

Nurse Education, Experience and the Hospital Context. Analysis of Nurse Expertise in a University Hospital of Catalonia (Spain)

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Abstract In hospitals and other health settings expert nurses are central to ensure the efficacy and efficiency of patient care. Hospital quality and safety policies contribute in promoting and ensuring expertise among their staff to improve patient health outcomes. To allow design of these policies, research is currently needed to understand how to apply two well-established definitions of expert nurse: (i) the influence of hospital contextual factors, as well as (ii) nursing practice levels. The former were previously studied in a large nurse sample of a hospital in Pennsylvania (USA). The later were characterized in P Benner's theory. In spite of their key importance, these two criteria are not yet standardized in nurse staffing policies. Here, the nurse expertise level following these two criteria was assessed in a University Hospital of Catalonia (Spain). To that end, we acquired primary data on the individual nurse education and experience, thereby contributing to define nurse expertise. Our findings of this cross - sectional study from 167 registered nurses showed that the hospital indeed adheres to the two definitions of expert nurse. Further, we characterized key markers such as a statistically significant association found between a nurse reporting a more advanced expertise level and a threshold of at least five years of experience and at least one year of postgraduate studies. This result is supported in current literature. In the future, further research along these lines will hopefully aid to clarify the relationship between nurse expertise and patient health outcome.

Keywords: nurse expertise, magnet hospitals, patient outcomes, work environment

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1. Introduction

Some health care roles more increasingly common as home hospitalization nurse, day care hospital specialist and nurse clinical specialists, are implanted under the assumption that the advanced or "expert" nurses will have beneficial results for the patients. To confirm this assumption, it is necessary an accurate description of expertise [1]. Benner et al. established five stages or levels of nursing experience: *Novice, advanced beginner, competent, proficient and expert* [2]; the transition from one stage to another was based on the experience accumulated over time, along with the development of clinical judgment [3,4]. Others have argued that there are three levels: *non-skilled, skilled and experienced expert* [5].

A nurse may act in so-called expert capacity if the other professionals, their "peers", regard her/his as an expert over and above her colleagues. By having this recognition, a nurse could expand her/his practice, for example, in the

areas of prescribing, dispensing and tests application. A non-expert nurse cannot cross this barrier.

Some authors have reviewed this conceptual framework incorporating a profile called *Advanced Nurse Practitioner (ANP)* [6,7,8]. In the clinical practice, the difference between a nurse practitioner and an ANP is subtle according to Benner et al [9,10,11]. A sum of the theoretical and clinical education allows nurses to ask the right questions and decide their actions to provide safe, and quality care [12].

In 2012, 60% of nurses in Spain were active in hospitals, 39% in primary care and the rest in the free exercise [13]. Since 2006, when a decree defining specialized training established seven nursing specialties [14], 6 nurse specializations have already been developed, namely Mental Health Nursing, Work Health Nursing, Geriatric Nursing, Obstetrical-gynecological or Midwife, Family and Community Nursing and Pediatric Nursing. A single annual nationwide call for examinations allows access to over 250 places for specialized health care roles. However, one of the seven defined nursing specialties has not yet been established. Strikingly, this is the specialty that should unify the content and competencies for

practice in medical and surgical care (Nursing Medical care - surgical) in the hospital clinical practice [15]. Nowadays in clinical practice, there are no distinct professional roles for nurses who have completed this academic training. The existing positions are two:

registered nurse, also known as generalist nurse, and in very low percentage, specialist nurse. Figure 1 summarizes the workflow of education needed to achieve the nurse profiles in Spain, as well as the aim of this study based on this workflow.

