

VALIDATION OF INDICATORS OF THE NURSING OUTCOMES CLASSIFICATION FOR HOSPITALIZED ADULTS AT RISK OF INFECTION¹

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ABSTRACT: This study aimed to validate the indicators of the Nursing Outcomes proposed by the Nursing Outcomes Classification for the diagnosis Risk of Infection. Content validation was performed according to 12 nurse experts from the clinical, surgical and intensive care units of a university hospital. The analysis was based on the weighted arithmetic average of the scores the experts assigned to each indicator assessed and scores that reached at least 0.80 were validated. Out of 132 proposed indicators, 67 were validated for eight nursing outcomes described for the diagnosis Risk of Infection, which had been validated in a previous study. The content validation process identified that the Nursing Outcomes Classification presents feasible results and indicators to evaluate and identify the best care practices. This study will support the implementation of the Nursing Outcomes Classification in clinical practice, teaching and research.

KEYWORDS: Nursing diagnosis. Validation studies. Nursing process. Nursing assessment. Classification.

VALIDAÇÃO DE INDICADORES DA NURSING OUTCOMES CLASSIFICATION PARA ADULTOS HOSPITALIZADOS EM RISCO DE INFECÇÃO

RESUMO: Este estudo teve como objetivo validar os indicadores dos Resultados de Enfermagem, propostos pela *Nursing Outcomes Classification*, para o diagnóstico Risco de Infecção. Foi realizada validação de conteúdo, segundo a opinião de 12 enfermeiros peritos, originários de unidades clínicas, cirúrgicas e terapia intensiva de um hospital universitário brasileiro. A análise teve por base a média aritmética ponderada das notas atribuídas pelos peritos para cada indicador avaliado, sendo validados os que atingiram, pelo menos, 0,80. Foram validados 67 indicadores, de um total de 132 propostos, para oito resultados de enfermagem descritos para o diagnóstico Risco de Infecção, os quais haviam sido validados em estudo anterior. O processo de validação de conteúdo identificou que a *Nursing Outcomes Classification* apresenta resultados e indicadores viáveis para avaliar e identificar as melhores práticas de cuidado. Acredita-se que este estudo servirá de subsídio à implantação da *Nursing Outcomes Classification* na prática clínica, ensino e pesquisa.

PALAVRAS CHAVE: Diagnóstico de enfermagem. Estudos de validação. Processos de enfermagem. Avaliação em enfermagem. Classificação.

VALIDACIÓN DE LOS INDICADORES DE LA CLASIFICACIÓN NURSING OUTCOMES CLASSIFICATION PARA ADULTOS HOSPITALIZADOS CON RIESGO DE INFECCIÓN

RESUMEN: Este estudio tuvo como objetivo validar los indicadores propuestos por los resultados de enfermería de la *Nursing Outcomes Classification* para el diagnóstico de Riesgo de Infección. La validación del contenido se realizó de acuerdo con la opinión de 12 enfermeros, procedentes de unidades de cuidados clínicos, quirúrgicos e intensivos de un hospital. El análisis se basó en la media aritmética ponderada de las puntuaciones asignadas por los especialistas para cada indicador evaluado, donde fueron validados aquellos que alcanzaron al menos 0.80. Fueron validados 67 indicadores de un total de 132 propuestos para ocho resultados descritos para el diagnóstico de Riesgo de Infección, los cuales habían sido validados en un estudio anterior. El proceso de validación de contenido identificó que la *Nursing Outcomes Classification* presenta indicadores posibles para evaluar e identificar las mejores prácticas. Se cree que este estudio servirá como un subsidio para la aplicación de la Clasificación de Resultados de Enfermería en la práctica, enseñanza e investigación.

PALABRAS CLAVE: Diagnóstico de enfermería. Estudios de validación. Procesos de enfermería. Evaluación en enfermería. Clasificación.

