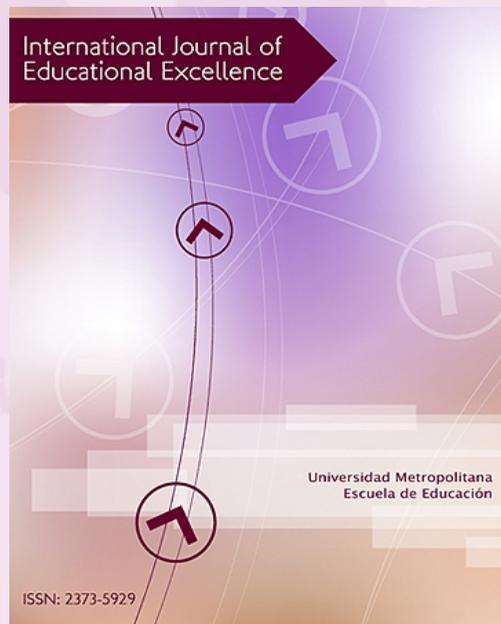


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**Volume 4
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Octaviano García Robelo & María Guadalupe Veytia Bucheli

Comparative Analysis of Research Skills and ICT: A Case Study in Higher Education

Mary Nelly Soto Malavé, Alfonso García Guerrero, José A. Cervera Marín & Zaida Vega Lugo

Nursing Education, Training and Practice in the Prevention of Ulcers in

Adults over 60 Years of Age: A Quasi-Experimental Study

Juan Arturo Rubio Arostegui

Expert-Panel Accreditation Evaluation-Practices: An Autoethnographic Case-Study in Spain

Regina K. Kaume-Mwinzi

Teaching Practices in the 21st Century in Kenya: A Qualitative Approach

María A. Mercado De Jesús & José Miguel Morales Asencio

Formation of Nursing Staff in Intensive Care Units: Evaluation of Adherence to Recommendations and

Variability in Management of Central Venous Catheters

Editor-in-Chief: **José Gómez Galán**

Universidad Metropolitana (SUAGM)

Escuela de Educación, PO Box 21150 San Juan, PR 00928-1150

International Journal of Educational Excellence

DESCRIPTION

The *International Journal of Educational Excellence* (ISSN 2373-5929) is a multidisciplinary scientific journal which main objective is the dissemination of studies that provide answers to the main educational scientific and social problems present in higher education, in order to achieve excellence quality in all their areas. Papers will be welcomed, regardless of the subject area to which they belong as long as they entailed a contribution, innovation or breakthrough in the development of models of teaching or scientific research in the scientific world which lead to a social improvement. Research work performed in other educational levels may also be considered, if they demonstrate a strong and justified relationship to higher education. All papers submitted for publication must be unpublished and originals, and should not be under any evaluation procedure for publication in other journals. Theoretical work as well as work based on field studies and empirical laboratory experiments are accepted. All kinds of strategies and methodological approaches may have been used for the study. They have to comply within the parameters of current scientific and technological research. The review criteria and selection process will take into account mainly the quality of the work under consideration: if it makes a significant contribution to the object of interest, main interests of the journal and if it offers a breakthrough or significant contribution to the current scientific knowledge and, ultimately, if it contributes to the progress of our society. This journal is of free and direct access (Open Access, OA), and it serves the international scientific community and open knowledge.

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Original submissions to the *International Journal of Educational Excellence* (IJEE) will be reviewed by external referees, a process known as peer review. Reviewers are academics and researchers who are experts in the corresponding specialized field of knowledge. Their main task will be to study all submitted papers critically and constructively. For a paper's evaluation a "double-blind" system will be used. This method consists of one in which authors and reviewers are not known to each other, aiming at a maximum objectivity in the evaluation of the manuscript. Those articles that are considered by the editorial and scientific committee of the journal with high possibilities for publication will be submitted to referees who will determine the relevance of their acceptance. It may be the case that they be sent back to the authors with suggested changes and then back again to the journal to continue with the evaluation process, which ultimately will assess the relevance of the article to be published or rejected.

JOURNAL FREQUENCY

The periodicity of the *International Journal of Educational Excellence* will be two issues per year, and these will form a volume. The first issue is published in the first half of the year, the second issue in the second half. There is no deadline for the submission of manuscripts, which will remain open during the whole year and publication of the

article will possibly appear in the following issue after a positive evaluation of the work. For monographs, in which contributions to a specific topic will be requested, the deadline for receipt of manuscripts for evaluation corresponds to June 30 for the first issue and December 31 for the second issue, both referred to volume of the year following the call of articles.

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The journal is named *International Journal of Educational Excellence*, and it is abbreviated IJEE. Its ISSN (International Standard Serial Number) number is 2373-5929. For cataloging, it should be referred to as International Journal of Educational Excellence (IJEE): ISSN 2373-5929. Access to the journal may be performed from the main web address: http://www.suagm.edu/umet/oa_pe_edu_ijee.asp

AUDIENCE

The journal is addressed to the scientific community and to the general to society as well. However, because of its own nature, the principal target audience should be: university professors, scientists, researchers, managers of higher education, social and political workers within the fields of education and science and others related.

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For all parties involved in the act of publishing (the author, the journal/publisher and the peer reviewer) it is necessary to agree upon standards of expected ethical behavior. The ethics statements for the International Journal of Educational Excellence (IJEE) are based on the Committee on Publication Ethics (COPE) Editors (www.publicationethics.org).

The value of scientific publishing relies on everyone involved behaving ethically. The publication of an article in the International Journal of Educational Excellence, a peer-reviewed journal, is a direct manifestation of the quality of work of the author and the institutions that support them. Peer-reviewed articles support and embody the scientific method. Ethics topics to consider: Authorship: Authorship should be limited to those who have made a significant contribution to the reported work. The authors should ensure that their study is original and written by them and their work has not been previously published and has been submitted only to the journal. / Originality: The authors should ensure that where material is taken from other sources (including their own published writing) the source is clearly cited and that where appropriate permission is obtained. / Data access: Authors may be asked to provide the raw data in connection with a manuscript for editorial review, and should be prepared to provide public access to such data. / Acknowledgement of sources: Proper acknowledgment. / Conflicts of interest: The authors should ensure that any real or apparent conflicting or competing interest is clearly stated on submission of their manuscript. / Reporting standards: Authors of reports of original research should present an accurate account of the work performed. / Human or animal subjects: The authors should ensure that they adhere to all research ethics. / Confidentiality and impartiality of the reviewers: The reviewers must maintain the confidentiality of the review process and conduct themselves fairly and impartially; immediately alert the editor-in-chief of any real or potential competing interest that could affect the impartiality of their reviewing and decline to review where appropriate.

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AUTHOR GUIDELINES

1. Introduction

The *International Journal of Educational Excellence* (IJEE) is open to all scientific articles which provide answers to the main educational and scientific problems currently impacting higher education with the purpose of achieving quality excellence in all areas. Papers will be welcome, regardless of the subject area to which they belong, as long as they entail a contribution, innovation or breakthrough in the development of models for teaching or scientific research within the university environment leading towards social improvement. Research work performed in other educational levels may be also taken into account, as well as they provide an adequate justification and a valid relationship with higher education issues.

All papers submitted for publication must be unpublished and original, and should not be under evaluation for publication in other journals. Theoretical work as well as those based on field studies and empirical laboratory experiments contributions, are accepted. All kinds of strategies and methodological approaches may be employed; however the selected method for each research has to be in compliance within the parameters of current scientific and technological research. The review criteria and selection process will mainly assessed the quality of the work under consideration in terms of the following criteria: significant contribution to the object of interest of the journal, a breakthrough to the current scientific knowledge and, ultimately, the contribution to the progress of our society.

2. Details for Submission

Manuscripts should be sent preferably sent in digital format. All manuscripts should be addressed to the journal Editor-in-Chief (email: jogomez@suagm.edu). Prior to submission, publishing standards should be carefully read at the following web site http://www.suagm.edu/umet/oa_pe_edu_ijee.asp. Only those articles that meet all the requirements and characteristics described at the web site will be accepted.

Submission of original digital file will preferably be in RTF format. The .ODF format is also accepted. Other formats (such as DOC, .PDF, etc.) are excluded.

In the rare event that the author (s) of an article cannot submit manuscripts electronically, the article shall be traditionally mailed. However, it should include a copy of the article in the previously outlined digital formats. Manuscripts will be sent by postal mail to the following address: International Journal of Educational Excellence (IJEE), Escuela de Educación, Universidad Metropolitana (UMET), PO Box 21150 San Juan, Puerto Rico, 00928-1150. The attention should be directed to: Editor in Chief.

3. Authorship and Responsibility

The author (s) of the article should submit one copy of the original article and a statement certifying that the work is original and has not been published before and that it has not been evaluated by another journal editorial committee.

The author (s) must also declare that [a] all named authors have materially participated in the development of the research or study that has led to the article, [b] any conflict(s) of interest, and [c] the sources of funding of research presented in the article or of the preparation of the research.

They shall also explicitly accept the journal rules of publication and the decision regarding the publication or rejection of an article. The *International Journal of Educational Excellence* (IJEE) assesses and requires all high international standards of ethical conduct of research and journal publication.

4. Preparation of Manuscripts

Articles should be submitted in proper English (British or American, however, but a mixture of both will not be allowed), whose length will be at least 3500 words and a maximum of 12,000, including references, notes, tables and figures. Exceeding this amount of words will be a major negative factor in evaluating the article, although articles exceeding this extension can be exceptionally published if they are properly justified and the work stands out for its quality.

The article must be preceded by an abstract thereof with a minimum of 150 and a maximum of 300 words. It must also be submitted in English language along with Spanish and Portuguese translated versions. The summary should also include five to seven key words in English, Spanish and Portuguese.

Articles of theoretical nature as well as those based on field studies will be accepted, and they will be considered as a positive evaluation element if those articles maintain the classical structure in scientific research papers, consisting of separate sections and subsections (eg. Introduction, Objectives, Methodology, Analysis, Results, Discussion, Conclusions, Appendices and Annexes, etc.). However, freedom is offered to the authors to establish the most appropriate structure, depending on the nature and characteristics of their research (and is especially significant in the case of theoretical articles). What is required in all cases is that the division of the article be clearly defined and numbered by the structure 1 (with 1.1, if 1.1.1, 1.1.2, etc.), 2, 3, etc. Each title and subtitle of the sections and subsections should be clearly identified through the use of spaces.

Standards of quotation, including references, must be governed by the style of the APA (American Psychological Association), contained in the *Publication Manual of the American Psychological Association*. Please see the following examples which are explained within the next paragraph:

Citations to text:

Whenever there is a quote of the author or authors of a publication, it should appear in the text in parenthesis followed by the year -for example if a single author is cited (Smith, 2014), if the citation refers to two to five authors (Smith & Brown, 2011 / Smith, Brown & Torrero, 2009), or if there are more than six authors (Smith et al, 2014) - and the full reference will appear in the list of references at the end of the article. If two or more works are cited, they will appear in the same order in the reference list separated by a semicolon (James, 2001, Smith, 2014). If in the article two or more references by the same author published in the same year are cited, they should be differentiated by lowercase letters (a, b, c, d, etc.) added to the year; in the text quote, the corresponding lower case letter will be used in each specific reference (Smith, 2014a).

If the citation refers to a general idea of the work, or if it is a general reference to an article, book or full investigation, but is not literally quoting a portion of the reference, it is only necessary to refer to the author and year of publication, without specifying the page intervals.

If the citation is literally quoting a text from a specific work, the author, year of publication and the page intervals should be entered preceded by "p" for example, according to Smith (2014) "the university teachers with many teaching hours have difficulty in carrying out research work" (p. 379), / in his study he argued that "university teachers with many teaching hours have difficulty in carrying out research work" (Smith, 2014, p. 379) but the author did not show the statistical analysis of the survey results.

In case the direct quotations exceed 40 words it is necessary to set up them within a separate text block, and quotation marks are omitted. It is recommended to begin the quotation on a new line with a tab on the left margin

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of ½ inch or 1.25 cm, maintaining this margin along the length of the cite. Page intervals should be indicated as described in the preceding paragraph.

Sometimes, in the work, it may be necessary to refer to indirect quotations, i.e. presenting information or ideas of an author who has been picked up and quoted by some other one. In this case, the two authors are cited; starting with the indirect reference, for example, Brown (cited by Smith, 2014, p. 179) suggests that research is essential in university teaching. It is also recommended to find out and cite the original source.

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The list of references should appear at end of the article. With this information, the reader may access any of the sources that have been cited in the main body of the work. Each and every one of the sources cited should appear in the reference list. Similarly, each of the references that appear in this list should appear in the main text of the article at some point.

The references list appears at the end of main body of article, and after two spaces, using the title "References", with the same format as each of the subtitles that make up the work. All lines subsequent to the first line of each entry in the reference list should be indented ½ inch or 1.25 cm. The names of the authors appear inverted (last name then first initial or initials of the first names). The entries in the reference list should be ordered alphabetically according to the first author of each work. If several works by the same author have been cited, these entries should also be collected in chronological order, starting from oldest to the most recent. The full title of the work should be provided, keeping the title used by the publication. Capitalization of all major words of journal titles is recommended.

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At present, the rules of APA citation are widespread in the field of social research, and its style is the most currently used to cite sources in this area. Therefore in case of any doubt regarding citations, we recommend consulting the *Publication Manual of the American Psychological Association* (6th edition), where it multiple examples of formats of research papers, text citations, footnotes, references, etc. can be found; here we have offered only general guidelines.

General Format of Manuscripts:

The manuscript should follow the general format not only meeting the scientific requirements requested by this journal but also identifying the best possible characteristics of the article. Submission the manuscript in digital format, or RTF .odf, double-spaced in a standard size paper (8.5 "x 11") or A4 (21 x 29.7 cm) 1 "(or 2 cm) margins, is recommended. Although any easily readable source may be used, the use of Times New Roman 12 point is recommended. The manuscript should include a header at the beginning of the page, providing the main scientific information of the author and the work. These data are:

Title: should be as concise as possible, reporting the content of the article. It should be taken into account that quite often titles are used by scientific database systems and information retrieval, so it is advisable that it contain words directly related to the content of work. It must not contain abbreviations or acronyms that are not widely known. The title should be centered as the first element of the header. The APA recommends that it does not exceed 12 words in length, but if it were required by the nature of the work, it shall not prevent the acceptance of the manuscript.

Name of author (s) and affiliation: should appear in full below the title, separated by a double space using the following format: First Name, Middle Initial (if applicable) and last name (both names if Latin American author (s). Titles (Dr.) or degrees (PhD) may not be used. In order to allow the precise localization of the institution where the research was performed, its full address should appear below the name of each author (City, country, zip code). Finally, below the institution's address, the e-mail of each author should appear.

Mailing address of the corresponding author: In addition to email, full address for correspondence is recommended but not mandatory (telephone numbers, country and local codes). It may appears as a footnote.

Abstract: It should be placed after the name, affiliation and email address of the corresponding author separated by double space. As indicated above, it should have a length between 150 and 300 words. It will be sent in English, Spanish and Portuguese and should summarize the main features of the research work (as a minimum it is advisable to include a summary of the objectives, methodology and results, especially if it is based on fieldwork research). Future research may be included, especially if it has given rise to different questions that invite subsequent effort.

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Volume 4, Number 1 (2018)

Keywords: will be entered below the summary separated by a double space. We recommend providing five to seven key words that identify the work more precisely, and may help other researchers to find it in the international databases. The keywords will be sent in English, Spanish and Portuguese, and for their selection it is advisable to use the thesaurus most used in the specialty.

Article: Below the keywords, the author will place the main body of the text submitted for publication in the International Journal of Educational Excellence (IJEE), in accordance with the recommendations given in this Guide for Authors.

Scientific and professional record of author (s): Placed below the main body of the manuscript leaving three lines and as the last element of the manuscript to be submitted. The scientific and professional background of each author should not be longer than 300 words, specifying recent published papers.

Notwithstanding the guidelines outlined above, it is strongly recommended for preparing manuscripts, to follow the APA style compiled in *Publication Manual of the American Psychological Association* (6th edition).

5. Publication of Articles

Submission of a manuscript to the *International Journal of Educational Excellence* (IJEE), implies a previous statement by the authors that the work submitted to the journal is original and unpublished, that it has been the result of the authors' work, that all the signatories have materially participated in its preparation, and that the manuscript is not under evaluation for publication elsewhere, whatever the media, especially that it is not under evaluation by other scientific journals. All journal rules are also accepted, as well as final the opinion resulting from the academic evaluation of Article whether it is accepted or rejected for publication.

The editorial staff of the *International Journal of Educational Excellence* (IJEE) is not responsible for the opinions, analysis, or results collected by the authors in their articles. It is also assumed that all material in articles are free of copyright rights and therefore it is not responsible for any disputes or claims related to intellectual property rights, which are the sole responsibility of the authors.

The decision to accept or reject the publication of the manuscript will be notified within a maximum period of four months. The notification will be sent electronically (e-mail) to the corresponding author. If accepted for publication, the paper will appear in the next volume of the journal.

The articles published in the *International Journal of Educational Excellence* (IJEE) are digitally edited and will retained all the characteristics of those published in traditional print journals. The articles appear in PDF format, conveniently typeset and numbered as classical journals. Therefore, in this sense the editors facilitate their distribution of the journal and articles and the scientific citation or its contents according to all current standards, making available to the scientific community, valuable contributions resulting from the research. We can say, that in general, this is a publication that takes advantage of all the benefits that ICT offers for easy editing and distribution, considering also the ecological side of publishing without paper. This means that only those parts that are needed should be printed if the case arises. In addition, the digital format of the articles of the *International Journal of Educational Excellence* (IJEE) is adapted to the new computer and telematics tools used in scientific and academic contexts, easily allowing information searching, online and bases data indexing, etc. Access to the content of the *International Journal of Educational Excellence* (IJEE) is free, thereby contributing to the globalization of science and culture.

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International Journal of Educational Excellence

Volume 4, Number 1 (2018)

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CONTENTS

- COMPARATIVE ANALYSIS OF RESEARCH SKILLS AND ICT:
A CASE STUDY IN HIGHER EDUCATION**
Octaviano García Robelo and María Guadalupe Veytia Bucheli15
- NURSING EDUCATION, TRAINING AND PRACTICE IN THE
PREVENTION OF ULCERS IN ADULTS OVER 60 YEARS OF AGE:
A QUASI-EXPERIMENTAL STUDY**
Mary Nelly Soto Malavé, Alfonso García Guerrero, José A. Cervera Marín and
Zaida Vega Lugo.....29
- EXPERT-PANEL ACCREDITATION EVALUATION-PRACTICES:
AN AUTOETHNOGRAPHIC CASE-STUDY IN SPAIN**
Juan Arturo Rubio Arostegui.....63
- TEACHING PRACTICES IN THE 21ST CENTURY IN KENYA:
A QUALITATIVE APPROACH**
Regina K. Kaume-Mwinzi.....77
- FORMATION OF NURSING STAFF IN INTENSIVE CARE UNITS:
EVALUATION OF ADHERENCE TO RECOMMENDATIONS AND
VARIABILITY IN MANAGEMENT OF CENTRAL VENOUS
CATHETERS**
María A. Mercado De Jesús & José Miguel Morales Asencio101

Comparative Analysis of Research Skills and ICT: A Case Study in Higher Education

Octaviano García Robelo^a & María Guadalupe Veytia Bucheli^a

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Abstract: The development of research skills in relation to the use of Information and Communication Technologies (ICT) is studied in two groups of the Master of Science in Education at a public university of the State of Hidalgo, with the purpose of generating strategies to foster the development of such skills. The methodology approach is a non-experimental transactional design, in which a highly reliable questionnaire with a Cronbach's alpha of .95, was applied to evaluate seven factors. A descriptive statistical analysis of the data was carried out to compare a group of applicants to the master's program with a group of graduating students. Among the results, it was found that both groups showed a high percentage use of technology with laptops, tablets and cell phones. However, even though both groups reported having received training or having partial knowledge of the use of ICT, only a very small percentage uses these tools as a way to strengthen their research skills. It is therefore proposed to consider these results for the design of strategies that promote the development, knowledge and application of research skills supported by the use of ICT across the different courses that integrate the curriculum, in a way to ensure the best training for students while studying in the science education postgraduate program.

Key-words: Research Skills, ICT, Master's Degree, Postgraduate Program, Student Training.

1. Introduction

The University is one of the main driving forces in the 21st century society, and in front of the current scenarios of change, uncertainty, globalization and incorporation of Information and Communication Technologies (ICT) in the different fields of the life of the human being, it

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requires to make adjustments to its structure and educational model, in such a way that it responds assertively to current demands; moving from paradigms based on teaching, to paradigms oriented towards permanent learning and to the construction of knowledge, both individually and collaboratively, using the different rhythms and learning styles of each of the students.

Research as a substantive function of the University constitutes a priority axis to shift from an information society to a knowledge society, by carrying out search, identification, analysis, reflection, assessment of information, and problem-solving processes when generating new knowledge. Also, to use preexisted knowledge in a creative way, and finally, to disseminate the results of research, in print and electronic media. When working this process, higher order skills are strengthened.

For Ibarrola, Sañudo, Moreno & Barrera (2012), postgraduate research is a privileged strategy for learning, thanks to which research skills are developed and strengthened; that is, conceptual, procedural and attitudinal knowledge is oriented towards using different ways of thinking, construction of knowledge by means of the search, selection and evaluation of information, use of methods, techniques and tools, observation, analysis and interpretation of information, resolution of problems as well as decision making.

Regarding the development of research skills in graduates, there are some studies, standing among them Piña (2013), who ensures that students enter to the masters' program with different profiles, and therefore, the training process for research and developing a thesis is complex, since for several students, this would be their first experience working in such modality.

Another fact that has diversified higher education systems, as well as the development of the research processes, is the use of Information and Communication Technologies. Then it is relevant to think about Why are ICT used in master degree programs? What are they used for? Who uses them? How are they used? And in this sense, think about the research training at the master degree programs, what the current trend is from Ibero-American countries, and in which ways technologies are incorporated in the development investigative skills in the students.

Based on the previous thoughts, it is pertinent to conceptually define the term 'skills' and then to go deep specifically in the investigative skill. In a concrete way, the idea of skills in the educational field has been defined by a diversity of international authors and organizations, enriching itself over the years. OECD (2002) defines it as the skills that enable successful requirement of the demands by mobilizing social prerequisites. UNESCO (2009) affirms that this concept refers to meaningful learning, highlighting four features in its conceptualization: 1) it takes the context into account, 2) it is the result of a process of integration of knowledge, skills and attitudes, 3) it is associated with execution or performance processes, and 4) it implies a responsibility.

Perrenoud (2008, p.7) defines them as "an ability to act effectively in a defined situation, capacity that relies on knowledge, but is not limited to them". Zabala and Arnau (2007) define it as "that that any person needs to respond to the problems to be dealt along life" (p.45).

This research takes the concept of Tobón, Pimienta and García (2008) as a referent of skill, defined as "comprehensive actions to deal with activities and problems from the context, suitably and ethically, integrating ways of being, doing and knowing from a perspective of continuous improvement " (p.11). In this sense, skills are not something finished, but they are enhanced and developed throughout life, and from a systemic and complex perspective (Morín, 2007).

Particularly in this study, research skills, addressed from the view of Aguirre (2016) and Pérez (2012), imply using knowledge in an adequate way, strengthening the skills to observe, question, record field notes, experiment, interpret information, and disseminate their results, besides considering personal fulfillment and enrichment of their practice. A similar approach has been presented in Gómez (2016). According to Gayol, Montenegro, Tarrés and D'Ottavio (2008) research skills refer to the ability to mobilize conceptual, procedural and attitudinal knowledge to solve a problem in a defined context; that is, to articulate knowledge, attitudes and behaviors to integrate them into a methodology that puts them into practice.

Estrada (2014, p.180) argues that the research skill "has been conceived in higher education, both in the practical procedural and formal structural curriculum throughout the university career", although in the development of the thesis the use of scientific methodology is evident, for the identification and solution of a problem, both theoretically and practically, applying the stages of scientific research.

In a public university of the State of Hidalgo, the Master program of Science in Education establishes, knowledge, skills, attitudes, values and research skills in the admission's profile, considering the following: 1) Participate in experiences of research and generate action strategies to carry out information search, and 2) Communicate oral and written ideas in a clear, coherent and structured way to generate specialized speeches in the area of their training.

For the development of this research, we worked with a group of 11 graduating students, class 2016-2018, and a group of 17 applicants that would become the class 2018-2020. This study recovers the importance of assessing the development of research skills from the students' perception, and to develop research skills with technological resources, therefore, the following research question is proposed: What are the research skills with the use of Information and Communication Technologies with which students enter and graduate from the Master of Science in Education at a public university of the State of Hidalgo?

In order to answer this question, the following objective is considered: To conduct a diagnosis of research skills with the use of the technologies with which the students enter and graduate from the Master of Science in Education at a public university of the State of Hidalgo, to generate strategies that increase their development.

2. Method

The present research is approached from a quantitative methodology with a non-experimental transactional design (Hernández, et.al. 2010), from the construction and application of a highly reliable questionnaire, with Cronbach's Alpha .95, which was sent to the applicants digitally. The questionnaire consists of 70 items, organized into four sections: 1) General data, 2) Technology availability and Internet access, 3) Command of technological resources, 4) Research skills.

3. Results

A descriptive analysis of the results, from each of the categories established in the questionnaire is presented, from a group of applicants to the Master of Science in Education of a public university in the State of Hidalgo. In class 2018 -2020, 88% are women and 12% men, while in the class 2016-2018, 55% are men and 45% are women.

In the section Technology availability and Internet access, the Class 2018-2020 reported that 71% of the applicants own a computer while 29% does not. 94% owns a laptop, which probably covers this need in several places. 100% owns a cell phone, 65% does not own a tablet. 100% accesses the internet several times a day, which defines this is a need for the applicants; 53% accesses the internet for recreation activities, 29% for academic content from which 18% is related to art and culture. 65% has received information about the use technological resources to strengthen their research processes while 35% has not.

In the same section, Technology availability and Internet access, the Class 2016-2018 reported that 91% owns a computer while 9% does not. 100% owns a laptop, which probably covers this need in several places. 100% owns a cell phone, 9% does not have a tablet. 100% accesses to the internet several times a day; 82% accesses for recreation activities from which 18% is related to art and culture. 91% has received information about the use technological resources to strengthen their research processes while 9% has not.

In these results, when relating the Information and Communication Technologies (ICT) and the development of research skills, it was observed that the applicants, Class 2018-2020, own several electronic devices, such as laptops and cell phones; however, their use to support academic work is null.

Unlike the students of the Class 2016-2018, where 73% reported to have received information about the use technological resources to strengthen their research processes. In this sense, it is observable that not only is access to technology, but its use enhances the research they are developing.

Variable	Class 2016-2018		Class 2018-2020	
	Mean * (N=17)	Standard Deviation	Mean * (N=11)	Standard Deviation
Use of computer software (Word, Power Point, Excel).	17 3.36	.67	3.29	.84
Use of email (Gmail, Hotmail, Yahoo).	3.63	.50	3.47	.87
Use de browsers (Internet Explorer, Google Chrome, Firefox, Opera, Safari).	3.63	.50	3.47	.71
Resources to share imagery and video (Flickr, Slide Share, YouTube).	2.81	1.16	2.00	1.11
Resources for collaborative edition (Wikis, Google drive).	2.81	.75	1.88	1.16
Social media (Facebook, Twitter, Instagram, Snapchat).	3.54	.68	2.94	1.08
Blogs.	2.45	1.29	1.29	.98
Communication tools (Messenger, Skype, Hangouts, WhatsApp).	3.27	1.00	3.41	1.00

Table 1. Command of technological resources

*Answers organized as follows: 0 (never),1(occasionally), 2 (one or two 2 times a month), 3 (several times a week), 4 (daily). Source: Authors.

According to the analysis of Table 1, the mean's response for class 2018-2020 students was 2.71, and 3.18 for the class 2016-2018, which indicates that the applicants use these technological resources several times a week. The least used resource is "Blogs", and the most used are email and internet browsers. In their answers, some applicants referred to have never used certain resources, while others stated to use all the resources on a daily base.

These results indicate the need to train and encourage understanding of ICT and the development skills for research, since it is one of the objectives of the program in Science Education.

