ORIGINAL ARTICLE

Study and implementation of a performance set of indicators for the nurse manager in a frailty hospital

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Keywords

Indicator • Performance • Nurse manager • Healthcare • Management

Summary

Introduction. *Hospitals are known to be the most complex entities to manage. In fact, the main problem in healthcare are the expensive needs with limited resources. During the last years the complexity of the nurse manager role has gradually changed from assistance to management. However, nowadays the methods for quantifying the nurse managers' skills and performance are not available. The aim of this study is to implement a method to assess and measure the skills of the nurse managers. An innovative indicator to globally evaluate the features, the professional skills and their performance is described.*
Methods. *The authors started with an interview with the directors of all the nurses as the top experts of the nurse managers' technical skills. The purpose of this step was to understand what were the features of a valuable nurse manager. The methods identified three different aspects (qualitative, quantitative and relational) that were transformed in a single indicator. These parameters also enable to identify the strengths and weaknesses of each professional. An important implication of this score is the possible improvement of loss-making skills.*
Results. *A total of 18 centres, with their nurse managers, were evaluated in this study. All the results confirmed the judgment of the Healthcare Professions Structure Manager.*
Conclusions. *This assessment method, validated with these tests, evaluated the nurse manager's ability to deal with personnel, resources and patients and to quantify his/her organizational and welfare performances. It is useful for planning actions that allow nurse managers to improve their skills.*

Introduction

The main problems in the healthcare are the expensive needs with limited resources. Furthermore, nowadays more attention is paid on the quality improvement of the output of each specific process. Quality is part of the daily routine for healthcare professionals [1]. Most of the interest on the quality of care has been developed as a response to the recent transformations of healthcare system [2]. Hospitals are known to be the most complex entities to manage [3, 4]. Quality can be improved without being measured, but its measurement plays an important role to achieve concrete results [5]. For this reason, during the last years, there has been a surprising increase of the international emphasis on the measurement of competencies and performance in healthcare occurred [6-8].
The nurse manager (NM) is responsible to achieve hospital strategic goals and to provide administrative and clinical support [9-11] but this role has gradually changed from assistance to management over the years [12, 13]. Recently, Europe has followed the model of the USA by implementing some performance indicators [14].
Merkely et al. [15] developed a nursing balanced scorecard to acquire or refine strategic approaches to measuring nursing performance. Krugman et al. [16] implemented a nurse manager (NM) performance profile to provide a comprehensive evaluation of staff and unit trend. Although several papers described the performance indicators and their correlation to the quality of care, the method to quantify the skills of NMs skills and their performance is still missing.
The purpose of this study is to describe the quantitative and qualitative assessment of the skills of NMs, and implement a method to assess and measure NM skills.

Methods

This study was conducted in level I hospital care from January to December 2015.
Figure 1 shows the organizational charts of the nurses in this institution.
The authors followed the method described by Fain et al. [17] (Fig. 2).

Study design

Phase 1

A literature review was conducted to identify the variables describing the skills of the NM.
A list of hypothetically identified variables describing the skills of the NM has been validated with the interview of the director of nurses and technicians.

Fig. 1. Organization charts of the nurses in this hospital.

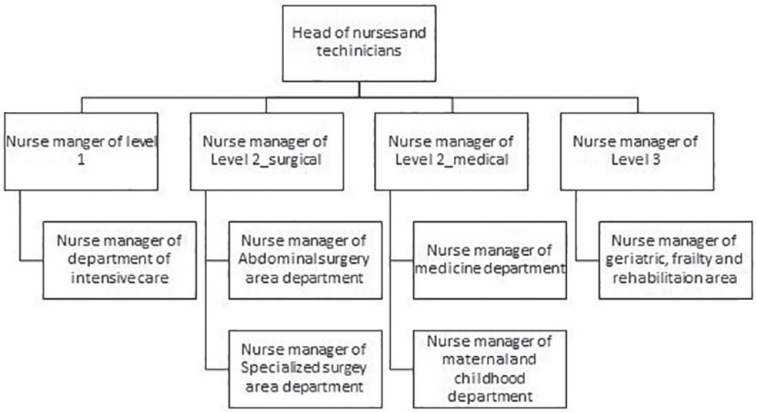
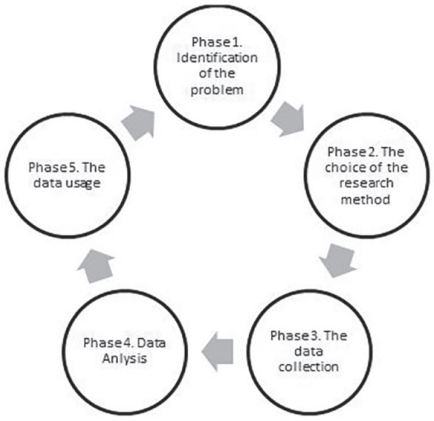


Fig. 2. Steps of the method adopted by the authors.



