Acta Biomed for Health Professions 2017; Vol. 88, S. 1: 61-68 DOI: 10.23750/abm.v88i1 -S.6284

Original article: Nursing and intensive care

The quality of nursing in intensive care: a development of a rating scale

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Abstract. *Background and aim:* The evaluation of nursing care is a topic of great interest and especially crucial in intensive care contexts. However, inside the Italian scientific scenario it is still difficult to measure NSO, or Nursing Sensitive Outcomes, due to the lack of indicators or scales shared by the nursing community. The aim of the present study was therefore to develop a Quality Nursing Care Scale for the Intensive Care (ICU-I-QNCS). *Method:* From the literature review of the Intensive Care Unit (ICU) quality standards, they were generated 63 items. Then 43 experts assessed them through the Content Validity Index (CVI). Items with a CVI score <0.90 were removed from the scale. *Results:* All the 63 items have achieved an average score CVI equal or greater than 0.90. 5 item reached an optimal average CVI score (=1); 23 showed an average CVI score between 0.90-0.94 and last 35 were between 0.95-0.99. *Conclusions:* The ICU-I-QNCS has obtained an acceptable CVI level and it reflects the underlying theoretical model of Doran (2002).

Key words: Quality Measurement, ICU, Scale, NSO, Indicators

Introduction

The Q*uality of Care Received* (QCR) is the ultimate goal of every health systems organizational action. In literature the QCR was defined as all the aspects of a service that impact on the ability to satisfy or meet the customer's implied needs (1). In this context, nurses are key actors in the complex and multidisciplinary care process. They are called to actively participate to the achievement of this objective, taking into account contemporary society features such as the technological development; the epidemiological and demographic changings; the increased request for assistance and safety by citizens who at the same time are becoming more aware about resources. This situation asks to identify pertinence and effectiveness criteria that would provide at one time benefits as quality, safety and lower cost (2). The nurse as part of the care process, has a direct responsibility, or "accountability" because he/she will answer for his/her own actions (3).

Thus it is clear the need to assess the quality of nurses services in order to improve the Nursing Sensitive Outcome (NSO). Since the 80s, various definitions and classifications of NSO have been developed from nursing involvement into the patient's care pathway (4). They refer to a patient or his family condition, behavior or measurable perception largely influenced by (or "sensitive" to) nursing care and that can be conceptualized as a variable (5, 6). NSO are therefore aspects of patient and family experience determined in whole or in part directly to nursing care and its quality (7). Therefore we can state that NSO are significantly influenced by nursing interventions (8) while, more generically, Nursing Outcomes (NOC) are both empirical evidence and highlight on nurses contribution achieving health results. Hence the importance of making a distinction between NOS and performance outcomes, understood as pure technical skills (9-11). According to Porter (2010), not single, but multiple outcomes can reflect progress towards the expected re-

sult. They can be divided into three domains: *health status achieved, healing process* and *sustainability* (12). Donadebian already suggested a quality care model which considered the observation of three aspects: S*tructure*, *Process* and *Clinical outcomes* (13). On the basis of this, it was conceived the *Nursing Role Effectiveness Model*, then reformulated with clinical trials by Doran (14). (Figure 1).

The model clearly expresses how structural aspects may relate to *Nurses* (eg. training, specialization, role and organizational functions), *Patients* (eg. age, sex and type and illness severity) and *Organization* (eg . staffing, staff mix, workload and working environment). Process aspects include three subcategories: the *Indipendent role* of nursing (eg. nurses functions and activities carried out in autonomy as a response to patients problems without medical prescription), the *Medical care-related role* (eg. functions and activities undertaken by nurses in response to a medical prescription, including nurse clinical judgment, implementation of care – plans and the required tests, assessment of the results on patients) and the *Inter-dependent role* (eg. communication and collaboration with other professionals health team members). The last point predicted by the model are the *Outcomes*. They are classified by the author as outcomes related to the family satisfaction and those related to nurses, such as job satisfaction and perception of care quality provided to patients. The latter were further divided into six sub-categories: *Patient safety /Adverse occurances* (eg. infections); *Care* (eg. patient hygiene); *Clinical outcomes* (eg. symptoms control); *Disease knowledge* (eg. side effects treatment); *Functional health outcomes* (eg. , physicla and social wellbeing, self-care); *Patient satisfaction and costs*. In literature there are many contributions that highlight how structural elements influence those of process and how both influence the outcome. For example, a better working climate is correlated with a good quality of communication with patients, as well as a reduction in adverse events, mortality and improved patient satisfaction (15-17). Other studies have concluded that there is a proven relationship between the higher number of nurses and a better quality of care (18). Even the onset of pressure sores, weight loss (malnutrition), the occurrence of nosocomial complications, increased length of stay and mortality appear to be affected by staffing (19-22). In literature the Nursing Sensitive Indicators (NSI) are considered as means to measure the nursing contribution compared to patient outcomes (23, 24); these indicators can measure aspects of the