Variable	Class 2016-2018		Class 2018-2020	
	Mean * (N=11)	Standard Deviation	Mean * (N=17)	Standard Deviation
Used concepts and key words to search for information in the	3.54	.52	3.41	.79

internet.				
Used internet advanced search with Boolean terms	1.90	1.30	1.58	1.32
Use of search engines and meta search engines (Google, Yahoo, AltaVista, Excite).	3.45	.68	2.58	1.22
Use of digital libraries (UNAM, ILCE, Biblioteca Digital Mundial, Biblioteca Digital Hispánica).	3.18	.75	2.47	.94
Use of high impact factor electronic journals (JCR, Scopus, Indexed in: Redalyc, Latindex, Scielo, MIAR, DOAJ, ORCID).	3.00	1.26	2.41	1.06
Use of reference managers (Mendeley, Zotero, Endnote, RefWorks).	1.54	.93	1.00	.93
Use of ICT for document and file storage (Dropbox, Pocket, One Drive, iCloud).	2.90	.94	2.29	1.26
Data base search (Eric, Dialnet, Ebsco Host, Google Académico, Latindex, Redalyc).	3.00	1.00	2.11	1.31
Use of thesaurus for information search (VOCED, ERIC, TESE, UNESCO, OIT).	1.18	1.07	.94	1.08

Table 2. Research-inquiry skill.

*Answers are organized as follows: 0 (never), 1 (rarely), 2 (sometimes), 3 (almost always), 4 (always). Source: Authors.

This research is supported by a process stems from the need to estimate the content validity of a test, as noted above, it has carried out an expert opinion. To do this we have collected information systematically, following the steps pose Escobar-Pérez and Cuervo-Martinez (2008):

Mean for the class 2018-2020 is 2.23 against 2.63 of the class 2016-2018, a closer response to the occasional use of these resources totally related to activities or the development of research products and inquiry, to a degree that most of the participants answered that they have never used them, as they do not know or need them. The skill that they have most developed was the use of keywords for information search, which indicates that this skill is limited, with the need to develop it, as it is essential to inquiry and research.

Among the lowest scores in this category are the use of Boolean operators with 1.90 in the class 2016-2018 and 1.58 in the 2018-2020. Also, reference managers as well as the use of thesauri for information search presented a low percentage. In this sense, it is important to think about the

level of research inquiry skill that both applicants and students of the master program possess. If adequate strategies were generated for information search, it would be possible to advance deeply in the object of study; otherwise valuable time is lost in the search and use of unintelligent information, increases the number of sources with limited scientific validity.

Variable	Class 2016-2018		Class 2018-2020	
	Mean * (N=17)	Standard Deviation	Mean * (N=11)	Standard Deviation
Save a webpage when relevant for the research Favorites in Internet Explorer or bookmarks in Mozilla Firefox).	3.7273	.46710	2.94	1.19742
Use social marks to save and classify the information found on the internet (tags).	2.1818	1.07872	1.52	1.23
Saved the information in managers (Zotero, Mendeley, End-Note).	1.0000	1.00000	.76	.97
Save information found in my computer using 'save as'.	3.6364	.92442	3.05	1.19
Review the history in my computer to identify information previously found.	2.6364	1.43337	2.76	1.30
Organize the information found in themes, levels or categories.	3.0909	1.04447	2.17	1.18
Use technological tools appropriately to cite in a requested style (APA, Harvard, Chicago and others).	2.5455	1.21356	2.23	1.09

Table 3. Organizational research skill

*Answers are organized as follows:0 (never),1(rarely), 2 (sometimes), 3 (almost always), 4 (always). Source: Authors.

The mean for the organizational skill (Table 3) for the Class 2018-2020 is 2.04 against 2.68 for the Class 2016-2018, which indicates that they sometimes use ICT to organize the information required. This is probably related to the first results in which they referred the use of ICT for recreation or cultural purposes; however, to do research, it is necessary to organize, recover and store the necessary information.

After information searching, selection is one of the most meaningful characteristics for someone who is training in research. The results obtained are remarkable in the limited use that both students and applicants have of technological tools such as reference managers, which is a resource that favors the organization of information, as well as its classification in

categories and subcategories, enabling a macro, mesa and micro view of the documents that have been reviewed.

Variable	Class 2016-2018		Class 2018-2020	
	Mean * (N=11)	Standard Deviation	Mean * (N=17)	Standard Deviation
Qualitative data analysis of information with specialized software (Nud.ist, Atlas.ti, Aquad, Ethnograph).	2.18	1.16	.88	1.05
Quantitative data analysis of information with specialized software (SPSS, SAS, BMPD, STADISTICA).	1.90	1.44	1.05	1.34
Use of plagiarism check software (PlagScan, Turnitin, Paper rater, Plagium, Plagiarism Cheker).	.45	.82	.23	.66
Use of software for visual data (Cmaptools, Hohli, WriteMaps, Diagramly, Google Chart Tool).	1.45	1.03	.47	1.06

Table 4. Analytical research skill *Answers are organized as follows:0 (never), 1(rarely), 2 (sometimes), 3 (almost always), 4 (always). Source: Authors.

The mean for the analytical research skill for the Class 2018-2020 is .66 compared to 1.49 in the Class 2016-2018, which indicates that participants never or rarely use this skill. Although their answers range from never (0) to always (4) about the use of specialized software for the analysis of qualitative or quantitative data, the low mean's response indicates a need to attend it, especially with the class 2018-2020, since the use of these software is fundamental to get to precise results during research.

The use of specialized software for both quantitative and qualitative analysis are resources that facilitate the organization of data and do deep in terms of the reflection around them; however, on one hand, it requires technological understanding of the software used, as well as clarity of what, how and why is to be analyzed, to achieve greater consistency in the results obtained, to reduce time for analysis, to represent information in a variety of formats, and well as to consolidate their work.

Variable	Class 2016-2018		Class 2018-2020	
	Mean * (N=17)	Standard Deviation	Mean * (N=11)	Standard Deviation
Use of Google Drive, Dropbox, OneDrive to share and create documents.	3.63	.67	2.76	1.34
Use of groups and chat to ana-	2.36	1.02	2.17	1.33

lyze, share and discuss information.				
Work in the virtual platform.	2.09	1.30	1.70	1.44
Use of Wikis to create collaborative knowledge.	1.45	1.12	.52	1.12

Table 5. Collaborative research skill

*Answers are organized as follows:0 (never), 1(rarely), 2 (sometimes), 3 (almost always), 4 (always). Source: Authors.

Regarding the collaborative research skill, the Class 2018-2020 obtained a mean's response of 1.79 compared to 2.38 of the Class 2016-2018, which tends to indicate that the applicants sometimes use this skill; some of them have never used it, and others, to a lesser extent, always do. When these resources derived from ICT facilitate network communication to develop group activities for research activities or products, with all the benefits of quality, flexibility, time and economy in many cases.

The development of collaborative work in the society of the 21st century is one of the priority activities, both in the academic and professional fields, and of course in the scientific field. Since collaborative networks are currently generated to do institutional and inter-institutional research nationally or internationally, training in research requires the development of collaborative processes since their earliest stages, to lead to the construction of learning communities where each one of its members have something to learn, and something to contribute to their colleagues.

Variable	Class 2016-2018		Class 2018-2020	
	Mean * (N=17)	Standard Deviation	Mean * (N=11)	Standard Deviation
Use of technological tools to present results (Glogster, Infografía, Prezi, Emaze).	2.3636	1.12006	1.41	1.46
Interchange of experiences in discussion forums and chats.	2.0000	1.00000	1.35	1.11
Participation in virtual congresses.	.8182	.75076	.41	.71
Member or collaborator in a research network.	1.0909	1.44600	.52	.94
Creation of online profiles (Google Academic, ResearchGate, ORCID).	1.1818	1.60114	.64	1.05

Table 6. Communicative research skill

*Answers are organized as follows:0 (never),1(rarely), 2 (sometimes), 3 (almost always), 4 (always). Source: Authors.

Regarding the communicative research skill, the Class 2018-2020 obtained a mean's response of 1.05, compared to 1.49 for the Class 2016-2018. This suggests that they seldom use this skill, as they have almost never participated in virtual congresses nor have they been members or collaborators in research networks. This might be a characteristic of some universities in which research is scarce and students are rarely involved in research activities or encouraged to participate in virtual congresses.

The use of this skill allows students to present partial or global progress of their research, both orally and in written form, and in some cases, receive an opinion or point of view from experts in the field; and in this way, expand the vision of object of study from several theoretical positions, as well as empirical experiences resulting from their research work.

Variable	Class 2016-2018		Class 2018-2020	
	Mean * (N=17)	Standard Deviation	Mean * (N=11)	Standard Deviation
Assessment of electronic sources (textual and non-textual documents, multimedia documents, hypertexts).	3.00	1.26	1.94	1.59
Use of technological tools to organize hierarchically main and secondary ideas (cmaptools, imindmap, freemind, mindomo, infographics).	1.36	.92	1.23	1.43
Argumentation using diverse electronic sources.	3.18	.87	2.29	1.53
Establishment of a personal position upon reflection on the electronic sources.	3.18	.98	2.47	1.23
Reflection on the different positions of the authors found in the electronic documents.	3.09	1.13	2.82	1.18

Table 7. Reflective research skill

*Answers are organized as follows: 0 (never), 1 (rarely), 2 (sometimes), 3 (almost always), 4 (always). Source: Authors.

Participants of the Class 2018-2020 obtained a mean's response of 2.15 compared to 2.76 of the Class 2016-2018 (Table 7). This suggests that sometimes they use the reflective research skill. In postgraduate studies, this skill requires high levels of cognitive activity and functions, such as analysis, reflection, decision-making, interaction and generation of new knowledge supported on electronic, valid and reliable sources and resources.

With the use of technological tools such as cmaptools, imindmap, freemind, mindomo and infographics, students explore diverse ways to

present information obtained when reviewing different references and electronic sources. Therefore, this skill implies not only the use of the technological tool, but the development of a higher order cognitive process that exceeds the technological instrumentation as well as the use of information as the base for meaningful construction of knowledge.

4. Conclusions

In This study lead to the identification of the main research skills that both applicants and students of the Masters of Science in Education from in a public university of the State of Hidalgo use. Coincidences in a more frequent use of electronic devices are presented for both classes. A negligible difference between the use of specific technological tools that facilitate the development of the investigative, organizational, analytical, collaborative and reflexive skills is observed.

Although both, the applicants and the graduating students of the Master of Science in Education, own laptops and other electronic devices, and more than half mentioned having received information about the use of ICT related with research, they do not carry out activities to use ICT to develop skills for research. This leads to think about the training in research that participants developed in their previous studies, as well as the use of ICT in their current professional or work activities. It is necessary to promote the development of knowledge in ICT related to research skills in undergraduate and postgraduate studies.

It is a fact that the use of ICT has considerably increased in recent years in several fields. It is very common to observe postgraduate students coming to the classroom with one or more electronic devices such as cell phone, ipad and laptop; however, after this first diagnosis in both classes of the Master of Science in Education, it is remarkable that its use is from an instrumental perspective and not necessarily from a pedagogical or research perspective.

Both applicant and graduating students referred to regularly use ICT. Nevertheless, they have not used tools that favor collaborative work such as Google Drive and blogs, which enhance the development of research processes. To become a good researcher, it is necessary to develop inquiry skills, where ICT offers a diversity of resources for the search, analysis, selection and integration of knowledge and information that is fundamental to develop the theoretical and methodological frameworks for the grounds, publication and dissemination of research. Therefore, it is necessary to constantly review and strengthen inquiry and research skills in postgraduate students.

During their training, applicants and graduating students of the Master of Science in Education were able to understand and use, from lower to higher intensity, the conceptual, procedural and attitudinal knowledge on the use of

ICT for a variety of activities; particularly for assignments, ICT-related courses and online practice. Since the orientation of the Master of Science in Education is research-based, the use of Information and Communication Technologies can be done transversally in each of the seminars to be taught.

The findings of this study present a picture about the level of use of ICT to perform research activities by students of two classes; one that is about to begin and the other that is about to graduate. At the same time, it constitutes an area of improvement for each one of the academicians that participate as professors in the seminars of the Master of Science in Education, by using ICT as didactic resources to strengthen the research processes in their students, generating activities oriented towards the construction of knowledge, both individually and collaboratively.

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Nursing Education, Training and Practice in the Prevention of Ulcers in Adults over 60 Years of Age: A Quasi-Experimental Study

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Abstract: The purpose of this article is to evaluate the effectiveness of the implementation of the methodology of NANDA NIC NOC Nursing, and the effectiveness of the Norton Scale in the prevention of ulcers in patients 60 years or older admitted by the emergency room area in a hospital in Puerto Rico and suggest the implementation of a protocol of a preventive nature on from the professionals in Nursing with the support of relatives and caregivers. Our research was completed applying a quasi-experimental methodology. The population and the sample are two hospitals (Hospital A-Experimental Group and Hospital B-Control Group). For each hospital a sample of 20 nurses (Total 40) and 40 patients (Total 80) were included, for a general total of 120 participants. The design is quasi-experimental. The analysis was performed with SPSS-version 20 for descriptive and inferential statistics. The GE Nursing staff reflected optimal use of the NANDA NIC NOC and Norton Scale methodology for the prevention of PPU in a 24-hour period in patients admitted to the emergency room. The process of documentation of interventions for skin assessment; postural change, examination and skin hygiene and pressure relief device was evident. No development of pressure ulcers was reported in patients with EG. The GC protocol for Staging Ulcer Management integrates valuable information; however, the results show that it is not consistently used by nursing staff to document interventions with patients admitted to the emergency room.

Key-words: Nursing Competencies, Nursing Education; Ulcer Prevention Family; Continuing Education; Nursing Professionals.

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1. Introduction

The development of ulcers in bedridden patients 60 years of age or older, waiting to be treated, has become a serious health problem in emergency rooms. As this can be worse than the disease that leads to a hospital in search of health services.

The study addressed four (4) objectives, which obey the prevailing need to demonstrate in practice the effectiveness of evidence-based nursing interventions to prevent the development of pressure ulcers (PUFA) in patients 60 years or older. The issue has been researched globally for many years; however, the problem continues to present ethical, moral and economic repercussions for hospital institutions as well as the suffering for patients and families. Hibbs (1987) described the effects of pressure ulcers as "an epidemic under the sheets".

Nursing staff are called upon to assess the risk of developing pressure ulcers through an individualized and effective preventive and care plan. Nursing staff has NANDA diagnostics, NIC interventions and NOC results. All this constitutes a fundamental tool to function as a starting point for the establishment of a quality program focused on the improvement of outpatient care, to facilitate teamwork and to allow the objective practice of care.

The objectives of the study include: 1) Analyze if there is a significant difference in the development of pressure ulcers (PPU) among a group of patients 60 years or older admitted to the emergency room area of Hospital A (GE) exposed to the skin assessment intervention based on the NANDA NIC NIC and Norton Scale methodology and another group of patients over 60 years old of Hospital B (GC) exposed to the protocol established at the institution for the care of the skin Ulcer Management by Stages; 2) Analyze if there are significant difference in the development of pressure ulcers (PU) among the patients of the GE whose relatives and / or caregivers receive instructions from the nursing staff on the care of the patient's skin to prevent the development of pressure ulcers (PU) based on the parameters of the NANDA NIC NOC and Norton Scale methodology and the CG patients whose family members and / or caregivers receive instructions from the Nursing staff based on the protocol established by the institution, Management of Stage Ulcers; 3) Analyze if there are significant difference in the development of pressure ulcers (PU) among GE patients exposed to periodic skin titration rounds in intervals of between 2 to 3 hours for a term of 24 hours according to the methodology NAND NIC NOC and the Norton Scale and GC patients exposed to skin titration rounds for a 24-hour term based on the protocol established by the institution for skin care Ulcer Management by Stages; and 4) Analyze the effectiveness of the NANDA NIC NOC Nursing methodology in reducing and preventing development of pressure ulcers (PU) in patients 60 years and older admitted by the emergency

room area of the EG versus the provided Nursing intervention In the Stage Ulcer Management GC.

Four questions were raised following the quasi-experimental design of the study. The first research question addressed the difference in the development of PPU between the SG patients and the CG patients from the assessment construct and skin care plan. The second research question addressed the difference in the development of PPU between the patients of the EG and the patients of the GC from the construct instructions of the nursing staff on the care of the patient's skin to relatives and caregivers. The third question addressed the difference in the development of PPU between the SG patients and the CG patients from the construct exposure to periodic rounds of skin titration. The fourth question was aimed at evaluating the effectiveness of the intervention methodology used with the patients of the EG versus the methodology of intervention used with the patients of the CG in the decrease and prevention of the development of UPP.

The results provide evidence of the effectiveness of the systematic use of the NAND NIC NOC and Norton Scale methodology in the prevention of PU in patients over 60 years old admitted to the emergency room and of the importance of involving family members and caregivers in the interventions from a preventive approach. The results of the study are presented for each question posed and are discussed fundamented on the revised literature on the subject. It summarizes the implications of the results for the hospital and care institutions of people over 60 years of age, higher education institutions (HEIs) that offer Nursing Science preparation programs, family and caregivers, and leaders in charge of Public policy in Puerto Rico.

This study can be replicated in other hospitals and care facilities for elderly people in Puerto Rico and in other countries with the objective of carrying out comparative studies aimed at establishing protocols of nursing interventions based on proven effective methodologies.

2. Methodology

2.1 Instruments and Participants

2.1.1 Instruments

The instruments implemented in our study are presented below followed by the description of their structure and approach concerning data collection. The principal investigator used secondary data collected from Instruments I and II of 40 patients admitted to the emergency room at Hospital A (GE) and 40 patients admitted to the emergency room of Hospital B (GC), respectively, in the period between Wednesday, June 1, 2016 and Friday, July 29, 2016, once approved from the Institutional Review Board of

the Sistema Universitario Ana G. Méndez (IRB-SUAGM, for its acronym in Spanish).

Instrument I. Registry of Skin Assessment and Nursing Interventions by the Professional Nursing Staff of Hospital A (Experimental Group). It collects the information required to assess the effectiveness of the implementation of NANDA, NIC and NOC Nursing methodology, education to family members and / or caregivers as well as the integration of systematic rounds at intervals of between 2 and 3 hours in the reduction and prevention of the development of pressure ulcer (PU) in patients 60 years or older admitted to the emergency room area. Instrument I consists of three (3) parts: Part I - Socio-demographic Data; Part II Norton Scale to assess risk; Part III - NANDA NIC NOC to evaluate nursing interventions. The alphanumeric code sequence of the instrument is: HAGE-I 001; up to HAGE-I 040.

Instrument II. Skin Evaluation and Nursing Interventions Registry by Hospital B Nursing Staff: The Management of Stage Ulcers (Control Group) is based on the Hospital Stage B Ulcer Management protocol. Instrument II consists of three (3) parts: Part I - Socio-demographic and health characteristics; Part II - Nursing Interventions by Stages; Part III - Comments. The alphanumeric codes sequence of codes of the instrument is: HBGC-II 001; to HBGC-II 040.

Instrument IIIa. Emergency Room Nursing Personnel Data Registry of the Three (3) Hospital Shifts. It is designed to collect the following information: years in the profession, academic preparation, a question to know if they had participated in courses of skin management; another that asks to identify the main focus of the course (s) you have taken, the topics covered and if you have helped in your professional practice; it concludes with a space for staff to express their training needs on the subject of skin management. For Instrument IIIa of Hospital A - Experimental Group the sequence of alphanumeric codes is: HBGCIIIa-001; To HBGCIIIa-020.

NANDA NOC NIC Training Module / NORTON Scale for Nursing Staff of Hospital A. This Module was developed by the researcher based on parameters of the Andalusian Guide for Patient Caregivers, the NANDA NIC NOC methodology and the Norton Scale. It was created with the purpose of providing the professional Nursing staff of the GE with training on the implementation of the proposed methodology for the prevention of pressure ulcers in patients over 60 admitted through the Emergency Room. The training was provided by the doctor in the training facilities of hospital A.

We highlight the following data related to the NANDA NIC NOC methodology and the Norton Scale. The Norton Scale sets a maximum score of 20 and specifies that a score of 14 or less represents risk of ulcers; 13-14 mean risk; 10-12 high risk; 5-9 very high risk. The intervention of the nursing staff was based on activating the following parameters of the methodology NANDA NOC NIC: NANDA-Code 0047 Risk of deterioration of skin

integrity; NOC (NANDA Outcome Code) Code 1101 Tissue integrity of skin and mucous membranes; NIC Intervention Codes - Code 3540 Prevention of PPU, Code 3590 Skin Surveillance and Code 3500 Pressure Management Nursing interventions 2 through 8 included: postural change, skin examination and hygiene, and pressure relief device.

2.1.2 Participants

The study was concluded in two hospitals: Hospital A (GE) and Hospital B (GC). In each hospital, a sample of 20 nurses (40) and 40 patients (80) were used, for a total of 120 participants.

The selection of study participants was for convenience (Teddlie & Yu, 2007). The inclusion criteria corresponds to secondary data of patients accompanied by family or caregiver, admitted by different medical conditions, whose stay or hours in the emergency room is 24 or more. Exclusion criteria corresponds to secondary data from patients who have suffered from ulcers or who suffer from them at the time of admission to the emergency room and patients with less than 24 hours in the emergency room.

The intentional or intentional sampling technique used was based on the investigators' judgment as to who could provide the best information to achieve the study objectives and were willing to participate (Teddlie & Yu, 2007). According to Teddlie & Yu, "Purist sampling techniques can be defined as units of selection (eg individuals, groups of individual institutions) based on specific purposes associated with responding to the questions of a research study" (2007, p.77). This sampling was extremely appropriate since one of our main objectives was to evaluate and describe the effectiveness of the implementation of NAND NIC NIC and Norton Scale in the prevention of pressure ulcers in a hospital facility in Puerto Rico.

Hospital A (GE), is located outside the metropolitan area of San Juan, capital of Puerto Rico. It complies with the Regulation Secretary of the Department of Health Number 117 for Licencing Regulations, Operation and Maintenance of Hospitals in the Commonwealth of Puerto Rico, the hospital has 16 beds for the admission of patients in the emergency room and 20 professional nurses.

Hospital B (GC) is located in the metropolitan area of San Juan, Puerto Rico. It complies with the Regulation of the Health Department Number 117 to Regulate the Licencing, Operation and Maintenance of Hospitals in the Commonwealth of Puerto Rico and with the accreditation of the Joint Commission Accreditation Hospital for more than 13 years. The hospital does not have beds in the emergency room, it has 27 stretchers for the admission of patients in the emergency room and 20 professional nurses. These hospitals offer medical services for patients whose condition requires a surgeon.

2.1.2.1 Socio-demographic profile of GE and GC nursing staff

The total frequencies for both hospitals in terms of years of nurses' experience are presented in Figure 1. There is no statistically significant difference between the years of experience of nurses in hospital A (GE) and B (GC): $\chi^2 = 16.1333$, $GL = 14$ and $P = 0.3053$.

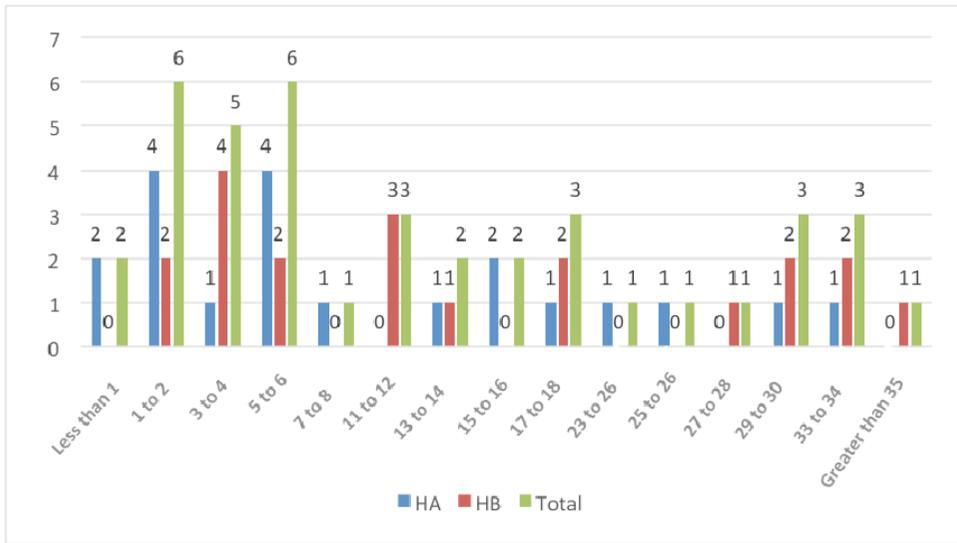


Figure 1 Frequencies in the ranges of years of experience of HA and HB nurses

The second variable corresponds to academic degree: Associate Degree or Baccalaureate. There is no statistically significant difference between the academic preparation of the nurses of the Experimental Group and the Control Group (Snedecor Test $F = 1$; $tStat = 0$; $CI = 95\%$).

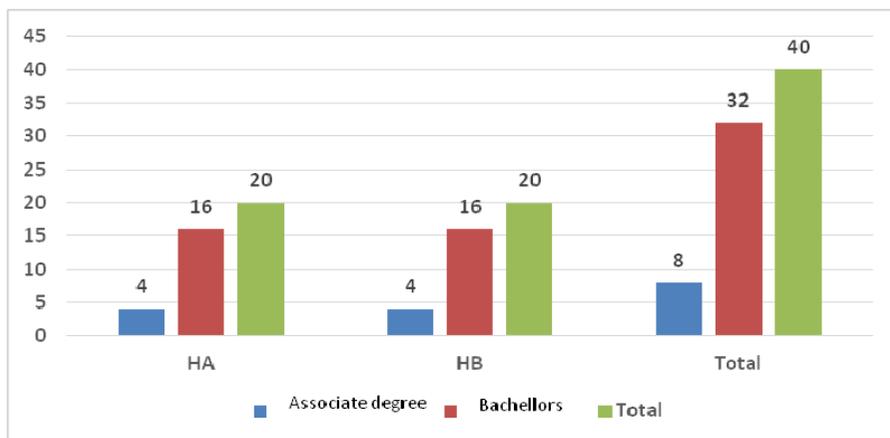


Figure 2 Frequencies for the variable "Academic Degree" of nurses

In the variable "participation in courses", there was no statistically significant difference between the participation in courses of the nurses of the GE and of the CG ($X^2 = 1.457$, $GL = 2$, $P = 0.43$)

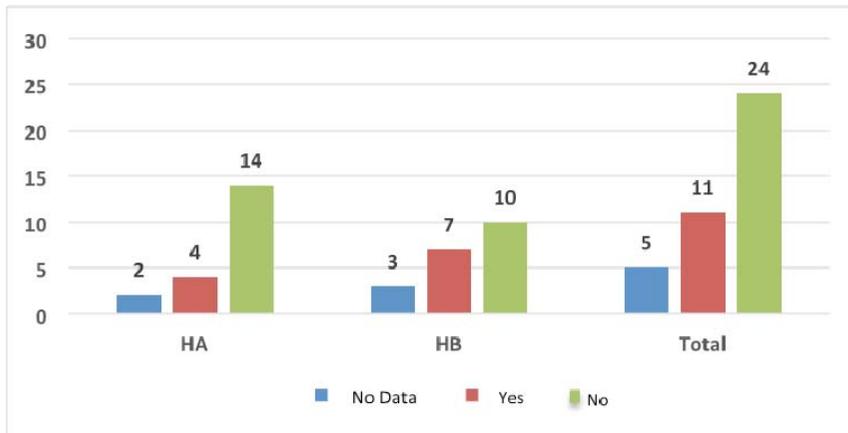


Figure 3 Frequencies for the variable "Has participated in courses"

In the variable "Main focus of the course that took or courses": Preventive, Curative or No data, no statistically significant difference was found between the main focus of the course taken by the nurses of the GE and those of the CG ($X^2 = 2.8$, $GL = 2$, $P = 0.2427$)

Figure 4 shows the frequencies of the variable "main focus of the course or courses taken by the nursing staff of the GE and the GC (31/40 = 78% did not provide the data, 5/40 = 12% preventive approach and 4 / 40 = 10% curative approach)

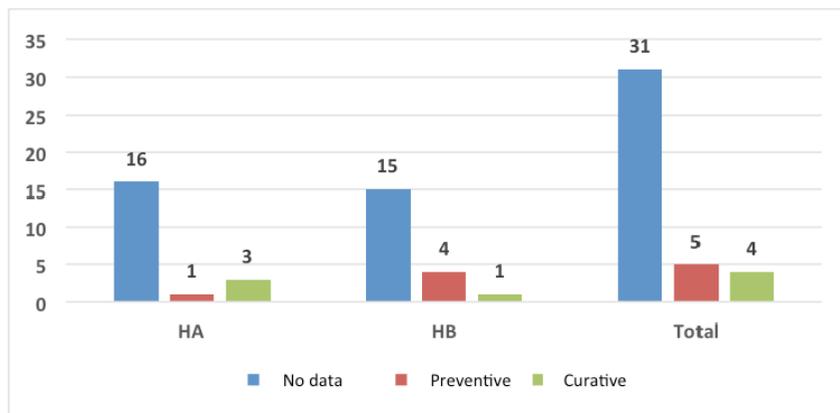


Figure 4 Frequencies for the variable "Main focus of the course or courses taken"

The results of the administered pre-test and post-test to the nurses of the A (GE) hospital show a statistically significant difference between the results of pretest (5.60) and post-test (9.90) administered by the doctoral student to the nursing staff of the GE during training in the NANDA NIC NOC methodology and the Norton Scale (Paired Wilcox test = -3.868; P = 0.000).

