

The assessment of the complexity of care through the clinical nursing information system in clinical practice: a study protocol

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Key words: Work Sampling, complexity of care, nursing time, nursing activities, clinical nursing information system

Parole chiave: Work sampling, complessità assistenziale, tempo infermieristico, attività infermieristiche, sistema informativo clinico infermieristico

Abstract

Background. The costs of nursing staff amounts to approximately 50% of the total budget of the health workforce and accounts for 20% to 30% of the total costs incurred by the health care companies. The goal of the study, by analyzing the complexity of care, is to provide a quantification of the assistance delivered, through the assessment of the technical aspects of the welfare activities according to the variable of time. Data from these activities flow into the clinical nursing information system Professional Assessment Instrument - PAI - which is used at the health facility involved in this study. This instrument allows nurses to document the nursing process in electronic format by using a standardized nursing language (nursing diagnoses, nursing interventions and nursing outcomes).

Methods. The design of the study is observational. The participants will be patients that are hospitalized in the cardiology departments, the intensive care units for cardiac and thoracic surgery, pulmonary medicine and medical oncology of the "A.Gemelli" hospital in Rome, Italy. The observers who will carry out the surveys will be students of the nursing degree course and the coordinators of the respective wards. The times recorded for each health care activity will be correlated with variables that are defined in the literature as the indicators of the complexity of care. The research protocol was approved by the Ethics Committee of the "A. Gemelli" Hospital in June 2015.

Results. In terms of results, this study aims to verify the reliability of the Professional Assessment Instrument tool as a system for the classification and measurement of nursing care which includes the entire care process, taking into account all of the variables deemed crucial to the nursing care effort.

Conclusion. This study will provide a tool for the assessment of the complexity of care, with the goal of improving the quality of care for the patients and of interacting with the health administration system for the management of resources.

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Introduction

Evaluation of the complexity of nursing care is one of the objectives of the organizational planning and management of health facilities (1). The costs of nursing staff amount to approximately 50% of the budget of the health workforce and account for 20% - 30% of the total costs incurred by the health organizations (2). It is an important endeavor to encode and understand the real weight (impact) of patient care. This encoding allows the measurement of the response to specific needs in terms of effectiveness and efficiency. Moreover, the large economic impact that nursing resources represent justifies the need to understand the burden of care of the patient and enable an active participation in health planning.

Over the decades numerous tools to measure the complexity of care delivered to the patient have been developed. Specifically, these tools take into account individual variables and provide a classification for the documentation of activities: the TISS (Therapeutic Intervention Scoring System) (3), the TOSS (Time Oriented Score System) (4) and the PRN (Project Research of Nursing) (5). Patient profiles are classified by the Swiss Method and the SIPI (Information System of Nursing Performance, in Italian) (6); and care indicators by the PINI (Patient Intensity for Nursing Index) (7) and the RAFAELA Method (8).

In the literature, the severity score having the task of identification of the intensity of care and complex care, generally refers to certain fields and parameters. Some of these tend to consider the volume of nursing activities while others consider the autonomy or degree of dependence of the individual patient and include elements which regard both the instability and the complexity, believing that to look only at the volume of activity as a parameter is too simplistic. The literature is unanimous in recognizing the severity score to be multidimensional,

requiring the most comprehensive tools for the clinical detection of the intensity and complexity of care.

Thus, the goal of the study was to be able to determine the complexity of care indicator through the use of the clinical nursing information system (CNIS) which takes into account all of the variables deemed crucial to the nursing care effort (5, 9-12). These variables include socio-demographic data, nursing discharge codes, the level of dependency of care needs, nursing diagnoses, interventions and the care time spent.

In the literature, there is a clear definition of the concept of complexity of nursing care (13). For some authors, this term is explained in terms of nursing intensity, representing in this description the actual weight of nursing care delivered to the patient (5, 7, 8, 14, 15). The intensity of care is described as the relationship between the care needs of the patient and the availability of staff resources (15).