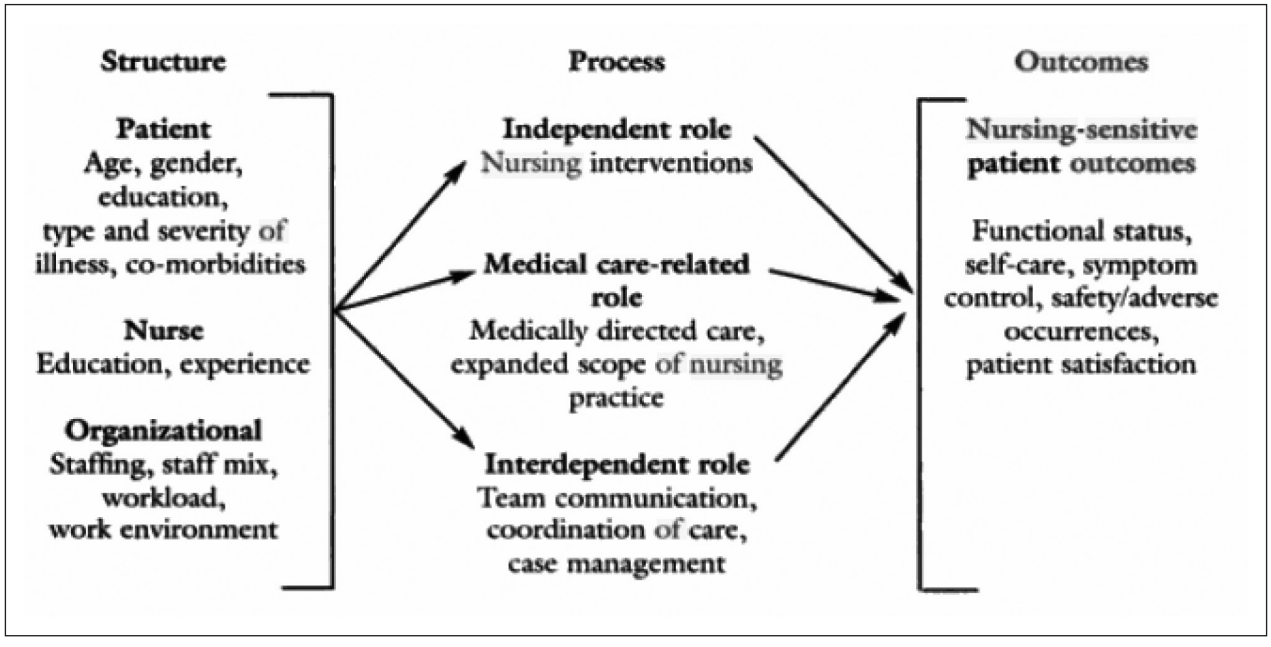

Figure 1. Doran's Nursing Role Effectiveness Model (2002)

structure, process and outcomes (25-28). The concept of the indicator is therefore of a quantitative measure that can be used as a guide to monitor and assess the quality of care on the patient and as support to the nursing activities. The "threshold level" of an indicator is also crucial when measuring the quality of care because it expresses the critical level of what is considered good and what is not (23). Although nursing literature richness about indicators definitions, there are very different ways with which these indicators are selected. At this regard, some authors identified different approaches to their selection through a systematic review of the literature: a *clinical* one, which includes indicators developed by focusing on a specific field, ward, department; an other approach focused on *generic aspects* of care applicable to all patients, such as satisfaction; a *specific aspects* approach applicable to care - plans or nursing diagnoses (eg. falls or chronic pain) and a *medical diagnoses* (such as diabetes or appendicitis) *based* approach (23). The use of indicators to measure nursing outcomes and how they are influenced by the elements of the structure and of the process, is useful only if the purpose of the survey is to check the reaching of an expected result or the highest care quality in a given context. To realize the potential use of indicators, nursing managers should consider some key elements: to choose which indicators for a specific context, which reporting mean (possibly a simple format to be used), to consider how they can support clinical practice and finally the need to develop databases that allow a broad spectrum comparability of the results obtained (29). In America there are already some positive experiences about nursing indicators databases as in the case of the National Database of Nursing Quality Indicators (NDNQI) to which belong smaller ones, such as the California Nursing Outcomes Coalition (CalNOC), the Military Nursing Outcomes database (MilNOD) and the Veterans Affairs Nursing Outcomes database (VANOD). Therefore NDNQI allows to compare all included hospitals performances on the whole United States territory (30).