	Mean	Standard deviation	Variance
Pre-test	5.60	1.635	2.674
Post-test	9.90	.447	.200
Difference	4.4	1.191	2.474

Table 1 Descriptive statistics of pre and post-test results administered to nurses

2.1.2.2 Demographic and epidemiological profile of the patients of the EG and GC

The profile was respectively compiled through instruments I and II.

Rango de edad	HA (GE)		HB (GC)		Total	
	Age range		<i>f</i>	%	<i>f</i>	%
60-65	6	15.0%	9	22.5%	15	18.75%
66-71	3	7.5%	6	15.0%	9	11.25%
72-76	7	17.5%	6	15.0%	13	16.25%
77-82	5	12.5%	5	12.5%	10	12.50%
83-87	5	12.5%	5	12.5%	10	12.50%
88-93	11	27.5%	5	12.5%	16	20.00%
94-99	3	7.5%	4	10.0%	7	8.75%
Total	40	100.0%	40	100.0%	80	100.00%

Table 2 Age ranges for HA patients and HB patients

The T-Student test was used, the type of nominal variable (age range) was coded to numerical (60-65 = 1, 66-71 = 2, 72-76 = 3, 77-82 = 4, 83-87 = 5, 88-93 = 6 and 94-99 = 7); we found the averages (\bar{x}) for each set of data; the Snedecor F test (0.758) was performed; Student's t-test (tStat = 1.2852) was performed with P = 0.2025. There is no statistically significant difference between the age ranges of hospital A (GE) and B (GC) patients.

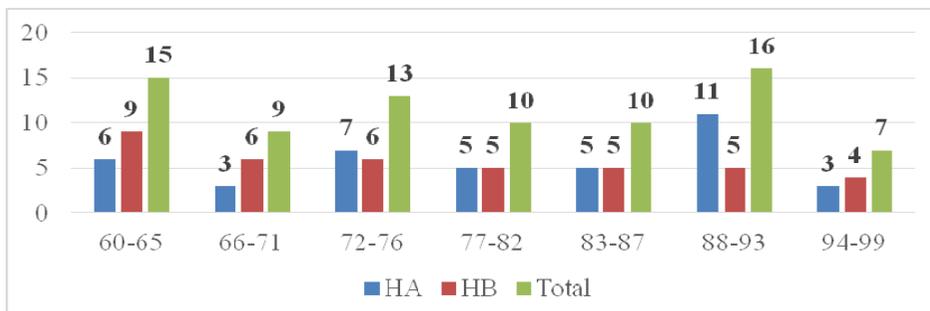


Figure 5 Frequencies for the age ranges of the participants

The variable "gender distribution" of the patients of hospital A (GE) can be seen in Figures 4 and 6.

Gender	HA (GE)		HB (GC)		Total	
	f	%	f	%	f	%
Masculine	17	42.5%	7	17.5%	24	30.0%
Femenine	23	57.5%	33	82.5%	56	70.0%
Total	40	100.0%	40	100.0%	80	100.0%

Table 3 Distribution by gender of patients in hospital A and hospital B

There is a statistically significant difference between the gender of the EG and GC patients ($t\text{-Stat} = -2.504$; $P = 0.0143$).

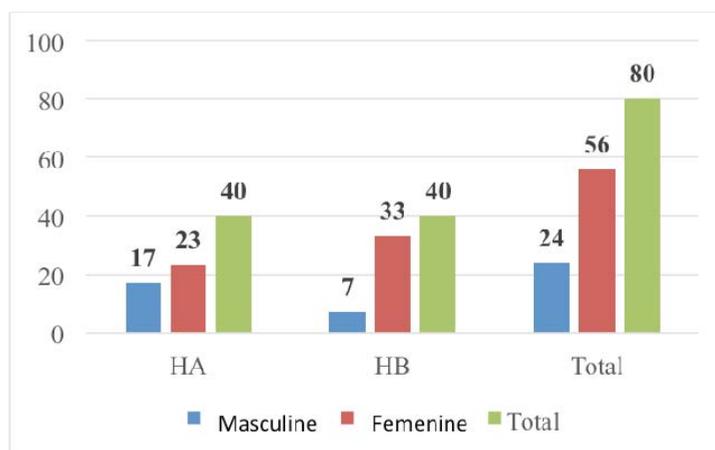


Figure 6 Gender frequencies in patients in hospital A and hospital B

For the variable "body mass" of Hospital A (GE) and B (GC) patients, no statistically significant differences were found ($F = 0.115$; $t\text{Stat} = 1.3215$; $P = 0.1902$).

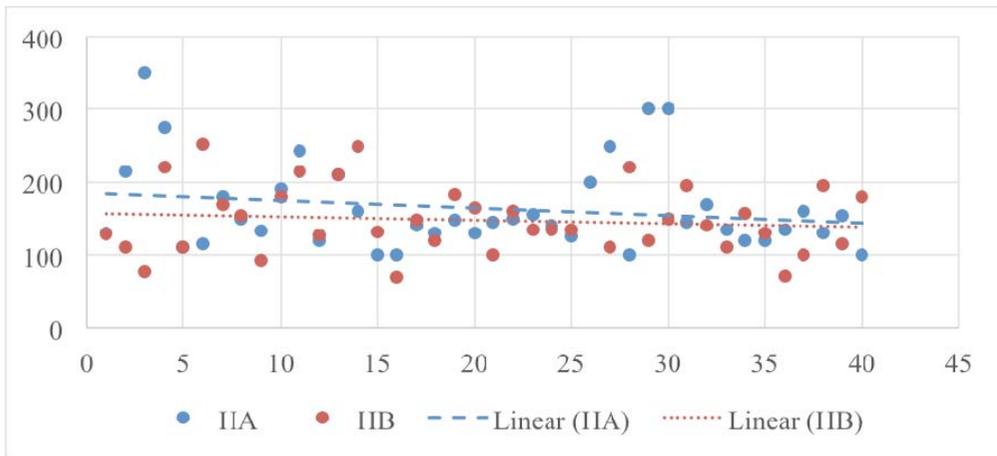


Figure 7 Dispersion of body mass of patients from hospital A (GE) and hospital B (GC)

The chi-square test (X^2) was used For the "Patient Disposition" variable. Figure 8 shows the frequencies of this variable.

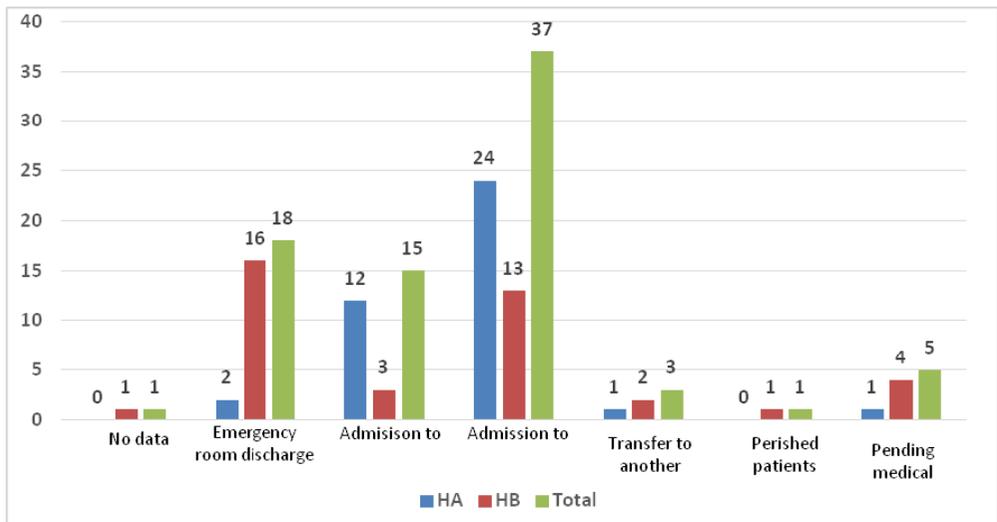


Figure 8: Frequency of patient disposition

It was determined that there is a statistically significant difference between the patient's disposition of hospital A (GE) and B (GC) ($X^2 = 23.6925$; $GL = 6$; $P = 0.0006$). For the variable "Condition of the patient", the X^2 test was performed with the purpose of validating whether or not there is interdependence between the data sets for patients in hospital A (GE) and patients in hospital B (CG) with a confidence of 95% ($X^2 = 10.8731$; $GL = 7$;

P = 0.14425). We found statistically significant difference between the SG and the GC this variable.

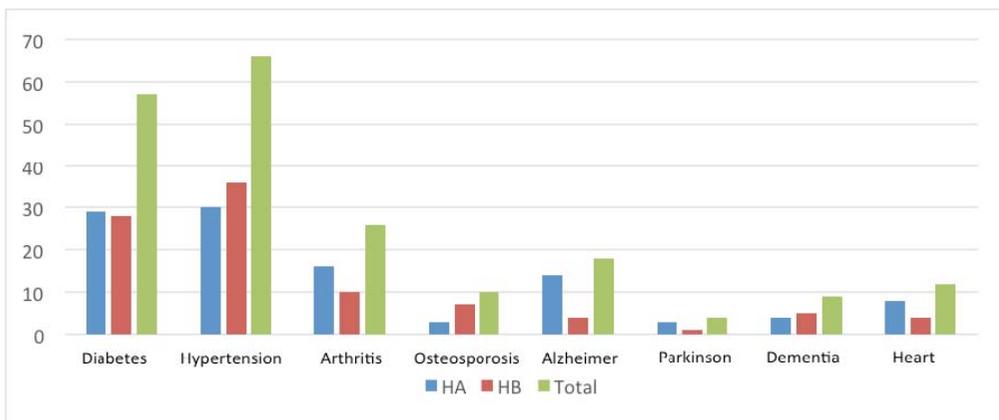


Figure 9 Frequencies for the variable "Condition of the patient"

2.2 Design

The research corresponds to a quasi-experimental design: 1) An Experimental Group (Hospital A) with a sample of 20 nurses trained by the researcher in the NANDA NOC NIC methodology and the Norton Scale for the prevention of pressure ulcers (PU) and secondary data provided by of 40 patients admitted by emergency room; 2) A Control Group (Hospital B) constituted by 20 nurses who did not receive the training who used the protocol of Stage Sores Management prescribed by the hospital and secondary data provided by 40 patients admitted to the emergency room. In the study we collected quantitative and qualitative data (Hernández, Fernández & Baptista, 2006), which were triangulated to integrate the interpretation of the results into the form of inferences to comply with the goal defined by Tashakkori & Teddlie as "construction by an investigator of the relationships between people, events, and variables, as well as their construction of the respondents' perceptions, behaviors and feelings, and how they relate to each other in a coherent and systematic way "(Handbook of Mixed Methods in Social & Behavioral Research, Chapter 1 , Page 27, 2010). The analysis of the data provided the basis for establishing the effectiveness of the use of the Norton Scale and the NAND NIC NOC methodology implanted in the GE on the GC Staging Ulcer Management protocol. The Statistical Package for the Social Sciences was used for data analysis.

2.3 Procedure

Table 4 summarizes the research procedure for (GE and GC).

Investigation Procedures	Experimental Group Hospital (GE) Procedures	Control Group Hospital B (GC) Process
	Part I	Part I
	20	20
	Professional Nurses	Professional Nurses
	<ol style="list-style-type: none"> 1. The principal investigator will conduct the Training session requested by the Director of Nursing Department or Hospital A emergency room personnel on the NANDA NIC NOC Methodology and the NORTON Scale on June 1, 2016. 2. The training will last 4 hours. 3. The first part of the training session will be devoted to the presentation and discussion of the Information Sheet corresponding to Hospital A. This part will be extended between 20 and 30 minutes. 4. Once the principal investigator has answered all the questions and clarified the doubts expressed by the participants, will proceed with the training in the order established in the Module. 5. At the end of the training, they will receive a sealed envelope from the principal investigator with 10 copies of <i>Instrument I - Registry of Skin Assessment and Nursing Interventions</i> by Hospital Professional Nursing Staff A (Experimental Group A), coded in sequence with the corresponding alphanumeric code. 6. Nurses will use <i>Instrument I - Registry of Skin Assessment and Nursing Interventions</i> by Hospital A Professional Staff (A-Experimental Group) to document their interventions with patients admitted to the emergency room during the period comprised Between 1 June and 31 July 2016. 7. Participating nurses will receive another envelope with <i>Instrument III-a - Demographic Data Record of Emergency Room Nursing Personnel of the Three (3) Shifts of Hospital A</i>, which will complete and deposit before leaving the training room in a 	<ol style="list-style-type: none"> 1. The principal investigator will NOT provide training to the nursing staff related to the skin care of patients admitted to the emergency room to the Control Group. 2. The Director of Nursing Services at Hospital B will indicate to the Emergency Room Nursing staff that the Hospital is participating in a study on the care of the skin to admitted patients and will request the 20 nurses of the three shifts to answer the Instrument III-b - Recording the Demographic Data of Emergency Room Nursing Personnel from the Three (3) Turns of Hospital B and depositing the same in the box that will be placed beside the space assigned to the principal investigator at the nurses station. 3. The principal investigator will check the box one (1) time per week and transport the instruments to his residence in a sealed envelope until the 20 are completed.

box located next to the exit door of the training room.

8. Nurses will receive a second envelope with a copy of the Fact Sheet and the contact information of the principal investigator who will be available to offer "coaching" to the Nursing staff during the period from June 1 to July 31, 2016.

40 Patients meeting the inclusion criteria	40 Patients meeting the inclusion criteria
<p>1. The nurses will document the interventions with the patients admitted to the emergency room through <i>Instrument I</i> - Registration of Skin Evaluation and Nursing Interventions by the Hospital Nursing Staff of Hospital A (Experimental Group A) and deposit the instruments in a box that will be located in the nurses station.</p> <p>2. The principal investigator will check the box one (1) time per week and transport the instruments deposited to his residence in a sealed envelope until 40 are completed.</p>	<p>1. The principal investigator will compile the secondary data of patients admitted to the emergency room through <i>Instrument II</i> -Registration of Skin Assessment and Nursing Interventions by Hospital Nursing Staff of Hospital B: (Control Group) to review the information contained in the clinical file of the patients that meet the inclusion criteria until completing 40.</p> <p>2. The principal investigator will collect the the data in a private cubicle that will be located in the nurses station until completing 40.</p>
20 Professional nurses 40 Patients meeting the criteria	20 Professional nurses 40 Patients meeting the inclusion criteria
<p>1. The nurses will document the interventions with the patients admitted to the emergency room through <i>Instrument I</i> - Registration of Skin Evaluation and Nursing Interventions by the Hospital Nursing Staff of Hospital A (Experimental Group A) and deposit the instruments in a box that will be in the nurses station.</p> <p>2. The principal investigator will check the box one (1) time per week and transport the instruments deposited to his residence in a sealed envelope until 40 are completed.</p>	<p>1. Análisis de los datos por la 1. The principal investigator will compile the secondary data of patients admitted to the emergency room through <i>Instrument II</i> -Registration of Skin Assessment and Nursing Interventions by Hospital Nursing Staff of Hospital B: (Control Group) to review the information contained in the clinical file of the patients that meet the inclusion criteria until completing 40.</p> <p>2. The principal investigator will collect the the data in a private cubicle that will be located in the nurses station until completing 40.</p>

Table 4 Summary of Research Procedure: Experimental Group & Control Group

The principal investigator will store all the research documents for the Experimental Group (Hospital A and B) for a term of five (5) years in a locked file in his residence. He will proceed to shred the documents of the investigation and the data stored in an electronic device will be erased permanently at the end of the specified term.

3. Results

3.1 Results per research question

3.1.1 Research Question 1:

In this section we present the results of the variables analyzed to establish statistically significant differences in the reduction and prevention of the development of pressure ulcers (PU) between the methodology of intervention of assessment of the skin provided to the Experimental Group versus the methodology provided to the Control Group based on the protocol of a care plan of the institution focused on the care of the skin.

3.1.1.1 Experimental Group (Hospital A)

The Norton Scale sets a maximum score of 20 and specifies that a score of 14 or less represents risk of ulcers; 13-14 moderate risk; 10-12 high risk; 5-9 very high risk. Assessment 1, performed by the Nursing staff at the time of admission to the Emergency Room, reflected one (1) patient at medium risk, eight (8) high risk patients and thirty (30) patients at very high risk of developing PPU . During the 24 hours of intervention at very high risk indicator, there were 29 (72.5%) patients of the sample; at high risk there were 8 (20%); at the moderat risk there were 2 (5%) and 1 (2.5%) with a score of 16. Notice that 95% of the sample reflected the same result as at the time of admission through the assessment period and interventions. The intervention of the nursing staff was based on activating the following parameters of the methodology NANDA NOC NIC: NANDA - Code 0047 Risk of deterioration of skin integrity; NOC (NANDA Outcome Code) - Code 1101 Tissue integrity of skin and mucous membranes; NIC Intervention Codes - Code 3540 Prevention of PPU, Code 3590 Skin Surveillance and Code 3500 Pressure Management Nursing interventions 2 through 8 included: postural change, skin examination and hygiene, and pressure relief device.

	Int. 2		Int. 3		Int. 4		Int. 5	
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
Postural change	40	100.0%	38	95.0%	38	97.4%	34	97.1%
skin examination and hygiene	39	97.5%	24	60.0%	20	51.3%	15	42.9%
pressure relief device	39	97.5%	37	92.5%	35	89.7%	34	97.1%
	Int. 6		Int. 7		Int. 8			
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%		
Postural change	26	96.3%	24	100.0%	19	90.5%		
skin examination and hygiene	15	55.6%	10	41.7%	19	90.5%		
pressure relief device	26	96.3%	24	100.0%	15	71.4%		

Table 5 Nursing Interventions: Instrument I Part IV Experimental Group

In GE Instrument I, nursing staff documented interventions that assessed patients' skin status; and documented "postural change", "skin examination and hygiene" and "pressure relief device" every two to three hours for 24 hours. The information collected is included in Table 5 and Figure 11. As the period of Nursing interventions (2-8) elapsed, the number of patients gradually decreased as available, as the percentages vary from one intervention to another .

As for "Postural change", the data collected reflected the following frequencies in each of the Nursing interventions: intervention # 2: frequency 40 (100%), intervention # 3: frequency 38 (95%); Intervention # 4: frequency 38 (97.4%); Intervention # 5: frequency 34 (97.1%); Intervention # 6: frequency 26 (96.3%); Intervention # 7: frequency 24 (100%); And in intervention # 8 the frequency was 19 (90.5%).

In relation to "skin examination and hygiene" the results in each nursing intervention are: 2 (97.5%) 3 (60%) 4 (51.3%) 5 (42.9%) 6 (55.6%) 7 (41.7%) and 8 (90.5%). In the Nursing intervention related to "Pressure relief device" the data for each intervention reflected: 2 (97.5%); 3 (92.5%); 4 (89.7%); 5 (97.1%); 6 (96.3%); 7 (100%) and 8 (71.4%). Figure 11 summarizes interventions 2 to 8 of the Nursing staff in the GE at intervals of 2

to 3 hours for postural change care, skin examination and hygiene and pressure relief device.

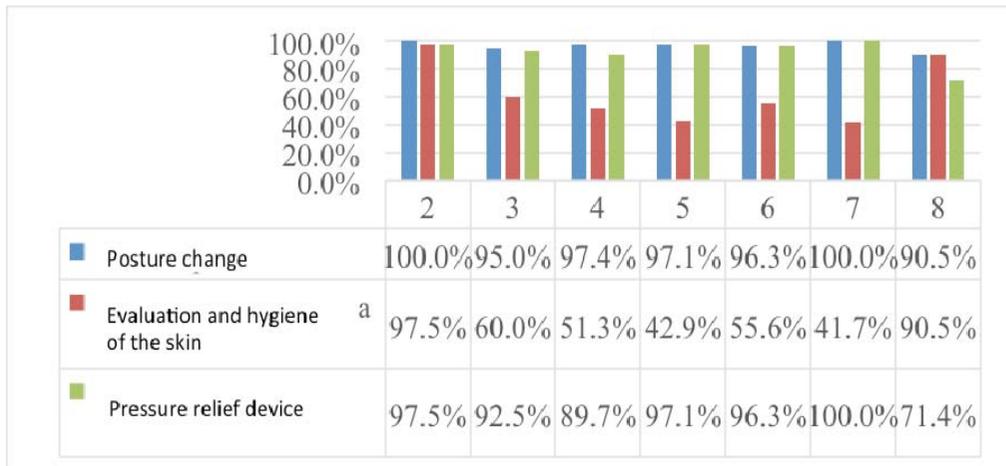


Figure 11 Percentage Distribution of Nursing Interventions: Experimental Group

Nursing staff interventions at Hospital A (GE) reflects consistency in the use of the NANDA NIC NOC and Norton Scale methodology for the prevention of PPU in a 24-hour period of time in patients admitted to the Emergency Room. The process of documentation of interventions performed for skin assessment; postural change, examination and hygiene of the skin and pressure relief device are evident. Although 24 (72.5%) of the patients in the sample showed a very high risk of developing PPU 8 (20%) of the high-risk patients, 2 (5%) of the moderate risk patients and 1 (2.5%) patient, did not report the development of pressure ulcers during the stay in the Emergency Room. One patient reflected a skin assessment of 16 through their stay in the Emergency Room of Hospital A. Note that 95% of the sample maintained the same skin evaluation results from their admission to the emergency room through the period of 24 hours. 100% of patients in the Experimental Group sample received Nursing interventions based on the NANDA NIC NOC methodology and periodic skin evaluations using the Norton Scale.

The Control Group (Hospital B) used their Stage Ulcers Management protocol. The results of the data obtained through Instrument II, Part II "Nursing Interventions by Stages" are presented in the following Tables 6, 7, 8, 9 and in Figures 13, 14, 15 and 16.

Nursing Intervention Treatment Protocol for Stage Ulcers: Control Group									
STAGE GRADE I		Yes		No		No data		Total	
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
1	All patients had beds with “Gel” mattresses assigned.	0	0%	33	82.5%	7	17.5%	40	100.0%
2	Incontinence care is offered daily in the mornings and P.R.N with saline and skin protection cream.	0	0%	33	82.5%	7	17.5%	40	100.0%
3	Change of position and / or repositioning every 2 hours.	0	0%	33	82.5%	7	17.5%	40	100.0%
4	Consult with Nutrition Services to determine nutritional status.	0	0%	33	82.5%	7	17.5%	40	100.0%
5	Educate the patient, family or significant person about the changes of positions in the bed.	0	0%	33	82.5%	7	17.5%	40	100.0%
6	Teach, if possible, the patient to change position by him/herself.	0	0%	33	82.5%	7	17.5%	40	100.0%
7	Evaluate the skin on each shift.	0	0%	33	82.5%	7	17.5%	40	100.0%
8	Document all of the above interventions, treatment and at least the weekly progress and / or changes in ulcers.	0	0%	33	82.5%	7	17.5%	40	100.0%

Table 6 Nursing Interventions: Grade I Stage

In Grade I, 82.5% (33) of the patients reflect that they did not receive the services and in 17.5% (7), the Nursing staff did not record the information in the protocol.

Nursing Intervention Treatment Protocol for Stage Ulcers: Control Group										
STAGE GRADE II		Yes		No		No data		Total		
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	
s	1	Evaluate the need for a surface that helps reduce pressure for bedding, heel protectors, elbows.	0	0%	6	15.0%	34	85.0%	40	100.0%
	2	Care is given to the incontinence area every morning and as needed.	0	0%	6	15.0%	34	85.0%	40	100.0%
	3	Make a change and reposition the patient every two hours.	0	0%	7	17.5%	33	82.5%	40	100.0%
	4	Use sheets to move the patient in bed.	0	0%	7	17.5%	33	82.5%	40	100.0%
	5	Use pillows to position the patient and to avoid skin-to-skin contact.	0	0%	6	15.0%	34	85.0%	40	100.0%

Nursing Intervention Treatment Protocol for Stage Ulcers: Control Group									
STAGE GRADE II		Yes		No		No data		Total	
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
6	Consult with Nutrition Services to determine the nutritional status of the patient.	0	0%	6	15.0%	34	85.0%	40	100.0%
7	Educate the patient, family or significant person about the change of position in bed. If possible, teach the patient to change positions by themselves.	0	0%	6	15.0%	34	85.0%	40	100.0%
8	Evaluate the ulcer once a day. Document location, stage, treatment and progress.	0	0%	6	15.0%	34	85.0%	40	100.0%

Table 7. Using Interventions: Grade II Stage

For Grade II, it was found that between 15% and 17.5% did not receive the services and for the other patients the information was not recorded (82.5% - 85%).

Nursing Intervention Treatment Protocol for Stage Ulcers: Control Group									
STAGE GRADE III		Yes		No		No data		Total	
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
1	Talk with your doctor to evaluate alternatives for chemical or surgical debridement.	0	0%	0	0.0%	40	100.0%	40	100.0%
2	I evaluated the need for pressure reduction / relief surface for bed, heel protectors.	0	0%	0	0.0%	40	100.0%	40	100.0%
3	Gives incontinence care in the morning and whenever necessary. (With each change of Diaper)	0	0%	0	0.0%	40	100.0%	40	100.0%
4	Change and reposition the patient every two hours.	0	0%	0	0.0%	40	100.0%	40	100.0%
5	Use sheets to move with pillows to position the patient in bed.	0	0%	0	0.0%	40	100.0%	40	100.0%
6	Consult Nutrition Services to determine the patient's nutritional status.	0	0%	0	0.0%	40	100.0%	40	100.0%
7	Educate the patient, family or significant person about the change of position in bed. If possible, teach the patient to change positions on his or her own.	0	0%	0	0.0%	40	100.0%	40	100.0%
8	Evaluate the ulcer at each change of dressing and document the procedure.	0	0%	0	0.0%	40	100.0%	40	100.0%

Table 8 Nursing Interventions: Grade III Stage

In the Grade III Stage, no data was documented, so it is not possible to determine if the patients of Hospital B received or not the services related to this Stadium.

<i>Nursing Intervention Treatment Protocol for Stage Ulcers: Control Group</i>									
<i>STAGE GRADE IV</i>		<i>Yes</i>		<i>No</i>		<i>No Data</i>		<i>Total</i>	
		<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
1	Talk with your doctor to evaluate alternatives for chemical or surgical debridement.	0	0%	3	7.5%	37	92.5%	40	100.0%
2	I evaluated the need for pressure reduction / relief surface for bed, heel protectors.	0	0%	3	7.5%	37	92.5%	40	100.0%
3	Gives incontinence care in the morning and whenever necessary. (With each change of Diaper).	0	0%	3	7.5%	37	92.5%	40	100.0%
4	Use sheets to move with pillows to position the patient in bed.	0	0%	3	7.5%	37	92.5%	40	100.0%
5	Consult Nutrition Services to determine the patient's nutritional status.	0	0%	3	7.5%	37	92.5%	40	100.0%
6	Educate the patient, family or significant person about the change of position in bed. If possible, teach the patient to change positions on his or her own.	0	0%	3	7.5%	37	92.5%	40	100.0%
7	Evaluate the ulcer on each change of dressing and document the procedure.	0	0%	3	7.5%	37	92.5%	40	100.0%

Table 9. Nursing Interventions: Grade IV Stage

At Grade IV Stage, staff did not document the interventions in 92.5% of the patients (37) and for the remaining 7.5% (3) patients reflected that they did not receive the services.

The data in Tables 7, 8, 9 and 10 are graphically summarized in Figures 13, 14, 15 and 16.