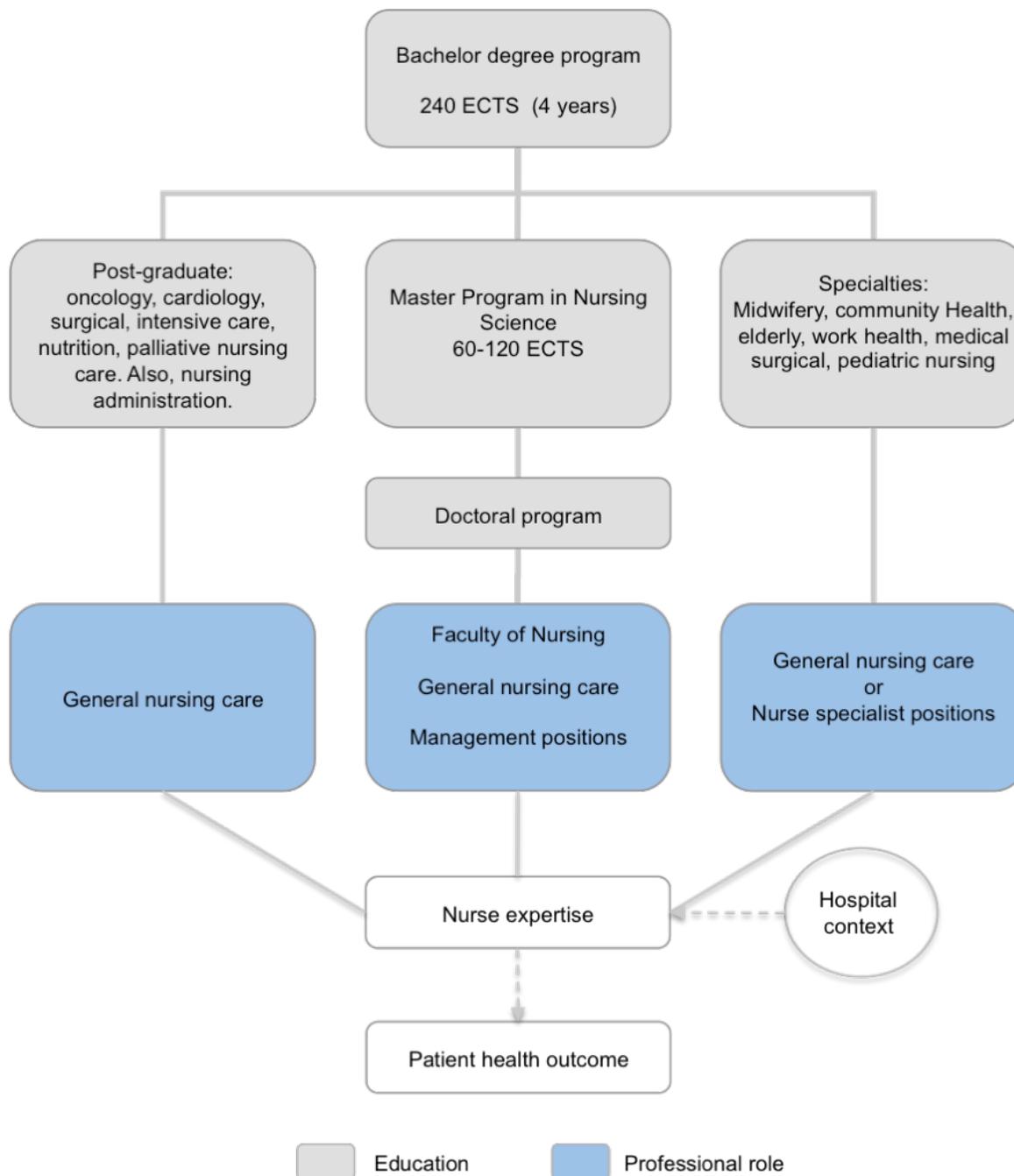


Figure 1. Aim of this study. Given the structure of nurse education and professional profile in Spain, we seek to measure nurse expertise and hospital context to characterize their potential impact in patient health outcome

Other countries have multiple paths to the nurse degree and generalist nurse positions. All indicate requirements to access a statewide exam that allows practice as *Registered Nurse (RN)*. The upper level, specialist and/or nurse practitioner (*Advanced Nurse Practitioner*) includes nurses possessing postgraduate degree equivalent to Master and PhD and accredited by professional associations of specialized areas of nursing establishing entry requirements and criteria.

