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Identification and comparison of France to other countries of the teaching of research to
nursing students: Results of an international survey of nursing educator

Running Head: Teaching research to nursing students

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ABSTRACT

Purpose: Registered nurses must have a level of scientific literacy to be able to interpret research data and access Scientific's knowledge. Several studies have been conducted to explore barriers and levers to the dissemination of nurse's knowledge; however, the scientific literacy that nursing students acquire has not been studied.

Objective: The aim was to examine and compare the way that research is taught to undergraduate nursing students in France and other countries.

Design: Cross-sectional, Internet survey.

Settings: Universities providing undergraduate nursing programs around the world.

Participants: Nurses educators.

Methods: Schools of nursing and universities were contacted by mail, through social networks and with the help of national or international nursing organizations. Respondents provided demographic data on schools and faculties of nursing, the teaching of scientific databases, Reading Critical Analysis and the teaching of scientific English. Information on the transmission of articles and access to scientific knowledge by students through the institution were also requested.

Findings: A total of 245 nursing schools/universities participated. Most respondents were educational research referees (52.2%), worked in a public institution (85.7%) and were in the nursing program leading to a bachelor's degree (74.3%). Databases were taught at 56.8%, Critical Reading of Articles at 70.1%, scientific English at 60.6% of nursing schools or universities. Articles were provided to students at 89.6% of institution and students had access to data through the institution in 66.1% of nursing schools or universities. Several significant differences were found between French schools of nursing and nursing schools/universities in other countries.

Conclusions: Our results show that most schools or universities of nursing teach the three majors' components to promote, provide articles to students and give access to scientific knowledge. However, there is wide heterogeneity between countries. There is a need to standardize research education for nursing students worldwide to promote the development of scientific literacy skills.

Key words: teaching research, nursing students, international survey, scientific literacy, nursing curricula

INTRODUCTION

Scientific literacy, a concept developed by Durant in 1994, indicates the skills to accept the need for more information about a clinical situation, but also to seek, find and use scientific knowledge for that specific clinical problem (Durant, 1994; Laugksch, 2000). The American Library Association defines a person with scientific knowledge as “a person who is able to recognize when information is needed and who has the ability to locate, evaluate, and effectively use needed information” (Association of College & Research Libraries, 2015). Scientific literacy skills include knowledge of scientific databases, the findings of useable information and its understanding (ability to read a specific vocabulary) and finally the use of this new information in a corpus of knowledge for integration in a reflection about practice and a change of practice. Scientific literacy skills contribute to the transfer of scientific knowledge into practice by providing more independence and scientific reflection in nursing decision-making (Valente, 2003), e.g. integrating a critical viewpoint on the purpose of the article read, methodological bias, method and design of the article. Scientific literacy skills are essential for nurses to use scientific evidence in their clinical practice. One way to develop these skills is through research education. Universities and schools of nursing around the world are the main vector for teaching research to undergraduate nursing students.

BACKGROUND

Learning theories are the main guide for educational systems, including nursing education. Teachers know the general principles of these theories and can use them in different learning situations. However, none of these theories is perfect. Teaching new knowledge's or skills in a field, such as nursing research, must include learning through exploration according to Piaget's theories, reinforcing behavior according to the behaviorist movement but also using the internal process of the learner (Piaget, 1977; Piaget et al., 1995).

Existing literature does not state the content of research education. However, a systematic review of the educational strategy used to teach evidence-based practice at a bachelor's degree shows varied learning techniques but nursing students still struggle to see the relevance of research finding to nursing practice (Aglen, 2016). Another study reports that nursing students are dissatisfied with the teaching of research and want more practice-oriented teaching (Ax & Kincade, 2001). However, teaching research to undergraduate nursing students has a significant impact on students' research skills and minimizes barriers to evidence use after graduation (Hatala & Guyatt, 2002; Leach, Hofmeyer, & Bobridge, 2016; Porter et al., 2010). It is therefore important for schools and faculties of nursing ensure that future professionals have the scientific literacy skills to promote dissemination and transfer (Cheek, Gillham, & Ballantyne, 2005; Johansson, Fogelberg-Dahm, & Wadensten, 2010).