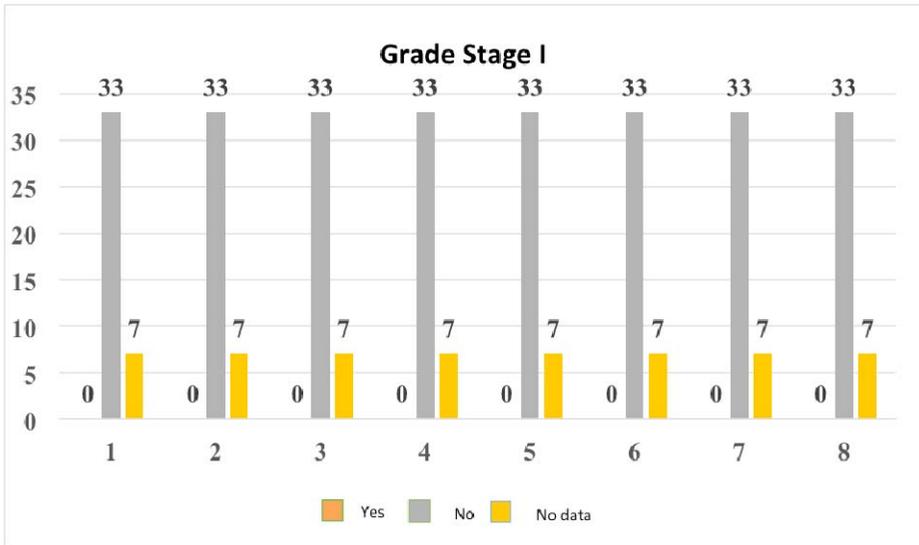


Figure 13 Frequencies for Stage I

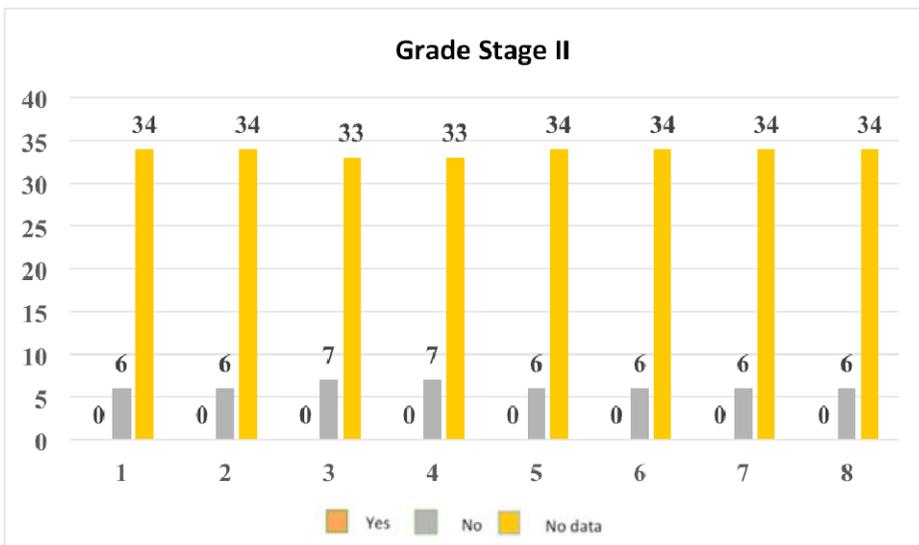


Figure 14 Frequencies for the Grade II Stage

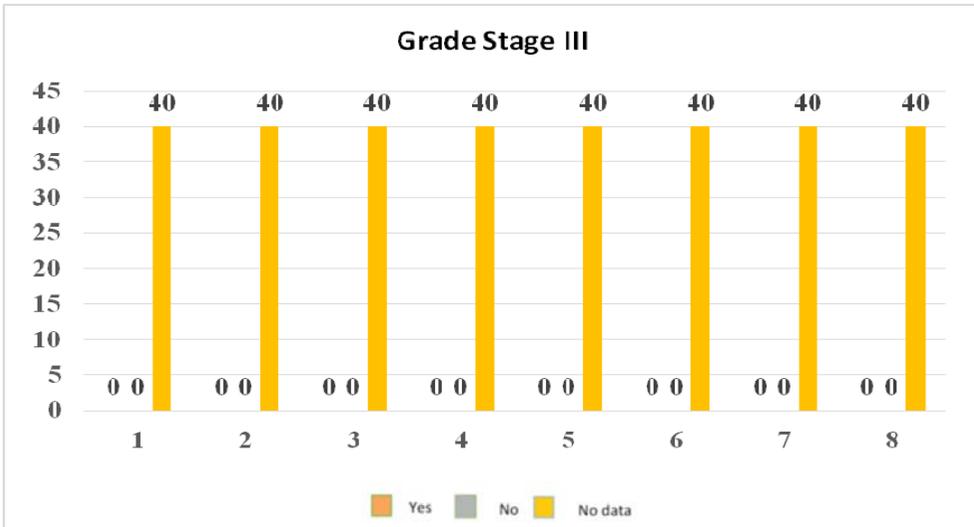


Figure 15 Frequencies for Stage III

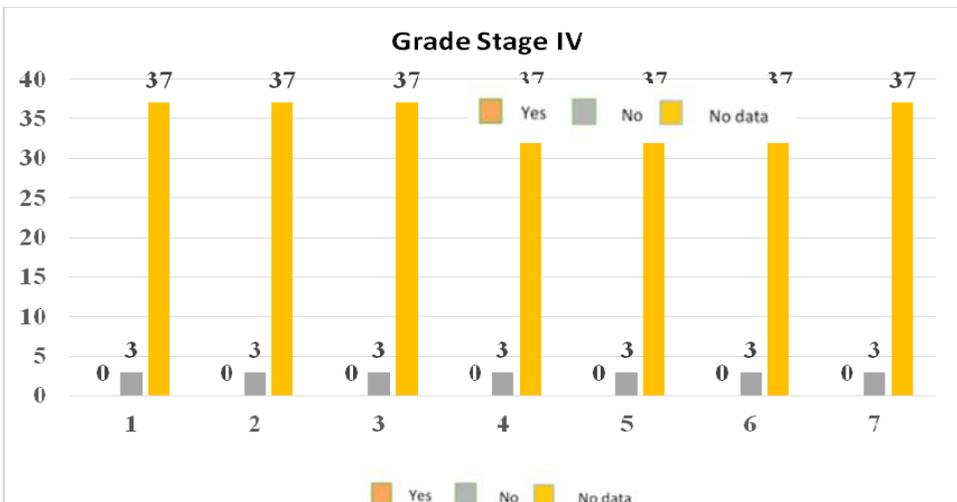


Figure 16 Frequencies for the Grade IV Stage

3.1.2 Research Question 2.

The variables analyzed to establish statistically significant differences between Nursing staff instructions on the patient's skin care to relatives and caregivers of Hospital A (GE) versus Nursing staff instructions on the care of the patient's skin to relatives and caregivers of the Hospital B (GC) in the decrease and prevention of the development of pressure ulcers (PPU) in patients 60 years or older admitted by the Emergency Room area included: in-

terest of family members and / or caregivers, / or caregivers on postural changes and questions from family and / or caregivers about skin care.

As shown in Figure 17, the results indicate that 55% (n = 22) of the relatives of Hospital A (GE) patients participated actively in interventions for the prevention of ulcers; Consistent with the importance of involving and educating family members and caregivers in the patient care protocol by the Nursing staff regarding the prevention of PU in people older than 60 years.

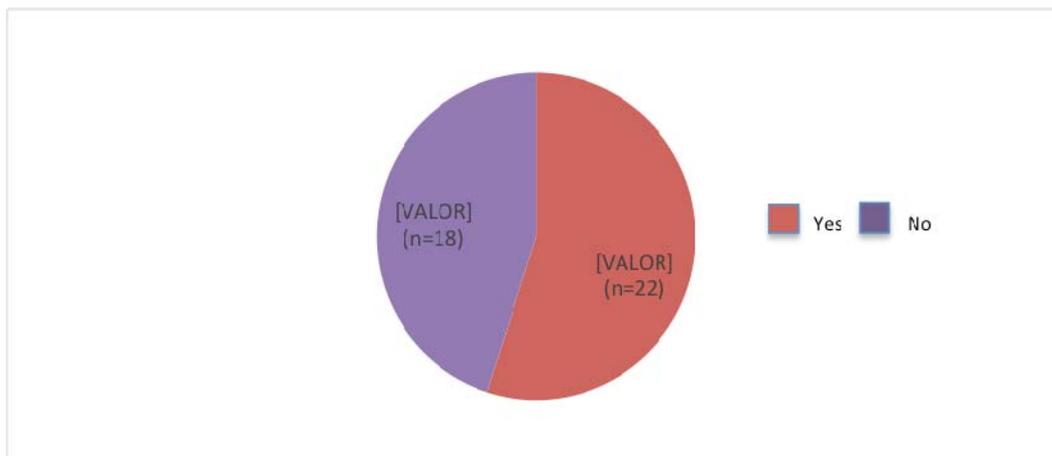


Figure 17. Percentage distribution of Hospital A (GE) patients whose relatives were actively involved in interventions for the prevention of ulcers

Hospital B data (CG) is related to the interest and participation of family members and / or caregivers in postural changes and to ask questions about skin care are reflected in the results of the interventions in Stages. Criterion 5: Educates the patient, family or significant person about the change of position in the bed (No = 82.5%); Stage II. Criterion 7: Educates the patient, family or significant person about the change of position in bed. If possible, teach the patient to change positions by themselves (No = 15%, Not documented = 85%), Stage III. Criterion 7: Educates the patient, family or significant person about the change of position in bed. If possible, teach the patient to change position by themselves (Not documented = 100%) and Stage IV. Criterion 6: Educates the patient, family or significant person about the change of position in bed. If possible, teach the patient to change position by themselves (No = 7.5%; No documented = 92.5%).

3.1.3 Research Question 3.

The variables analyzed to establish statistically significant differences between the development of pressure ulcers (PUU) in patients 60 years or older admitted by the Emergency Room area and the periodic rounds of skin evaluation of the nursing staff of Hospital A (GE) versus patients 60 years or

older admitted to the Emergency Room area and the periodic rounds of skin evaluation of Hospital B (GC) nurses included: time and outcome of the level of risk in each round of assessment of the skin made by the nursing staff.

Figure 10, included in the section corresponding to the results of research question 1, summarizes the result of the assessment of the risk of suffering from UPP according to eight (8) skin assessment interventions performed by the Nursing staff in the Hospital A (GE) and compiled through Instrument I created by the doctorate based on the methodology NANDA International, Inc., NIC NOC and the Norton Scale.

The periodic rounds of skin assessment were at intervals of 2 to 3 hours of GE showed to be NANDA NIC NIC NOR and Norton Scale interventions appropriate for the prevention of the development of pressure ulcers. The consistency and systematization of the assessment of patients certainly prevents the development of PPU since the nursing staff is attentive to changes in the condition of the skin and ready to perform the interventions required to prevent the development of PU as postural change, examination and hygiene of the skin and use of devices to relieve the pressure.

On the other hand, the CG results point to poor documentation of nursing interventions related to periodic skin titration rounds at specific intervals as shown in Table 6 (pp. 23-24).

In Grade I Stage, 82.5% (33) of the patients reflect that they did not receive the services and 17.5% (7) of the patients reported that the Nursing staff did not document their intervention. Criteria 3 and 7 of the interventions required in the Grade I Stage reflect results contrary to the expectation of periodic rounds of skin assessment. In criterion 3, 82.5% (33) of the patients were not changed or repositioned every 2 hours as required by the Hospital B protocol. The same result was obtained in criterion 7, where the skin of 82.5% of the patients was not evaluated at each round.

3.1.3 Research Question 4.

The variables analyzed to study the effectiveness of the NANDA NIC NOC Nursing methodology and the Norton Scale in reducing and preventing the development of pressure ulcers (PPU) of the Experimental Group (Hospital A) versus the protocol of the Care Management Plan Ulcers for Stages of the Control Group (Hospital B) included: calibrating the results of the presence or absence of ulcers in the patients of both groups within 24 hours of being admitted to the Emergency Room, analyzing the nursing interventions and establishing the profile Epidemiology of groups.

For the variable "Ulcer at bedtime", the frequencies described below and presented in Figure 18: 0 for the "No data" alternative and 40 for the "No" alternative were found in the EG. In the GC 40 were documented for "No data" and 0 for "No". In sum, the total frequencies for both hospitals were: 40 for the "No data" (GC) alternative and 40 for the "No" (GE) alternative.

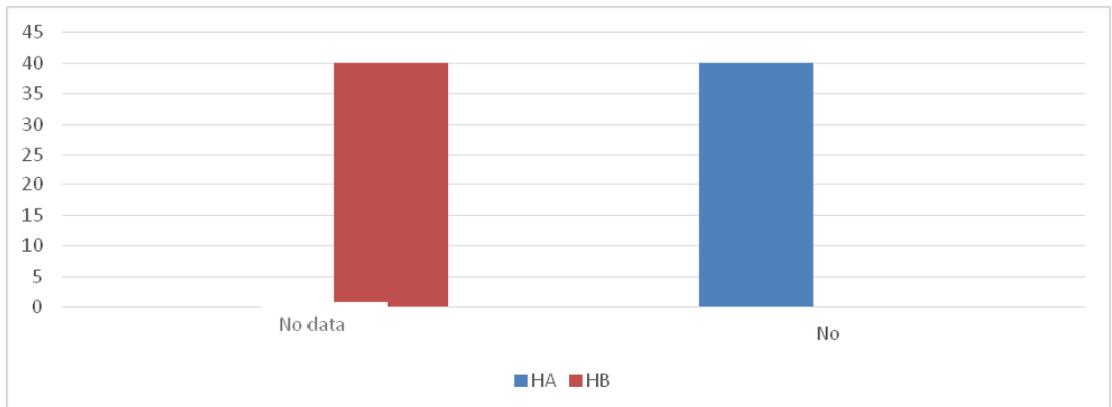


Figure 18 Frequencies for the variable "Sleeping ulcer" of patients in hospital A (GE) and hospital B (GC)

There is a statistically significant difference between the ulcers at bedtime between SG and GC ($X^2 = 80$, $GL = 6$, $P = 3.74e-19$). The 40 GE patients did not show ulcer at bedtime.

Nursing staff interventions in the GE reflect consistency in the use of the NANDA NIC NOC and Norton Scale methodology for the prevention of PPU in a 24-hour period in patients admitted to the Emergency Room. The process of documentation of interventions performed for skin assessment; postural change, examination and hygiene of the skin and pressure relief device were evident. Despite the fact that during the 24-hour intervention, 29 (72.5%) of the patients in the sample showed a very high risk of developing PU; 8 (20%) high irrigation; 2 (5%) mean risk and 1 (2.5%); the development of pressure ulcers (PPU) was not reported during the stay in Emergency Room in the 40 patients of the EG. One patient reflected a skin assessment of 16 through their stay in the Hospital A Emergency Room. 95% of the sample (GE) maintained the same skin evaluation result from their admission to the emergency room through the period Of 24 hours of study until its disposition. 100% of the patients in the GE sample received nursing interventions based on the NANDA NIC NOC and Norton Scale methodology. As shown in Figure 19 none of the patients in the SG developed PU during their hospitalization in the Emergency Room of Hospital A.

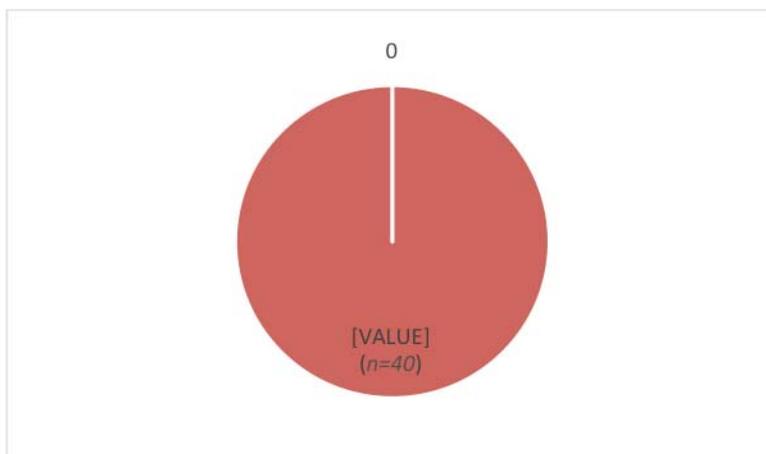


Figure 19. Percentage distribution of Hospital A patients who developed ulcers

The results of our study show that there is a difference between the development of UPP in patients exposed to the protocol that establishes the NANDA NIC NOC methodology and the Norton Scale under the health care of Nursing professionals whose interventions were based on measurement, evidence, systematization And documentation and the implanted Management of Stage Ulcers protocol of the GC.

Figure 20 demonstrates the results of the risk symptoms of developing ulcers presented by the Control Group sample (Hospital B). Of these, 8% presented erythema, 2% frequent urination and 90% no symptoms.

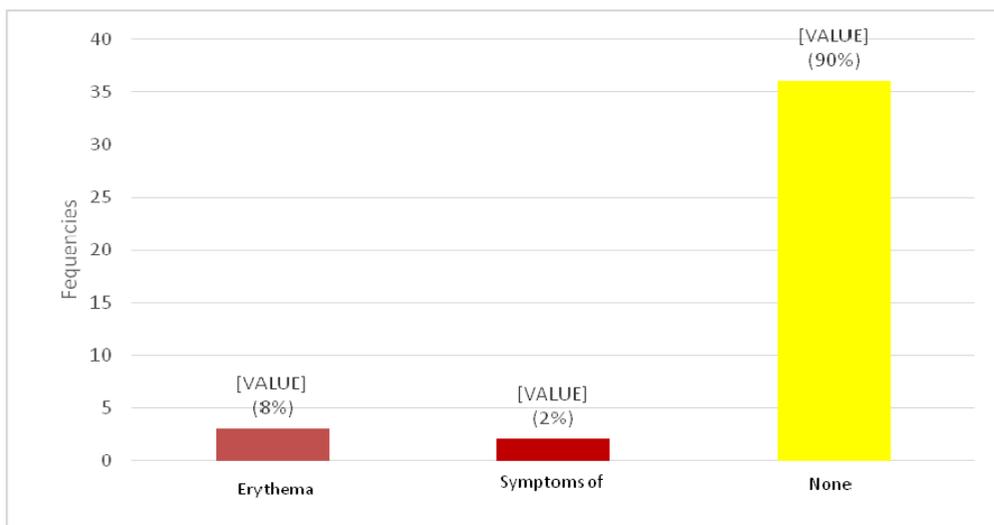


Figure 20. Distribution of ulcer symptoms in Hospital B patients

The Control Group of Stage Ulcers Management protocol integrates valuable information, however, the results of our study show that it is not used, by nursing staff, to document their interventions with patients.

The poor documentation of GC nurses in the Stage Ulcer Management protocol is a significant finding of our research. This finding is consistent with the results reported by Thoroddsen et al., 2013 that attempted to compile information on the progress or deterioration of patients with Grade I ulcers and confronted the problem of poor documentation of information from patients at risk of developing ulcers by the staff.

Among the limitations of the study the following were highlighted: 1) the poor documentation of the nursing interventions provided by the CG staff; 2) results related to the effectiveness of the NANDA NIC NOC methodology and the Norton Scale, although proven, will require future research in which all parties provide the necessary documentation to be in a position to make strong generalizations.

4. Discussion and Conclusions

The development of pressure ulcers (PPU) can be prevented. The literature on management and prevention of pressure ulcers (PPU) is robust. However, this problem continues to grow with ethical, moral and economic repercussions for hospital institutions worldwide, and Puerto Rico is no exception. A lot remains to be done to counteract the effects of pressure ulcers, which Hibbs (1987) termed as an epidemic under the sheets. According to Necul (2011), pressure ulcers developed in hospitals are a problem worldwide and argue that the staff is silent witness to the issue. According to the author, 95% of the patients present ulcers that were avoidable.

The natural behavior of the skin, development of pressure ulcers (PUU), its prevention, equipment and materials for healing, scales of measurement, intervention guides, "Triage", family and caregiver intervention, advances in the practice of the profession, use of technology in the emergency room, communication and team work in emergency room, documentation of interventions, intervention methodologies (Anguera, Colodrero, García, Mateo, Roca, & Velasco, 2009, Bautista And Bocanegra, 2009, Bavaresgo & Lucena, 2012, Beinlich & Meehan, 2014, Berman & Snyder, 2013, Eng & Chan, 2013, Gonzalez, Cardona, Murcia, & Matriz, 2014, Guerrero, 2013, Martinez & Ponce, 2011, Meddings, Reichart, Hofer & McMahan, 2013, Myer, 2000, Necul, 2011, Pancorbo, García, López & Álvarez, 2006, Rangel, Hernández & García, 2010, Rogers, 2013, Schuetz, Hausfater, Haubitz, Fassler, Grolimund & Mueller, 2013, Se (2005), Shek & Hoyt, 2012, Thoroddsen, Sigurjónsdóttir, Ehnfors & Ehrenberg, 2013, Vallarejo, 2011, Watkins & Patrician, 2014, Zapico, 2005).

Beinlich and Meehan (2014) indicate that Nursing should put aside ritualism, and start an evidence-based practice using prevention, as well as assess the potential complications of the patient with the potential to develop ulcers. This is precisely the conceptual framework on which our research is based.

In a study by Guerrero (2008), completed in the emergency services of the Hospital San Jaume de Calella, shows that there is an autonomous role in the emergency room nurse related to the prevention of ulcers. He indicated that 51.6% of ulcers occur inside the hospital itself and that 95% of these are preventable and associated with the existing pathology. In his study, he explains that the first two hours of waiting in the emergency room are key to preventing the development of ulcers. A pressure of 60 to 70 mm HG is sufficient for two hours to develop pressure areas. According to Berman & Snyder (2013) the thinner the skin, the greater the risk of developing ulcers. On the other hand, Segovia et al., 2012 indicate that exposure to poor hygiene followed by evacuation or urine develops an irritating wet chemical medium that increases skin permeability by lowering the barrier of skin protection, making it more fragile and avid for breakage. Moisture-related injuries are not an inevitable consequence of incontinence, but can be preventable and improve the patient's dignity (Segovia et al., 2012).

González et al., 2014 in a research on the prevalence of ulcers in Colombia indicate that this is a problem attributable exclusively to nursing care. Myer (2000) emphasizes that skin management is subject to the knowledge that health professionals have when working with elderly patients. Bautista & Bocanegra (2009) concur with Myer (2000) pointing out that health professionals must possess the necessary knowledge to work with skin management especially with older patients.

Betty Neumann (1972) establishes that Nursing actions include primary, secondary and tertiary prevention. Primary prevention is one of the pillars of the theoretical basis of our research. Primary prevention strengthens the normal defense line by identifying factors in the "Triage" area associated with current and potential risks that may affect the patient; and ensures the implementation of a protocol of nursing interventions focused on attacking identified stressors before the development of ulcers and family integration (Nursing Theories, 2012).

In the language of the emergency room, "Triage" means to discern and classify patients according to their health condition for prompt attention. Schuetz et al., 2013, point out the serious problem that emergency rooms are presenting with regard to patient screening. Researchers mention that the current "Triage" system is an initial system that underestimates health care and nursing decisions (Schuetz et al., 2013); one of the recommendations of our study.

Shea and Hoyt (2012) express that the traditional "Triage" model is not being effective. Researchers are invited to create innovative strategies that expedite the patient's medical treatment from the initial screening in Triage. Treatment of the patient is delayed in the emergency room when there is no effective communication (Watkins & Patrician, 2014). Larner (2013) emphasizes that nursing knowledge deficit does not contribute to patient safety in preventing the development of ulcers.

Rogers (2013) points out that the documentation that the nursing staff has should be adequate, correct and consistent. This article discusses how the lack of documentation between doctor and nurses, and the care directed to the patient, are not coordinated, and stresses that education on the level of the emergency room should be continuous and of interest in the management of ulcers. Our study shows similar results, reflected by the almost null GC documentation. Rogers (2013) used the Norton scale as a skin assessment mechanism; recommends that the doctor consider the same.

The clinical documentation process is meritorious to know the progress or deterioration of patients, as it measures the quality of nursing care. The correct documentation on the condition of the skin is today one of the major problems for the hospital industry. This result is evident in the GC of our research. Meddings et al. (2013) emphasize the need to have the necessary equipment and the preparation of nursing staff in the prevention of the development of ulcers. The PPU prevention-training module used in our study is a tool that remains at the service of hospitals in Puerto Rico and programs for the preparation of nursing professionals.

The National Institute for Health and Care Excellence (NIHCE, 2014) offers guidance for the prevention and management of ulcers. The NIHCE (2005) identified key parameters that should be assessed in the initial contact and periodically by the Triage Nursing staff: health status, acute, chronic illness and terminal comorbidity, e.g. diabetes, malnutrition, state of postural mobility, sensory impairment, level of consciousness, systemic signs of infection, nutritional status, blood pressure damage, pain status, psychological factors, social factors, continence status, medication, cognitive status and blood flow, among others.

Nursing professionals have screening tools that consistently and systematically facilitate the "Triage" process and prevent the development of PPU. The Norton Scale is a measurement instrument that contemplates five aspects in the prevention of ulcers: (a) the patient's physical condition, (b) the patient's mental condition, (c) his level of activity, (d) his level of Mobility, and (e) factors associated with incontinence (Eng & Chan, 2013). Pancorbo et al., 2006, studied the use of the Norton and Braden risk measurement scale in clinical practice. In their study they reviewed thirty-three cases. The results showed a reduction in the risk of ulcers when using the Norton and Braden scale as an indicator.

In a study carried out in Brazil in 2012 on nursing interventions using the classification of Nursing NIC, nursing interventions were found for patients at risk of suffering from pressure ulcers. This study validates the NAND, NIC and NOC classification as an effective methodology in the prevention of pressure ulcers, to implement specific interventions and to relate risk factors to the development of the lesion with implications for practice, teaching and research in Nursing. Dr. Steven Kronick, MD, an adult emergency services specialist, points out that the patient deserves the respect of being attended promptly and with excellence. The study concluded that nursing staff did not distinguish between ulcer stages, as documented between 1995 and 2014 (University of Michigan Health System, 1995-2014). This result is consistent with the lack of documentation from the CG of our study.

Anguera et al. (2009) studied the factor of education in the prevention of pressure ulcers and concluded that the training of nursing professionals in the application of standardized preventive measures decreases the incidence of PU. In a study conducted by the Faculty of Nursing at the University of Antioquia on an educational program for caregivers of poly traumatized patients, Rangel et al. 2010, found that the intervention program was effective in positively impacting the level of knowledge of caregivers as the evolution and prevention of complications in the patient with a variety of traumas. This is the case of the results of our GE research whose family members became more actively involved in patient care. It is not the case of the relatives of the GC. The education of the adult patient as a topic of discussion is and will be the key to the transformation of ideas and attitudes regarding the management and prevention of the development of skin ulcers in hospitalized patients (Martínez & Ponce, 2011). A well-educated caregiver on prevention of ulcer development will be vigilant and will implement the measures learned.

Zapico (2005) argues that the Nursing profession is a discipline that builds its own body of knowledge based on the interpretation of the reality that surrounds it; that the analysis of the tasks and their evolution, will guide on the present competences and the capacity of the group to face the challenges of the 21st century. According to the researcher, new strategies and new processes must be put into practice for the sake of preventing the development of ulcers. It also points out that hospital institutions must restructure the concept of "Triage" as a private place, not open to the public, and maintain privacy for a screening capable of detecting the risk of developing ulcers (p.261).

The National Pressure Ulcer Advisory Panel (NPUAP, 2009) presented guidelines for quality inpatient services, including guidelines and elements related to skin management: skin care and protection, positioning and pressure relief device, nutrition, condition of the patient, caregiver and the nursing professional.

The NPUAP and the European Pressure Ulcer Advisory Panel (EPUAP, 2009) emphasize proper skin management through regular care of this system, keeping skin clean and free of irritants, use of emollients on dry skin, They could behave like friction. The Pan American Health Organization (PAHO) (s.f.), in its guide for diagnosis and management of pressure ulcers, developed four global objectives: 1) Identify the risk factors that contribute to the appearance of ulcers; 2) Identify the stages of pressure ulcer formation; 3) Recognize prevention and initial treatment measures; 4) Determine when a patient should be referred.

The World Health Organization (WHO) notes that treatment begins by identifying patients at risk for developing ulcers and preventing them. The prevention aspects in patients at risk include, as a priority: preventing ulcers, avoiding patient suffering and avoiding a greater burden on caregivers. Work with formal and informal caregivers should be narrow, with emphasis on educational aspects. The cooperation of caregivers in the monitoring of ulcers and the prevention of complications are essential.

Hospitals in Puerto Rico are full capacity with a waiting time for bed availability, from 10 hours to four days on average. The wait may fluctuate between five, ten or more days in hospital settings for adult patients with prolonged stays and these remain lying on a metal stretcher with a thin cover for damping bony prominences (Planning Board, 2015).

Our results are consistent with the literature reviewed. They provide data that strengthens and supports our position regarding the need to continually educate nurses in the emergency rooms of our hospitals to refine the Triage process by integrating a preventive approach in a systematic and evidence-based manner and educate family members and caregivers to create allies in the care of admitted patients. Education is key to ensuring quality nursing health services guided by proven effective intervention methodologies in the profession. The conclusions of our research:

1. Patients aged 60 and over admitted to the emergency area exposed to the NAND NIC NOC methodology protocol, who received interventions based on measurement, evidence, systematization and documentation, did not develop PPU during their stay in an emergency room.

2. Nursing staff interventions in the EG with patients admitted by emergency room area reflect consistency in the use of the NANDA NIC NOC and Norton Scale methodology for the prevention of UPP in a 24-hour period compared to the protocol Of Ulcers Management by GC Stages.

3. The CG, in general, did not adequately document their nursing interventions through the Staging Ulcer Management protocol.