Examples are nurse anesthetists, midwives, and nurses in pediatrics, neonatology or cardiology. They are legally

qualified for administering treatments autonomously or in the community and are also responsible for monitoring and controlling some types of patients [16]. In the UK, the *National Health Service* enhanced the role of nurse consultant, existing since 1999, to assume leadership roles in the control and planning in 2004, based on the skills for planning templates nursing system [9].

The setting of a “favorable” hospital environment can be a fertile field for the nursing managers and cultivate the expertise in nursing, attracting and retaining the best professionals; organizations accredited as “magnetic”

foster clinical autonomy, facilitate advanced and continuing education and promote the exchange of experiences and knowledge with physicians. This hospital organizational model has been successfully applied in multiple centers, which then received the so-called “Magnetic” qualification. Since the late 90s to today, the fundamental studies by Aiken and others became a reference for a number of studies, including this one [17]. As an example, a study conducted in two United States of America hospitals [18] stated three organizational hospital characteristics that can potentially encourage expertise: social interaction with colleagues or peers, commitment with to the rules and own communication patterns [19]. The authors found four objective characteristics of expertise: years of nursing experience, academic education, to be consulted by peers, and nursing students tutoring. In sum, a favorable hospital practice environment could provide more opportunities for professional development and thereby promote progress towards the expertise of nurses as a feature of the organization. Nevertheless, the wide evidence regarding the benefits of “magnetic” hospitals and nursing expertise on patient outcomes, which exists in many countries, is not yet established in Catalonia for poorly understood reasons.

The first aim of this study is to explore the relationship between years of experience and individual training and its association with the level of nurse expertise. After assessing the nurse expertise, the second aim is to measure the hospital practice environment and its potential relationship with the level of nurse expertise in order to compare the results in a Spanish hospital with those in previous studies, which included analysis of patient outcomes. Thereby, we hope to aid understanding of the potential impact of nurse expertise and practice environment on patient outcomes in university hospitals such as the one in this study.

2. Method

2.1. Cross-sectional Study

We designed a study based on primary data of the nursing staff in a university hospital of high technology equipped with 750 inpatient beds. The sample included all nurses at Medical-Surgical units who could be interviewed in a single day to answer a questionnaire regarding the hospital context. The same nurses were interviewed a second time to study nurse expertise level.

The outcome variable was *Nurse Expertise* declared by the nurses, obtained through a survey where she/he was offered a choice among four levels of Benner’s clinical nurse practice levels, namely Novice-Advanced beginner, Competent, Proficient and Expert. Each participant also answered two related questions: 1) How many times have you been requested as a student’s tutor, and 2) How many times have you been asked by a colleague to give your clinical judgment.

The objective characteristics of Nurse Expertise were Nurse Education (expressed in postgraduate studies conducted) and Experience (expressed as time of practice as a nurse).

As indicator of Nurse Education we created a binary variable, which summarized all possible levels of

education reported as (i) Specialty and postgraduate courses, and (ii) Masters Degree and PhD.

The calculation for average experience was obtained from a numeric variable representing the number of years each interviewee worked as a nurse.

Hospital Context was measured using the PES-NWI questionnaire (Practice Environment Scale -Nurse Work Index) [20] in the validated Spanish version [21]. It consists of 31 items distributed within five subscales, from here on termed dimensions. These dimensions characterize the areas of competence of the nursing profession. The results of the dimensions were obtained from the mean score of each item. The score ranged from 1 to 4, where higher score indicated greater agreement. We selected as threshold a theoretical midpoint of 2.5, where a score above this value indicated agreement with the survey questions and a score below indicated disagreement. This questionnaire allows classification of clinical settings in hospitals as unfavorable, mixed and favorable. Hospitals that scored favorably (over the theoretical midpoint) on none or one subscale were classified as *unfavorable*, those who scored above the theoretical midpoint in two or three subscales were classified as *mixed* and those who did so in four or five subscales were classified as *favorable*.

