Neurological status: awareness* has been validated as the most important for neurological patients. The Tissue Perfusion: Cerebral got 4.58 in score of importance, but its use in practice is moderate, according to the researches nurses.[16]

Neurological examination of the patient is essential in the care of critically ill patients. The assessment carried out by the nurse is based on three fundamental aspects: assessment of the consciousness level, examination of pupils and classification of motor response. Its frequency depends on the severity and type of cerebral event. One of the instruments most commonly used in this assessment is the Glasgow Coma Scale (GCS).[17] The indicator *Impaired neurological reflexes* received greater CVI. In this sense, we can tailor the GCS in the operation of this indicator in addition to the *Decreased level of consciousness*, tracing parameters on the evolution of the patient. The advantages of using this scale include fast assessment, easy training of the nursing team, also provides a common language between professionals.[17]

Other indicators that were considered *critical* are related to blood pressure. The NOC[6] categorizes this vital sign on three indicators: *Systolic blood pressure, Diastolic blood pressure* and *Mean arterial pressure*. Hypertension (HTN) is one of the risk factors for Cerebrovascular Accident-stroke (CVA). It is noteworthy that the *Systolic* (SBP) and *Diastolic Blood Pressure* (DBP) are important indicators for the decision making of treatment with tissue plasminogen activator (t-PA) intravenously, and as a criterion for exclusion of that thrombolytic therapy sustained SBP> 185 mmHg or sustained DBP> 110 mmHg.[18]Also, population studies of Brazilian cities revealed the prevalence of HTN above 30%.[19] In this sense, there is the importance of this indicator for clinical practice.

For studied ND, besides the management of blood pressure and assessment of the level of consciousness, there is a direct relationship of these indicators with the monitoring risk status, or not, of ineffective cerebral perfusion. It is known that cerebral perfusion pressure (CPP) is defined as the mean arterial pressure (systolic blood pressure + 2x diastolic blood pressure/3) minus intracranial pressure values (ICP). From that, the CPP values lower than 60 mmHg, are insufficient[20], in this case, therapeutic actions should be initial for ineffective brain tissue perfusion.[21] However, the *Intracranial pressure* indicator was not considered *critical* by judges to evaluate the status of the risk of ineffective cerebral tissue perfusion.[2] This assessment may have occurred because of the ICP continuous monitoring not be practical in emergency units. Corroborates this inference the fact that the sample contain a larger number (n = 12) of nurses coming this practice field, or the fact that this ND was real until the edition of NANDA-I (version 2007-2008)[14], and has been updated in hospital nursing prescription system under study for risk of ineffective cerebral tissue perfusion in 2011.

Increased ICP can produce pupillary changes, and the indicator that evaluates this state is present in the result *Neurologic State*[6], which had Consensus of 85.71%. The inclusion of this indicator in the NO *Cerebral Tissue Perfusion*[6], would be of great value, because it is of clinical evidence in the assessment of critic neuropatient. Among the supplementary indicators, we highlight those related to neurological signs or symptoms such as *Agitation, Impaired Cognition, Syncope, Restlessness, Unexplained Anxiety, listlessness, Vomiting* and *Hiccoughs*, The variability of these indicators with CVI between 0.79 and 0.50, could facilitate the clinical examination in accordance with the state of the result, but also during the initial inspection of the patient with suspected acute brain injury, based on the initial score of the indicator, thus monitoring the outcome of nursing care.

The *supplementary* indicators *Headache, Fever* and *Cerebral angiography findings* are directly

related to the prognosis of the severity of critical neurological patient, for example, the *Headache* was present in 43.9% of patients with some kind of pain, ranked at stages II, III and IV of Manchester protocol[22], and the sum of these symptoms may both increase blood pressure, as the ICP, determining changes in cerebral perfusion pressure. In what concerns the control of body temperature, it is considered critical and should be monitored intensively, within the first 72 hours, in the case of stroke[23] and acute critical patient encefálico[24] to improve neurological prognostic, in this case is verified the importance of the indicator *Fever*.

Is highlighted the indicator *Cerebral angiography findings*, with CVI 0.68, which is related with imaging test results. This examination is a valuable tool to investigate vascular diseases or abnormalities related to the permeability of the cerebral circulation. Nurses perform a series of clinical care related to the procedure, including the neurological assessment.[25] Its CVI (0.68) was relatively low, in this sense, would be conducting a follow-up to check its use before and after the nursing interventions for patients with Risk for ineffective cerebral tissue perfusion. The result of this examination directs the decision-making of other professionals, and can be connected to the assessment of other nursing diagnoses. Similarly, the *Carotid bruit* indicator was *disposed* by the judges. In this sense, as the neurological clinical manifestations vary in intensity and the degree of commitment, means that the use of these indicators can be used in accordance with the patient's risk factors for risk of ineffective cerebral tissue perfusion and stratified according to magnitudes of NOC scales.[6] Using this relevance, and accuracy of nurses in the assessment of critically ill patients, approaches the Nursing Process and classifications of evidence-based practice.

Conclusion

The study selected and validated clinical indicators, according to the Nursing Outcomes Classification (NOC) to monitor patients with *Risk for ineffective cerebral tissue perfusion*. In the first stage of the study the result *Cerebral Tissue Perfusion* showed 100% consensus, according to the assessment of the judges, and in the second stage, of the 18 indicators of this nursing result, *five* (27.7%) were validated as *critical* (Impaired neurological reflexes, Systolic blood pressure, Diastolic blood pressure, Reduced level of consciousness and Mean arterial pressure), 12 (66.6%) were validated as *supplementary* (Agitation, Impaired cognition, Intracranial pressure, Syncope, Vomiting, Cerebral angiography findings, Headache, Restlessness, Fever, Unexplained anxiety, listlessness and Hiccughs) and *one* indicator (5.5%) was *disposed* (Carotid bruit).

The NOC[6] proved to be valid in the studied context, in the opinion of judges, allowing the identification of clinical indicators to monitor patients with Risk for ineffective cerebral tissue perfusion. This validation can facilitate the assessment of conditions of risk and early intervention to minimize the consequences of ineffective cerebral tissue perfusion. These findings need to be validated clinically to verify the changes in the health status of the patient after the nursing interventions. Also, check the psychometric properties of the NOC scales, in order to offer better perspectives of its use for patients. A possible limitation was the research with judge's nurses in just one institution, although it could be argued that the studied hospital has over 40 years of experience in the use of Nursing Process. Since 2000 uses the terminology of nursing diagnoses of NANDA-I in clinical practice, in addition to prescription of care mapped to the NIC, and has been studying the inclusion of the NOC in the electronic patient record. Moreover, the studied units are reference in field of cerebrovascular care. The methodology used was adequate; however, a larger sample of judges, egalitarian, of both services, could maximize the impact of the findings. Validation for patients with certain neurological diseases or signal of neurological commitment could discriminate use of these clinical indicators.

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