By the broad conceptualization of the complexity of care, one can say that its origin is founded on an analytical definition of the care needs of the patient in relation to the health-disease continuum. The greater the amount of care needs to which the person/patient is unable to compensate, the greater is the commitment of care to which the healthcare professional must be responsible. A holistic approach to health care assumes the complex system that takes charge of the person in respect to the request for assistance, and is characterized by the growth of complexity and expectations of the individual (12).

Several studies in the relevant literature demonstrate the need to evaluate the varying aspects of complexity of care related to health management systems because this is attributed to a highly predictive power in terms of the outcomes of care provided, such as 30-day mortality, falls, errors using drugs, the occurrence of nosocomial infections, the formation of pressure ulcers, freedom from

pain, time of weaning from a mechanical ventilator, hospital readmissions, satisfaction with the treatment received and the length of stay (16-18).

This leads to the identification of a system that is able to classify and measure specific avenues of nursing care within the entire care process (19).

Methods

The aim of the project is to measure the complexity of care through a CNIS, contributing to the construction of the Nursing Minimum Data Set (NMDS), allowing the analysis of the variables which determine that indicator. The study intends to assume that through a NMDS one should be able to quantify the complexity of care.

This study protocol reflects the complexity of nursing care through the temporal examination of care activities that are executed. Data regarding the activities flow into the data collection system, Nursing Minimum Data Set (NMDS), built by the information system Professional Assessment Instrument (PAI) which is used at the health facility involved in this study. This instrument allows nurses to document the nursing process in electronic format by using a standardized nursing language (nursing diagnoses, nursing interventions and nursing outcomes) (20).

The set objectives were:

- To assess the complexity of the nursing care.
- To detect the time variable for each health care activity.
- To identify the variables associated with the indicators of nursing care complexity.
- To create classes of membership of the complex care for patients that are being studied, as a function of the activity scores/time detected in correlation with the other variables in the study.

To develop a tool for the assessment of the objectives and reproducibility of the complexity of care.

An observational study design has been selected to meet the aims and the objectives of the study, with Phase 1 using a work sampling survey and Phase 2 being the development of the system to assess complexity of care through data collection of all of the other variables examined in the study. Research into work activity is a well-established practice within nursing and other health care professional areas (21) and the work sampling methodology is frequently used in this field (22). Phase 1 of the study will obtain the average time needed to deliver specific care activities. The work sampling technique involves taking randomly-spaced observations of work activities that can be generalized into a picture of clinical work patterns (21, 23, 24).

Training programme for data collectors.

A training programme will be conducted for a group of collectors, prior to the actual collection. In fact, as pointed out by several authors (22, 25), the training of the person making the survey is essential to ensure good reliability.

The training will cover the coordinators of the departments and the students that are enrolled in the Nursing Degree program.

Phase one: work sampling survey

Sample. The study will be carried out in the "A. Gemelli" hospital in Rome, Italy. The pool of participants will be selected using non-probability convenience sampling. The choice of sampling was made on the basis of a reduced sample size chosen arbitrarily, thus forming a pilot sample. As the study can be considered as preliminary research for an eventually more elaborate analysis, this framework was deemed suitable. The departments involved in the study will be: cardiology wards, intensive care units for cardiac and thoracic surgery, pulmonary medicine and medical oncology. The choice was made to include various types of

patients exhibiting different pathologies as the main reason for their hospitalization, so as to study all of the different, specific care processes involved. The study participants will be patients admitted in the period of time defined by the study, in the departments specified above.

Data collection. In this study, a technical Work Sampling method will be employed. With respect to the variable of time, the technique of Work Sampling is appropriate for measuring the time spent by the nursing staff to carry out each individual health care activity. Work Sampling enables healthcare management to identify how staff are spending their time (26, 27), with the view to improving the quality of care provided. The tool that will be used is:

GRID of Survey to measure time of nursing activities delivered

A Grid of Survey will be developed by the research team to measure the time taken for the nursing activities delivered. The survey grid will be built according to the detection technique chosen, Work Sampling. The grid will be based on literature review, respecting the reliability criteria established (22). The procedure involves making observations of staff at random intervals, and recording their observed work activity in predetermined categories (7). Overall, there is agreement in the literature that the most reliable method of data collection for work sampling is the use of independent trained observers (21, 24, 28).