4. The results indicate that the active participation of family members and caregivers of the EG patients in interventions for the prevention of ulcers was significant, the participation and training of family members and caregivers by the Nursing staff in the CG was practically nul.

5. Periodic rounds of skin titration at intervals of 2 to 3 hours of EG, postural change, skin examination and hygiene, and use of pressure relief devices, proved to be a Nursing intervention of the NANDA NIC NOC methodology, very suitable for the prevention of the development of pressure ulcers.

6. The CG results reflect poor documentation of nursing interventions related to periodic skin titration rounds at specific intervals described in the Stage Ulcers Management protocol.

7. The NANDA NIC NOC Nursing Methodology for the reduction and prevention of development of pressure ulcers (PPU) in patients 60 years or older admitted by the emergency room area was effective whenever the GE staff implemented the same Systematically and documented the interventions made.

8. The Hospital Stage B (GC) protocol for Staging Ulcer Management represents a nursing methodology, but it is not used by nurses systematically for the prevention of PPU.

9. It is essential to restructure the Triage procedure. It should be based on a solid theoretical and methodological basis, such as NANDA NIC NOC as well as integrate recognized risk measurement scales of PPU development such as the Norton Scale and / or other available scales.

10. Nursing training curricula should include the preventive approach to ulcer development, from a proven theoretical and methodological foundation.

11. Nursing Schools should train and strengthen cooperative practice agencies in ulcer prevention and promote the importance of family and caregivers in the health services team.

12. It is a duty to impact the public policy of the country through the discussion of the results of the study in different forums to raise awareness about the problem and propose solutions to attack the development of PPU in hospital and care facilities government and private in Puerto Rico.

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Expert-Panel Accreditation Evaluation- Practices: An Autoethnographic Case-Study in Spain

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Abstract: Accreditation is defined by the European Higher Education Area quality-assurance agencies as a key element in quality management and continuous improvement in university teaching-learning processes, and is an institutional practice that started to be developed in 2014 in Spain where there is evident a oversizing of the quality assurance agencies for higher education. This paper illustrates the case of the Community of Madrid Quality Agency, as a case-study analysis through my experience as a panel member for the accreditation of higher-education qualifications. Methodologically, it is based on an autoethnographic approach and uses the theory of symbolic interactionism to reveal and analyse the evaluative process and culture. For this purpose, two analytical axes were drawn: student learning-outcomes and the value of the human resources assigned to the degree in terms of their academic research, both criteria which the quality agencies consider to be critical for a favourable final report. The interactions of the expert panel at the different stages of the accreditation consideration-process, based on these two criteria, are presented with the aim that future case studies will test them in the context of collaborative learning, helping to achieve the greatest possible academic rigor in the accreditation process.

Key-words: Accreditation, Agentification, Evaluative Cultures, Peer Review, Learning Outcomes.

1. Introduction: Oversizing of the Quality Assurance Agencies for higher education in Spain and the agentification

The agentification of Higher Education in Spain is a clear example of how states and stakeholders linked to public policies are adopting institutional

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and cultural changes at a rapid pace. The transition from a centralist state under the Franco's regime towards a decentralized and democratic state (named State of the Autonomies) took place in the decade of the 80s in the twentieth century. In less than thirty years our universities moved from a closed curricular model, where Central Government defined the Higher Education contents, to a much more open model where universities, by virtue of their autonomy, defined their studies. They now offer many degrees and the quality agency defines its possible implementation and prospect accreditation. Therefore in Spain, we have evolved from a non-existent assessment culture and the lack of value of accountability to a proliferation of Quality Agencies without precedent in any other European country. If we refer to the free public data in the Web, available in both the European Quality Assurance Register for Higher Education (hereafter, EQAR) and the European Association for Quality Assurance in Higher Education (hereafter, ENQA),

The percentage of presence of the autonomic and central state administration Quality Agencies is higher than in any other European country, even in cases of Federal States such as Germany. This oversizing is even bigger if we compare with Southern European countries (Portugal, Greece and Italy). When regarding EQAR, there are eight Spanish agencies for every Portuguese agency and no presence of any regarding Greece and Italy. When analyzing ENQA, where Italy is not represented by any agency, the proportion is similar. This polarization of values associated to assessment cultures and accreditation, as an outcome of this movement from one extreme to the other, calls into question the concept of Path Dependence in the neo-institutionalist theories, although this is not the main aim of the article. The analysis developed in this article takes place in this Spanish Agencies setting, in particular in the Community of Madrid.

Accreditation is one of the axes upon which quality management at most universities pivots. Coming from the Anglo-Saxon culture, accreditation first appeared at the beginning of the twentieth century in the United States, is characterised by the open-curriculum model, and is largely unregulated. It contrasts, with the historically closed and strongly regulated curricular models in the geographical environments of continental Europe. Accreditation has been implemented by the European Higher Education Area since the beginning of the twenty-first century, disruptively so in the university culture, thus producing one of the most prominent changes in this system in recent history.

The agentification of universities has some very specific effects depending on the geographical and institutional environment in question. For example, in Great Britain accreditation also deepened the stratification of higher education institutions, reinforcing university hierarchies through their reputation, which in turn, is based on research indicators (Brennan and Williams, 2004). The evaluation culture that became part of degree-program

accreditation is better suited to the British arm's length principle in which the academic and political are differentiated, than the Spanish or French institutional context—as previously studied in the case of cultural policies and public cultural facilities (Rius Ulldemolins and Rubio Arostegui, 2013, 2016; Rubio Arostegui, 2016). From this comparative institutional context, this manuscript aims to provide details about the practices implemented in academic-environment evaluation cultures and accreditation styles in Spain, a phenomenon that began in the Community of Madrid, as well as in the rest of Spain, in 2014.

The author's own experience as an evaluator inside the accreditation process is the leitmotif of this work, which aims to improve these evaluation processes and to contribute to the debate about how to best carry them out; the work starts from the premise that this can be achieved through collaborative learning in an institutional environment of transparency. It is clear that, through higher-education program accreditation, public administrations are allocating human and financial resources with the aim of creating constant improvement in university degrees. Therefore, the goal of this article is also to promote the public value of accreditation both within the university community and in society in general. This is because in more institutionalised contexts such as that of the United States, among other factors, the lack of rigor in the process is frequently criticised (Ewell, 2015, Gillen, Bennett, and Vedder, 2010; Dickeson, 2006).

2. Methodological approach

Ethnography, as discussed by Pabian (2014), is not a predominant research tool in higher education, even though there is growing academic interest in the potential of the ethnographic approach in education. This is reflected in the newly emerging scientific literature and in the organisation of conferences linking ethnography and education—most recently in Spain in 2013 in the Spanish National Research Council headquarters [<https://cieye.wordpress.com>]. However, the autoethnographic perspective, in terms of the everyday academic practices of evaluative cultures, does have some precedent (Meneley and Young, 2005). Using this approach here, I try to highlight the processes involved in evaluative decision-making, based on the evaluator's own subjectivity and interaction with other panel members.

One of the purposes of this article is to expose the routines and practices of peer review through my experience as an undergraduate and master's degree-level accreditation-panel member for the Community of Madrid Quality Agency and the Knowledge Foundation Madri+D (FCM). Therefore, one of the goals of this paper is to present the characteristics of peer review as an interactive process between evaluators and to show how, within this dynamic, the initial expert assessments of degree-level qualifications are

transformed during the course of the negotiation, finally reaching the end of the process with the drafting of the panel's report. This process is concluded when the final report (taking the expert panel's original opinion as an essential reference), is prepared by a branch committee and is published on the FCM and the Ministry of Education, Culture, and Sport's Registry of Universities, Centres and Titles (RUCT) websites.

Thus, autoethnography as a self-reflection exercise (Garfinkel, 1967), helps to reveal the procedures, feelings, attitudes, and values of panel members during the assessment process, while trying to mitigate and shorten the distance in discursive practice between claims of what will be done and what actually is done [self-reflection is understood in the same way as when we reflect upon our own research processes in the spirit of criticism, and where strategic use of one's meta-cognitive capacity can accommodate emotional dimensions]. This article aims to tackle the subject matter by taking a symbolic interactionism approach, under the pretence that this contributes legitimacy, both to the process of reaccreditation and to the agencialised context of the Spanish university system itself. Regarding other types of academic evaluations such as academic journal peer-review assessments or even certain competitive calls for research projects, the accreditation-process evaluation involves interaction between the expert panel members.

Under the premise of symbolic interactionism we can analyse the dynamics created by the interaction between different social subsystems (academics, students, and employers, among others) involved in the evaluation process. These are represented by the panel secretary, academics, and students at the visits that take place at the university centres presenting their qualification-programs for reaccreditation. In accordance with Lamont (2015), we understand that degree-program accreditation, specifically the peer-review phase of the assessment, is an emotional and interactive process: consensus building is fragile and requires emotional and rational effort on the part of the panel members.

3. The practice of degree-program evaluation, another variation of academic peer review

What values and criteria are considered when evaluating the accreditation? In academic peer-review evaluation, key values such as creativity and innovation—and how, in turn, these are defined in different ways according to the field of knowledge and the discipline in question (Lamont, 2015)—do not carry the same weight in the accreditation as they may have in journal or research project peer-review assessments. Notwithstanding, as discussed in other work (Mahoney, 1977, Smith, 2006, Bocking, 2005), although an assessment-rubric similar to that of academic journal reviewers is applied in the accreditation evaluation-process, in practice, emotional and extracognitive

factors with affiliations and phobias towards certain focuses or lines of investigation, are also considered. In short, in every academic evaluation, a contextual interaction process occurs in which academics are inserted into a position of power, endowing them with disproportionate symbolic “capital” (Bourdieu, 2008). Thus, the evaluator’s habitus, which is necessarily tied to their position in the academic field, determines the results of the peer review, in which the concept of objectivity, at least as understood in the sciences, is difficult to sustain.

According to the FCM Evaluation Guide (whose full title is translated from Spanish as: *Evaluation guide for renewing the accreditation of the official undergraduate and Master’s degrees*, 2014) the goals of the official university degree-program accreditation essentially refer firstly to testing if the qualification program was developed according to the stipulations set out in the certified report; secondly, to provide transparency and to disseminate information about the degree; thirdly, to make recommendations and suggestions based on continuous improvement; and finally, to implement the accreditation process as a key moment within the framework of university agentification.

The objectives, features, and values associated with these expert panel functions are defined and sequenced according to the FCM guide, and can be summarised as: a) understanding the criteria for the reaccreditation; b) preparation of an individual report that must be shared with all of the panel members prior to the visit; c) depending on whether the member’s role is as a contributor or president, taking responsibility for producing the final visit report from the visit for its subsequent use by the accreditation branch committee. Once these axiological and functional premises have been defined, we enter into the panel evaluation process, establishing the following phases:

1. Reading the degree-program self-report prepared beforehand by the degree coordinator.
2. Evaluation and analysis of any other documents and evidence associated with the qualification.

The quality of reports produced for the different degree-programs is very disparate and this determines the evaluator’s position regarding the qualification at the start of the panel member’s individual-report writing process. In our case, this document, notoriously, influences the initial perception of the degree-program. Therefore, a well-written report that understands and recognises the strengths and weaknesses of the course, and that provides a coherent discourse based on evidence and data, predisposes the evaluator to like it, even before assessing the other required documentation such as the certified report, previous monitoring report, and any other data, ratios, and indicators. Given the disparity in the quality of the coordinator self-reports, they should be evaluable. This is because in certain cases not even the minimum requirements are met and it appears that their authors are unaware of the university

normative environment. Here, I give the following example (individual report on an undergraduate-degree course, 2016):

In the introduction, this individual report states that the necessary modifications were not requested because: “the law for educational reform (Spanish Organic Law 8/2013, of 9 December), which allows for a three-year undergraduate degree-course structure, restrained the proposal in order to provide more time for reflection on the desirability of these changes in one direction or another.” Based on their own evidence, this statement is erroneous and serious on two counts: on the one hand, the law that they refer to (LOMCE) does not apply to universities, and so it does not affect how these institutions should plan their studies. On the other hand, the Spanish Organic Laws are not an obstacle to requesting a modification during the verification of these degree courses. Ignorance of the basic legal architecture of university education in Spain and its articulation in the European Higher Education Area is a very negative factor which is evident in this individual report. (Individual report on an undergraduate degree program, 2016).

Another key document for consultation is the certified report, the changes that are made to it over time, and the monitoring report produced by the Quality Agency. Given the volume of the documents included in the certified reports, the most difficult task is to get a clear general idea of the degree-program and its development. To do this, I try to apply this conceptual map:

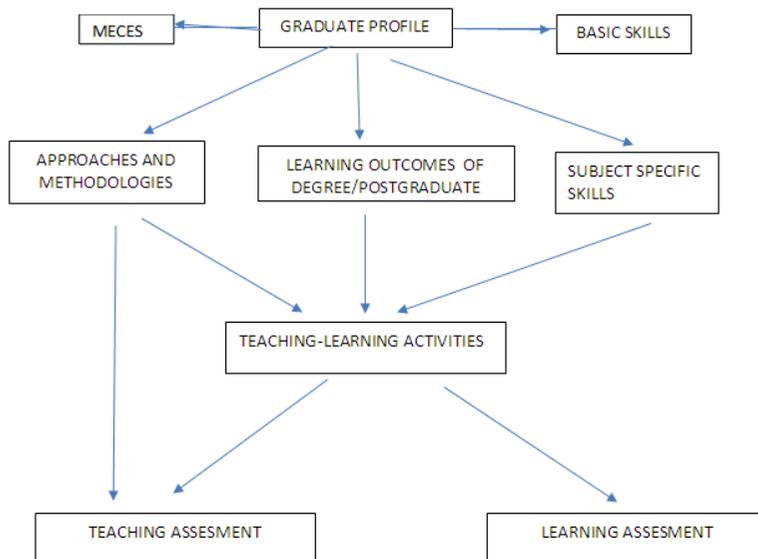


Figure 1: The centrality of the graduate profile and of the learning outcomes in the development of degree programs. MECES: Qualifications Framework for Spanish Higher Education (*Marco Español de Cualificaciones para la Educación Superior*, in its original Spanish). Source: Rubio Arostegui (2014). Taken from: Workshop on the assessment of learning outcomes in the process of university degree-program accreditation (Universidad Antonio de Nebrija).

This scheme allows us to link the graduate profile to the degree program in question, aligning with the Qualifications Framework for Spanish Higher Education (MECES, for Marco Español de Cualificaciones para la Educación Superior in its original Spanish) and the basic skills required for the degree course, and beyond these with subject-specific skills and learning outcomes. This is a theoretical written approximation that can be used by the panel member to draft their report. It can also be contrasted at the subsequent centre-visit when evidence in the form of coursework, exams, virtual campus content, or training activities recorded in an audiovisual format, from three or four selected subjects comprising the course, are made available to the panel.

In this article it is impossible to cover all of the many assessment-process dimensions and criteria that the evaluator must complete according to the standardised reference model. Therefore, here we will focus on only two dimensions of the degree-program that are considered by the quality agencies as “critical criteria”: learning outcomes and the value of the human resources teaching the course based on their individual research profiles. If these criteria receive a negative evaluation it could lead to closure of the degree-program as the result of an unfavourable report. In terms of the learning outcomes, there is usually a lack in theoretical alignment with the work proposed in the degree course, and this must subsequently be underpinned in teaching practice and student learning. Table 1 shows an example of such an alignment for the work proposed in a degree course; I constructed it when writing the coordinator self-report for the FCM when applying for reaccreditation of the Performing Arts degree at the University of Antonio de Nebrija in the first call for accreditation renewal in 2014.

General skills evaluated in the undergraduate course/learning resulting from the program	Relationship to the bloom taxonomy	Relationship to meces skills
Capacity for analysis and synthesis	Analysis-Synthesis	a/c
Ability to manage information	Knowledge	a/c
Ability to apply knowledge in practice	Application	a/b/c
Ability to solve problems	Application	b/c/e
Critical ability and capacity for self-criticism	Evaluation	c/d
Creativity in approach or development of the work	Evaluation	d/f

Table 1. Example of the alignment between the MECES undergraduate skills with the undergraduate end-of-degree coursework. Source: taken from the accreditation coordinator self-report for the Performing Arts Undergraduate degree at the University of Antonio de Nebrija (2014).

In this case, the undergraduate end-of-degree coursework was taken as a reference model because it was impossible to perform this exercise with all of the work undertaken for every subject comprising the course curriculum. Moreover, panel members are usually grateful for the conceptual development of a selection of degree-course topics so that they can visualise the alignment between the common framework MECES skills and the degree course's learning outcomes. This alignment could also be shown with the specific skills which are necessarily tied to the course graduate profile.

Regarding the value of the human resources teaching within the degree program, as measured by their research profile, we try to examine the relationship between the academic researcher "capital" and their links with the degree course. In some degrees this is very obvious and the links are sufficiently explicit, for example given the number of six-year-terms completed by the degree's academics, links to the field of knowledge, or lines of research with a similar profile to the degree. On other occasions insufficient evidence is provided or the researcher capital simply does not exist. This can be seen in the example below (undergraduate course assessment report, 2016):

The university teaching-staff research activity requirements are not included in the certified report, its amended version, or in the coordinator self-report. Nor is there any evidence to allow the research activity of the teaching-staff to be evaluated at the individual level (in the case of [...]) and there is a lack of experience: none of the research staff at [...] have completed terms of more than six years, either at the group level or at the institutional level. Similarly, there was no evidence for teaching-staff research activity (their performance in terms of publications at different levels in indexed scientific journals or their impact in their research activity fields) mentioned in the course coordinator's self-report.

The issue of the research activity undertaken by the teaching-staff affiliated with the course has recently been rescaled by other Spanish quality agencies following the experience of the first accreditations in the Spanish university system. Therefore, as discussed by the Quality Agency of the University System of Catalonia (AQU) in a 2016 review of additional factors in the accreditation of qualifications, the interaction between research and teaching activity should strongly influence the process of reaccrediting the degree-program: "the interaction between investigation and teaching in the training program benefits student learning; specifically, how research activity in the discipline is used to reinforce teaching and student learning" (AQU, 25).

Therefore, we understand that research activity should be referenced within the following criteria:

- Organisation and development of the degree (Criterion 1):
 - Highlighting undergraduate/master's degree coursework derived from research activity in the research groups linked to the degree course or if they are related to research lectures in disciplines connected to the degree.

- If there is evidence that the undergraduate/master's course has emerged within the framework of research projects or research activity consultancy contracts.

- For master's degrees with a research orientation, it is understood that the course is obliged to relate the degree work to the group's research activity or with that of teaching groups, and this should extend to the doctorate-level, if there is one.

- Academic staff (Criterion 4):

- Synthetic indicators of academic staff research activity: experience measured as the number of six-year-terms completed, H-index, i-10 index, or other indicators normally used in the research domain, even though these give a numerical value that encompass all of the scientific production of a professor. However, this must be contextualised within the scientific discipline of the degree being evaluated.

- Research results publications or participation in research or consulting projects that could have an innovative impact on the teaching of the degree.

- Learning outcomes (Criterion 6):

- In many cases, innovation in teaching is a consequence of a prior research process.

- Involvement or participation of students in research projects, according to their level of training at different stages of their undergraduate or master's formative trajectory is an indicator of links to the university's research and teaching activity.

This scheme allows criteria 1, 4, and 6—all critical to the reaccreditation process—to be checked a priori from a research activity focus, beyond the other indicators recommended by the Guide such as the percentage of doctors per research group teaching in the degree.

4. Interaction during the visit and negotiation of the assessments

Every panel member must prepare a report prior to their campus visit, however, we could call the process of constructing this report 'the rubbish-bin model' (Lamont, 2015) because the decisions made by different panel members can be so contradictory. In fact this also usually occurs even in the critical dimensions, even though the final report may achieve a high degree of consensus between panel members. Incidentally, the panel normally comprises two academics and one student, although in the case of artistic degrees a professional from the field in question is added—whether a professor in higher arts education or not. The panel secretary is responsible for compiling all of the panel members' assessments into one document which can then be refined to reach agreement among the panel, even though the final word on the draft

goes to the president, who concludes the visit by reading an oral report and signing the final visit report.

The dimensions for managing the degree are assigned beforehand in agreement with the Guide, thus establishing that the critical criteria must be the academic staff, the learning outcomes, and performance and satisfaction indicators. However, some other dimensions can trigger an unfavourable assessment of the degree-program, such as the organisation and development of the course or the material resources. The agreements and disagreements between panel members are also exemplified in the different assessments that are given according to the standardised criteria on a qualitative A, B, C, and D scale that graduates from excellence to non-compliance with the required minimum. At the visit to the campus the panel members meet face-to-face, different assessments are exchanged, and each member tries to argue their vision of the degree-program both in general and in terms of its dimensions. This is also where the degree-program indicators are contrasted.

Limiting ourselves in this article only to analysis of research activity and learning outcomes, interviews conducted with the teaching staff and management team at the centre and the university should clear up any doubts there may be about the research indicators. If the degree assigns professors and research groups with plausible activity, they will be able to provide specific answers to any questions the panel members may ask, for example about the lines of research, level of international research activity, and research projects being carried out. Another very different matter is how much this evidence is valued by the panel, in which there are different perceptions about the value of different research activities. Thus, as shown in the following table, the described degree-program assessment (which was evaluated in 2016) started out with one very negative individual panel-member report on research activity indicators, which evolved during the accreditation process, gradually losing this negative evaluation at each stage of the assessment until it practically disappeared in the final branch committee report.

	Reference to the research activity deficits of the teaching-staff affiliated with the undergraduate course (Human Resources)
Individual panel member report	States: “The university teaching-staff research activity requirements are not established in the certified report, its amended version, or in the coordinator self-report. Nor is there any evidence to allow the research activity of the teaching-staff to be evaluated at the individual level (in the case of [...]) and there is a lack of research experience: and none of the staff at [...] have completed terms of more than six-years, either at the group level or at the institutional level. Similarly, there was no evidence for teaching-staff research activity (their per-

	formance in terms of publications at different levels in indexed scientific journals or their impact in their research activity fields) mentioned in the coordinator's self-report."
Panel final report	States: "Implementation of a tool for assessing the merits of individual and group research activity is recommended."
Branch committee report	There was no reference to the research activity in the human resources criterion.

Table 2. Evolution of the research activity assessment in the Human Resources criterion through the three reports comprising the degree-program accreditation phase.
 Source: produced internally.

Finally, so all of the panel members would approve it, we insisted on once again mentioning the aforementioned deficit by enclosing the following as a comment in the final report: "In the case of [...] the research activity indicators (in terms of experience measured as six-year research terms served, research groups, and publication performance) are very weak and should feature in some way. [in the final panel report]." In this case there is no doubt that the panel president did not share the same opinion on the assessment as the academic contributor when gauging the research activity. Consequently, this negative dimension disappeared in the branch committee report because of the weight of the president's opinion. In the final corrections proposed for the panel report, and even after its finalisation, panel members sometimes make their disagreement clearly known, as discussed by another panel member in an e-mail written after the report was finished:

The Report includes everything that we agreed upon for the summary. However, I remain deeply concerned because the Spanish university system is proposing undergraduate degree courses as poor as this one and Assessment Agencies are validating them. It is reasonable to allow degree-program coordinators time to implement improvements to these courses, especially because they do not yet have the experience of having concluded the first year of graduation from the program. However, they are being granted a vote of confidence in order to test if, in the next 6 years, they are capable of normalising something that started out chaotically. (E-mail sent by a panel member to the rest of the panel).

With regard to learning outcomes, at the visit the panel members can gauge the learning of the students enrolled in the course resulting from them following the subjects the panel had previously approved as part of the program. Paradoxically, when the evidence of learning outcomes in the form of coursework, exams, or other supporting material is available, it is difficult to get an idea of the training by using the MECES framework. Some panel members have no knowledge of the qualifications framework or the learning-outcomes standardisation process, both at university and non-university teach-

ing levels. Ignorance of the cognitive frameworks, or disagreement between panel members in terms of the beliefs and values regarding learning outcomes, leads to a scenario of disorientation between those without this knowledge or who do not believe in it. This makes it difficult to assess if the activities evaluated are in line with those described in the certified report, and consequently with the undergraduate or master’s degree MECES framework.

Thus, in the debates at the visit the fact that one of the members does not start from the premise of MECES means that the assessment can become quite difficult to agree upon as there is no framework to use as a reference model or rubric prior to evaluating if the activities match those established in the certified report. This is a very difficult matter that, as noted by Ashwin (2009), goes beyond the accreditation itself because, even in our own teaching practice it is very difficult to distinguish differences at the level of MECES between undergraduate and Master’s degree courses on similar subjects (e.g. the bachelor’s degree course in Primary and Secondary Education and the Master’s training course for Secondary Teaching at Universidad Antonio de Nebrija). The pedagogy suggested by Sin (2015), which yields to the utilitarianism of learning outcomes with a view to possible employability, has not yet reached academic fields. Moreover, in some cases of artistic degree courses applying for accreditation, we have found that the degree-course subject student-assessment methods implemented are insufficiently rigorous—for example, only a sheet with a written review or commentary of film may be submitted instead of coursework or exams as evidence of learning.

Reference to the Learning Results	
Individual panel member report	<p>States: “Therefore, the following is required: an ad hoc definition of the learning outcomes, linked to the skills associated with the degree program and its subjects or materials and b) a relationship between the learning outcomes and the six MECES skills for the course level.”[...]</p> <p>“It is crucial that teaching must accomplish the ultimate objective of seeking and achieving deeply focused and committed student learning.”</p> <p>The panel member’s comment at the end of the report document also states:</p> <p>“Some of the evidence we saw, as in the case of the work we observed for the [...] course, was clearly insufficient to meet the requirements the of MECES undergraduate framework.</p>
Panel final report	<p>States: “The evidence shown in the case of [...] demonstrates that the performance level could be increased....”</p> <p>“Work must be done, both at theoretical and practical levels, to increase the level of some of the material</p>

	which produces poor learning outcomes.”
Branch committee report	States: “The evidence shown in the case of [...] demonstrates that the performance level could be substantially increased....”

Table 3. Evolution of the learning outcomes evaluation through the three degree-program reports. Source: produced internally.

5. Conclusions

This study provides details about the practices implemented in academic-environment evaluation cultures and accreditation styles in Spain, a phenomenon that began in the Community of Madrid, alongside the rest of Spain, in 2014. Through the author’s experience as a panel member, it tries to apply rigor to the process of evaluation practice so that in the future it can be contrasted with other panel practices and thus, used to improve the quality of university evaluation. Academic peer-review creativity and innovation in the process of accrediting undergraduate and master’s degrees plays a secondary role to the values generated during peer interactions. Similarly, the culture of agentification that pivots upon key concepts such as skills, learning outcomes, continuous improvement, and use of indicators of student satisfaction with the teaching, has not spread equally among different panel member types, especially among the generation of lifelong teachers that usually form part of these expert panels.

Quality agencies’ emphasis on testing whether degree programs have been developed in accordance with the stipulations set out in the certified report can become a factor that impedes the identification of better and more innovative ways of developing and managing university courses, as Ewell (2015) points out in the case of the United States. In the same way, in some cases, educational innovation has resulted from the digital transition of teaching-learning processes. It is very probable that certain types of educational innovations will go unnoticed by panels where the president and/or the academic contributor are unfamiliar with digital training environments. In this respect the author tends to agree with Ashwin (2009) that only very few European countries (for example, Sweden and Great Britain) have a strategy and policy in place with public resources to support higher education teaching.

The two criteria selected for analysis in this accreditation case-study—learning outcomes and the value of the human resources in terms of their research activity—highlight the differing logic between the panel members. In the first case, as noted by Ashwin (2009) and Sin (2015), the difficulty results from moving from abstract to tangible learning outcomes and the tensions and problems that the panel members struggle with to reach an agreement. This is especially the case if these members do not share a common attitude to the processes of learning standardisation and the MECES framework. In this

sense, the quality agencies' efforts to standardise learning outcomes have not yet had the desired effect on the degree-program coordinators or the evaluators themselves. On the other hand, the trend towards gauging learning outcomes by their measurability and employability as one of the main values of education, is detrimental to acknowledging the educational experience (and thus, satisfaction) of students, as shown by Eisner (2004) in the dynamics of education teaching practice in the United States.

Regarding the contribution of research activity to developing the degree course and its innovation, the assurance of a minimum quantity of academic capital, makes it much easier to contrast and compare learning outcomes. Although the tendency (or at least that expressed by the AQU in Catalonia) is to give greater weight to researcher capital in the accreditation of undergraduate and master's degrees, on certain panels there is a lack of agreement between the academic panel members on the value of the activity, and so the panel president's opinion eventually prevails.