Three main aspects to include in the final assessment were:

- *qualitative items*;
- *quantitative items*;
- *complains* reported to the Public Relation Office (PRO).

Phase 2

The design of the study is a quantitative research.

The *qualitative items* (QL*) were strictly connected to patient safety and the quality of care and consisted of six features:

1. hygiene;
2. organization;
3. health;
4. drugs and narcotics;
5. kanban;
6. staff room (only for the wards).

All the defined qualitative items were assessed by the head of NM of each level (Fig. 1) through the objective evaluation template designed by the authors to critically detect all the parameters through physical inspection.

Figures 3-8 show the evaluation template used in the setting of the present study by the head of NM of each level to conduct the inspection. The inspection started with the extractions of three random Hospital Discharge Registers (HDR). The correctness of the following parameters has been assessed: completing HDRs, use of devices according to the law, patient identification bracelets, therapy administration and management of prosthetics containers, presence of hand cleaning solutions and hygienic conditions. "Kanban" referred to the correct application of the hospital strategical project. The wards applied this lean technique to manage the product supply.

The head of the nurses and the technicians customized the relative weight applied to each ward in order to have balanced data. All relative weights applied for the analyzed ward are reported in Table I.

Qualitative parameters were translated into a single qualitative indicator (QL*).

The quantitative items (QN*) measured the ability of NMs to organize the work of their center with the assigned staff.

Each ward was compared with the ward of the same level according to intensive care model (Fig. 1).

The management of the overtime hours of the nurses was assessed. The parameter was calculated by summing the two items: R* and HO*. The ratio (R) between the days really worked by the nurses and the days of patient hospitalization was used as a parameter to compare

Tab. I. Weights of the different structures for the qualitative aspect.

Structure	Hygiene	Organization	Health	Drug and narcotic	Staff room	Kanban
Wards	25%	10%	30%	25%	5%	5%
Emergency department	35%	15%	20%	30%	0%	0%
Intensive Care Unit	30%	10%	30%	30%	0%	0%

Fig. 3. Hygiene evaluation template.

HYGIENE															
		entrance	toilet	room	room	room	room	room	room	nurses' room	stairs	elevator	dirt storage	clean storage
1	Does the floor show stains, organic residues or anything else?													
2	Does the wall show stains, cobwebs or infiltrations?													
3	Do doors, windows and switches show dust, grease stains or anything else													
4	Is the doorbell present and functioning?													
5	Does the bed's structure show stains or dust?													
6	Are bedpan and urine bottles clean?													
7	Do the closet, the bedside table, the chair and the ? Does it show stains or dust?													
8	Do shelves, desks and closets show stains or dust?													
9	Is the WC without stains, biological liquid or anything else?													
10	Is the toilet rim present, fixed and intact?													
11	Are there toilet paper, paper towels and soap?													
12	Is there the alcoholic hand cleaning solution?											YES	NO	
13	Are there recycling bins?											YES	NO	
14	Is there unsuitable material in the organic waste bin?											YES	NO	
15	Is there unsuitable material in the paper bin?											YES	NO	
16	Is there unsuitable material in the plastic bin?											YES	NO	

Fig. 4. Organization evaluation template.

ORGANIZATION			
1	Is there the expected staff, as per shift posted in the ward?	YES	NO
2	Does the staff show the badge?	YES	NO
3	Is the staff's uniform in compliance with dispositions?	YES	NO
4	Are there municipality's handouts at the mortuary rooms?	YES	NO
5	Is there the funeral service nomination form?	YES	NO

different wards (by number of beds and staff) of the same level (Fig. 9).

R compared the amount of time work nurses' (hours of daily work) with the amount of time dedicated to the patients. A small ratio reflected a better performance of the NM and higher ratio a worse parameter.