INTRODUCTION

Nowadays, nurses increasingly need to describe and measure the outcomes of their practice, which determined the creation of classification systems like the Nursing Outcomes Classification (NOC).¹ The NOC complements two other nursing classifications, NANDA International, Inc. (NANDA-I), which describes the diagnoses, and the Nursing Intervention Classification (NIC), which describes the interventions. Researchers from the University of Iowa developed links between these three classifications, as they are mutually complementary and can be used in computer systems for the application of the nursing process (NP).²

Studies using the NOC are incipient in Brazil and internationally, but a recent increase is verified in the scientific production related to this classification, mainly in the international context.³⁻⁴ In Brazil, a cross-sectional study⁵ assessed the NOC indicators for the nursing diagnosis (NDx) Ineffective Breathing Pattern in children with cardiac diseases. In that study, 17 NOC indicators were assessed for this NDx, seven of which revealed statistically significant differences between children with and without the NDx. The indicator breathing difficulty was assessed as the main problem among the groups, which permitted the evaluation of the differences and level of breathing problems among children with and without Ineffective Breathing Pattern.⁵

Another Brazilian study⁶ aimed to determine the validity of the operational definitions constructed for the NOC indicators that assess the breathing pattern in children with congenital heart disease. Therefore, eight trained nurses assessed 45 one-year-old children with the disease who had been previously diagnosed with Ineffective Breathing Pattern. Two indicators were significant in all statistical analyses: asymmetric thorax expansion and percussion sounds.⁶

Around the world, validation studies are increasing, not only for NDx, but also for nursing outcomes (NO).⁷⁻¹⁰ The number of these studies remains unsatisfactory though, particularly with regard to the NO. Hence, this factor helps to emphasize the importance of research in the area, with a view to reducing the uncertainties, difficulties and limitations met.¹¹

Not only validation studies about the nursing outcomes of the NOC are scarce,⁴ but also the methods to develop them. Various models have

been proposed for the validation of ND. Fehring's method is highlighted, which has been widely used in nursing and whose main characteristic relates to the diagnostic content and clinical validations. As a model the nurses are accustomed to, it has been used for the validation of NO.⁷⁻¹⁰ This justifies researchers' choice to adapt this method, constructed for the validation of NDx,¹¹ but which has been applied recently to validation nursing interventions and outcomes.^{10,12-15}

As observed, further advances are needed in studies about the NOC with a view to deeper knowledge and use in practice, as described in a recent study that involved patients with heart failure in home care.¹⁶

The NDx Risk for Infection, defined as being "at risk for being invaded by pathogenic organisms", was the most frequent at the three nursing services in a Brazilian study.^{10:39} This finding is in line with the results of other studies with surgical, clinical and critical patients.¹⁷⁻¹⁸ The NDx Risk for Infection can be identified as the most frequent in hospitalized patients, as a result of different factors in the hospitalization process, demanding a preventive attitude that should guide the nursing actions in the care plan, taking into account its interface with other diagnoses. Risk for Infection is associated, among others, with the treatment-related factors (surgery, presence of invasive lines and medication therapy).¹⁰

Therefore, this research was developed to enhance the knowledge about the NOC. The objective was to validate the indicators of eight outcomes in this classification, previously validated in an earlier study¹⁰ for the NDx Risk for Infection. This NDx was selected for the study as it is the most frequent among adult clinical, surgical and intensive care patients at the institution where the research was carried out and in the literature.^{10,17-18} The researchers hope that the results of this validation can help to complement and qualify the use of the computerized NP at the study hospital, besides helping other health institutions and supporting the qualification of nursing care.

METHOD

This is an excerpt from a content validation research of the NOC nursing outcomes, based on Fehring's method¹⁰⁻¹² adapted for this research. This type of study essentially involves the systematic examination of the assessed content,

with a view to determining whether it covers a representative sample of the domain that is to be measured.¹⁹

The research was developed at a university hospital in the South of Brazil. The content of the indicators established by the NOC for the assessment of previously validated outcomes was validated,¹⁰ presented in the chapter about links between NOC and NANDA-I for the NDx Risk for Infection.