In France, the 2009 nursing education reform identified research as a needed skill and aimed to develop nurses' ability to use research in clinical reasoning (Limaiem, 2015). Since then, French nursing schools have been teaching research to students in the aim of promoting nursing as a scientific profession. But also to support the profession in an academic way. In this context, it is interesting to explore, 10 years after the reform of nursing studies in France, the similarities and differences between French research programs and those of other

countries and the skills that these programs could enable students to acquire. Furthermore, nurses have always considered their profession as a passport to the world. It is therefore important that nursing education reflect the challenge of the globalization of nursing. However, to our knowledge, no comparison has been conducted between France and other countries in term of nursing research training.

To investigate how scientific knowledge might be transferred into practice, it is necessary to determine how research is taught to undergraduate nursing students. However, little is known about what is taught to undergraduate nursing students around the world and how it is delivered, nor is it known if there are differences between France and other countries. The purpose of this study is to evaluate research education in schools (or universities) of nursing and to compare teaching in France and other countries.

METHOD

Study Design

The design was a cross-sectional survey using a web-based questionnaire.

Survey Design

An online questionnaire was developed based on the American Library Association's publication on the scientific literacy skills of students and nurses in health care (American Library Association, 2013; Association of College & Research Libraries, 2015). Authors developed the survey questionnaire. Before starting the online survey, we performed a pilot evaluation of our questionnaire by sending it to a French nursing school. Two French nursing educators conducted this evaluation. This pilot evaluation assessed the understanding and acceptability of the questions, the relevance of the answers, and the time taken to complete the questionnaire, but no psychometrics data was collected. This pilot evaluation allows us to

highlight five problem areas. Three areas concerned the understanding and choice of answers to questions 8, 12 and 15.7 and 2 areas concerned the relationship between the questions. The survey was then revised.

The questionnaire consisted of 17 questions (21 sub-questions) to explore 3 teaching topics. The topics studied were the teaching of scientific databases (examples of database, use of simple or advanced research), Critical Reading of Articles and scientific English. The teaching of scientific English means the knowledge of an English vocabulary that facilitates the relationship with patients and the understanding of scientific data published in English. These teachings were chosen because they enable nurses to be autonomous in answering a clinical question in their future practice with evidence-based data and because they are the first step towards scientific literacy. For each teaching, the number of hours of supervised work (class organized with a small group of students and aimed to practicing) and of lecture hours (class organized with all students corresponding to the first, second or third year) was requested. We also examined the tools made available to students by nursing schools or universities and the number of articles provided to the undergraduate students by the institution throughout nursing education. The characteristics of schools of nursing were asked through 11 questions.

Skip logic was used to reduce respondents' burden and avoid irrelevant questions. For example, if a respondent stated that his or her institution did not teach a course, the questionnaire automatically presented the questions of the next course and skipped all sub-questions. A copy of the questionnaire is available in Supporting Information.

The survey was administered using GoogleForms (www.GoogleForms.com) between December 2018 and July 2019. This period was chosen to reflect the trade-off between obtaining usable data over a short period of time and a significant amount of participation time.

Settings and participants

All national and international schools or universities of nursing were eligible to participate in the survey. The usual methods were used to conduct the survey (Van Selm and Jankowski, 2006). These methods involved distributing the questionnaire by e-mail to respondents or making a general request in an electronic communication environment. But also, response time management which incorporates several incentives for respondents. As part of our study, emails containing an offer to participate in the survey and its explanation, as well as two links to the online questionnaire (in French and English) were sent to national or international nursing organizations in order to disseminate our survey by network. Nurses' organizations were approached as they have direct links with nursing schools and could easily disseminate our survey to nursing schools. In addition, several messages were published on social networks (Linked In and Facebook), requesting participation in the survey and its dissemination to schools or universities of nursing. Finally, French schools of nursing were contacted by direct e-mail using an index of French schools of nursing.

A total of 326 French nursing schools and 15 nursing organizations and their social network profiles were contacted. A reminder was sent 2 weeks after the first contact by email with the letter introducing the survey and the two links. This reminder was repeated every 3 weeks after the first contact until the end of the study. One participation per nursing school or university was requested.

Data collection

GoogleForms data were collected automatically. FD, LJ, FF, and NB at the end of the study managed the data.

Ethical considerations

Participation in the survey was voluntary and responses were anonymous. No incentives were offered for participation or dissemination of the survey. The questionnaire and the email

included an introduction on the purpose, intent and use of the data. Completion of the questionnaire constituted implied consent to participate. Data were stored on password-protected computer, only the principal investigator knew the password. No information identifying the schools/universities (excluding the country) was collected.

Data analysis

All calculations were performed using version 3.4.2 of the R software.