Finally, the mean value of R for each level (μRL) and the standard deviation (σRL) were calculated. The Gaussian distribution method was used for the attribution of the score R* as shown in Figure 10. The range of R* was from 2,5 to 15 points: 2,5 points reflected a worse performance whereas 15 points an excellent performance comparing it to the average of the level.

This means that for each ward R* was calculated as the result of the distance (± σ) of it between the average (μ) for the belonging level (Fig. 10). Moreover, the overtime hours of each nurses for each ward (HO) has been considered. The overtime hour average for each level (μHOL) and the standard deviation (σHOL) of each level were calculated. Thereafter the score, HO*, was attributed using the Gaussian method (Fig. 10). The HO* score ranged from 2.5 to 15 points and also in this case 15 points meant an excellent performance whereas 2.5 a minimum value.

The quantitative items (QN*) was the sum of R* and HO* and it ranged from 5 (minimum value of performance) to 30 points (maximum value of performance). For clarity we converted QN* into a number in scale 0-100 with a proportion.

The last aspect of the analysis focused on commendations and complaints submitted to the Public Relation Office (PRO) by patients and their relatives. The PRO collected each day the voluntary opinions of the patients and of their relatives for each ward. A score was assigned depending on the number of commendations and complaints.

The number of commendations (C1) and complaints (C2) for each ward were summed up and the average of C1 and C2 for each level (μC1L and μC2L) was calculated with standard deviations (σC1L and σC2L) of each level. The relative scores, C1* and C2*, were attributed using the Gaussian method (Fig. 10). The same approach used for the quantitative item was used as showed in Fig. 10 with a range from 2.5 to 15 points. The indicator for this aspect was C* and it was the sum of C1* and C2* and ranged from 5 to 30 points. For clarity, C* has been converted in a number on a scale between 0-100 with a proportion.

The final performance indicator of each nurse manger's P was calculated as the sum of QL*, QN* and C* and it was translated, for clarity, into a 0-100 scale through the proportion (P*).

Phase 3

The data collection for the qualitative aspect was conducted during the routine ward inspection (3 times a year) as prescribed by law. The survey, reported in Figures 3 to 8, was composed by four pages signed by the NM level (the inspector) and by the NM (the person inspected). Thereafter,

Fig. 5. Health evaluation template.

HEALTH

#		general part	needs detection	health interventions	aims	assessment	health diary	discharge form
1	Is the nursing documentation in use correctly filled out?							
	SDO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO
	SDO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO
	SDO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO

#		Conley scale	Braden-Norton scale	LDP management
2	Are these prevention and management forms used?			
	SDO	YES/NO	YES/NO	YES/NO
	SDO	YES/NO	YES/NO	YES/NO
	SDO	YES/NO	YES/NO	YES/NO

#		
3	Is the practice containments monitoring form present and filled out? SDO.......	YES/NO

#		Baldder catheter	CVC/PICC/Midline	LDP management
4	For these medical devices are insertion date, size, type and replacement date registered?			
	SDO	YES/NO	YES/NO	YES/NO
	SDO	YES/NO	YES/NO	YES/NO
	SDO	YES/NO	YES/NO	YES/NO

#		
5	Has the following devices the protection and safety mechanism? Is it used correctly?	
	Introducer needle (cannula)	YES/NO
	Introducer needle (eclipse)	YES/NO
	Winged needle	YES/NO
	EGA syringe	YES/NO
	Insulin syringe	YES/NO
	Scalpel blade	YES/NO
	Lancing device	YES/NO

#		Gloves		Gowns		Headset		Safety glasses and protective visors	Surgical mask		FFP2 facemask	
6	Are the following individual protection devices present and correctly used?	YES	NO	YES	NO	YES	NO	YES	YES	NO	YES	NO

#		Introducer needle (eclipse)		Winged needle		Scalpel blade		Insulin syringe	Insulin syringe		Introducer needle (eclipse)	
7	Are the following devices present and correctly used?	YES	NO	YES	NO	YES	NO	YES	YES	NO	YES	NO

#			
8	Has the patient the identification bracelet?	YES	NO
9	Is the therapy administred after the barcode reading of the patient's bracelet?	YES	NO
10	Is the therapy administred after the barcode reading of the drug's AIC code?	YES	NO
11	Are there prosthetics containers (denture, etc.)?	YES	NO
12	Have patients received the prosthetics containers?	YES	NO
13	Is there the alcoholic hand cleaning solution?	YES	NO

#		hands	foot	head	navel	oral cavity	bed	
14	Is the patient in satisfaction hygienic conditions?							
	Ward .... N° SDO	NO	YES	YES	NO	YES	YES	NO
	Ward .... N° SDO	NO	YES	YES	NO	YES	YES	NO
	Ward .... N° SDO	NO	YES	YES	NO	YES	YES	NO

the results were anonymously reported by a secretary in Microsoft Excel table that automatically converted the results in the vote. This excel file has been assessed by an industrial engineer. For each positive answer a point was assigned.