Fehring recommends that nurse experts be involved in this study. It is known, however, that there are difficulties to find a sample of professionals who attend to the criteria proposed by the author, who acknowledges the fact and indicates the conditions required by the American Nurses Association Social Policy Statement.¹² These include at least a Master's degree, research on the NDx under analysis and papers published about diagnoses. These criteria are hard to find in the Brazilian reality. Therefore, in this study, the criteria were modified to permit the development of the research.

Thus, a group of 12 nurse experts was selected who are active at adult clinical, surgical and intensive care services. The criteria to determine the experts in this study were: participate or having participated in study and qualification activities about the NP for at least four months in the last five years or having academic-scientific production on NP and Nursing Classifications; having at least two years of professional experience as a nurse; working at the research institution for at least one year, using the NP; and having at least one year of experience with surgical, clinical or intensive care patients in the last five years.

Fehring proposes the categorization of the NO indicators as critical, with a weighted arithmetic average of 0.80 or more, and supplementary, when the average ranges between 0.79 and 0.50. NO indicators with averages below 0.50 are discarded.⁸⁻¹² In this study, however, the cut-off point for the NO indicators was set at 0.80, eliminating other categories. The cut-off point selected in this study is justified by the 80% inter-expert agreement level Fehring suggests to categorize the main or critical¹² indicators. The inter-expert agreement level of 80% is intended to enhance the consistency, soundness and applicability of the set of NOC nursing outcomes indicators for use in the computer system.

Data were collected through an instrument with 132 indicators, related to eight NOC outcomes that had been validated in an earlier study¹⁰ as critical indicators for the NDx Risk for Infection. These are: Knowledge: infection management; Risk control: infectious process; Wound healing: secondary intention; Wound healing: primary intention; Knowledge: treatment procedure(s); Immune status; Tissue integrity: skin and mucous membranes; and Risk control: sexually transmitted diseases.¹⁰

The data collection instrument consisted of a seven-column table for each NO: 1st column – indicators proposed in the NOC; 2nd to 6th columns – five-point Likert scale (1=not important; 2=hardly important; 3=important, 4=very important and 5=extremely important) to measure the importance of each indicator in related to the NO and the NDx Risk for Infection; 7th column – space for the experts to mark suggestions, criticism or observations.

The data were organized in Microsoft Excel 2007 and analyzed using descriptive statistics based on an adaptation of Fehring's method.¹⁰ The weighted arithmetic average of the scores the experts attributed to each indicator was calculated, considering the following: 1=0; 2=0.25; 3=0.50; 4=0.75; 5=1. According to the adaptation for this research, indicators with arithmetic average of 0.80 or higher were validated and the remainder was discarded.

The nurse experts who accepted to participate in the research received a letter with information, a questionnaire about their professional characteristics and the data collection instrument. All the participants terms of free and signed the Informed Consent. Approval for the research was obtained from the Health Ethics Committee at the institution, under number 08-184.

RESULTS

The 12 experts were categorized according to their educational background and professional experience (Table 1). Some of them held more than one degree, with five (41.65%) M.Sc. and seven (58.31%) specialists.

In total, 132 NOC indicators were submitted to the content validation process, related to eight proposed outcomes for the NDx Risk for Infection. Of these, 67 critical indicators were validated.

Table 1 - Characteristics of nurse experts in the sample. Porto Alegre-RS, 2011

Characteristics (N=12)	N (%)
Academic degree *	
Finished Master's	5 (41.65)
Ongoing Master's	1 (8.33)
Specialization	7 (58.31)
Teaching diploma	2 (16.66)
Study or qualification activities about NP/time	
4 years or more	3 (24.99)
2 years - 3 years and 11 months	4 (33.32)
4 months - 1 year and 11 months	4 (33.32)
Scientific production about NP	
Paper	1 (8.33)
Poster	4 (33.32)
Abstract in proceedings	4 (33.32)
Course conclusion paper	1 (8.33)

* some nurses held more than one academic degree

For the outcome Knowledge: infectious control, nine indicators were proposed in the NOC, four of which were validated (44.44%) as criti-

cal. As for Knowledge: treatment procedure(s), six (60%) out of 10 indicators were validated (Figure 1).