Continuous data were presented as median and interquartile range, while a number and percentage represented categorical data. Unless otherwise indicated, categorical variables were compared by a Chi-square test or Fisher's exact test, as appropriate, and continuous variables were compared using a Student's t test or Wilcoxon-Mann-Whitney test, as appropriate. All statistical assessments were two-tailed and considered significant at the 0.05 level. If the analysis of the heading question of the teaching item was significant, the comparative analyze was continued on sub-items. A similar sub-groups analysis was repeated using only schools or universities of nursing with Associate or Bachelor level.

RESULTS

Respondent characteristics

A total of 245 nursing schools or universities participated. Respondents came from France (n=202, 82.4%), other European countries (n=17, 6.9%), North America (n=12, 4.9%) and Asia (n=14, 5.7%). Of the participating schools, 94.3% (n=231) were from non-English-speaking countries. Table 1 shows the number of responses by country. Most respondents worked in a public institution (n=210, 85.7%) and 54.2% (n=133) were referent teachers for research education. Institutions have 270 [180; 380] students per year and 15 [11; 21] instructors. For most respondents, nursing education provided an Associate/Bachelor's level (n=184, 75.1%) and is based on a curriculum provided by their country's government or ministry (n=227, 95.8%). The total duration of the course was 36 [34; 36] months. Research

was taught in most nursing schools or universities (n=240, 98.4%). Teachers of research courses were mainly professional masters (n=179, 73%) or a research masters (n=86, 35.1%). Only, 26.5% (n=65) of schools of nursing have teacher-researchers or teachers with a PhD in research. Table 2 presents demographics data.

Research teaching in nursing schools or universities

Table 3 shows the description of each teaching topics and their comparison between France and the other countries.

Teaching of scientific databases

Scientific databases were taught in 137 (56.8%) of nursing schools or universities. The teaching consisted of 5 [2; 10] hours of supervised work and 3 [2; 5] hours of lectures. However, French schools of nursing teach significantly less database search strategies -i.e examples of database, use of simple or advanced research- than other countries, with 51.3% (n=102) and 83.3% (n=35) respectively (p=0.001). Furthermore, a significant difference was observed in the type of teaching of scientific databases between France and the other countries (p<0.0001). Indeed, the other countries teach the CINAHL database more frequently (71.4%, n=25 of 43 schools of nursing in the other countries) than schools of nursing in France (34.3%, n=35 of 202 French nursing schools).

Critical Reading of Article

Critical Reading of Article is taught in 70.1% of the nursing school or universities investigated with a significant difference (p=0.001) between France (n=131, 65.8 %) and other countries (n=38, 90.5 %). Teaching included 8 [4; 13] hours of supervised work and 4 [2; 7] hours of lectures.

Among the 10 items included in the Critical Reading of Article (CRA), the teaching of “bibliometry” principles such as the meaning of the *Impact factor* or the number of citations of an article (n=44, 26%) and the “applicability of results” (n=77, 45.6%) were not often reported by schools or universities of nursing (Table 3). Schools or universities of nursing in other countries were more likely to teach at least five CRA items than French schools of nursing (p=0.001). Seventy-five percent (n=127) of schools or universities of nursing distributed between 1 to 5 articles in the native language of nursing students during all years of education, with no significant difference between schools of nursing in France and those in other countries. However, schools or universities of nursing in other non-English-speaking countries were more likely to study articles in English than French nursing schools (p<0.0001). Indeed, 76.2% (n=100) of French schools of nursing did not study articles in English compared to 10.5% (n=4) of schools or universities of nursing in other non-English-speaking countries. The methodology of articles read by students is uniform. Indeed, 68%, 56.8% and 76.9% of the articles read respectively have a qualitative, quantitative and mixed methodology. No significant difference between French nursing schools and those in other countries was found (p=0.05). Students from nursing schools or universities in other countries studied systematic reviews (n=26, 68.4%) and meta-analyzes (n=15, 39.5%) significantly more than students from French schools of nursing (n=40, 45.9%, p=0.023 and n=26, 19.8%, p=0.023, respectively).

Scientific English

Scientific English (English vocabulary facilitating the relationship with patients and the understanding of scientific data published in English) was taught in 60.6 % (n=146) of the nursing schools or universities studied, with a significant difference between France (n=128, 64.3%) and other non-English-speaking countries (n=18, 42.9%; p=0.009). The teaching scientific English most often includes reading professional articles (n=109, 74.7% of nursing

schools and universities). Only 28.8% of nursing schools or universities include the reading of scientific articles in the teaching of scientific English with a significant difference between France (n=30, 23.4%) and other non-English speaking countries (n=12, 66.7%, $p<0.001$).