The quantitative aspect was calculated through the data provided by:

- the human resources office of the hospital. These data consisted of the nurses' timesheets divided by those belonging to the ward.
- The informatics unit of the hospital. These data consist of the sum of the length of stay of the patients divided by those belonging to the ward.

The commendations and complaints data is a list of them divided by those belonging to the ward.

Phase 4

Three parameters for 18 nurse managers of the hospital were calculated following the method reported in Phase 2.

Results

A test on two different wards was conducted to verify the validity of the analysis. The two wards selected for the test were selected by the head of the nurses and technicians.

Fig. 6. Drugs evaluation template.

DRUGS					
1	Are cupboard without stains or dust?			YES	NO
2	Are cupboard closable?			YES	NO
3	Are in the cupboard expired drugs?			YES	NO
4	If the answer is YES, how much are they?	from 1 to 5	from 5 to 10	more than 10	
5	Is the therapy cart without stains or dust?			YES	NO
6	Are on the therapy cart expired drugs?			YES	NO
7	Is the ..... cart without stains or dust?			YES	NO
8	Are on the .....cart expired drugs?			YES	NO
9	Are cart wheels clean and functioning?			YES	NO
10	Are multidose containers closed after use?			YES	NO
11	Reconstituited drugs and eye drops:				
	1. Do they show the reconstitution date?			YES	NO
	2. Are they kept in the fridge?			YES	NO
	3. Are they kept within the expected time after opening?			YES	NO
	Are drugs that require refrigeration kept in the fridge?			YES	NO
12	Are there sample of medicines?			YES	NO
13	Are samples and/or drugs for clinical trials kept separately?			YES	NO
14	Are there concentrated potassium solutions?			YES	NO
15	Are there concentrated potassium solutions already diluted and ready to use?			YES	NO
16	Are concentrated potassium solutions kept separately from the other drugs?			YES	NO
17	Is the cuboard containing the concentrated potassium solutions closed? Does it show the alarm signal attached to the operational instruction?			YES	NO
18	Is at the moment of the inspection the diluited potassium solutions infusion going on by the staff of the ward?			YES	NO
19	If the answer is YES, is the content and the dosage reported on the bottle?			YES	NO
20	If the answer is YES, for the administration is an infusion pump or a flow precision regulator used?			YES	NO
21	Are cupboard for medical devices without stains or dust?			YES	NO
22	Are cupboard for medical devices closable?			YES	NO
23	Are there expired medical devices?			YES	NO
24	If the answer is YES, how much are they?	from 1 to 5	from 5 to 10	more than 10	
NARCOTICS					
25	Are substances being tested kept in a locked closet all the time?			YES	NO
26	Are all the loading and unloading movements recorded in the appropriate register within the scheduled time (24 hours)?			YES	NO
27	Does the accounting hold correspond to the real one?			YES	NO
28	Are there expired drugs to be returned to the pharmacy (waiting for collection stored separately in an envelope)?			YES	NO
29	Is the register filled in with legible calligraphy?			YES	NO
30	Is the register compiled in all its parts as required by the company procedure?			YES	NO
31	Is the register signed by the Director of the Structure?			YES	NO
32	Are any corrections countersigned?			YES	NO
33	Are partial administrations correctly managed according to Law 15/02/95?			YES	NO

Fig. 7. Kanban evaluation template.

CUPBOARDS AND KANBAN CONTAINERS			
1	Are there cupboards and/or Kanban container in the ward?	YES	NO
2	If the answer is YES, is there only clean and orderly material?	YES	NO
3	Does the material contain correspond to that described in the check-list affixed inside the closet (type and quantity)?	YES	NO
4	Do open packages of multidose products (gloves, disinfectants, lotions, etc.) show the opening date?	YES	NO
5	Is the cupboard's cleaning with sodium hypochlorite and/or alcohol carried out once a week?	YES	NO
6	Is the cleaning documented on the specific sign-in sheet with the date?	YES	NO
7	Are there rigid containers for the sharp components?	YES	NO
8	Are there stains, organic residues, waste, butts, writings or anything else in the dressing room for staff ..... ?	YES	NO
9	Are there stains, organic residues, waste, butts, writings or anything else in the dressing room for staff ..... ?	YES	NO
10	Are there stains, organic residues, waste, butts, writings or anything else in the refreshments area?	YES	NO

Fig. 8. Staff room evaluation template.