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Teaching Practices in the 21st Century in Kenya: A Qualitative Approach

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Abstract: Education is an engine for the growth and progress of any society and it is responsible for building human capital which sets technological and economic growth. In the pre-technology education context, the teacher controlled the instructional process, the content was delivered to the entire class and the teacher emphasized factual knowledge. However, the current global demands in education require the use of approaches that are learner-centered and embracing integration of ICT. The purpose of this study is to establish the pedagogy used in Kenya for the 21st century learner. The case study design was used to collect qualitative data from three teachers who were purposively sampled from three education sub-sectors in Kenya: primary, secondary and university. The interview was guided by three research questions: Which teaching practices are used in Kenya? Which are the 'best' teaching practices in Kenya in the 21st century? What are the barriers for the 'best' teaching practices in Kenya? The findings were that the teaching methods currently in use were mainly teacher-centered although the respondents revealed that the 'best' teaching practices for the 21st century learner were student-centered. However, the barriers were large classes, lack of resources and facilities among other factors. The study recommends re-alignment of education policies to give priority to build pedagogical capabilities of teachers, provide digital tools and other resources. This would enable the 21st century learners' opportunity to unleash their potential.

Key Words: Human Capital, Learner-Centered, Pedagogy, Technology, Teacher-Centered, Teaching Practices, Technological Capabilities, 21st Century Learner.

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1. Introduction

Education is an engine for the growth and progress of any society and it not only imparts knowledge, skills and inculcates values but is also responsible for building human capital which breeds, drives and sets technological innovation and economic growth (Damodharan, 2007). In the pre-technology education context, the teacher is the sender or the source, the educational material is the information or message and the student is the receiver of the information. In terms of the delivery medium, the teacher can deliver the message via the chalk and talk method and overhead projector transparencies. This directed instruction model has its foundations embedded in the behavioral learning perspective discussed by Skinner (1976) cited in GSI Teaching and Resource Centre (2014). It is a popular technique which has been used for decades as an educational strategy in all institutions of learning.

Basically according to Gray (2016) the teacher controls the instructional process, the content is delivered to the entire class and the teacher tends to emphasize factual knowledge. That is, the teacher delivers the lecture content and the students listen to the lecture. Thus, the learning mode tends to be passive and the learners play little part in their learning process and this conventional lecture approach in classroom has been found to be of limited effectiveness in both teaching and learning for in such a lecture, students assume a purely passive role and their concentration fades off after 15-20 minutes.

The current global demands in education require the use of approaches that are learner-centered, embracing integration of ICT and creative enough to provide quality and relevant Education. The requirement is backed by a number of policies on Education For All (EFA) in Kenya (Republic of Kenya, 2007) and the needs of a dynamic 21st century learner as described by the partnership for 21st century skills. A 21st century learner possess attributes that integrate knowledge, skills, values and attitudes that result in learning outcome that is holistic and produce critical thinkers, problem solvers, with integrity, independence and responsible and positive self-esteem, which outweighs the current practices that target achievements in cognitive domains inclined to test score (Huitt, 2011)

The 21st century learner is democratic and critical in ICT and the education is perceived to prepare the child for life and the schools have to equip the learner with skills, knowledge and attitudes that enables the learner to have integrity and self-respect, moral courage, use the world around them, speak, write, read well and enjoy their life and work (Center for British Teachers, 2012). Globally, the most crucial of these skills also termed the 4Cs are critical thinking and problem solving, creativity and innovation, communication and collaboration.

2. Teaching in the 21st century

When the 21st century teaching is taking place; schools should stop being buildings defined by walls and times of day but they should transform into community nerve centers. Walls should become porous and transparent and teachers and students become connected to the outside world from the immediate surrounding community to people and knowledge across the planet. Teachers should stop being dispensers of data and become something more akin to coaches, imparting skills that help students become not just content experts but expert learners. Lastly, learners should be excited by flexible, open-ended, project-based and real- world learning situations that not only teach content skills but they also instill curiosity- fundamental to lifelong learning. They should develop communication and teamwork skills and should appreciate the freedom and responsibility that comes from taking charge of their own learning (Kellner, 2012).

2.1 Teaching practices

Teaching practices are the specific actions and discourse that take place within a lesson and that physically enact the approach and strategy. Teaching practices (Alexander, 2001) comprise:

- Teacher spoken discourse including instruction, explanation, metaphor, questioning, responding, elaboration and management talk.
- Visual representation using a chalkboard, writing, diagrams, pictures, textbooks and learning aids such as stories, experiments and drama to understand or construct the new knowledge being presented or indicated to the learner.
- The act of setting or providing tasks for learners to cognitively engage with new content or develop physical skills such as experimentation, reading, writing, drawing, mapping, rehearsing, problem solving and practicing.
- A variety of social interactions in which language is central between learners or learners and a teacher such as pairs, groups, individually or whole-class.
- Teachers' monitoring, use of feedback, intervention, remediation and formative and summative assessment of the students or assessment by the students themselves.

2.1.1 Teaching approaches

The choice of teaching approach depends on what fits educational philosophy, classroom demographic, subject area(s) and the school mission statement. However, teaching theories primarily fall into two categories or approaches: teacher-centered and student-centered.

In teacher-centered approach, the teachers are the main authority figure and the students are viewed as empty vessels whose primary role is to pas-

sively receive information via lectures and direct instructions with an end goal of testing and assessment. It is the primary role of the teachers to pass knowledge and information onto their students. In this model, teaching and assessment are viewed as two separate entities. Student learning is measured through objectively scored tests and assessment.

While teachers are an authority figure in student-centered approach to learning, teachers and students play an equally active role in the learning process. The teacher's primary role is to coach and facilitate student learning and overall comprehension material. Student learning is measured through both formal and informal forms of assessment including group projects, student portfolios and class participation. Teaching and assessment are connected; student learning is continuously measured during teacher instruction.

2.1.2 Teaching strategies

In educational pedagogy, there are three main teaching strategies (styles) based on these two approaches: direction instruction, inquiry-based learning and cooperative learning.

Direct instruction is the general term that refers to the traditional teaching strategy that relies on explicit teaching through lectures and teacher-led demonstrations. It is the primary teaching strategy under the teacher-centered approach and the teachers are the sole supplier of knowledge and information. Direct instruction is effective in teaching basic and fundamental skills across all content areas. According to Gill (2013) teachers are formal authority and are in a position of power and authority because of their exemplary knowledge and status over their students. Classroom management styles are traditional and focus on rules and expectations. He further argues that in direct instruction, teachers are experts and are in possession of all knowledge and expertise within the classroom. The teacher's primary role is to guide and direct learners through the learning process and the students are viewed solely as the receptors of knowledge and information – empty vessels. In addition teachers are personal models who lead by example, demonstrating to students how to access and comprehend information and students learn through observing and copying the teacher's process.

Inquiry-based learning is a teaching method that focuses on student investigation and hands-on learning. The teacher's primary role is that of a facilitator, providing guidance and support for students through learning process. Inquiry-based learning falls under the student-centered approach and the students play an active and participatory role in their own learning process. There is a strong emphasis on the teacher-student relationship (Gill, 2013) and both the student and the teacher undergo the learning process together. The student learning is loosely guided by the teacher and is focused on fostering independence hands-on learning and exploration. There is a sense of autonomy in the learning process for teachers play a passive role in students learn-

ing. Teachers act as a 'resource' to students, answering questions and reviewing their progress as needed while students are active and engaged participants in their learning.

Cooperative learning refers to a method of teaching and classroom management that emphasizes group work and a strong sense of community. This method fosters students' academic and social growth and includes teaching techniques such as think-pair-share and reciprocal teaching and it falls under the student-centered approach because learners are placed in responsibility of their learning and development. This method focuses on the belief that students learn best when working with and learning from their peers.

2.2 The 21st century learners

For effective teaching it is good to know the type of learners the teachers in the 21st century would be dealing with and the following are some of the characteristics of these learners (Dublin, 2015).

- Broad and deep understanding of the world. Learners these days know that they live in the world where there are diversity and a lot of issues to address such as health concerns, environment protection, economic growth and many more. They try to play an important role in taking care of the environment and help lessen the contribution of society to its destruction. They also tend to be more financially literate and can make economically sound decisions.
- Make interdisciplinary connections. These days, students can apply and relate what they learn in different subject areas such as mathematics, science and the arts to address an issue or achieve a certain project. Doing so gives them a deeper sense of understanding and appreciation of the complex concepts and equations that they have to study every day.
- Think critically and creatively. 21st century learners can process the information that they receive, ask questions, analyze them and make arguments, beliefs and decisions based on this information. They do not limit themselves to becoming one-trick-ponies only. They often think outside the box and do not stick to a single approach to attack a dilemma.
- Communicates and collaborates with others. Two heads are better than one and the learners today realize the power of a unified group and learn how to deal with different personalities in an effective and courteous manner.
- Creates, evaluates and utilizes information. Technology has made it possible for everyone to gain access to a diverse and abundant amount of information. Students can harness this, evaluate which one is accurate and is significant and use it to address a certain issue.
- Career-ready and prepared for life. The real world can be harsh and cruel, unlike the environment the learners have been used to. It is certainly going to take more than just knowledge and theoretical ideas that are going to

make a person survive the grown-up life. However, the learners of today are more flexible and can easily adapt to new environments.

- Eyes on the prize. Teaching today should be more than just giving lessons and assignments. It should be a two-way process where both the learner and the teacher learn from each other and this would enable the learners to further the 21st century skills – skills that will allow learners to function, learn and adapt throughout life in this post-modern world.

All these learner characteristics would therefore culminate into the 21st century learning which means the constellation of learner characteristics which equips learners to enjoy a high quality of life, work and relationships by being resilient, intentional, creative and confident learners who understand the values of collaboration, the relationship of effort to results and the need to be continually growing and learning (Walker, 2012).

2.3 Effective pedagogy

The ultimate goal of any pedagogy is to develop student learning and yet the 2005 Global monitoring report on quality (UNESCO, 2005) includes creative, emotional and social development as indicators of quality learning. Effective pedagogy is inclusive of those teaching and learning activities that make some observable change in students, leading to greater engagement and understanding and/or a measurable impact on student learning. However, Alexander (2008) distinguishes indicators of quality from measures, recognizing that there are non-measurable indicators that may be culturally or contextually specific but difficult to gauge by objective measurements.

Effective pedagogy practices can be seen through measurements of enhanced student cognition which are key, although other indicators are included such as changes in student confidence, participation or values and social indicators such as teacher-student interaction and inclusion (Westbrook *et al*, 2013). In addition, secondary outcomes of successful learning as a result of effective teacher pedagogic practice may be higher student attention, use of resources, use of specific practices and stakeholder's satisfaction such as parents and community members.

In the old pedagogies (Fullan & Langworthy, 2014) a teacher's quality was assessed primarily in terms of their ability to deliver content in their area of specialization and pedagogical capacity was secondarily important for teaching strategies meant direct instruction. Technology on the other hand had been layered on top of content delivery and used to support students' mastery of required curricula content. However, in the new pedagogies model, the foundation of teacher quality is a teacher's pedagogical capacity – their repertoire of teaching strategies and ability to form partnerships with students in mastering the process of learning. Technology is pervasive and it is used to discover and master content knowledge and to enable the deep learning goals of creating and using new knowledge in the world.

2.3.1 New Pedagogies components

The following three components when integrated enable deep learning outcomes according to Fullan and Langworthy (2014), new learning partnerships between and among students and teachers, deep learning tasks that restructure the learning process towards knowledge creation and purposeful use and digital tools and resources that enable and accelerate the process of deep learning.

- Effective partnering is built on principals of equity, transparency, reciprocal accountability and mutual benefit. Through such partnering teachers not only become learners but also begin to see learning through the eyes of their students. This visibility is essential if teachers are to continuously challenge students to reach for the next step and if they are to clearly see whether teaching and learning strategies are achieving their intended goals.

- Deep learning tasks harness the power of the new learning partnerships to engage students in practicing the process of deep learning through discovering and mastering existing knowledge and then creating and using new knowledge in the world. Deep learning tasks are energized by the notion of learning leadership in which students are expected to become leaders of their own learning, able to define and pursue their own learning goals using the resources, tools and connections that digital access enables.

- Deep learning tasks redesign learning activities to: restructure students' learning of curricular content in more challenging and engaging ways made possible by digital tools and resources; give students real experiences in creating and using new knowledge in the world beyond the classroom; develop and assess key future skills, called the 6Cs:

- Character education – honesty, self-regulation and responsibility, hard work, perseverance, empathy for contributing to the safety and benefit of others, self-confidence, personal health and well-being, career and life skills.
- Citizenship – global knowledge, sensitivity to and respect for other cultures, active involvement in addressing issues of human and environmental sustainability.
- Communication – communicate effectively orally, in writing and with a variety of digital tools; listening skills.
- Critical thinking and problem solving – think critically to design and manage projects, solve problems, make effective decisions using a variety of digital tools and resources.
- Collaboration – work in teams, learn from and contribute to the learning of others, social networking skills, empathy in working with diverse others.
- Creativity and imagination – economic and social entrepreneurialism, considering and pursuing novel ideas and leadership for action.

- Digital tools and resources have the potential to enable, expand and accelerate learning in ways previously unimaginable. Technology strategically integrated with other core components of the new pedagogies unleashes deep learning. When pedagogical and deep learning capacities are clearly defined and developed, digital tools and resources enable the discovery and mastery of new content knowledge; the collaborative and connected learning; the low cost creation and iteration of new knowledge; the use of new knowledge with authentic audiences for real purposes; and the enhancement of teachers ability to put students in control of their learning process, accelerating learner autonomy.

In the new pedagogies, learning partners use technology: to construct knowledge, to investigate and solve real problems, to give each other feedback and assess one another's work, to collaborate beyond the boundaries of the classroom and the school day and to communicate with peers, experts and others throughout the world. The how of technology use is dynamic and co-determined by students and teachers.

2.3.2 Effective teaching principles

These are teaching characteristics that relate to students' experience and they are the blueprint for effective teaching.

- Enhancement of social-emotional student learning. There are five key components to social and emotional learning: Social awareness, self-management, self-awareness, responsible decision-making and relationships skills. The teachers can address these social-emotional learning components through the following teaching strategies:

- Meeting one-on-one regularly with students to discuss challenges or social themes. This can help students become more self-aware of their actions, improve relationship skills with the teacher and develop responsible decision-making skills, they can use moving forward to resolve any challenges or issues they face in school.
- Starting and ending the day with personal connection. This can help students understand the importance of their work and the influence it can have on their success. Teachers can share their own learning challenges and successes in school or other areas of life in an effort to connect with students and encourage honest discussion.

- Enhancement of a positive mindset. Practicing a positive mindset can improve student learning. The positive thinking can improve the emotional and motivational support or even cognitive functions for numerical problem solving, reading ability, working memory and math reasoning. The positive mindset teaching strategies include the following:

- Using teachable moments. When faced with adversity in life or in the school environment, teach the students how to see the situation in a positive light and how to move forward. This is a great time to

practice empathy and teach the students that there are others who may be more disadvantaged.

- Delivery attitude lessons. Ask students to compare someone in their life who has a positive mindset with another who has a negative attitude. Students can also assess their own attitude and how they could improve.

While social competence and a positive mindset may not be commonly tested learning areas, they are important skills that can drastically impact student learning outcomes and student success in education and other important areas of life (Mattero, 2016).

Other teaching characteristics that make an effective teacher (Weimer, 2009)

- Enhancement of interest and explanation. When our interest is aroused in something, we enjoy working hard at it until we come to feel that we can in some way own it and use it to make sense of the world around us. Coupled with the need to establish the relevance of content, teachers need to craft explanations that enable students to understand the material. This involves knowing what students understand and then forging connections between what is known and what is new.

- Enhancement of concern and respect for students and student learning. Good teaching is nothing to do with making things hard and also nothing to do with frightening students. Good teaching is everything to do with benevolence and humility; it always tries to help students feel that a subject can be mastered; it encourages students to try things out for themselves and succeed at something quickly.

- Enhancement of appropriate assessment and feedback. This principle involves using a variety of assessment techniques and allowing students to demonstrate their mastering of the material in different ways. It avoids those assessment methods that encourage students to memorize and regurgitate. It recognizes the power of feedback to motivate more effort to learn.

- Enhancement of clear goals and intellectual challenge. Effective teachers set high standards for students and they also articulate clear goals. Students should know up front what they will learn and what they will be expected to do with what they know.

- Enhancement of independence, control and active engagement. Good teaching fosters a sense of student control over learning and interest in the subject matter. Good teachers create learning tasks appropriate to the student's level of understanding. They also recognize the uniqueness of individual learners and avoid the temptation to impose mass production standards that treat all learners as if they were exactly the same.

- Enhancement of learning from students. Effective teaching refuses to take its effect on students for granted. It sees the relation between teaching and learning as problematic, uncertain and relative. Good teaching is open to

change and it involves constantly trying to find out what the effects of instruction are on learning and modifying the instruction in the light of the evidence collected.

3. Statement of the problem

In the report of education task force on re-alignment of education to the Kenya constitution (Republic of Kenya, 2012), the task force singled out a crucial question, is the Kenyan education system and its institutions and programs fit for the purpose? Specific issue identified in this question include relevance in regard to content and delivery: sufficient flexibility to adapt to the changing socio-economic needs, requisite quality to match global competitiveness and to address challenges of the 21st century.

The 21st century learners outpace their teachers in technological innovation and creativity and Kenya is no exception. The learners tend to get bored quickly with the curriculum delivery system embracing teacher-centered strategies which have no room for innovation and creativity. The outcome has been student unrest and protests, exams cheating and emergence of increasing dissatisfied youth (Laurillard, 2012), hence, the need for alternative approaches that are relevant. Moreover, the current teaching practices in Kenya focuses on producing “A” grade learners and those societal settings that attach a lot of value to test score.

It is therefore, in this landscape that the research has been done with a view of highlighting the effective teaching practices that can equip and develop the 21st century Kenyan learner.

4. Methodology

A case study design was used in the research to enable collection of qualitative data from three respondents who were purposively sampled. These were teaching professionals: a primary school teacher, a secondary school teacher and a university lecturer. These were from three sub-sectors of education in Kenya: primary, secondary and the university.

The study was guided by three research questions which were used to prepare the one-on-one interview schedule for in-depth data collection: Which teaching practices are used in Kenya? Which are the ‘best’ teaching practices in Kenya in the 21st century? What are the barriers for the ‘best’ teaching practices in Kenya?

5. Findings

The study respondents were three teachers from a primary and secondary school and a university whose pseudonyms were Peter, John and Nelly respectively.

Peter was a primary school teacher and had a bachelor's degree in education. He had been teaching in primary school for three years and the teaching methods he used included the following:

(i) Explanation. This is teacher-centered approach, the teacher explains the content to the learners as they listen but they can ask questions if need be. These explanations sometimes are accompanied by visual aids to help the learners visualize an object or problem.

(ii) Narration. This is an interactive teaching method. The teacher narrates stories to the learners and thereafter learners narrate stories to their partners or the whole class.

(iii) Discussion. This is learner-centered approach and the teacher facilitates by putting the students into discussion groups and the teacher is guiding the discussion and giving feedback.

(iv) Case study. This is the study of a famous personality, an event or an occurrence and is teacher-centered. The teacher takes the learners through such breath-taking phenomena and form a discussion revolving the case study.

(v) Mimicry. It is learner-centered and the teacher guides the learners in areas of imitation so as to bring out the character being imitated.

(vi) Look and say method. It is teacher-centered and ideal for language learning. The teacher flashes a written placard and the learners read aloud what is written. The reading can be done by an individual, a group or the whole class.

Peter noted that from his teaching experience in primary school level in Kenya, the following methods had been effective.

(i) Explanation. It is effective because the teacher assessed the level/ability of the learners and explains the content with the target to reach each learner at their level and simplifies by examples what seems difficult to understand. The teacher would use the medium of instruction which the learners can understand. The learners, on the other hand would be using and developing their listening skills as well as asking questions for better understanding.

(ii) Discussion. This is effective because the discussion/lesson would begin from the known to the unknown. That is, the learners would bring in their prior knowledge to the lesson/content as the teacher guides them to the frontiers of the new concepts.

(iii) Narration. This is effective for it involves all the learners and requires

them to develop such skills as speaking and listening. It also encourages them to learn from each other.

On further probe on the “best” teaching practices needed in Kenya in the 21st century, Peter suggested the following practices:

(i) Role play. This introduces a problem situation dramatically and is learner-centered. It provides an opportunity for learners to assume roles of others and thus appreciate another person’s point of view. Role play allows for exploration of situations and provides opportunity to practice a number of skills such as listening, speaking, questioning and reasoning. The teacher has to define the problem situation and the roles clearly and must give very clear instructions.

(ii) Resource persons. This can be used as practical examples in the classroom. The goal here is to show the learners that what they are learning has practical application and teachers need to effectively utilize relevant resource persons to enhance their teaching and achievement in class.

(iii) Modeling. This is learner-centered and it is active learning strategy. Its logic is ‘we learn by doing and learning is a constructing process’. The learners work in small groups or individually using clay or paper to build or make models or diagrams in lower and upper primary respectively. The teacher gives them the question(s) to be answered by the model or diagram.

(iv) Experiential learning. This is the process of learners making meaning from direct experience making observation and recording the observed items. It focuses on the learning process for an individual through observation and interaction with the environment as opposed to reading from a book. The learner, thus makes discoveries and experiments with knowledge first hand.

(v) Identification and sorting. This deals with visual representation of knowledge and information on colors, sizes and shapes. The learners are expected to identify and sort out items as per the question. The teacher’s role is to guide and give feedback.

The barriers Peter revealed for the ‘best’ teaching practices in primary schools for learners in Kenya were:

(i) Language barrier. This is mostly experienced in the lower primary. The learners come from different backgrounds and some have never had proper introduction with the language of instructions in Kenya schools – English; this becomes a road block for the ‘best’ teaching practices.

(ii) Cultural backgrounds – in some cultures girls do not mix with boys and this can be a problem especially when the teaching practice requires learners to work in pairs or groups.

(iii) Family status and set up. This touches on characteristics that would contribute to the learners’ absenteeism. Chronic absenteeism or when many learners are absent, the ‘best’ teaching practice may be difficult to practice.

(iv) Sudden changes of curriculum. This happens due to political influences and although such changes are seen as a culmination of a government policy, they are impediment to 'best' teaching practices.

(v) Exam oriented curriculum. This gives a lot of pressure to both learners and the teacher in terms of syllabus coverage in order to attain the 'A' grade at the end of the course. Thus, the use of some 'best' teaching practices such as experiential learning is limited since it is time consuming.

(vi) Large classes. It prohibits the use of 'best' teaching practices since the teacher finds it difficult to meet the needs of every learner and the slow learners tend to be left behind. In addition, such large classes make it harder for the teacher to source for and use resources for 'best' teaching practices.

Peter concluded by asserting that despite all these setbacks, primary school teachers in Kenya were making an effort to provide quality teaching.

In secondary school sub-sector, John who had a master's degree in education was interviewed. He had been teaching in secondary schools for five years. He had been using the following teaching methods:

(i) Lecture. This is a teacher-centered approach. It is used when presenting materials not easily obtainable, supplementing test book materials, developing interest and appreciation and summarizing points after a topic. It is a teaching and learning procedure by which the teacher seeks to create interest, influence and stimulate the learners. The factual material is presented in a logical manner.

(ii) Discussion. This involves active participation of learners and the teacher giving feedback. The learners not only learn to communicate ideas but to also dissect and evaluate them to find wider and more practical applications for them. The learners are given adequate time to search for information on the topic and the teacher assists them by suggesting sources of information. The teacher's role during discussion is guidance and the learners are given time to express their ideas and participate actively in the lesson.

(iii) Demonstration. It is a process of teaching through examples or experiments. It is used to prove a fact through a combination of visual evidence and associate reasoning. Demonstration helps to raise student interest and reinforce memory retention because they provide connections between facts and real-world applications of those facts. It trains learners to be good observers and it stimulates thinking to form concepts.

(iv) Question and answer. In this method, the teacher asks the questions and the learners give the answers. The questions are prepared in advance so as to be clear and fit for the purpose. The questions can be factual involving mere recall of factual information or thoughtful requiring thinking, application and intelligent manipulation of learned materials. This is done by the teachers stating the question, pausing to allow the student to think about the answer to the question, naming the student and listening to the answer and finally, the teacher gives the feedback.

(v) Simulation. It is kind of a role playing but the teacher and learners play some role without any preliminary training or rehearsal. The role playing skill is displayed spontaneously. The learners are only acquainted with the conditions, they discuss in groups and go ahead with the subject matter. Simulation develops communication skills and educational process is carried on in artificially created situations. It imitates a real-world activities and processes in a safe environment.

John noted that the effective teaching methods in secondary schools were:

(i) Demonstration: it allows the learners to personally relate to the presented information especially in experiment demonstration. This is because connections between facts and real-world applications of those facts are provided. Demonstration helps to illustrate and explain new materials to learners, hence, understand the new concepts being introduced.

(ii) Discussion. This involves active participation of students and giving feedback through asking questions and giving answers. A discussion can be expository oriented whereby the teacher presents the objectives, explains the learning activity, demonstrates it and then invites questions from the learners before concluding the teaching activity. A discussion can also be inquiry oriented and the teacher states the objectives, arranges for the discussion to take place and the whole activity is open-ended.

(iii) Simulation. It provides an experience as close to the real-thing as possible. A simulated activity, however, has the advantage of allowing learners to reset the scenario and try alternative strategies and approaches. This allows learners to develop experience of specific situations by applying their wider learning and knowledge.

The 'best' teaching practices for Kenyan learners in secondary schools which John revealed were:

(i) Collaboration. It allows learners to actively participate in the learning process by talking with each other and listening to others point of view. Collaboration establishes a personal connection between learners and the topic of study and it helps learners think in a less personally biased way. A good example of this practice is group discussion which involves preparing specific tasks for a group to deal with and this allows participation of everyone. Collaboration helps to assess student's abilities to work as a team, leadership skills or presentation abilities. After the discussion with a clearly defined roles the teacher gives the feedback.

(ii) Peer teaching. Learners assume the role of a teacher and teach their peers. The learners who teach others as a group or as individuals must study and understand a topic well enough to teach it to their peers. By having learners participate in the teaching process, they gain self-confidence and strengthen their speaking and communication skills.

(iii) Field work (experiential learning). It involves the direct use of the environment as a source of physical information. Field work involves the learners during preparation stage through information gathering on the topic and preparation of the data collection instruments such as questionnaires, involvement in data collection activities like asking questions, collection of samples and recording of information and involvement and follow-up activities such as report writing, presentation and display of collected items. Thus, field work provides a learner with sound and concrete basis for conceptualization, first-hand information, makes learning more meaningful and gives the learner long lasting memory and opportunity for improving social relationships among students and students and teachers.

(iv) A resource person. Classroom visits by informed professionals is a valuable teaching tool. Resource persons provide additional content support to the classroom materials and participates in critiquing and debriefing activities in which learners take various decision making roles. The resource person benefits the learners by sharing unique, specialized knowledge and experiences; sharing instructional media as well as published teacher-constructed instructional materials; sharing divergent way of thinking; providing role model; identifying possible options and goals for future career growth; and stimulating a realistic approach to educational problems. There is a short period at the end of the visit for a question and answer session.

John revealed the barriers to the 'best' teaching practices in Kenyan secondary schools as follows:

(i) Large classes. This restricts the teacher to some teaching practices because learner-teacher contact is minimal which makes it hard for the teacher to know each learners abilities and their needs. No matter how committed the teacher may be the learning resources may not be enough for the large class.

(ii) Limited learning resources and facilities. The teacher may improvise some learning resources but it gets difficult sometimes to improvise facilities like buildings.

(iii) Curriculum. The curriculum is exam oriented, thus, the syllabus must be covered on time for quality grades by every learner. This calls for other unorthodox teaching practices which might yield the expected results.

(iv) Teachers and learners attitude. Due to pressure to produce the most sought after exam grades, both the teacher and learners are apathetic to the 'best' teaching practices.

(v) Students' ability. It is unfortunate that some schools due to the structure of the education system in Kenya admit learners who are slow in learning. This is an impediment for 'best' teaching practices because such learners are affected by myriad shortcomings such as lack of resources, facilities and experienced teachers.

(vi) Costs. It is costly due to large classes to provide adequate resources and facilities for 'best' teaching practices in secondary schools in Kenya.

At university level, Nelly who holds a doctor of philosophy (Ph.D) in education was interviewed. She had been a university lecturer for four years. She said that she had been using the following teaching methods:

(i) Lecture. It is teaching using verbal message to create interest, influence and stimulate learners. Communication is mainly one way, thus, teacher-centered approach. It is used to present new information orally to passive listening learners at times. To enhance learner retention, the learners take notes, the teacher asks questions and the learners give the answers and vice versa. The lecturer can also ask rhetorical questions which are pre-planned and the learners record the answers in their notes. Although the overriding teaching method is lecturing, the amalgamation of other methods – question and answer method and discussion method – are used for effectiveness.