The study was evaluated and approved by the Ethics and Research Committee of the Hospital Clínic of Barcelona. The collaboration of all participating nurses was voluntary and anonymous.

2.2. Statistical Analysis

Gender of the participants in two questionnaires was considered categorical variables and was described as frequencies and percentages. Age as well as number of years of experience were considered continuous variables and were described as mean and standard deviation, median and percentiles 25 and 75.

2.3. Bivariate Analysis

To assess the influence of the objective characteristics on the levels of expertise, we used a bivariate analysis. The objective characteristics of expertise were measured according to McHugh MD and Lake ET adapted questionnaire [1] as described above. Analogously, the levels of expertise were measured using the P Benner theory [3]. Within the bivariate analysis, Fisher's exact test was used to compare categorical variables. For the comparison of continuous variables ANOVA was the chosen method. To correct for multiple hypothesis testing, Bonferroni adjustment was performed in the pair wise comparisons.

2.4. Logistic Regression

To assess the association between levels of Nurse Expertise and Experience, Education and the Hospital Context a model of ordinal logistic regression was used.

To that end, the nurse expertise was used in the regression as dependent variable. Three objective characteristics of Nurse Expertise, namely Experience (years) and two levels of Nurse Education, as well as two characteristics of the Hospital Context were considered independent variables.

3. Results

3.1. A Cross-sectional Study Measures Nurse Expertise

To measure the Hospital Context, we acquired 167 responses of individual nurses to the PES-NWI questionnaire. The nurses were distributed in 16 medical surgical units out of a total of 23 medical surgical units. A total of 155 surveys were answered by women and 12 by men. The mean number of professionals interviewed was 9.5 per unit, which represents 73% of the average number of nurses working in one day on the units included.

The medical surgical units involved were 70% of the hospital total, and the excluded units were Intensive and Intermediate Care Units, Emergencies, Recovery rooms and Psychiatry.

The nurses who took part in the PES-NWI questionnaire were asked to answer a second questionnaire on Nurse Expertise, and 78 nurses (46.7%) accepted. Of these, 72 were women and 6 men. The characteristics of the sample consisting of nurses answering the two questionnaires are summarized in Table 1.

Table 1. Characteristics of the two sample groups

Questionnaire clinical practice setting (n = 167)	
Women	155 (93%)
Age (years)	37 ± 11; 37 (28-45)
Experience (n = 162) (years)	14 ± 10; 13 (4-22)
Declared Expertise Questionnaire (n = 78)	
Women	72 (92%)
Age (years)	40 ± 12; 40 (29 - 50)
Experience (years)	17 ± 11; 17 (5-28)

Discrete variables: data expressed as n (%). Continuous variables: data expressed as mean ± SD; Median (P₂₅ - P₇₅).

The PES-NWI questionnaire characterizes Hospital Context by studying five so-called dimensions, namely "support of middle management", "relationship with medical colleagues", "resource adequacy", "participation in decisions", and "quality of care". To understand the characteristics of the Hospital Context, the responses from the 167 nurses were aggregated into the five dimensions

of the PES-NWI questionnaire. Generally, we found that two dimensions featured a high average value, i.e. "support of middle management" and "relationship with medical colleagues", while in the three subscales "participation in decisions", "quality of care" and "resource adequacy" the average seemed to be low. 46% of the units reached a consideration of mixed Hospital Context, 35% unfavorable and 19% favorable (see methods for the implementation of favorable, mixed and unfavorable). These values indicate that the hospital, as a whole, could be classified as having a *Mixed* Hospital Context.