STAFF ROOM			
1	Does the floor show stains, remains of food, other waste or water?	YES	NO
2	Does the wall show spots, cobwebs, grease marks? Is it peeling?	YES	NO
3	Does the ceiling show spots, cobwebs or moisture spots?	YES	NO
4	Do windows show spots or visible marks of grease or other?	YES	NO
5	Do switches show spots or visible marks of grease or other?	YES	NO
6	Is the refrigerator free of odors and water leaks? Is the freezer free of ice packs?	YES	NO
7	Is the temperature of the refrigerator included in the range _____ and recorded on the appropriate card?	YES	NO
8	Are there expired food items, visibly damaged or unpackaged, inside the refrigerator?	YES	NO
9	Are the foods of the patients separate from those of the staff?	YES	NO
10	Are there unpleasant odors in the room?	YES	NO
11	Do staff's room closets show stains, grease marks, dust or food residues?	YES	NO
12	Is the food trolley working?	YES	NO
13	Are aprons for distribution free of stains?	YES	NO
14	Does the staff wear apron and headgear during the food distribution?	YES	NO
15	Does packages for food transport arrive intact in U.O.?	YES	NO

Fig. 9. R formula.

$$R = \frac{\text{Days really worked by the nurses}}{\textit{Days of patients' hospitalisation}}$$

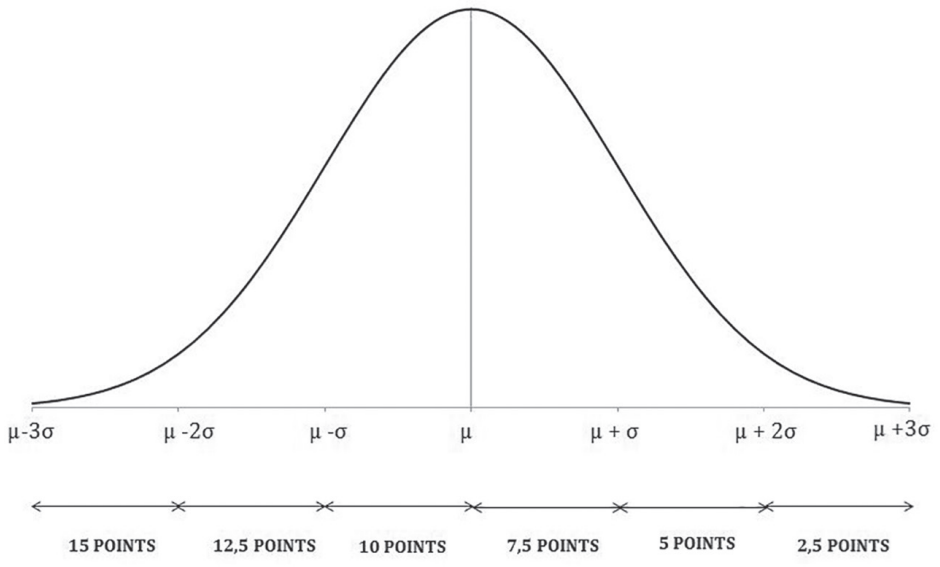
Ward 1 was hypothesized to be the most well managed of the hospital and ward 2 the worst one. The method proposed by the authors reflects exactly this situation because ward 1 achieved a total result of P1* of 83/100 instead ward 2 obtained a P2* of 46/100.

After this initial test, the analysis was extended to all the other departments: inpatient wards, Emergency department and intensive care unit. The ward names and the names of the NMs were converted in anonymous form for the conduction of this study. A total of 18 structures, with related NMs, were evaluated in this study. Four of these structures belong to Level 1, 5 to Level 2_surgical, 4 to Level 2_medical and 5 to Level 3. Final results are ordered in a classification reported in Table II.