(ii) Group discussion. Assignment is given to each group so as to undergo a common experience but contrasting viewpoints are expected. Enhanced understanding results when learners discuss the meaning of their experiences with each other. Each group is exposed to a common experience to draw them into participation, establish a personal connection with the content and provide a shared reference from which their ideas are exemplified. In group discussion, learners get connected with both a concrete example of the content and each other.

(iii) Take-away assignment. This enables learners to interact with new materials and also be formatively assessed. The teacher allows a given period of time for the learners to do the assignment which the teacher marks and gives written feedback for each assignment done. The learners are involved in doing something on their own and get to think of what they are doing.

(iv) Peer teaching. Learners are allowed to choose topics they think they can read and understand. A period of time is allowed for the learners to accomplish the tasks after which they would explain the conceptual relationships of their topic to the other learners and this defines their own understanding of the material under study. In peer teaching, learners are allowed to plan and evaluate their learning, hence, fostering learner self-responsibility.

(v) Multimedia technology. The teacher uses technology to modify the contents of the material and present it in a more meaningful way using Ms PowerPoint which can allow materials to be modified and customized for the final presentation to the learners. It is an interactive learning process involving the teacher, the technology and the learner which stimulates the learner to read further.

On effective teaching methods in Kenyan universities, Nelly had the following:

(i) Lecturer, question and answer and discussion methods combined. These three methods should be viewed and used as a component for effective

teaching. The combination encompasses teacher-centered as well as student-centered approach which makes it quite interactive.

(ii) Take-away assignments. It stimulates the learners to study on their own and make them understand concepts of the material they are reading. It is ideal for both wide and in-depth reading.

(iii) Peer teaching. Learners work on their own to assemble and organize the new material for presentation to other learners and as such they are expected to be responsible, creative, articulate and exude confidence when teaching. It is an effective method of teaching for it utilizes the three main domains when teaching: cognitive, psychomotor and affectionate.

The 'best' teaching practices that Nelly noted for Kenyan learners at the university level were:

(i) Cooperative group assignment. It is an active learning procedure that places learners as workers and forces the achievement of a group goal. This interdependence affects three broad and interrelated outcomes: effort exerted to achieve quality of relationship among participants and psycho-social adjustment. Cooperative group assignment embraces "team member teaching", that is, each member of the group is assigned a portion of the whole and teach the other members (of the group). Ultimately all the group members will have learned the assigned task. Cooperative learning tasks with clear goals measure results in high-level reasoning and generation of new ideas and solutions. In addition, cooperative learning groups enhance positive inter-dependence, individual accountability, group processing, social skills and face-to-face interaction.

(ii) Learning cells. The reading tasks are categorized into two groups and the learners are also put into two groups. Each group is assigned a category of reading tasks but each learner in the group does independent reading after which the learner would be randomly assigned a partner from the other group to teach the essence of the material and vice-versa. This is true to the saying that we learn by doing and the class would have as many learning cells as there are pairs!

(iii) Peer teaching. This is allowing learners to take an active role in teaching some portion of the course. Individual learners are assigned areas of study to teach their colleagues and in so doing they would strive to understand the material under study in order to explain the new concept to their classmates. Peer teaching has many benefits – holistic learners.

(iv) Technology. It is universal and used to discover and master content. Technology enables the learning goals of creating and using new knowledge in the world. The digital era has changed fundamental aspects of education: traditional roles of teachers and textbooks as the primary sources of content; students discover, create and use knowledge in the real world to apply their solutions to real world problems which are beyond the boundaries of their schools. Technology affects learning in a unique way that is not only to fa-

cilitate the delivery and consumption of knowledge but to also enable learners to use their knowledge in the world.

The barrier to the 'best' teaching practices in universities in Kenya revealed by Nelly were:

(i) Large classes. This force the teacher to use ineffective lecturer method which can accommodate such number of learners. Moreover, the teaching materials /resources are inadequate and the teacher is at a loss.

(ii) Inadequate facilities /resources. This can only allow learners to be crammed in small spaces and use scanty resources to the chagrin of the teachers.

(iii) Inadequate teaching personnel. This is a barrier due to heavy teaching loads. A teacher (lecturer) has many (6-8) course units to teach per semester and again the number of learners is large per unit. Thus, the use of the 'best' teaching methods is unattainable due to this pressure.

(iv) Limited use of technology. In Kenya which is a third world country and still grappling with other third world such problems as famine and diseases, technology which takes colossal amounts of money takes a back seat in implementation. In the universities, technology is not fully embraced but we are going there slowly but sure.

(v) Teacher attitudes. Most teachers and especially the professors, think that they are source of knowledge, hence use of traditional and tired methods of teaching-lecturing.

6. Conclusions and recommendations

6.1. Conclusions

- The interviewed teachers were from three sub-sectors of education in Kenya, primary, secondary and university. They all had university degrees. Their teaching experience ranged between three and five years and this means that they trained as teachers in the 21st century and as such they were expected to be conversant with the teaching practices of the century.

- The respondents revealed that the teaching methods they used in class lean mainly towards the teacher-center approach although they were aware that using a combination of various teaching methods including those that are student-centered, would lead to a more effective learning. However, they were all in agreement in revealing that using teaching methods that are student-centered effectively promote learning.

- The interviewed teachers revealed that the 'best' teaching practices for the 21st century learner are those teaching practices that have student-centered approach. However, the respondents' examples of the 'best' teaching practices were "traditional" student-centered approach methods such as field trips, role play, collaboration and peer teaching. This is an indication that the Kenyan teachers are ignorant of the latest research literature on effective

pedagogy of the 21st century learner. The research literature gives information on the characteristics of the 21st century learner and the possible teaching practices that can engage such a learner; these include teaching methods that foster teacher-student partnerships in learning, use of technology and engagement with deep learning tasks. These findings concur with Knapper (2008) indicating that the best ideas for effective teaching include: teaching methods that focus on the student activity and task performance rather than just acquisition of facts; opportunities for meaningful personal interaction between students and teachers; opportunities for collaborative team learning; more authentic methods of assessment that stress task performance in naturalistic situations, preferably including elements of peer and self-assessment; making learning processes more explicit and encouraging the students to reflect on the way they learn; learning tasks that encourage integration of information and skills from different fields.

- The barriers to the ‘best’ teaching practices in Kenya which were revealed by the respondents across the board in this study included large classes, lack of resources and facilities including technology, teachers’ and learners’ attitude, exam grades, pressure and inadequate finances. However, these are common features ‘inflicting pain’ on education systems in most third world countries in the 21st century.

6.2. Recommendations

- The Kenyan education system policies and economies should be realigned in order to build the pedagogical capacities of the teachers in the three education sub-sectors: primary, secondary and university. Effective teaching practices should be the new focal point of education policy because these practices define and measure the success of education system and more so when education is not centered only on covering the mandated curricula for exams that serve the education system rather than the student.

- The 21st century learner has natural instinct to learn and create, therefore, the Kenyan teachers should embrace the 21st century learning practices that can unleash this potential. These teaching practices can inspire and ensure learners are capable of independent learning and can use practical experiences and technical skills to create valuable environment for the society.

- Kenyan schools in the 21st century need technology in order to form learning partnerships. Therefore, fiscal constraints are no longer an excuse to delay the use technology in the schools. These are digital tools and resources that can be provided with the existing levels of funding. However, it is more a matter of political will than of economies.

- The barriers for the ‘best’ teaching practices in the three education sub-sectors in Kenya emanate from social, economic, technological, political and organizational contexts. Therefore, the education policy makers must

realign the policies and prioritize the needs for the 21st century learner vis-à-vis teacher's pedagogy.

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Formation of Nursing Staff in Intensive Care Units: Evaluation of Adherence to Recommendations and Variability in Management of Central Venous Catheters

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Abstract: The use of devices such as catheters is crucial in the formation of nursing professionals. Venous catheters are extensively used in the healthcare system, primarily in ICUs. Although its effectiveness has been proved, its use implies complications such as bacteremia associated to its insertion and maintenance, with associated morbidity and mortality rates. The objective of this investigation was to evaluate the effect of variability in the management of Central Venous Catheters (CVCs) by nursing professionals in intensive care units, as well as their adherence to CDC recommendations and the importance of nursing staff in this regard. Using the National Patient Safety Goals, hospital accrediting agencies require hospitals to keep their healthcare professionals, including students, properly educated with regard to the competencies and skills associated with their profession before beginning clinical practice. This way, they are better prepared to practice their profession and will be able to reduce the risk of complications in patients. It is up to educators to keep their students up to date with regard to the development of practices based on new scientific evidence, particularly concerning the use of devices, in this case CVCs, so that these professionals are better prepared for the work field upon completion of their degree..

Key-Words: Nursing Education, Nursing Competencies, Adherence, Bacteremia, Central Venous Catheter, CDC, Intensive Care, Clinical Practice.

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1. Introduction

Venous catheters are increasingly used in hospitals, in ambulatory procedures and above all in intensive care units. In the United States, approximately 30 million of these are used yearly. Of this amount, 3 million are of the central venous catheter type (CVCs) (Kusek, Soule, Kupka, Williams & Koss, 2013). Although the effectiveness of catheters has been proven, its use implies a great amount of complications, among them bacteremia associated to insertion and maintenance of the instrument, causing a significant amount of morbidity and mortality in patients (Philippart, Max, Couzigou & Misset, 2013; O'Grady, N.P., et al., 2011).

Nosocomial infection (caused by the invasion of bacteria in the blood) related to the use of central catheters is within the ten most frequent injuries associated to incidents in health care (Organización de la Salud, 2010). Blood infections are reported annually in one of every twenty hospitalizations in the United States and Puerto Rico associated to central lines; they are a cause of hospital deaths, with a mortality rate of 12% to 25%, and critical patients are among those with the greatest incidence of this problem (Malpie et al, 2011).

The rise of new multiresistant bacteria worsens this situation (Ruiz, Montelli, De Fátima, Silvaa, De Batista, Matuura, Moreira, & Paula, 2013). Despite these risks and complications, the use of catheters appears to be here to stay (Philippart, Max, Couzigou, & Misset, 2013).

This has led to the creation of recommendations, guidelines and preventive and epidemiological strategies aimed mainly towards personnel working with central line patients (Almirante & Pahissa, 2013). Nurses are vital components in these scenarios, so they must not only incorporate this new knowledge in clinical practice, but also participate in its procurement. It is the responsibility of all nursing professionals to attend to professional development and growth activities to guarantee secure patient care. The information must be updated to reflect updated and evidence-based practices (Ingwerson, 2016). However, the mere availability of evidence for prevention of complications associated to CVCs does not guarantee its systematic application in patients, and analyses and studies concerning the extent to which patients are benefiting from the existing knowledge on this subject is crucial. Nursing professionals are key to improve access to attention and quality through the formative milestones evidenced in clinic practice (Ingwerson J., 2016).

The objectives of this study were to describe the frequency of infections related to central catheters in intensive care patients, to analyze patients' factors associated to the appearance of infections related to central catheters and its consequences on mortality, length of stay and readmission; to explore the adherence and knowledge of professional nurses in Intensive Care Units as relates to CDC recommendations for infection prevention and management of CVCs; and to identify and characterize the actions and strategies used in dif-

ferent hospitals to implement recommendations on the management of critical patients with central line catheters by nursing staff in ICUs.

2. Methodology

2.1 Design

An analytic retrospective observational study was carried out for analysis of the first two objectives, and a transversal analytic study for the last two. Two units of analysis were used for the study: nursing professionals working in the intensive care unit of the participating hospitals and clinical files of patients who had a CVC during the years 2009 and 2012.

2.2 Sample of patients' clinical files

The sample of patients was obtained through files of patients older than 21 who had central catheters in 2009 and 2012 of hospital 1 and hospital 2. No sampling was carried out; rather, the whole qualifying population during these periods was selected. However, we estimated the necessary sample assuming an incidence of 1.65 infections for every 1,000 days of central venous lines in ICU patients (CDC, vital signs, 2011) with an alpha value of 0.05 and a 0.2% rate of precision. For a total population of 164 patients a year with CVCs in both participating hospitals, 138 patients were necessary. Once the necessary sample was established, all subjects who had CVCs during the studied periods (2009 and 2012) admitted to the intensive care unit were included. On the other hand, for objectives concerning nursing professionals, no sampling was carried out; rather, the complete nursing population working in the ICUs of the participating hospitals were voluntarily surveyed.

In the case of patients, up to 164 clinical files of subjects with CVCs admitted to the ICUs of the two hospitals during the studied period (2009 and 2012) were included, whether they were inserted in the same unit or in another hospital, of both genders and older than 21, with a minimum stay of 12 hours in the ICU. Patients admitted to the ICU for less than 12 hours and those younger than 21 were excluded.

In the case of nurses, all nursing personnel older than 21 years working in the intensive care units of both participating hospitals who willingly decided to participate were surveyed. Nursing professionals who worked for less than three months during the studied period were excluded (short-term substitutions and those who had some permanent link to the unit, but were absent from it for any reason for more than 3 months, such as permits, licenses and sick leave), as were nursing professionals who did not work in ICUs.

2.3 Instruments

Two questionnaires were used for data collection: the first one was designed by Labeau (2008), Vereecke, Vandijck, Claes & Blot (2008), who

authorized its use, and which was translated from English to Spanish by Colón (2016). The questionnaire focused on two areas: sociodemographic profile and knowledge of catheter maintenance. The instrument is composed mainly of 10 items (questions) for a total score of 10: 1 point was assigned for each correct answer. From this information, and for evaluation and classification purposes, the global knowledge score was calculated (PGC, for its Spanish acronym). The second questionnaire used was the CDC (2011), which explores nursing adherence to CVC maintenance recommendations.

2.4 Ethical and legal aspects

In order to carry out an ethical and correct process during the study, the researcher obtained IRB and HIPAA certifications associated to federal confidentiality law and the protection of human rights. The protection of human subjects was guaranteed, the principles of confidentiality were observed, as well as the protection of identity; the questionnaires and CD containing the information of patients' files in Excel format were stored in the principal address of the principal investigator. After 5 years the questionnaires will be destroyed with a paper shredder and the CD with a compact disk shredder. Study approval was obtained from the Institutional Review Board (IRB) of the Metropolitan University. Authorization was obtained from both hospitals where the study was carried out for administration of the questionnaire to health care professionals working in the intensive care unit and to collect information from the files of patients hospitalized in 2009 and 2012.

2.5 Data collection

After obtaining IRB approval, patient lists were obtained from the Computer Center Departments (in both hospitals where authorization was received to carry out this study), without identifiers, corresponding to those admitted to the ICUs in 2009 and 2012 with central venous catheters. For the purposes of the study, clinical patient files were identified by means of an alphanumeric code.

The information of patients' clinical files was obtained from their clinical history, nurses' notes, microbiological results and medical progress notes. The information obtained was transferred to an Excel sheet including demographic variables, intrinsic and extrinsic risk factors and information of diagnosed infections. The information was then exported for analysis in SPSS 21.

2.6 Analysis

A descriptive analysis was carried out using central tendency and dispersion measures as well as the Kolmogorov-Smirnov goodness of fit test. Bivariate analysis was carried out using Student's t-test and chi-square according to the characteristics of the analyzed variables, when they were normally distributed. In the opposite case, non-parametric tests were used such as

the Wilcoxon signed rank test and the Mann-Whitney U test. Likewise, ANOVA was used for the quantitative and qualitative analysis of variables in pertinent cases, with robust measures of central tendency in cases of non-homoscedasticity (as measured by Levene's test) using the Welch and Brown-Forsythe tests. Confidence intervals were calculated at 95%.

3.Results

The total patient sample was composed of 164 subjects with a median age of 72.78 (SD: 15.01). 43.30% of these were men and 55.5% women. The sample was distributed, with 117 subjects in the first hospital (71.30%) and 47 in the second one (28.70%). Organized by period, 39.00% (n = 64) of patients belonged to the first wave of samples (2009) and 61.00% (n = 100) to the second (2012). Organized by type of patient, the most frequent type consisted of those who had cardiovascular conditions (n = 43, 26.20%), followed by respiratory (n = 38, 23.20%) and infectious diseases (n = 19, 11.60%). These three types of patients made up more than half of the sample (61%). 54 patients died in intensive care (32.9%), and 53 within 30 days of hospitalization. 17.7% (n = 29) of the patients were readmitted to the hospital.

Of 164 evaluated patients, 147 (90%) had urinary catheters, 78 (48%) received mechanical ventilation care, 70 (43%) nasogastric tubes and 46 (28%) received parenteral nutrition. CVC insertion areas for 140 patients (85.9%) were in the jugular vein (90, 54.9%) and the subclavian vein (n = 50, 30.5%).

Concerning bandage changes to the CVC area, 40 of the patients (24.4%) underwent one change, followed by 21 patients (12.8%) who had two changes. 20 (12.2%) patients with CVCs underwent three changes. 81 patients, representing 70.7% of the sample, received between one and three changes. However, a greater amount of changes was carried out for the rest of the patients, to a lesser degree. No information on this variable was available for 35 (21.3%) patients.

Finally, patients with urinary catheters spent approximately 16 days with the catheter, followed by central venous catheter patients, who spent approximately 14 days. Patients with the other appliances: mechanical ventilator, nasogastric tubes and parenteral nutrition, had the catheters for 6, 5 and 3 days, respectively.

73.8% of evaluated patients acquired one of the following infections during their stay in the hospital: 53 patients (32.3%) acquired pneumonia, 45 (27.4%) acquired urinary tract infections, 15 (9.1%) CLABSI and 8 (5%) sepsis. Of these patients, 10% (n = 17) presented two acquired infections, among them sepsis, UTI or CLABSI.

Appliance	Hospital 1		Hospital 2		Total	
	Yes	No	Yes	No	Yes	No
Urinary Catheter	106 (90,6%)	11 (9,4%)	41 (87,2)	6 (12,8%)	147 (89,6%)	17 (10,4%)
Mechanical Ventilator	63 (53,8%)	54 (46,2%)	15 (31,9%)	32 (68,1%)	78 (47,6%)	86 (52,4%)
Parenteral Nutrition	35 (29,9%)	82 (70,1%)	11 (23,4%)	36 (76,6%)	46 (28,0%)	118 (72,0%)
Nasogastric Tube	54 (46,2%)	63 (53,8%)	16 (34,0%)	31 (66,0%)	70 (42,7%)	94 (57,3%)

CVC Insertion Area	Hospital 1	Hospital 2	Total	
	F	%	F	%
Subclavian Vein	26	22,4	24	51,1
Jugular Vein	73	62,9	17	36,2
PIC Line	8	6,9	2	4,3
Femoral Vein	9	7,8	4	8,5
Total	116	100,0	47	100,0

Table 1. Distribution of appliance characteristics and invasive techniques in patients by hospital.

Patient deaths in the ICUs were high for both hospitals, with a slightly higher rate in hospital 1. The difference in death distribution of patients in intensive care by hospital was statistically significant ($p = 0.046$). Deaths during the 30-day stay of patients were similar for both hospitals, as both showed high death rates during the admittance period. Distribution of patients' death by hospital was not statistically significant ($p = 0.066$).

Significant differences were observed in terms of days spent with a mechanical ventilator ($p = .006$) and parenteral nutrition ($p = .004$) between hospitals. For the rest of the studied variables, no significant differences between hospitals were identified. Regarding the distribution of infections acquired during patients' admittance in intensive care by hospital, no significant difference was observed ($p = .079$).

Finally, CLABSI analysis was carried out using standardized indicators for comparison with the obtained sample using CLABSI rates in Puerto Rico obtained in the INNIC study. The adjusted CLABSI rate for 1,000 days of CVC in hospital 1 was similar to that seen in the rest of the country. On the other hand, in hospital 2, this standardized rate showed an increased incidence of CLABSI in comparison to the rest of the country.

Days with CVC	CLABSI	CLABSI rate*	SRI**	
Hospital 1	1617	11	6,8	1
Hospital2	651	6	9,2	1,36
Total	2268	17	7,5	1,1

*CLABSI / 1.000 days CVC

Table 2. Analysis of CLABSI according to international standardized indicators.

The characteristics of evaluated patients were studied through bivariate analysis to detect possible correlations between the studied factors and infections associated to CVCs and other appliances by year (2009 and 2012). No significant differences were observed as regards mechanical ventilation ($p = .749$), urinary catheter ($p = 1.0$), parenteral nutrition ($p = 0.725$), catheter insertion area ($p = .05$) or mortality rate ($p = 0.610$).

The distribution of patients with nasogastric tubes differed. In hospital 1, 46.2% of patients had the device, while in hospital 2, 34.0% did not.

The distribution of infections acquired during the hospital stay of patients in the intensive care units was studied by period, and a significant reduction was seen in 2012 except for sepsis, which increased ($p = .015$).

For the 2012 period, the proportion of patients with CLABSI was higher in both hospitals, at a rate of 10.3% in hospital 1 and 9.2% in hospital 2, although this difference was not significant ($p = 1.0$), when compared to the rate in 2009, 7.7% in hospital 1 and 7.7% in hospital 2 ($p = .417$). However, globally, the proportions were similar; approximately 10% ($n = 17$) of patients had CLABSI during both periods.

No significant differences were observed for mortality rate in CLABSI patients in intensive care during either period (2009, $p = .406$) (2012, $p = .720$). No significant differences were observed in mortality rates during the 30-day period in either hospital, either in 2009 ($p = .406$) or 2012 ($p = .719$).

Significant differences were observed regarding CLABSI patients and readmission per period; namely, no significant difference was observed in 2009 ($p = .142$), but a difference was seen in 2012 ($p = .009$).

Significant differences were observed regarding length of hospital stay in 2009 ($p = .018$) and in 2012 ($p = .004$), days with urinary catheters ($p = .007$), days with CVCs ($p = .017$) and days with nasogastric tubes ($p = .028$).

The distribution of patients with CLABSI by CVC insertion area and type of appliance was evaluated. According to the chi-square test, no significant differences were seen for patients with mechanical ventilators ($p = .798$), urinary catheters ($p = 0.390$), parenteral nutrition ($p = .086$) and nasogastric tubes ($p = .070$). CLABSI risk estimates confirmed no association with parenteral nutrition (.918; 7,081), mechanical ventilators (.465; 3,478), nasogastric tubes (.918, 7,798) and urinary catheters (1.26; 1,920).

Regarding the distribution of CVC insertion area by CLABSI infection, the greatest proportion of CLABSI infections was seen in cases of jugular

vein insertion (47.1%) followed by subclavian vein insertion (35.3%), although this difference was not significant ($p = 0.872$).

To indicate the fluctuation of patient factors with regard to CLABSI infection and its consequences on mortality and hospital stay and readmissions, logistic regression was used as a test of multivariate probabilistic prediction.

In the first model, the presence of urinary catheters, nasogastric tube and days with central venous catheters and parenteral nutrition were used as independent variables. Results indicate that the presence of CLABSI was less probable in patients with urinary catheters as well as those who spent more days with CVCs, parenteral nutrition and nasogastric tubes.

Variables	B	Standard Error	Wald	DOF	P value	OR	95% C.I.	
							Lower	Upper
Urinary catheter	-2.112	.883	5.725	1	.017	.121	.021	.682
Days with CVC	.098	.031	10.228	1	.001	1.103	1.039	1,172
Days with parenteral nutrition	.089	.037	5.798	1	.016	1.094	1.017	1,176
Nasogastric tube	1.479	.660	5.022	1	.025	4.389	1.204	16,002
Constant value	-3.285	.878	14.004	1	.000	.037		

Table 3. Variables in the equation: first model.

Variables	OR	95% C.I.		P Value
		Lower	Upper	
Urinary catheter	.065	.010	.428	.005
Days with CVC	1.132	1.054	1.216	.001
Days with parenteral nutrition	1.088	.996	1.189	.063
Nasogastric tube	5.644	1.325	24.029	.019
Readmission	12.462	2.883	53.869	.001
Constant value	.017			.000

Table 4. Logistic regression model.

A third model was constructed adding hospital and time period as categorical variables to the second model, with no significant differences observed.

Variables	OR	95% C.I.		P value
		Lower	Upper	
Urinary catheter	.058	.008	.416	.005
Days with CVC	1.139	1.057	1.228	.001

Days with parenteral nutrition	1.093	.996	1.200	.060
Nasogastric tube	6.758	1.483	30.803	.014
Readmission	12.702	2.859	56.440	.001
Hospital	.494	.124	1.966	.317
Period	.554	.137	2.229	.405
Constant value	.030			.002

Table 5.

An additional regression model was constructed substituting the presence of urinary catheters as a predictor variable for the presence of infection related to urinary catheters, but UTI was not found to be a risk factor for CLABSI. Previously, chi-square was used to associate the presence of urinary catheters to UTI frequency with no significant correlation found.

Variables	B	Standard Error	P Value	OR	95% C.I.	
					Lower	Upper
Days with CVC	.108	.028	.000	1.114	1.053	1.177
Nasogastric tube	1.124	.635	.077	3.077	.887	10.672
Readmission	2.247	.669	.001	9.456	2.548	35.091
Urinary Catheter	-1.865	1.060	.078	.155	.019	1.236
Constant value	-5.008	.899	.000	.007		

Table 6.

With regard to the barriers and knowledge of nurses on CVC management and adherence to guidelines of evidence-based care, the greatest proportion of correct responses (table 5, bold) were seen for items 1 (72%), 5 (70%), 6 (72%) and 9 (74%) related to the direct function of nurses in their work areas and central venous catheter changes. The number was below 70% for items 2, 3, 4, 7, 8 and 10, which represent most questions.

Questionnaire item	Frequency	Percentage
1. Routinely replace CVCs		
Yes, every seven days	9	18.0
Yes, every three weeks	1	2.0
No, only when indicated	36	72.0
Don't know	4	8.0
Total	50	100.0
2. Use a guiding wire to replace CVCs		
Yes, every seven days	2	4.0
Yes, every three weeks	2	4.0
No, only when indicated	32	64.0

Don't know	13	26.0
Yes, every seven days	49	98.0
Lost data	1	2.0
3. Routinely replace pressure transducers and tubes		
Yes, every four days	14	28.0
Yes, every eight days	1	2.0
No, only when instructed	26	52.0
Don't know	8	16.0
Total	49	98.0
Lost data	1	2.0
4. It is necessary to use antiseptic catheters		
Yes, in patients whose CVCs...	31	62.0
No, because the use of these catheters...	11	22.0
Don't know	8	8.0
Total	50	100.0
5. Change dressing in the catheter insertion area		
Daily	2	4.0
Every three days	12	24.0
When indicated (dirty, loose), at least every seven days	35	70.0
Don't know	1	2.0
Total	50	100.0
6. Cover the catheter insertion site with:		
Polyurethane dressing	36	72.0
Gauze dressing	1	2.0
Both are advisable...	12	24.0
Don't know	1	2.0
Total	50	100.0
7. Disinfect the catheter infection site with:		
2% aqueous chlorhexidine	14	28.0
0.5% chlorhexidine	18	36.0
10% povidone iodine	12	24.0
Don't know	5	10.0
Total	49	98.0
Lost data	1	2.0
8. Apply an antibiotic ointment when inserting a CVC		

Yes, because it reduces the risk of infection	19	38.0
No, because it causes resistance to antibiotics	11	22.0
No, because it does not reduce the risk of infection	12	24.0
Don't know	8	16.0
Total	50	100.0
9. When lipid emulsion... substitute adm...		
Within 24 hours	37	74.0
Every 72 hours	3	6.0
Every 96 hours	1	2.0
Don't know	8	16.0
Total	49	98.0
Lost data	1	2.0
10. When lipid emulsion doesn't... substitute adm...		
Every 24 hours	29	58.0
Cada 48 hours	9	18.0
Cada 96 hours	2	4.0
Don't know	8	16.0
Total	49	98.0
Lost data	1	2.0

Table 7.

Significant differences were seen in terms of nurses' knowledge by hospital of origin in item 6 ($p = .049$), which measures type of dressing required to cover the catheter insertion site, and item 8 ($p = .018$), which measures whether applying an antibiotic ointment in the insertion site reduces the risk of catheter-related infections.

The variable of time spent by nurses working in the ICU, when correlated with the global knowledge score concerning evidence-based guidelines for the prevention of CVC-related infections, showed a Pearson correlation coefficient of 0.160, a positive and very weak correlation.

The variable of nurses' education on infection prevention (HAI), when correlated with the global knowledge score concerning evidence-based guidelines for the prevention of CVC-related infections, showed a Pearson correlation of 0.269, a positive and weak correlation. The greatest proportion of adherence in the clinical domain was 26%, in the installation domain 10%, and in the strategy domain 8%. However, the significance test indicated no significant difference between nursing personnel adherence by domain and hospital: Clinical ($p = .399$), installations ($p = .261$) and strategy ($p = .506$).

As concerns domains of adherence when correlated to the academic level of nursing personnel and post-graduate education of nursing personnel

working in intensive care, no significant differences were found between domains of adherence and nurses' education level. Clinical adherence was compared with years of experience of ICU nursing personnel, showing a significant, negative and weak correlation.