Regarding the highest level of education received as measured in the second questionnaire [1] 57% of nurses had basic qualifications (Nurse Diploma), 27% studied a year or more of graduate study (Specialty, postgraduate and master courses,) 12% an official Masters and 4% a degree other than nursing (Degree, Master, PhD). Analysis of the Nurse Expertise (number of nurses answering questionnaire n = 78) showed that 8% of nurses had a "Novice –Advanced beginner" level, 45% "Competent", 24% "Proficient" and 23% "Expert."

3.2. Quantitative Analysis Indicates Key Markers Relating Objective Characteristics and Expertise Level

Next, we aimed to assess the level of nursing expertise. To that end, we performed parametric analysis comparing medians, which revealed no statistically significant differences between Beginner/competent vs. Proficient (p = 0.093), neither between Novice and Proficient. However, there were statistically significant differences between beginner/competent vs. expert (p <0.001) and proficient vs. expert (p <0.0001).

The low number of nurses who were classified as "beginner" did not allow considering this level of Expertise as a category in itself. Therefore, the "beginner" category was merged with "competent", thereby grouping four levels of Expertise into three: advanced / proficient, advanced and expert beginner. The resulting bivariate analysis between the three levels of expertise according to Benner P [2] and the objective characteristics of expertise according to McHugh MD and Lake ET [1] are summarized in Table 2.

Table 2. Bivariate analysis quantifies relationship between objective characteristics of expertise and expertise level

		Expertise level				p
		Beginner /Competent	Proficient	Expert	Total	
Total		41 (53%)	19 (24%)	18 (23%)	78 (100%)	
Selected as a tutor	Never	20 (49%)	4 (21%)	1 (6%)	25 (32%)	0.0119
	Rarely	4 (10%)	3 (16%)	1 (6%)	8 (10%)	
	Occasionally	8 (19%)	4 (21%)	8 (44%)	20 (26%)	
	Often	9 (22%)	8 (42%)	8 (44%)	25 (32%)	
Consulted by another nurse or professional	Never	2 (5%)	0 (0%)	0 (0%)	2 (3%)	0.1695
	Rarely	6 (15%)	0 (0%)	1 (6%)	7 (9%)	
	Occasionally	19 (46%)	6 (32%)	7 (39%)	32 (41%)	
	Often	14 (34%)	13 (68%)	10 (55%)	37 (47%)	
Postgraduate Education	Basic studies	12 (30%)	6 (32%)	1 (6%)	19 (24%)	0.0874
	Specialty or Master	17 (41%)	4 (21%)	7 (38%)	28 (36%)	
	Master degree or another official	29 (12%)	9 (47%)	10 (56%)	31 (40%)	
Experience (years)		11 ± 10 June (3.5 - 20)	16 ± 9; 15 (10-21)	June 31 ± 30 (27-34)	17 ± 11; 17 (5-28)	<0.0001

Columns show the three categories of level of expertise as shown in P Benner theory [2] and rows show the objective characteristics of expertise according to Mc Hugh & Lake modified questionnaire [1]. Data are expressed as n (%) statistic. Exact fisher test shows p-values for bivariate analysis between the three levels (dependent variable) and the objective characteristics (independent variables) as described in methods.

Next, we sought to understand whether the level of expertise perceived and reported by nurses was supported by the objective characteristics used by Mc Hug MD and Lake ET [1]. Therefore, the bivariate analysis was extended to the objective characteristics. Statistically significant differences between the level of Expertise and the characteristic "being selected as a tutor" were found to be more frequent in the expert level. The same finding was observed regarding years of experience ($p < 0.0001$), i.e. a higher level of Expertise seemed to be associated with a growing number of years of experience. Interestingly, no relationship between this level and the characteristic "to be consulted by a nurse or professional" was observed, neither in the characteristic graduate education. This indicated that "being selected as tutor" and "years of experience" are key characteristics that reveal how to identify expertise markers.

The analysis of education as a whole showed 24% of nurses with the basic qualification compared to 76% who had completed a year of graduate studies or more.