The elements just described have also a resonance in Italy where on many occasions has been highlighted the need to investigate further the process that leads to the measurement of the indicators and the NSO evaluation.

The Emilia Romagna Region in particular, conducted three surveys during the year 2012 in order to know which NSO are monitored inside all the 17 Health Public Companies of its area. The main observations drawn from are: all the companies collect data with large investments but the indicators and the collection methods often turn out to be unclear and very heterogeneous, as well as data processing, making not affordable a comparison between companies (31). Thus it is clear the need to expand the knowledge and experiences regarding the quality of care received evaluation in order to promote and to study a set of health care quality indicators and, therefore, assessment tools applicable in specific fields.

Highly specialized settings, such as intensive care units seem particularly suited to such surveys. In fact there are a limited number of measuring instruments designed for the measurement of quality, (32, 33) difficult to apply in the Italian context and of complex use in clinical practice (34). In Italy there isn't a specific intensive care set of indicators (or scales) that is coded, shared and comparable.

Aim

The aim of the study was therefore to develop a scale for assessing the nursing care quality applicable to the ICU (Intensive Care Unit), first of all with a view to orientation and improvement of clinical practice and outcomes assessment methods later.

Materials and methods

Starting from the theoretical model of Doran reference (14), two leading steps were taken in the development of ICU – Quality of Nursing Care Scale: literature review to the creation of an item pool, and content validity data analysis.

Literature review/generating item pool

In this first phase Italian version of Quality of Nursing Care rating Scale has been designed (ICU -I-QNCS; Intensive Care Unite - Italian - Quality Nurs-

ing Care Scale). Through careful review of national and international literature, the researchers explored the quality standards of nursing care in intensive care and related rating scales. After analyzing the results of the literature review, the researchers generated a list of items to include into the new rating scale. At this stage, a contribution was given by Zeraati study (2014): some basic ICU nursing items identified by the authors (34) were included in the new scale after a translation into the Italian language (through forward and backward translation by 2 independent translators) and reviewed and discussed by 3 expert judges in scientific English language wich of them 2 were nurses and 1 was a doctor. The rating scale developed by all researchers included 87 items constituing a 4-point Likert-type electronic format questionnaire (from 1 = "not at all" to 4 = "very" while 2 and 3 points representing intermediate positions). The last part of the questionnaire provided a space for comments (eg.revision proposals or the inclusion of additional elements).

Content validity and data analysis

This phase was planned to assess the content validity as the degree of experts agreement regarding a tool content relevance (35, 36). Through a convenience sample, the questionnaire has been online administered to 43 experts with at least five years of work experience in 4 North-Central Italy hospitals intensive care units; of which 40 nurses - 24 women and 16 men - and 3 doctors - 1 man and 2 women. 7 nurses were aged less or equal than 30 years; 14 nurses age was between 31-40 and 19 were aged between 41-50. Doctors: 2 were aged between 31-40 years and the other 1 between 41-50 years. The experts, after being informed about the research and their role, were asked how much they meant "important and clear" each item (*important* as fundamental in ICU nursing, and *clear* as understandable from the semantic point of view). The collected quantitative data were analyzed by predictive analysis software "SPSS" (Statistical Package for Social Science), version 19. To assess the validity of the instrument content and reliability among evaluators, we calculated the Content Validity Index (CVI) for each item and for both the aspects considered, *Importance* and *Clarity* (36). The entire assessment tool

$$\text{CVI or \% agreement} = \frac{\text{(Number of experts agreeing on items rated as 3 or 4)}}{\text{(Total number of experts)}}$$

Figure 2. Content Validity Index (C.V.I.) formula

CVI score has been calculated from the average CVI of all the items. Considering the optimal value of the CVI = 1.0 (36, 37), acceptable average CVI value became equal to or greater than 0.90. Scores < 0,90 excluded items to be part the scale. The CVI formula is Represented by Figure 2.