The variables of years of experience of nursing personnel in the ICU, when correlated to the facilities domain score, showed a positive, weak Spearman's rho correlation ($\rho = .005$). No significant differences were seen with regard to the global knowledge score across nurses by hospital of origin.

Significant differences were found with regard to adherence in the facility domain between professionals with 1 to 5 years of experience as compared to those with 6 to 10 years of experience, as well as between the latter group and professionals with 10 years of experience or more.

Dependent variable	(I) Years of experience as a nurse	(J) Years of experience as a nurse	Difference in averages (I-J)	P value	95% CI		
					lower	upper	
Clinical							
Games-Howell	1 to 5	6 to 10	.50000	.588	-.7620	1.7620	
		10+	.25000	.829	-.8128	1.3128	
	6 to 10	1 to 5	-.50000	.588	-	.7620	
		10+	-.25000	.791	-	.7606	
	10+	1 to 5	-.25000	.829	-	.8128	
		6 to 10	.25000	.791	-.7606	1.2606	
	Installations						
	Games-Howell	1 to 5	6 to 10	.72222	.028	.0728	1.3717
10+			.43056	.270	-.2490	1.1101	
6 to 10		1 to 5	-.72222	.028	-	-.0728	
		10+	-.29167	.014	-.5290	-.0543	
10+		1 to 5	-.43056	.270	-	.2490	
		6 to 10	.29167	.014	.0543	.5290	
Strategy							
Games-Howell	1 to 5	6 to 10	.51389	.404	-.4722	1.4999	
		10+	-.27778	.758	-	.6732	
	6 to 10	1 to 5	-.51389	.404	-	.4722	
		10+	-.79167	.106	-	.1400	

				1.7234	
10+	1 to 5	.27778	.758	-.6732	1.2288
	6 to 10	.79167	.106	-.1400	1.7234

Table 8. Multiple comparisons.

As regards the correlation between adherence area and nurses' global knowledge score, as presented in the following table, no significant correlation was found.

Correlations			
		Global Knowledge Score	
		Correlation coefficient	P value
Spearman's Rho	Clinical	.033	.817
	Installations	.003	.985
	Strategy	.133	.357

Table 9.

4. Discussion

The objective of this study was to evaluate the effect of variability in the management of CVCs by intensive care nursing professional as well as their adherence to recommendations in their professional formation.

The total sample of patients consisted of 164 subjects from two hospitals in the Metropolitan area of San Juan, Puerto Rico. The average age of the subjects was 73 years; 55% were men and 43% women. According to the 2014 report of chronic diseases in Puerto Rico for the years 2000 and 2010, the structural population of Puerto Rico is older; the population with at least 65 years increased by 46% (11.2% to 16.4%). This population was reflected in our study.

The most frequent patients were those with cardiovascular conditions, as according to the Chronic Disease Action Report for Puerto Rico for 2010 and 2020, cardiovascular conditions are the first causes of death in PR, and the data was similar to that observed in the United States.

33.9% of deaths occurred in ICUs, and 32.3% of deaths occurred within the first 30 days of general hospitalization. 17.7% of patients were readmitted to the hospital, and according to the information found, these readmissions were associated to CLABSI. The average days of hospitalization in intensive care of the 164 evaluated patients was 22.1 in hospital 1 and 12.7 in hospital 2. Hospital-acquired infections (HAIs) caused by the invasion of bacteria in the bloodstream and related to the use of central catheters (CLABSI) is within the ten most frequent injuries related to healthcare incidents, according to a 2010 report by the World Health Organization. This number implies a serious

and worrying risk, as it involves the deaths of patients. Annually, one of every 20 hospitalizations in the United States and Puerto Rico report a catheter-related blood infection, which can cause hospital deaths with a mortality rate of 12% to 25%, critical patients being among those with the highest incidence of this problem (Malpie et al, 2011).

Of the 164 evaluated patients, 90% had urinary catheters, 48% received mechanical ventilation care, 43% had nasogastric tubes, and 28% had par-enteral nutrition. Due to the complexity of patients in critical care areas, most of them require the previously mentioned appliances. All patients had more than two devices, and literature indicates that this increases the risk of acquired infections and complications (Malpie et al, 2011).

Of the 99.4% of patients with CVC evaluated, 54.9% of were cannulated in the jugular vein. With regard to insertion area, evidence points to a lower infection rate for subclavian vein catheters (4 for every 1,000 catheters per day) when compared to internal jugular catheters (8.6 for every 1,000 catheters per day) as well as for femoral catheters (15.3 for every 1,000 catheters per day) (Kelbourne et al, 2009). According to these authors, the subclavian vein is more accessible than the internal jugular vein, especially for trauma patients and those with cervical collars. The femoral artery can be cannulated without interruption of the airway, but there is a higher infection rate. The femoral catheter must be changed frequently to a subclavian or internal jugular catheter (Kelbourne et al, 2009). The internal jugular vein and type of hemodialysis are factors associated with deep vein thrombosis (Malinouski et al, 2013). According to the author, this information can be used to determine the ideal insertion site and type of catheter. Various authors point out that catheters inserted in the jugular or femoral vein are colonized more quickly than those inserted in the subclavian vein (Seisededos, 2012). For this reason, doctors should choose the best CVC cannulation site to reduce infection risk.

With regard to bandage changes by nurses, 21.3% did not carry out or did not document the procedure, which includes cleaning of the CVC cannulated area every seven (7) days as per CDC Central Venous Catheter Patient Management guidelines (2011). According to the study, nurses play principal roles in these scenarios, for which reason they must not only incorporate this new scientific evidence in clinical practice, but also participate in its procurement and document it in patients' files.

Five scientific evidence measures used by recommendation of the CDC have significantly reduced bacteremia associated to central catheters: maximum sterile barriers, handwashing, cleaning insertion site with chlorhexidine, avoiding the use of the femoral vein for insertion, as well as the quick removal of unnecessary catheters in critical patients (Valls & Garcia, 2010). Other recommendations include: indications of the catheter, choice of appliance, choice of pathway, hand hygiene, use of maximum barrier in CVC man-

agement and documentation of information in patients' files, such as date of insertion, type of catheter, pathway used, reason for insertion, date of removal and cause (CDC, 2011). In this variable associated to compliance with bandage changes, documentation was severely lacking, as there was insufficient evidence in the files. We may infer that, if there is no written evidence, maintenance procedures for patients with CVC were not carried out.

Bloodstream infection rates related to central catheters, according to the International Nosocomial Infection Control Consortium (INICC, 2013), occur at a rate 2 for every 1,000 days spent with central catheters in developed countries, and 7 CLABSI for every 1,000 days with CVC in developing countries, three times higher than in the United States. Puerto Rico is considered a developed country, for which reason 2 infections for every 1,000 days was used as the standard value. CLABSI rates in hospital 1 were similar to that of other hospitals in Puerto Rico. However, in hospital 2, a 36% higher CLABSI rate was seen when compared to the standard value.

73.8% of patients ($n = 121$) studied acquired one of the following infections during their stay in intensive care in both hospitals: pneumonia, UTI, CLABSI and sepsis. According to investigators such as Kusek, Soule, Kupka, Williams & Koss (2013), these conditions are the most commonly acquired infections due to the use of the devices. For this reason, patients are more susceptible to complications. We found that 10% of patients ($n = 17$) acquired more than one infection during their time in intensive care.

Differences were seen in terms of CVC insertion site. In hospital 1, the subclavian vein was the most common insertion site, and the jugular vein in hospital 2. Literature points out that catheters inserted in the jugular or femoral vein are colonized more quickly than those in the subclavian vein, so we can infer that hospital 2 does not choose the best CVC cannulation site for patients, therefore the evidence points towards a higher risk for these patients.

A reduction in amount of substitutions was seen for hospital 1. This group of patients has a lower risk of bacteremia than those who undergo substitution, according to literature.

The average of days for patients with parenteral nutrition was higher for patients of hospital 1 than those of hospital 2. According to the World Health Organization, CVCs are used to provide parenteral nutrition to patients, and one of the benefits of TPN consists of administering nutrients to the organism with the purpose of maintaining the patient in a good nutritional state. However, patients who receive nutrients by the parenteral pathway and spend more than 12 to 15 days with TPN are more exposed to risks.

Finally, significant differences were seen in the distribution of mortality during the time spent in intensive care for patients between the two hospitals. Hospital 1 showed more deaths than hospital 2. Literature indicates that nosocomial infections are within the ten most frequent lesions associated to healthcare incidents (World Health Organization, 2010). Hospital 1 had a

greater number of patients with mechanical ventilators, and this device makes patients more vulnerable to complications. This number implies a serious risk as it involves the possible deaths of patients associated to mechanical ventilator complications.

2009 was selected for the study as the CDC revised the Practice Guidelines for Central Venous Access in early 2009 for the first time (CDC Guidelines, 2009), and 2012 was selected as it was one year after the second revision in 2011 (O'Grady, Alexander, Burns, Dellinger, Garland, Heard, & Saint, 2011). In this last revision, the guideline recommendations became more rigorous. Among other things, changes were made regarding insertion site care as well as the use of chlorhexidine for cleaning, the use of transparent bandages, among others. The use of the betadine ointment in the healing process was discontinued. Checklists were implemented to facilitate the process. This revision also addressed the frequency of cleaning in the insertion area; instead of every 48 hours of site care, the recommendation of the CDC is seven days. For this purpose, we aimed to evaluate nurses' adherence to the recommendations and variability in the management of patients with central venous catheters in intensive care personnel. This is why these years were selected, as they were fundamentally important in the development and management of patients with CVCs in hospitals in Puerto Rico, particularly those in intensive care.

Significant differences were seen in the distribution of amount of CVC substitutions and dressing changes between each period. In 2012, a reduction in the amount of CVC substitutions was seen. This is a positive finding in our study, as according to CDC Guidelines, it is not a matter of routinely changing the central venous catheter, but rather of daily evaluating the clinical need for maintaining or discontinuing the CVC, thus reducing the risk of catheter contamination. We can infer that this reduction was due to the education surgeons obtain regarding the importance of substituting CVCs as little as possible, and the education offered to nursing professionals on changing bandages as per CDC recommendations.

There were other factors associated to risk of CLABSI infection in 2012: readmission, length of stay at ICUs, days with a mechanical ventilator, days with a urinary catheter, days with CVC and days with nasogastric tubes. The factor associated to risk of CLABSI infection in 2009 was the amount of days spent in intensive care during the 30-day period.

Ceballos-Acevedo, Velásquez-Restrepo y Jaén-Posada (2014) carried out a study on hospital stay where the average of days spent per patient was used as an indicator of efficiency, as according to scientific evidence, it implies the best usage of hospital beds and agility of services offered in the hospitals. Jiménez, cited by Ceballos, also points out in his study that a prolonged stay can be considered an indicator of lack of efficiency in patient flow and can have effects on the risk of adverse events and mortality. The conclusions

of the study by Ceballos-Acevedo, Velázquez-Restrepo and Jaén-Posada (2014) concerning the causes of prolonged stays were the following: delays in carrying out surgical procedures, early diagnosis, need for more complex attention, socio-familial situations and patients' age.

Data analysis showed that those patients with urinary catheters had a lower risk of CLABSI. This information was contradictory insofar as the CDC points out that it is the most common healthcare-related infection, showing a high morbidity and mortality rate in patients, as well as the second most common cause of secondary bloodstream infections. In fact, in our study's sample, 29.9% (n = 49) of subjects had a UTI, although no association was found between the presence of urinary catheters and UTIs despite the clear relationship existing between both factors (Galiczewski, 2016). The only plausible explanation for this finding is attributable to a lack of a sufficient sample to attain the statistic power necessary to establish this association.

Álvarez-Lerma, Olaechea, Inssausti y Cerda (2013) carried out a study on urinary infections related to urethral catheters for patients in critical care units in Spain. They prospectively included all patients with urinary catheters during more than 24 hours between 2005 and 2010, as well as the amount of days the patients spent with the catheter. The objective was to describe the evolution of national rates of urinary infections related to urethral catheters, as well as etiology and multiple resistance markers. The results of this study point towards a reduction of days with urethral catheters but an increase of resistant strains.

According to a report by the Department of Health of Puerto Rico, CAUTI levels are at 48%, close to the national rate of 50%, acceptable in terms of significant infection rates (SIR).

Although our study did not evaluate antibiotic-resistant infections, multiresistant infections related to CAUTI in Puerto Rico, as per 2015 information, showed a 34% resistance to antibiotics, a reduction when compared to 2010 (Díaz, 2016), in conflict with the study by Álvarez-Lerma, Olaechea, Inssausti y Cerda (2013).

Most of the patients in our study had a nasogastric tube for enteral nutrition. The study carried out in Spain by Yemlahi (2014) evaluated complications related to nasogastric tube insertion, such as infections, diarrhea, vomiting, constipation, pulmonary aspiration, tube dislodgment, tube obstruction, hyperglycemia and electrolytic alterations, pneumothorax, pneumonitis, among others.

According to researchers, elderly persons with an average age of 76 in intensive care present difficulty swallowing. Although the age average for our study was 73 years, our patients showed the same risk due to old age. Scientific evidence points out that, to avoid complications in patients with NGT, nurses must comply with the following recommendations: estimate daily gas-

tric residuals, verify tube placement, use precautionary standards, among others (Yemlahi, 2014).

Finally, the patients readmitted to hospitals show a 12.7% higher chance of CLABSI infections than those who were not readmitted, and readmissions were associated to CLABSI in our study. Centers for Medicare & Medicaid Services (CMS) in the United States started publishing information on patients readmitted to hospitals within 30 days showing certain medical diseases (Kassin, Owen, Pérez, Leeds, Cox, Schnier, & Sweeney, 2012). Kassin et al (2012) carried out a study which measured readmission risk factors within 30 days for general surgery patients.

For this purpose, the Patient Protection and Affordable Care Act came into effect in March 2010, which makes hospitals accountable for patient readmission within 30 days after discharge for certain diseases, among them surgical infections and CLABSI (Kassin et al, 2012). This law is already implemented in Puerto Rico, and Medicare is already reducing reimbursements as hospitals are legally obligated to report all readmissions. This situation is already having an economic impact on hospitals, which points to the importance of reducing hospital acquired infections.

According to a study by Kassin et al (2012), 16.6% of Medicare beneficiaries subjected to major intestinal surgery were readmitted for gastrointestinal problems, and only 6.4% were readmitted for post-surgical infections. The authors identified an increased risk for post-surgical conditions, with a 16.9% readmission rate. High risk factors included in the study were the following: gender (women), obesity, non-programmed surgeries, and patients with prolonged stays. There is little information on readmitted patients related to CLABSI. In Puerto Rico, there is no information on this, but our study hints that the cause for most patients' readmissions is in accordance with Kassin et al's findings or are due to infections acquired within 30 days after admission, considered Hospital Acquired Infections (HAIs).

Sandoval, Guevara, Torres y Vilorio (2013) studied HAIs in a Venezuelan hospital (developing country) with the purpose of determining the frequency of HAIs associated to CVC use in patients. They studied 31 patients who had a central venous catheter inserted during surgery services, adult emergencies, medicine and intensive care, and the dialysis unit. The results of the previously mentioned studies indicate that 41.9% of patients had some acquired infection related to catheter use, bacteremia being the most frequent with a rate of 46.1%. The researchers also pointed out that the unit with the greatest incidence was the intensive care unit with 30.8%. In accordance with our study, one of the greatest risk factors was amount of days with CVC. They concluded the study providing recommendations regarding the importance of documenting the use of adequate techniques and proper catheter placement and management by medical and nursing personnel in patients' files.

An important factor according to scientific evidence to reduce the risk related to patients' stay in these critical areas is the reduction of devices to avoid complications and deaths.

When the studied hospitals were compared, the same situation was found with a significant variability observed in surveyed participants with respect to their choice.

Significant differences were seen regarding knowledge of personnel by gender in three items: item 1, which measured how often catheters should be routinely changed, number 3, which measured how often pressure transducers and tubes should be routinely changed, and number 6, regarding the recommended disinfectant.

No significant differences were seen with respect to nurses between those with post-graduate studies and those without, or between hospital of origin. A correlation was found between the amount of time the professional worked in ICUs and the global knowledge score on evidence-based practice for the prevention of infections related to CVCs.

A correlation was found between the variable "education time of nursing personnel on the prevention of hospital acquired infections (HAI)" with the global knowledge score regarding evidence-based guidelines for the prevention of CVC-associated infections, a positive and weak correlation.

These results should aid in the exploration of the knowledge the studied personnel has in the implementation of better, evidence-based practices to avoid infections caused by the management and maintenance of CVCs. Clearly, they allowed us to infer that they do not possess the knowledge or at least have many doubts regarding correct practice. That, in turn, allowed us to infer that there is not an acceptable degree of adherence.

In the Future of Nursing report, the Institute of Medicine (2011) stated that nurses should strive for higher levels of education and training to respond to the demands of a developing healthcare system and to satisfy the changing needs of patients. Everyone should advocate to include the nursing profession in the emergent care delivery models through the demonstration of education.

According to the PARISH model (Kitson, Rycroft-Malone, Harvey, McCormack, Seers & Titchen, 2008), evidence-based practice depends on the strength and mutual relationship of evidence, context and facilitation. Establishing that implementation is more likely to be successful if the evidence is of high quality, scientifically robust and coincides with professional consensus and the needs of the patient; if the context is likely to change based on cultural sympathy, strong leadership and proper monitoring and feedback systems, and if there are the proper means of change with the contribution of an external expert and with internal facilitators (Kitson, 2008). The achievement of this implementation given the level of complexity depends on the type of process which should occur. A careful arrangement of the interrelation between evidence, context and facilitation including how this interaction oc-

curs at the different layers of the organization, the weight of each factor with regards to the possibility of carrying out evidence-based practice, whether the content of the model to be used is comprehensive, and whether it is well understood by the involved parties (Kitson et al, 2008). Continuing education can serve as a tool, along with organizational and individual factors, to positively influence innovation and the successful implementation of evidence-based practice (Yost et al., 2015)

A dramatic example was seen with project Pronovost upon the simplification of guidelines based on scientific knowledge to what is practically a checklist implemented in a well-organized, participative and motivational context which resulted in processes of adherence, which in turn made it possible to save lives by reducing infections to practically zero.

Upon studying the two critical care units in the hospitals of the metropolitan area of San Juan, Puerto Rico, the situation described in the previous paragraph was not seen. A group of workers (nursing professionals) was surveyed through a thoroughly validated questionnaire, and the results point to doubts and deficient performance.

But the level of adherence could not be completely determined. We mentioned our intention of exploring knowledge and adherence through the tool used for this particular objective. A lack of knowledge was observed concerning adherence, so this exploration revealed the need to go beyond the instrument used.

The adherence shown by nursing professionals in intensive care units has therefore an important component concerning context. Kitson et al (2008) point to the importance of context when adherence is being evaluated.

According to Valiente (2015), knowledge and adherence has been facilitated or carried out using the following strategy: An Infection Prevention and Control Committee composed of an infectologist (president), an epidemiology nurse, an executive director, a nursing director, a bacteriology director, among others. This committee discusses the rate of infections acquired by patients, the working conditions of nursing professionals, and situations and problems related to healthcare. Valiente points out that all members must present all new, emerging scientific evidence in the committee for discussion, as for instance the latest revision of the Central Venous Catheter Patient Management Guidelines. The committee makes directors and leaders accountable or delegates on issues concerning rule monitoring and compliance, protocols and guidelines discussed concerning new evidence. The scientific evidence is validated, and how they will help reduce the rate of infection is discussed, including CLABSI.

It is insufficient for practices to be validated with scientific evidence, or whether or not they have been successful in other contexts; rather, they must be evaluated in the research environment (Gómez Urquiza, Hueso Montoro, Reina Leal, Hernández Zambrano & Amezcua, 2014).

Our study shows similarities with other studies reviewed. In an investigation carried out in Belgium, doctor S. Labeau (2008) found that evaluated nursing personnel had numerous erroneous conceptions on the management and maintenance of CVCs.

In a study by Jardim, Lacerda, Soares De Jesus and Nuñez (2013), the authors found 0.0% compliance with appropriate central venous catheter insertion practice, 91.6% for evidence concerning CVC insertion and management, 51.5% for adhesion to care, maintenance and preparation for CVC and its appliances, and 10.7% for the practice of hand hygiene when carrying out procedures for the care and maintenance of CVCs.

Adherence of nursing personnel to recommendations and guidelines has been well-studied from the perspective of establishing interventions to ensure guidelines (Flodgren et al, 2013). Practically all reviewed studies have shown deficiencies, doubts and poor performance, implying the need for better intervention strategies.

The greatest domain of adherence was in the clinical domain for both hospitals. An average of approximately 13 nursing professionals complied with the actions and recommendations of the clinical domain. An average of approximately 5 and 4 nursing professionals complied with the actions and recommendations in the domain of facilities and strategies, respectively.

Another finding was a negative correlation with regard to experience in ICUs and adherence to the clinical domain. The more time the nurse had spent in intensive care, the lower the adherence in the clinical domain for infection prevention with regard to hours of education. With relation to hours of training in infection control during the last twelve months, the great majority of participants indicated 4 hours; we may infer that these 4 training hours correspond to the mandatory continuing education in Puerto Rico for license renewal, where the topic is Management of Patients with HIV, AIDS and Hepatitis, within the topic of infection control. In Puerto Rico, this topic of Management of Patients with Central Venous Catheters was not part of continuing education and was available starting on December 2016.

The strategies for the prevention of infections related to central venous catheters have been developed in guidelines by the Center for Disease Control (CDC) since 2002. They were revised in 2009 and 2011. The CDC is recognized as a leading agent in the protection of health and security by all research studies as well as for its orientation to compliance with evidence-based practices. The CDC carries out a series of recommendations for the management of patients with central catheters, categorized according to existing scientific data (CDC, 2011).

In Puerto Rico, the Joint Commission (Hospital Accrediting Agency) has been more rigorous since 2006 in evaluating the compliance of one of its National Goals, the Management of Patients with Central Venous Catheters. To accredit hospitals, they are required to present strategies used for CLABSI

reduction. The rate of CLABSI patients are among the requirements so that they demonstrate the implementation of CDC recommendations. Both hospitals studied are accredited by the Joint Commission; however, not all CDC recommended actions and strategies are fully implemented for the management of patients with CVCs.

As pointed out by Marrero (2016), multiple strategies have been implemented in Puerto Rico for the reduction of infections related to CVCs, particularly in CLABSI, among which are: incorporation of the latest 2011 CDC Guidelines, development of workgroups for the discussion and implementation of these guidelines, the implementation of bundles for the insertion of central lines, among other recommendations. Also, according to Marrero, yearly education is offered to all nursing personnel, including doctors, regarding the management and prevention of infections in patients with CVCs. This continuing education must be demonstrated to the accrediting agencies as evidence of the strategy used to reduce the risks associated to CVCs.

According to Marrero, instructions were also given for the placement and management of central lines and quality improvement indicators were developed to measure the performance of nursing personnel and doctors with regard to the management of patients with CVCs. In hospital 1, no standardized documentation was found, unlike hospital 2. Not all hospitals in Puerto Rico use the checklists recommended as per scientific evidence to standardize nursing documentation in the management of CVCs. Some use them, but they are not part of patients' files (Diaz, 2016).

Rosenthal, Dueñas, Sobreyra, Ammar, Navoa, de Casares, Concepción and Villanueva (2013) carried out a study in four developing countries (El Salvador, México, the Philippines and Tunisia) as part of the International Nosocomial Infection Control Consortium (INICC). It used a multidimensional approach with the objective of reducing bloodstream infections associated to central catheters in 4 intensive neonatal care units. The sample consisted of 2,241 patients hospitalized in 40,045 days. During phase 1, active surveillance was carried out, and in phase 2 the multidimensional infection control approach of the INICC was put into practice. This included the following: a central catheter care "bundle", education, result surveillance, process surveillance, CLABSI rate generation and revival of infection control practice effectiveness. During phase 1, 2,105 catheters a day were registered, and 17,177 catheters per day in phase 2. After application of the multidimensional approach, catheter-associated bacteremia was reduced to 55% (Rosenthal et al, 2013). This study concluded that a multidimensional approach was associated with a significant reduction in CLABSI rates.

According to Varela, Sierra, Drake and Terol (2009), it is insufficient to reduce CVC-related infection, but rather the aim must be to reduce them to zero. In Spain, the Ministry of Health and Social Policy (MSPS) started the Bacteremia Zero Project in 103 ICUs and implemented various patient safety

interventions, significantly reducing the bloodstream infection rate associated to CVCs by 62%. According to these authors, Spain was the first country to take this initiative, and was designated by the WHO as an exemplary program in the reduction of CVC related infection in ICUs.

In Scotland, Kelly, Green and Hainey (2015) carried out a study entitled *Implementing a new teaching and learning strategy for the care of patients with central venous catheters*. The authors point out that, according to evidence, educating and training health professionals is essential to avoid complications. They also point out that this approach has not been thoroughly studied. Results show that nurses felt safer after having participated in training outside the clinical setting, as it provided a safe place to practice without interruptions. The findings of this study suggest that working installations can provide a safe and effective environment for nursing professionals to develop trust and knowledge regarding the management of patients with CVCs.

The study has some limitations due to its transversal design, with which it is difficult to establish causal relationships which could be present before surveying the nurses. Similarly, an information bias could have occurred if the nurses erroneously interpreted the different questionnaires, but it should be noted that previously validated instruments were used and that they have shown good comprehension in previous studies.

On the other hand, analysis in two different time frames allowed for comparing possible variations in the studied variable, but evidently, only a longitudinal study with continuous follow-up throughout those years would have been able to establish greater certainty in the associations found. It is possible that events and modifications occurred between those two years in the practice environment of both hospitals which could have affected the evaluated outcomes.

Finally, patients' clinical information was taken from their clinical histories, and it is possible that some events such as the appearance of determined infections or the use of appliances, catheter substitution, bandage changes, etcetera, were inadequately registered, but that is a common limitation in this type of study.

5. Conclusions

Nursing personnel in ICUs did not demonstrate sufficient knowledge of CDC recommendations for the prevention and management of CVCs, regardless of the variables of education and experience, and there is no generalized adherence to the evidence-based recommendations for the management of these situations.

The implication these results have on the World Health Organization strategies are important from the perspective of multicomponent strategy design which includes not only knowledge, but also barriers and facilitators in

the practical context of nursing professionals for a successful implementation of these measures, which have such a significant impact on patients' health.

Moreover, the patients evaluated in this investigation presented particular clinical traits which increased the risk of infections associated to appliances, in this case CVCs. In addition to the central venous catheter, these patients also used other devices such as mechanical ventilators, urethral catheters, parenteral nutrition and nasogastric tubes, all of which imply an increased risk. The most common insertion area for CVCs was the jugular vein, followed by the subclavian vein. The unit of insertion was the ICU. Generally, the bandage was changed between 1 and 3 times. The average amount of days patients remained with the CVC device was approximately 14. This means that the recommendations for patient care set forth by the CDC are not followed. These patients remained in the hospital an average of 22 days, 12.7 in the ICU. Most of the patients acquired one or two infections during their stay at ICU, among them CLABSI.

Hospital 2 showed an increased frequency of CLABSI when compared with the country's average rate. For the period of 2012, there were more factors associated with CLABSI infection than in 2009. The factors associated with CLABSI infection during 2012 were readmission, length of stay at ICU, days with mechanical ventilators, days with CVCs and days with nasogastric tubes. The factor most closely associated with CLABSI infection in 2009 was length of stay.

The risk of CLABSI infection rose in function of readmission factors, days with nasogastric tube and days with CVC. The nursing professional in intensive care settings did not demonstrate full knowledge of the CDC recommendations for the prevention and management of CVCs, independently of their educational background or experience. The educational background and experience of nurses, such as length of experience in intensive care settings and hours of education on preventing infections, showed a weak correlation with the global knowledge of the CDC recommendations for the prevention and management of CVCs.

Nursing personnel in intensive care settings of both hospitals failed to fully implement the actions and strategies recommended by the CDC for the management of critical patients with central lines. The greatest domain of adherence by nursing staff was clinical. Time of experience of nursing staff in intensive care units showed a negative and very weak correlation with staff adherence to the clinical domain. Nurses' hours of education on infection prevention showed a negative and very weak correlation with staff adherence to the clinical domain. A correlation was found between years of experience of nurses working in intensive care units and the domain of facilities. No correlation was found between staffs' adherence to CDC recommendations and the global knowledge score.

Nursing professionals participate in continuous learning pursuant to better practices, including evidence-based decision making, which contributes to improve the quality of patient care. The nurses' technical skills and critical thinking by the patients' bedside are not, by themselves, sufficient to maintain an evidence-based practice setting. Nursing professionals are responsible of guaranteeing the competencies associated with important implications for continuing education (Ingwerson, 2016).

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