3.3. A Number of Characteristics Affect Level Of Expertise

To assess which characteristics of the Hospital Context seemed to affect the level of Expertise, we calculated a logistic regression model. Table 3 shows the results of the ordinal logistic regression, considering the level of Nurse Expertise the dependent variable and as the independent variables three objective characteristics of Nurse Expertise, namely Experience (years) and two levels of Nurse Education, as well as two characteristics of the Hospital Context. A significant relationship between Nurse Expertise level and years of experience was observed, so that the probability of increasing a level of Expertise (or being in a higher level of Expertise) was 15% higher for each additional year of experience. Given periods of 5 years of experience, the result was that the probability of being in a higher category was twice for each 5 additional years of experience and four times every 10 years.

Table 3. A logistic regression model calculates potential causality of objective variables and Hospital Context on the level of expertise

Variable	β	SE	OR	CI ₉₅	P
Years of experience	0.1403	0.0272	1,151	1091-1214	<.0001
Basic studies vs. Another official Master degree +	-0.3844	0.4246	0.419	0110-1605	0.3653
Specialty or master vs. Another official Master degree +	-0.1	0.3605	0.558	0185-1683	0.7815
Unfavorable vs. Favorable	0.4144	0.3894	2,015	0404-10048	0.2872
Mixed vs. Favorable	-0.1281	0.3623	1,171	0253-5420	0.7236
Expert	-4.2075	0.7315			<.0001
Advanced	-2.4541	0.5901			<.0001

Variables shown as rows are all independent. For each row, a logistic regression model was calculated with the same independent variable, namely level of expertise. Coefficients (β), Standard Error (SE), Odds Ratio (OR) and confidence interval (CI₉₅) and significance level (p) for one model calculated for the independent variable shown as each row.

4. Discussion

In this study, we analyze the level of Nurse Expertise after acquiring primary data from a Spanish hospital using two questionnaires: the P. Benner Level of Nursing Practice theory for conceptualizing the different stages of nurse expertise, and the hospital Practice Environment (PES-NWI) questionnaire to measure the Hospital Context.

First, we aimed to assess the relationship between objective characteristics of expertise and expertise level. This was accomplished using a bivariate analysis. Next, we quantified the potential causality of both the objective characteristics of expertise and the Hospital Context on the level of expertise. To that end, we calculated a logistic regression model.

The results indicate that the studied hospital consists of a *Mixed* Hospital, as we concluded based on the observation of a good assessment of the existing nursing staff and resources and good relationship with the doctors. We also found that the hospital features a high number of experienced and well-trained nurses. In addition, our analysis showed a statistically significant association between experience and high level of Nurse Expertise.

The results found here are consistent with the study conducted in 182 hospitals in the USA. The majority of these (66%) had a *Mixed* Hospital Practice Environment [22]. This finding is consistent with other work in the Balearic Islands [23] and preliminary studies within the European project RN4CAST [24].

We found that nurses with five or more years of experience show a perception of expert level. Importantly, in our logistic regression model the Odds-Ratio evidenced that the probability of being in a higher level of Expertise increased by 15% with each additional year of experience.

The low number of nurses who were classified as beginners is consistent with the average age and years of experience in the population studied here (37-40 years), given their socio-demographic distribution.

In addition, we found a statistically significant association between the level of Expertise and the characteristic "be selected as a tutor", this being more common in the expert level, probably due to the very clear assumption of the hospital Clinic Nursing Model that almost all nurses are responsible for voluntarily tutoring students. The lack of statistical association of the experience with two objective characteristics of Nurse Expertise (postgraduate education and peer consultation) is likely due to the lack of incentives for nurses to develop their career. Fortunately, this trend seems to be nowadays shifting, as indicated by the latest data reflecting the current number of nurses in the hospital of this study achieving the highest professional level (data not shown).