A further level of analysis, finally, provided for subsequent regrouping of selected and valid items in various areas (structure, process and outcome), as theoretical model after researchers unanimous agreement.

Results

All 43 experts who were invited to participate to the study have completed and returned the questionnaire with a 100% response rate. The average CVI score of the entire instrument (87 items) was 0.91 with a variation between 0.64-1.0, excepted one item (related to the central venous catheter heparin washing every 3 hours and its documentation) that gained a very low average CVI score (=0.31).

Most of the items of the instrument (63/87) achieved an average CVI score greater than or equal to 0.90. Therefore were included into the rating scale; among them 5 items have reached an a optimal CVI average score (=1); 23 showed a mean CVI score between 0.90-0.94 and remaining 35 were between 0.95-0.99 (Table 1). Otherwise, 24/87 voices were excluded from the assessment tool because gained an average CVI score <90 (Table 2).

From the items grouping on the rating scale in areas, such as from the theoretical model of reference, has emerged that the majority (59/63) of valid items was related to patient care processes and 4/63 related to organizational aspects. Table 3 illustrates some examples of how the process items were related to the outcome subcategories provided by Doran's theoretical model (2002). Specifically, they were distributed as

Table 1. Content Validity Index (CVI) about *Importance* and *Clarity* for the I- QNCS items (e.g.)

Item	CVI Importance	CVI Clarity	(average) CVI
Wounds dressed as prescribed by guidelines	1	0.88	0.94
Antithrombotic therapy given and recorded at correct time as prescribed by guidelines	0.98	0.98	0.98
Chest – abdomen drain changed as by protocol	0.95	0.90	0.93
Chest - abdomen drain insertion area dressed as by guidelines	0.98	0.93	0.96
Patient washing once a day and recorded	0.95	0.98	0.97
Patient mouth washing as by ward pocedure and recorded	1	1	1
Pain assessment with scale and recorded	0.98	0.95	0.97
Pain managment as by medical prescription	1	0.98	0.99
Information and involvement of family into end of life care by both nurse and doctor	0.98	0.85	0.92
Continuous education program for ICU nurses	1	0.81	0.91
Satisfaction questionnaire about work periodically administered to nurses	0.98	0.78	0.88
Assessment and record reflex presence (e.g.ocular...)	0.98	0.90	0.94
Proper patient positioning in bed	1	0.98	0.99
The risk factors for pressure sores have been documented	1	0.95	0.98
Body Temperature values have been updated in the last 24 hours.	0.98	0.95	0.97
The pulse oxymetry has been monitored and recorded.	0.98	0.93	0.96
The ECG and vital signs have been recorded on admission to ICU	0.98	0.98	0.98
Fluids intake and output have been recorded.z	1	1	1
Monitor alarms properly set	1	1	1
Mechanical ventilation equipment has been replaced according to protocols	0.95	0.93	0.94
ABG result 1 hour after endotracheal tube removal is available	0.98	0.95	0.97
Endotracheal suctioning performed as per prescription and recorded	0.98	0.90	0.94

follows: *Care* (8/59), *Functional status* (12/59), *Safety/ Adverse Occourance*s (35/59), S*ymptoms Control* (2/59), *Family satisfaction* (1/59) and *Nurses satisfaction* (1/59).

Discussion

The rating scale seems to understand ICU nursing care quality indicators reflecting the different aspects of the underlying conceptual model: structure, process of care and outcomes. The 63 items of the rating scale here developed have achieved a quite high CVI score compared to the optimal cut off expected in literature.

Experts haven't pointed out the need of integration of other elements. Among the various items, those considered most important by the experts were related to the nursing load rating (0.95), the importance of competence considering, the experience of professionals in the team formation, the staff mix (0.98) and the nurse staffing – numbers of patients balanced (1). The relevance of these aspects in intensive care organizational processes is particularly documented in literature as aspects which, if underestimated, are related to negative outcomes such as patient mortality (38-43). Just one item was considered unimportant. It concerned support to family members in the waiting room from dedicated staff (0.68). The exclusion can be explained by the fact that the meeting with the family, in most of the cases here in Italy takes place in the filter room at the entrance to the ICU. One of the aspects that emerged involved the standardization of processes of care. In fact experts have expressed the importance of procedures, especially those that can be documented directly in the patient's charts. Among these we have,

Table 2. Content Validity Index (CVI) about *Importance* and *Clarity* for the items removed from the I- QNCS (e.g.)