Discussion

This study was carried out for the increasing attention on the role of NM into clinical nursing skills [18]. A proof of this is that a literature review has been conducted on this topic [19]. According to Boomer et al. [20] the NMs play an essential active role for the growth of the performance of the nursing staff. In fact, a deep association exists between the leadership of the NM and the nurse performance [21]. The staff members are strongly influenced by their leader's practices who can

Fig. 10. Gaussian distribution for the assignment of the points for the quantitative and the relational aspect.



Tab. II. Final results of the study.

Level	Nurse manager	Qualitative aspect (QL*)	Quantitative aspect (QN*)	Relational aspect (C*)	Tot/300 (P)	Tot/100 (P*)
1	C	83	92	75	250	83
2_surgical	O	90	67	83	240	80
3	T	71	75	92	238	79
2_surgical	N	76	83	75	234	78
3	S	62	75	92	229	76
1	A	81	75	50	206	69
1	B	83	50	67	200	67
2_surgical	M	62	75	58	195	65
2_medical	H	77	67	50	194	65
2_medical	E	82	83	25	190	63
2_surgical	L	80	50	58	188	63
3	P	78	58	50	186	62
3	Q	74	67	33	174	58
2_medical	G	74	50	42	166	55
3	R	71	25	67	163	54
2_medical	F	74	42	42	158	53
1	D	90	25	33	148	49
2_surgical	I	72	50	17	139	46

make the difference in their performance [21]. A successful leader achieves important results for the team whereas an incapable one is unable to encourage the group. Krugman et al. [16] studied the method to implement a NM profile in order to improve th unit performance. In addition, Krugman et al. [16] underlined how… "Traditional methods of evaluating NMs, such as meeting budget targets, employee ratings, or facility benchmarks, may not provide a complete picture of performance". A 1-page 2-sided visual graphic picture of quality data has been used in this paper to develop the manager profile. Many parameters have been measured from different databases including specific nurse scales. All these parameters have been reported in the poster. The result of this work is, on the one hand, an extremely detailed report and, on the other, not immediately understandable by everyone results such as the final outcome implemented in the present work (Tab. II). In fact, an in-depth study of the document is required to understand all the data. In addition, much strictly nursing performance has been reported instead of performance directly related to the NM. Moreover, all the NMs are evaluated in the same way without characterising the skill required for the different wards. It is essential that each NM is valued with a key performance indicator and a related target value fitting with the actually required skills according to the ward or to the emergency department directed by the NM. In this paper the head of the nurses of the hospital customized it. Furthermore, the present method allows to assess the ability of the NM to manage personnel, resources and patients and to quantify his/her organizational and welfare performances. This partition of the evaluation into the three parameters has allowed to highlight the different characteristics of each NM and the most effective areas besides those where improvement is needed.

Another applicability of the present system was to plan actions to improve personal skills and to identify strengths and weaknesses. In addition, from the NM point of view, the hospital requests have been quantified. Monitoring their own performance year by year, head nurse could understand if they were on the right way to improving their professionalism.

This study has some limitations, especially in the aspect concerning commendations and complaints. The latter are spontaneously expressed by patients and family members. Unfortunately, the PRO collects all the commendations and complaints but, at the moment, it is not able to separate the reason of the reporting. In other words, a patient can report a complaint for the collapsing infrastructures or for the bad manner of a doctor. In the method showed all the complaints and the commendations are attributed to the skills of the NM. In a future study the authors will also implement a method to evaluate the performance of the nurse and technician managers of different structures in reference to operating rooms, labs and ambulatory care.

With this article, we hope also to increase interest on performance indicators for NMs and stimulate research activities on their validity in different national set-ups in Europe.

Conclusions

In this study the authors implemented a unique NM performance indicator. This indicator is formed by quantitative and qualitative items. This method allowed to numerically quantify the technical skills of NM.

Acknowledgements

The authors want to mention Adriano Lagostena for his contribution to the analysis and to his continuous incentive to research in the field of management.

Funding sources: this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest statement

None declared.

Authors' contributions

IC and CP conceived, designed and coordinated the research. IC defined the feature to evaluate the skill of an NM and CP implemented the index and the tool to assess it. IC customized the relative weight applied to each ward. LC and FG calculated the index and assessed the literature review. IC evaluated the results. CP wrote the manuscript. PC reviewed the manuscript. All Authors revised the manuscript and contributed to improving the paper. All authors read and approved the final manuscript.

References

[1] Campbell SM, Braspenning J, Hutchinson A, Marshall MN. Improving the quality of health care. Research methods used in developing and applying quality indicators in primary care. BMJ 2003;326:816-9. doi: 10.1136/bmj.326.7393.816.