Regarding the age and education of the participants, observation of the sample showed that, in the group answering the first questionnaire *-Hospital Practice Environment-*, the mean age and experience were 37 and 14 respectively and there were a 16% of nurses with Master studies degree or another. On the other hand, in the subgroup who answered the second questionnaire *-Expertise declared individually-*, mean age and experience

reached higher values, up to 56% and coincided with an older age (40 years) and extensive professional experience (17 years).

The aggregate data of experience and postgraduate training confirms a probable association. The high number of postgraduate and masters evidenced the interest of nurses surveyed in continuing their education, while they increase their clinical experience.

A potential explanation for the lack of confirmatory results of the relationship between Hospital Context and clinical practice experience levels and individual training can be attributed to the measuring instrument. The PES-NWI cannot capture all the elements and all relevant sides of clinical practice [1]. The American Association of Professional Nursing (AACN) has defined eight milestones of the hospital Practice Environment [25]. Comparing with the PES-NWI the AACN has identified uncovered areas such as autonomy, recognition of advanced study and experience, professional development and peer support aspects that should be analyzed in future projects.

In Spain there are few reliable and systematic records that bring together information on Hospital Context in order to compare results between hospitals. In other European Union member states, including Belgium, UK, Netherlands and Ireland as well as in the USA, there are databases accessible with population samples in size and quality criteria to refine key instruments and obtain better results in research [26]. The collaborative project *RN4CAST* [24] is an example illustrating this statement. This study has several limitations. As in many statistic-based studies, the design of this work does not allow establishing causal relationships [27]. The Nurse Expertise dependent variable is self-assessed, but there is not enough evidence of the validity of the content provided. In future studies, other methods should be combined to study the nurse Expertise such as objective assessments or control by peers. The potential risk of misunderstanding both questions "How many postgraduate and master courses have you followed?" and "Did you earn the official Master degree or equivalent?" existed in both groups surveyed. Finally, the data acquired represents a specific university hospital in Barcelona, so it may not be generalizable to hospitals of different size and complexity or non-teaching hospitals.

The studies on nursing education and health outcomes carried out in the English-speaking context focused mostly on two undergraduate levels of education, *BSN* and *Associate Program*. The information needed for the comparison comes from the National Health Institute (NHI) nurse staffing database [28]. On the contrary, our results have relied on primary data of the hospitalization unit nurses. The good quality of this primary information shows that since the general qualification (BSN) (the minimum mandatory qualification in Spain) a wide number of nurses had carried out specialization or postgraduate training. Nevertheless, we did not find a link between the reported level of Nurse Expertise and the high levels of postgraduate education, which we did observe. Along the same lines, we did not find a relationship between nurse expertise and consultation by peers; neither between nurse expertise and Hospital Context. However, we did find a statistically significant relationship between nurse expertise and mentorship of the nursing students, as

well as years of experience, indicating these two could be interesting markers.

5. Conclusions

As there is no central administrative data on health outcomes related to nursing care, this study did not include a survey to the nurses about the relationship between expertise and health outcome of patients. However, we believe that this will be a key step forward in the future to improve health outcome. Indeed, other studies have found that the proportion of *BSN* in hospital experience and Hospital Context were significant predictors of better health outcomes for patients, and lower mortality [28]. Another study reported that postgraduate education was associated with better patient outcomes, due in part to greater critical thinking developed by the Bachelor of Science degree program in nursing *BSN* [25]. Blegen et al [29] studied health outcomes considered more typical nursing markers, such as falls and medication administration errors. In the future, further studies along these lines will help to understand how nursing staffing policies which favor education and expert nurses could benefit patient health outcome, as well as improved quality of care.

We believe that the results shown above can be helpful for those responsible for the clinical management to strategically plan elements to design the composition of nursing staff. Thereby, it would be possible to increase the number of nurses who combine longer experience with specialized master's degree in order to enhance nurse expertise and advanced roles. Programs available to complete postgraduate studies would add value to training policies, thereby hopefully improving the quality of clinical outcomes.

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