Figure 1 - Indicators validated as critical for the outcomes Knowledge: infectious control and Knowledge: treatment procedure(s). Porto Alegre-RS, 2011

NO: Knowledge: infection management		NO: Knowledge: treatment procedure	
Total indicators (N=9)		Total indicators (N=10)	
Validated indicators (N=4)	Mean	Validated indicators (N=6)	Mean
Practices that reduce transmission	0.95	Purpose of procedure	0.87
Mode of transmission	0.91	Treatment procedure	0.85
Factors contributing to transmission	0.89	Treatment side effects	0.83
Signs and symptoms of exacerbation of infection	0.83	Restrictions related to procedure	0.81
		Appropriate action for complications	0.81
		Contraindications for procedure	0.81

Twenty-four indicators were proposed for the outcome Risk Control: infectious process in the NOC, eight (33.33%) of which were validated as critical. For the outcome Risk Control: Sexu-

ally transmitted diseases (STDs), 17 indicators are described in the NOC, all of which (100%) were validated as critical (Figure 2).

Figure 2 – Indicators validated as critical for the outcomes Risk Control: infectious process and Risk control: sexually transmitted diseases. Porto Alegre-RS, 2011

NO: Risk control: infectious process		NO: Risk control: sexually transmitted diseases	
Total indicators (N=24)		Total indicators (N=17)	
Validated indicators (N=8)	Mean	Validated indicators (N=17)	Mean
Practices hand sanitization	0.97	Uses methods to control STD transmission*	0.97
Identifies personal signs and symptoms that indicate potential risk	0.89	Notifies sexual partner(s) in event of STD infection	0.93
Uses universal precautions	0.89	Acknowledges individual risk for STDs	0.91
Practices infectious control strategies	0.89	Monitors personal behaviors for STDs exposure risk	0.91
Identifies infection risk in everyday situations	0.87	Acknowledges personal consequences associated with STDs	0.89
Maintains a clean environment	0.87	Monitors contacts for STDs exposure risks	0.89
Identifies strategies to protect self from others with infection	0.83	Develops effective strategies to reduce STDs exposure	0.89
Obtains recommended immunizations	0.81	Inquires of partner's STDs status before sexual activity	0.89
		Maintains absence of STD	0.89
		Recognizes STD signs and symptoms	0.87
		Complies with treatment for STD	0.87
		Commits to exposure control strategies	0.85
		Follows selected exposure control strategies	0.85
		Adjusts exposure control strategies	0.81
		Participates in screening for STDs	0.81
		Participates in screening for associated health problems	0.81
		Uses community health care services for STD treatment	0.81

* STD - Sexually Transmitted Disease

The outcome Wound healing: primary intention has 14 indicators in the NOC, nine of which were validated (64.28%). Wound healing: secondary intention has 18 indicators, 10 (55.55%) of which were validated (Figure 3).

Figure 3 – Indicators validated as critical for the outcomes Wound healing: primary intention and Wound healing: secondary intention. Porto Alegre-RS, 2011

NO: Wound healing: primary intention		NO: Wound healing: secondary intention	
Total indicators (N=14)		Total indicators (N=18)	
Validated indicators (N=9)	Mean	Validated indicators (N=10)	Mean
Wound edges approximation	0.87	Granulation	0,95
Scar formation	0.87	Foul wound odor	0,93
Foul wound odor	0.87	Decrease wound size	0,91
Increase skin temperature	0.85	Scar formation	0,89
Skin approximation	0.85	Purulent drainage	0,87
Purulent drainage	0.83	Surrounding skin erythema	0,87
Surrounding skin erythema	0.83	Wound inflammation	0,87
Surrounding skin bruising	0.81	Periwound edema	0,85
Periwound edema	0.81	Necrosis	0,85
		Tunneling	0,83

For the outcome Immune status, 19 indicators are proposed in the NOC, seven of which (36.84%) were validated as critical. The outcome

Tissue integrity: skin and mucous membranes has 21 indicators, six of which were validated (28.57%) as critical (Figure 4).