The work activity categories must be selected and defined so as to leave no doubt in the mind of the observer how each and every activity that is observed should be categorized. Activities are mutually exclusive and organized into categories (25).

The grid consists of nine items, related to the patient's encoding, the observer student, the date of detection, the codes of the measured nursing activities, the time unit (minutes: seconds) and the presence or absence of support personnel.

Data collection will take place from April 2016 to February 2017.

Data collection will take place in the departments defined by the study as previously described, during the morning shift (7.00-14.00 a.m.) and afternoon shift (14.00-22.00 p.m.). The detection phase of the times/activities will include continuous monitoring of the students involved in the study by the coordinators of the project.

Phase two: development of the system to assess complexity of care

Based on the outcomes of the surveys carried out in phase one, all the other variables examined in the study will be analyzed.

The following tools of data collection will be used:

TRICO (Triage corridor)(29) to measure severity of illness

The TRICO instrument assesses the instability and severity of illness at admission. It consists of the Modified Early Warning Score (MEWS) and the Index of Dependence of Assistance (IDA). MEWS is a tool for bedside evaluation based on five physiological parameters: systolic blood pressure, pulse rate, respiratory rate, temperature and AVPU score (A for 'alert', V for 'reacting to vocal stimuli', P for 'reacting to pain', U for 'unconscious') (30). IDA is a tool for dependency evaluation based on seven dimensions: nutrition, urinary and fecal elimination, hygiene and comfort, mobilization, diagnostic procedures, therapeutic procedures and sensory perception (29).

PAI (Professional Assessment Instrument) (20) to measure levels of dependency, nursing diagnoses and nursing interventions

PAI includes data concerning patients (socio-demographic data, admission data), data concerning level of dependence on care (assessment of models of care needs) and data related to the customized care plan (nursing diagnoses, nursing interventions and nursing outcomes) (31). The PAI information system is built on the use of shared linguistic

codes, using the terminology of NANDA International (NANDA-I) for nursing diagnoses (NANDA International, 2009). The codes of the activities will be identified in relation to the nomenclature of the care activities of the PAI.

RAD-SICA (Nursing discharge form for the continuity of care, Directive n.6/2010 of the Agency of Public Health, Italy).

The form is made up of an initial part consisting of a master field comprising the origin and date of admission, the main NANDA-I nursing diagnosis and medical diagnosis, and a portion followed by the “discharge criteria” composed of 9 items, divided into admission and discharge data respectively.

The data of phase two will be collected by the coordinator of each department and by the data manager, identified in each department.

Data Analysis. In this study, the quantitative data collected will be presented in the form of appropriate descriptive statistics. Logistic regression analysis will be applied to identify factors associated with time spent to carry out the nursing care activities. Univariate analysis of the association between each of the outcome variables and each factor will be carried out by logistic regression. Those factors with $p < 0.25$ (32) in univariate analysis will be selected as candidate variables for stepwise multivariable logistic regression to delineate factors independently associated with the time spent to carry out nursing care activities. The results of the final models for the outcome variables will be presented by odds ratios and their associated 95% confidence intervals of the important factors identified. This study aims to obtain the average of the performance times of each health care activity which can then be correlated with all of the other variables of the study, and then to observe how the presence of certain factors affects the time used to perform the individual welfare activities.

Discussion and Conclusions

Analysis of the complexity of care, understood as the real weight of individual patient assistance is a key indicator in the system of management and health management (2). It is important to measure this indicator because it is associated with both (a) the analysis of outcomes that affect the allocation of nursing resources and (b) the aim of improving the process of care provided to the patient and ensuring that assistance adheres to high standards of quality (21).

The aim is to expand the project to involve other interested qualified research centers in the national territory so as to obtain a multi-centre study.