Item	CVI Importance	CVI Clarity	(average) CVI
Unconscious patient pain assessment and recorded	0.84	0.74	0.7
Record of likely need to patient restaints as per prescription	0.93	0.86	0.90
Relatives / family satisfaction assessment	0.84	0.71	0.78
Planning patient inteviews during hospital stay	0.88	0.79	0.84
Providing for support staff at the waiting room	0.68	0.60	0.64
GCS score has been recorded	0.86	0.81	0.84
Patient repositioning every two hours. and recorded	0.81	0.74	0.78
Arterial blood pressure has been checked with the sphyngmomanometer over the last 24 hours	0.58	0.67	0.63
The CVC has been flushed with heparin solution every 3 hours	0.21	0.40	0.31
Dressings have been changed as per prescription	0.81	0.79	0.80
Date and time of feeding tube insertion recorded	0.86	0.76	0.81

Table 3. Effective I- QNCS items classified on Doran's model subcategories (2002)

Item	Subcategories	(average) CVI
Wounds dressed as prescribed by guidelines	Care	0.94
The eye-care method has been documented	Care	0.92
Patient washing once a day and recorded	Care	0.97
Patient mouth washing as by ward pocedure and recorded	Care	1
Body Temperature values have been updated in the last 24 hours	Functional status	0.97
The ECG and vital signs have been recorded on admission to ICU	Functional status	0.98
Fluids intake and output have been recorded	Functional status	1
Date and time of urinary catheters insertion and replacements have been documented	Functional status	0.98
ABG result 1 hour after endotracheal tube removal is available	Functional status	0.97
Catheter-end sterile caps are in place for central and peripheral venous lines	Safety/ Adverse Occourances	0.99
Control procedure on blood and blood products infusion	Safety/ Adverse Occourances	1
IV infusions have been recorded and signed for on the ICU chart	Safety/ Adverse Occourances	0.99
Administered drugs properly recorded	Safety/ Adverse Occourances	1
There's consistency between actual infusion rate in ml/hour and prescribed infusion rate	Safety/ Adverse Occourances	0.97
Prescribed IV infusions are in progress	Safety/ Adverse Occourances	0.98
Monitor alarms properly set	Safety/ Adverse Occourances	1

for example, documentation of fluids intake and output (1), the evaluation and documentation of body temperature and the endotracheal aspiration (0.98), which, if understimated, are often responsible for ICU poor performances, unfavorable outcomes for the patient and increases in health care costs (44). So experts have assigned special importance to patient safety and adverse events and specifically to all the activities concearnig the infections prevention, such as the air system cleaning (0.93), the central and peripheral venous systems control (0.98), the dressing of drainage thoraco-abdominal insertion site (0.98), the administration of blood products such as the documentation of vital signs before and after administration (0.98), the drug therapy management such as the monitoring of correspondence between the infusion ongoing speed and

prescription (0.98) and that therapy prescribed is in progress actually (0.98).

Most of the aspects included in the rating scale were related to activities provided independently by nurses, due to the ICU clinical criticality level and complexity of equipment. All activities considered important by experts represent the ongoing challenges in care processes; it is estimated that every ICU patient receives about 178 activities a day and that errors occur in1% of the cases (45).

Conclusions

The ICU I-QNCS scale here developed, even if preliminary, appears to have good features to become a valuable tool for the quality of nursing care measuring, thanks to the set of relevant indicators validated by experts in order to deliver quality care in the ICU. The planned scale, in fact, seems to investigate various dimensions of care process, from hygiene practices and personal care to the most specialized monitoring and safety nursing actions, reflecting theunderlying theoretical model as well. Aware that the findings need further investigation to complete the assessment tool (ICU-I-QNCS), including the expansion of the number of participants, however, we believe that this "first" set of quality indicators, expressed in clear and homogeneous language, can contribute to document the changing patients condition; to implement strategies of outcome improvement in highly specialized settings as ICUs; to plan documentation tools focused on outcomes to be achieved and to focus nursing students preparation on recognized clinical outcomes such as more sensitive to nursing.

Acknowledgment

This work has been conduct as a part of Master's Degree in Critical Care. University of Parma, 2016.

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Received: 16 January 2017
Accepted: 25 February 2017
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