Figure 4 - Indicators validated as critical for the outcomes Immune status and Tissue integrity: skin and mucous membranes. Porto Alegre-RS, 2011

NO: Immune status		NO: Tissue integrity: skin and mucous membranes	
Proposed indicators (N=19)		Proposed indicators (N=21)	
Validated indicators (N=7)	Mean	Validated indicators (N=6)	Mean
Body temperature	0.87	Skin integrity	0.93
Immunizations current	0.85	Skin lesions	0.91
Absolute white blood count	0.85	Necrosis	0.91
Differential white blood count	0.85	Mucous membranes lesions	0.87
Recurrent infections	0.85	Skin cancers	0.85
Skin integrity	0.81	Erythema	0.81
Tumors	0.81		

DISCUSSION

Validation is one of the tools used in the NP and is considered an important step, as it contributes to the development and improvement of knowledge and clinical practice.¹⁹ In the content validation, the literature offers a systematic content analysis by nurse experts.¹¹ However, it is difficult to set the criteria to include experts in validation studies as, besides the lack of a consensus in the literature about specific criteria, another barrier is related to the specific education and professional qualification of nurses.²⁰

The cut-off point selected in this research is justified by the 80% inter-expert agreement level Fehring¹² suggests to categorize the critical indicators. In addition, the NOC recommendations to select only outcomes and indicators that are truly relevant in the care context where they will be employed is highlighted.¹

For the outcome Knowledge: infectious management, 44.44% of the indicators were validated, possibly because the experts consider that the patient's knowledge about the prevention and identification of signs and symptoms, among other infection-related information, can influence its incidence and limit the development of the infectious process, to the extent that the patients themselves are able to identify the signs and symptoms.

The fact that six (60.0%) of the indicators proposed for the NO Knowledge: treatment procedure(s) were validated discloses the importance the nurses grant to the patient's knowledge about the health treatment. Nevertheless, the

question is raised whether this outcome and its indicators are truly appropriate to the ND Risk for Infection. It is appropriate for patients to have knowledge about the infectious process, signs, symptoms and prevention methods, but the NO Knowledge: treatment procedure(s) and its indicators are not closely linked with knowledge about the Risk for Infection. The proposal of the NOC authors is emphasized concerning the exclusive use in practice of NO and indicators that are essential in the context they will be used in, discarding non-critical NO and indicators.¹ This can make the evaluation of the NO more objective and demand less time from the nurses.

Among the indicators for the NO Risk control: infectious process, "practices hand sanitization" was scored 0.97, the highest indicator score in this study. This demonstrates the accuracy of the expert validation, given that the literature indicates the importance of hand washing with regard to Risk for Infection.²¹⁻²²

The hands are the main transmission route of nosocomial infection. Hand washing is the most efficient and economical way to prevent hospital infection, a fact that is known around the world.²¹ Today, attention to patient safety involving the theme "Hand Washing" has been prioritized, like in the "Global Patient Safety Alliance", an initiative by the World Health Organization (WHO) that has been closed with different countries.²³ In 1989, the Brazilian Ministry of Health launched the manual "Hand washing" to standardize this technique in Brazilian health services, providing the health professionals with technical support for

the hand washing standards and procedures with a view to the prevention of hospital infections. The Ministry of Health further acknowledged the importance of this practice when it included hand washing recommendations in Decree 2616/98, issued on May 12th 1998. In 2001, to encourage health professionals' adherence to hand washing, the Brazilian National Health Surveillance Agency (ANVISA) launched the campaign "Hand washing - a small gesture, a great attitude".²¹

The high percentage (100%) of validated indicators for the NO Risk control: sexually transmitted diseases (STDs) can be justified by its specific nature, as the actions these indicators evaluate are extremely important for the NO. Nevertheless, the evaluation of this NO for surgical, clinical and intensive care patients is questioned, as the indicators of this NO are related to actions the patients perform in their community life and are difficult for the health professionals to evaluate during hospitalization.