The scientific impact of a multi-centre study, in terms of results, will allow the determination of economic indicators for nursing resources delivered, the definition of care outcomes and large quantities of nursing epidemiology data. The fostering of cooperation and integration with other research centers is still in the preliminary stage and is starting with the publication of the project and the presentation of the project objectives to the interested university hospitals.

With this study, in terms of results, we expect to obtain the weighted averages for each health care activity and point estimate of the index of complex care for the sample set. By obtaining these results, they will be categorized in classes of complex care and this information is necessary to undertake an analysis of the correlation between the variables in question, considering the possible interactions between these and the real weight of the patient care. The study will be used to investigate the complexity of care, assuming quantification of this indicator through the analysis of data produced by the PAI nursing information system. The aim of the project is to verify the reliability of the PAI tool as a system of classification and

measurement of nursing care that includes the entire care process, taking into account all of the variables deemed crucial to the nursing care effort.

The collection methodology could become an automatic way of monitoring, ensuring standardization and reproducibility of the data.

The application of the work sampling technique for the detection of the execution time of each care activity allows the study of the time variable for defining the complexity of the care delivered to the patient, thus assigning a weight to each health care activity as a function of the time spent to provide that assistance. It will be possible to outline the class of complex care in correlation with other variables related to the NMDS. This will allow the evaluation both in the management and in relation to the outcomes and will improve the quality of care provided.

Limitations

The limitations of the study are related to the limitations of the technique of work sampling. One of the limitations of this technique is that it only assesses the variable of time for each health care activity and does not assess the quality of care. This study is intended as a starting point for the coding of the indicator of complexity of care - future developments could also evaluate the quality of care delivered.

Acknowledgements

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Competing interest

The authors declare that there are no conflicts of interest.

Ethical considerations

The research protocol was approved by the Ethics Committee of the A. Gemelli Hospital in Rome, Italy, in June 2015.

Riassunto

La valutazione della complessità assistenziale attraverso un sistema informativo clinico infermieristico nella pratica clinica: un protocollo di studio

Introduzione. I costi del personale infermieristico sono pari a circa il 50% del bilancio totale del personale sanitario e rappresentano il 20% al 30% dei costi complessivi sostenuti dalle aziende sanitarie. Certamente, attraverso l'analisi della complessità assistenziale si vuole dare una adeguata risposta all'assistenza erogata, attraverso la valutazione degli aspetti tecnici delle attività assistenziali in relazione alla variabile del tempo. Attività che confluiscono nel sistema informativo clinico infermieristico rappresentato dal sistema operativo, Professional Assessment Instrument, PAI, in uso presso la struttura sanitaria coinvolta nello studio. Questo strumento permette al personale infermieristico di documentare il processo di cura in formato elettronico, utilizzando un linguaggio infermieristico standardizzato (diagnosi infermieristiche, interventi infermieristici, outcomes infermieristici).

Metodi. Disegno di studio osservazionale. I partecipanti saranno i pazienti che sono ricoverati nelle unità operative di cardiologia, terapia intensiva cardio-chirurgica, chirurgia toracica, pneumologia e oncologia medica del Policlinico "A. Gemelli" di Roma. Gli osservatori che effettueranno le rilevazioni saranno gli studenti del Corso di Laurea in Infermieristica e i coordinatori delle rispettive unità operative. In relazione ai tempi registrati per ogni attività assistenziale verranno correlate le variabili definite dalla letteratura come indicatori della complessità assistenziale. Il protocollo di ricerca è stato approvato dal Comitato Etico della Fondazione A. Gemelli di Roma, Italia, nel mese di giugno del 2015.

Risultati. In termini di risultati questo studio si propone di verificare l'affidabilità del PAI, come sistema di classificazione e valutazione dell'assistenza infermieristica che comprende l'intero processo di cura, tenendo conto di tutte le variabili considerate determinanti per l'assistenza infermieristica.

Conclusioni. Questo studio fornirà uno strumento per la valutazione della complessità assistenziale con l'obiettivo di migliorare la qualità delle cure per i pazienti e interagire nel sistema organizzativo sanitario per la gestione delle risorse.

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