Articles provided to nursing students (excluding the teaching of CRA)

Most schools or universities of nursing (89.6%, n=216) reported providing scientific articles to students with no significant difference between France and other countries. The number of articles provided to nursing students is heterogeneous. However, most nursing schools in France offer 5 - 10 articles during all years of training (n=47, 26.1%) while nursing schools or universities in other countries offer more than 30 articles (n=10, 27.8%). As with the results of teaching Critical Reading of Articles, most of the articles provided to nursing students in France were in their native language (n=152, 84.4%). In nursing schools or universities in other non-English speaking countries, articles provided to nursing students were as much in English (n= 17, 47.2%) as in both languages (native and English language) (n=16, 44.4%).

Access to articles through nursing schools or universities

Through nursing schools or universities, students have access to online and print journals (n=162, 66.1%). Access to articles by subscription is significantly different between France and other countries ($p<0.0001$). Nursing students in other countries were more likely to have access only to online articles (n=12, 28%) than nursing students in France (n=11, 5.4%).

Comparison of France and World teaching at a bachelor's level

This analysis give almost the same results as those obtained without excluding other university degrees. Indeed, only the question on the type of articles read and the questions on the teaching of scientific English changed their results (See Table 3).

DISCUSSION

This study evaluated the research education of 245 national and international nursing schools or universities. Our results show that most nursing schools reported teaching the 3 research teaching topics studied by our work (Scientific database, Critical Reading Teaching and Scientific English), but also provided articles to students and provided access to scientific knowledge. They show that scientific databases are taught in 56.8% of schools or universities of nursing and the PubMed database in 79.7% of schools or universities of nursing worldwide. The PubMed and CINAHL databases are the best-known and most comprehensive biomedical and nursing databases. Searching on PubMed provides enough information to solve a clinical issue, but CINAHL allows nurses or paramedics to access to specialized scientific and academic information (Klem and Weiss, 2018). Although 70.1% of nursing schools or universities teach Critical Reading of Articles, the content of the teaching is highly varied (see Table 3). Our results show that 61.5% of non-English speaking schools of nursing did not study an article in English while teaching Critical Reading of Article. If students do not read in English while teaching of Critical Reading or Scientific English, they are likely to graduate without having read many articles in English, which represents a significant teaching gap because health knowledge sciences is published in English. In this way, and because English is currently the international language of research and people, it is crucial to teach English to nursing students (Starkey, 2015). If registered nurses are not able to read articles in English, it is unlikely that their knowledge will be updated. Therefore, not teaching English could have a negative impact on patient care.

Our results highlight a wide heterogeneity in the teaching of research to nursing students around the world. In fact, although research is taught in most schools or universities of nursing, the composition of research teaching and the resources available for research differ from country to country.

These findings highlight the need to standardize the teaching of research to nursing students worldwide for two reasons. First, there is a need for nurses to be able to work, collaborate and communicate easily with each other and with other health professions on patient care. In addition, research is one of the main goals of the university. That is why we recommend that professionals who do research themselves teach research to nursing students through the university. In addition, the inclusion of nurses in a dynamic learning environment helps to limit the turnover of nurses (Mahon, 2018). Second, improving research education might increase evidence-based-nursing practice by promoting the development of nurses' scientific literacy skill in schools of nursing or universities. Scientific literacy skills can empower nurses and create a vocation among students (Kaplan Jacobs et al., 2003). It is therefore necessary to examine the competencies that nurses need after graduation. Research education is crucial for the development of skill in scientific literacy. Scientific literacy is a major lever for improving care practices with a long-term vision (Ruzafa-Martínez et al., 2016). Scientific literacy is important in valuing nursing care by giving credibility to decision arguments in nursing care choices. Given the wide variety of research teachings, some may not be able to offer scientific literacy skills to nursing students. As a result, the transfer of knowledge into practice may be more challenging.

It will be interesting to focus future research on the acquisition of research skills by nursing students by comparing, for example, skills assessment strategies. Similarly, the comparison of research teaching content using slides and course materials could be of interest.