The NO Wound healing: primary intention and Wound healing: secondary intention have 32 indicators. Nineteen (59.37%) of these were validated. The experts probably validated such a large number of indicators because they consider the surgical incision an important site for contamination by microorganisms and for the development of hospital infection.

In Brazil, it is estimated that Surgical Site Infection (SSI) takes place in 11% of the surgical procedure. This fact extends the hospitalization, generally by 7 to 10 days, increasing morbidity and mortality rates and care costs.²⁴ In addition, SSI represents a great socioeconomic burden due to the hospital costs, besides a burden for the patients, due to the extended distance from their professional activities and relatives.²⁴

Surgical wound infection is a severe complication that interferes in the healing process and can increase the patient's discomfort. The first 24 to 48 hours after the surgery are critical, because the inflammation process starts to destroy bacteria that may have been deposited while the wound was open.²⁵ One aspect that needs to be considered is the surgery's classification concerning the degree of contamination, besides other factors, such as age, presence of chronic conditions, habits, nutritional and metabolic status, which will give an idea of the wound infection risk each patient is exposed to.²⁵

As regards the NO Tissue integrity: skin and mucous membranes, the literature describes that

invasive, therapeutic or diagnostic procedures can disseminate infectious agents during their accomplishment or dwelling. Most hospital infections are manifested as complications in severely ill patients, due to the hospitalization and the application of invasive or immunosuppressive procedures the patient received either correct or incorrectly. Therefore, it is important to evaluate indicators for the NO Tissue integrity: skin and mucous membranes, as the skin, for example the surgical site mentioned earlier, serves as the entry door for infections to get established in the individual's organism.²²

Seven indicators were validated (36.84%) for the NO Immune status, which is therefore considered important to assess the Risk for Infection. The patient's immunological status directly reflects the possibility of catching an infection, as confirmed in the literature.²² Most hospital infections are caused by a disequilibrium in the existing relation between the normal human microbiota and the host's defense mechanisms. This can happen due to the patient's own baseline pathology, invasive procedures and alterations in the microbial population, generally induced by antibiotics use. The predominant microorganisms in infections rarely cause infections in other situations, have a low virulent load but, due to their innocuous condition and the host's reduced resistance, the infection process develops.²²

CONCLUSION

This study validated the content of the indicators for eight NOC nursing outcomes previously validated for adult clinical, surgical and intensive care patients with the ND Risk for Infection. Out of 132 indicators for these outcomes, 12 nurse experts validated 67 (50.75%). The indicator "practices hand sanitization", related to the NO Risk control: infectious process, received the highest score (0.97).

The use of the nursing classifications has shown significant advances, not only in the quality of the records, but also in the nursing practices. Studies about the theme have highlighted that the existing connection between the NANDA-I, NIC and NOC classifications have enhanced better patient care practices. It is emphasized that simply establishing the ND is insufficient to see all of the patient's needs. To obtain desired and satisfactory outcomes, it is necessary to relate interventions and establish what outcomes are to be achieved.

Based on the above, the researchers suggest the clinical validation of the indicators whose content was validated in this study for the ND Risk for Infection in clinical, surgical and intensive care patients. The clinical validation can help to choose truly relevant indicators in the care context they will be employed in, discarding non-critical indicators for the patients in question.

As a study limitation, the fact is indicated that only the indicators of the ND Risk for Infection were validated. The magnitudes of the scales to evaluate these indicators were not considered in this study. Another limitation relates to the adaptation of Fehring's criteria for the inclusion of nurse experts in the study.

Finally, the main implication of this study for clinical practice is to support the implementation of the NOC, together with the NANDA-I nursing diagnoses and NIC interventions in computer systems, at the teaching hospital where the study was undertaken as well as in other health institutions. Nevertheless, other studies are needed to look for the best way to implement the ND and their respective indicators in computer systems.

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