[2] Mainz J. Defining and classifying clinical indicators for quality improvement. Int J Qual Health Care 2003;15:523-30. doi: 10.1093/intqhc/mzg081.

[3] Santric Milicevic MM, Bjegovic-Mikanovic VM, Terzic-Supic ZJ, Vasic V. Competencies gap of management teams in primary health care. Eur J Public Health 2011;21:247-53. doi: 10.1093/eurpub/ckq010.

[4] Drucker P. The practice of management. London: Routledge 2012. https://doi.org/10.4324/9780080942360.

[5] Donabedian A. Explorations in quality assessment and monitoring. Vol 1. The definition of quality and approaches to its assessment. Ann Arbor, MI: Health Administration Press 1980.

[6] World Health Organization. The world health report 2000: health systems: improving performance. 2000.

[7] Dubois CA, D'Amour D, Pomey MP, Girard F, Brault I. Conceptualizing performance of nursing care as a prerequisite for better measurement: a systematic and interpretive review. BMC nurs 2013;12:7. doi: 10.1186/1472-6955-12-7.

[8] McCance T, Telford L, Wilson J, MacLeod O, Dowd A. Identifying key performance indicators for nursing and midwifery care using a consensus approach. J Clin Nurs 2012;21:1145-54. doi: 10.1111/j.1365-2702.2011.03820.x.

[9] Gunawan J, Aungsuroch Y. Managerial competence of first-line nurse managers: a concept analysis. Int J Nurs Pract 2017;23:e12502. doi: 10.1111/ijn.12502.

[10] Thrall TH. Nurturing your nurse managers. Hosp Health Netw 2006;80:71-2, 74, 2.

[11] Chase. Nurse manager competencies. PhD (Doctor of Philosophy) thesis. University of Iowa, 2010. doi: 10.17077/etd.03y9rc4t.

[12] Surakka T. The nurse manager's work in the hospital environment during the 1990s and 2000s: responsibility, accountability and expertise in nursing leadership. J Nurs Manag 2008;16:525-34. doi: 10.1111/j.1365-2834.2008.00901.x.

[13] Skytt B, Ljunggren B, Sjoden P, Carlsson M. The roles of the first-line nurse manager: perceptions from four perspectives. J Nurs Manag 2008;16:1012-20. doi: 10.1111/j.1365-2834.2006.00684.x.

[14] Fisher C, Anema HA, Klazinga NS. The validity of indicators for assessing quality of care: a review of the European literature on hospital readmission rate. Eur J Public Health 2011;22:484-91. doi: 10.1093/eurpub/ckr165.

[15] Merkley J, Mcallister M. Using a nursing balanced scorecard approach to measure and optimize nursing performance. Nursing leadership 2011;24(1). doi: 10.12927/cjnl.2011.22334.

[16] Krugman ME, Sanders CL. Implementing a nurse manager profile to improve unit performance. J Nurs Adm 2016;46:345-51. doi: 10.1097/NNA.0000000000000355.

[17] Fain JA. Reading, understanding, and applying nursing research. FA Davis 2017.

[18] Foulkes M. Nursing metrics: measuring quality in patient care. Nursing Standard 2011;25:40. doi: 10.7748/ns2011.06.25.42.40.c8582.

[19] Gifford W, Davies B, Edwards N, Griffin P, Lybanon V. Managerial leadership for nurses' use of research evidence: an integrative review of the literature. Worldviews Evid Based Nurs 2007;4:126-45. doi: 10.1111/j.1741-6787.2007.00095.x.

[20] Boomer CA, McCormack B. Creating the conditions for growth: a collaborative practice development programme for clinical nurse leaders. J Nurs Manag 2010;18:633-44. doi: 10.1111/j.1365-2834.2010.01143.x.

[21] Brady Germain PAMELA, Cummings GG. The influence of nursing leadership on nurse performance: a systematic literature review. J Nurs Manag 2010;18:425-39. doi: 10.1111/j.1365-2834.2010.01100.x.

Received on May 10, 2018. Accepted on July 19, 2019.

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How to cite this article: Patrone C, Cassettari L, Giovannini F, Cremonesi P, Cevasco I. Study and implementation of a performance set of indicators for the nurse manager in a frailty hospital. J Prev Med Hyg 2019;60:E229-E236. https://doi.org/10.15167/2421-4248/jpmh2019.60.3.963