Our study has some limitations. Firstly, few nursing schools or universities in countries other than France participated in the survey. It was therefore impossible to compare the teaching of research by country. Despite this under-representation of nursing schools or universities from countries other than France, our study compared research teaching in France and other countries with significant results. Second, no French nursing schools confers a university

degree beyond the bachelor's degree. A subgroup analysis was performed by excluding schools that confer a degree beyond the bachelor's degree rather than adjusting for the level of education. Finally, our data collection instrument was not validated with psychometric data. Nevertheless, we carried out an assessment of the comprehension of our survey tool with two French nursing educators.

CONCLUSIONS

The teaching of research is essential for the development of scientific literacy skills of nursing students. Our study showed a wide variety in the content of research education around the world. Standardization and reflection on the content of research education for students could lead to an increase in evidence-based care practices.

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Table 1: Countries of nursing schools included.

* English-speaking countries that were excluded from the analysis of English learning.

Country	Nursing schools included
France	202
Other European Countries (n=17)	
Belgium	2
Germany	2
Hungary	1
Malte	1
Portugal	4
Spain	2
Sweden	2
Switzerland	3
United Kingdom*	1
North America (n=12)	
Canada*	8
USA*	4
Asia (n=14)	
Israel	1
Japan	1
Russia	11

Table 1 : Characteristics of participating nursing schools or faculties.

Items	n	All		
		%	Md	[IQ]
1. Completed by				
Instructor referent to research	133	54.2		
Instructor	66	27		
Director of training program	23	9.4		
Assistant director	23	9.4		
2. Status				
Public	210	85.7		
Private	23	9.3		
Associative	12	4.9		
9. Instructor with 2-year Master degree			4	[2; 8]
10. Instructor with PhD degree			6	[3.5; 14.5]
11. University level				
Associate/ Bachelor's	184	75.1		
1-year master's	52	21.2		
2-year master's	2	0.8		
None	7	2.9		
12. Degree level of teachers who teach the research courses				
Associate or bachelor	72	29.4		
Professional master	179	73		
Research master	86	35.1		
Professional doctorate	20	8.2		
Research doctorate	65	26.5		

Table 3 : Description of research teaching and comparison between nursing schools in France and abroad * $p < .05$; † On PubMed and CINAHL answers ; ‡ On nursing schools which have answered 5 or more propositions.

Items	France		Other countries		p	All	
	n	%	n	%		n	%
14.3 Databases taught					<0.0001*†		
PubMed	76	74.5	34	94.4		110	79.7
CINAHL	35	34.3	25	71.4		60	43.8
Others	51	50	12	34.3		63	46
All	162		71			233	
14.4 Content of teaching							
Simple research	85	83.3	28	80		113	46.9
Advanced research	68	66.7	32	91.4		100	41.5
Filters	58	56.9	28	80		86	35.7
MESH terms	21	20.58	24	68.6		45	19.1
All	232		112			345	
15.3 Teaching of CRA included					0.001*‡		
Statistics	62	47.3	34	89.5		96	56.8
Bibliometry	30	23	14	36.8		44	26
Study biases	66	50.4	30	78.9		96	56.8
Consistency of results	95	72.5	28	73.7		123	72.8
Selection of study population	91	69.5	33	86.8		124	73.4
Goal of the study	115	87.8	34	89.5		149	88.2
Applicability of the results	48	36.6	29	76.3		77	45.6
Article structure	103	78.6	29	76.3		132	85.8
Internal validity	19	14.5	31	81.6		50	29.6
External validity	15	11.5	29	76.3		44	26
All	644		291		935		
15.5 Number of articles read in English					<0.0001*		
0	100	76.2	4	10.5		104	61.53
[1-5[	27	20.6	17	44.7		44	26.03
[5-10[	1	0.8	5	13.2		6	3.56
[10-20[	0	0	7	18.4		7	4.14
More than 20	0	0	4	10.5		4	2.36
All	128		37		165		
15.7 Type of articles read							
Original articles	99	75.6	35	92.1	0.05	134	79.3
Systematic review	60	45.9	26	68.4	0.023*	86	50.9
Meta-analyzes	26	19.8	15	39.5	0.023*	41	24.3
All	185		76			261	
16.1 Teaching included							
Reading professional articles	95	74.2	14	77.8		109	74.7
Reading scientific articles	30	23.4	12	66.7	<0.001*	42	28.8
All	125		26			151	

18. Access to subscription					<0.0001*		
None	9	4.5	4	9.3		13	5.3
Online journal	11	5.4	12	28		23	9.4
Print journal	47	23.3	0	0		47	19.2
Both	135	66.8	27	62.8		162	66.1
All	202		43			245	