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Learning of medication in Bachelors Nursing Education

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Learning of medication in bachelors nursing education: a systematic literature review

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Laurea University of Applied Sciences **Abstract**
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Learning of medication in nursing education: A systematic literature review.

Year 2013 Pages 36

This review is to describe students the learning of medication in the bachelors nursing education on the basis of systematic literature review. The review examines evidence related to the topic for the study and the knowledge gained is essential for the understanding and appropriate learning of medication by student nurses, but particularly those in the degree nursing education.

A systematic literature review was used as method of data collection for this study and this was done by conducting a literature search concerning the area of study, selecting the relevant data with regards to the purpose of the study, description and analyzing the data collected. The studies used in this thesis were chosen based on the fact that its content answered the research question and were analyzed using an inductive content analysis method. The total of articles used for this thesis is 7.

Data analysis of literature identified three categories concerning the learning of medication namely,(1)the culture and environment of the clinical setting,(2)a blended and improved study curriculum for medication and pharmacology,(3) strategies employed by students in learning medication. The findings of the study reported that, students learn a lot about medication from the type of mentorship and supervision offered during clinical placements, the student taking up responsibility and initiatives in learning medication, adapting to the problem based method of learning where students become masters of their learning process and the effect of the e-learning approach. The findings also show that involving students in medication reconciliation reviews and the student's ability to master medication calculation helps in developing the students interest and confidence level in dealing with medications.

Medication is an important aspect of the nursing field of study and it is required that students identify the appropriate ways of learning medication in order to be able to administer the prescribed drugs to clients without difficulty. Ensuring that nurses administer medication safely has been of great concern in rendering care. Several key issues need to be dealt with when considering this issue. There are numerous approaches by which students learn medication. It is important to also note that learning styles are particular to individuals, and they are thought to allow student learn best. Each student has a particular preferred technique of interacting with and processing information.

Keywords: Learning, Medication, Medication administration, Nursing education.

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1 Introduction

Ethical, safe and effective medication is an important component of client care. As it is with any other nursing procedure, administration, the recommendation and prescribing a drug or medicine requires adequate knowledge, technical skills and judgment. It is one of the main responsibilities of nurses and for this matter nurses require the knowledge and competence to access the appropriateness of a medication for a client, manage adverse reactions when they occur, and understand precise issues that are related to consent and to make concrete ethical decisions about the use of medications.(Braswell & Duggar,2006)

It is important to note that the administration of medication is an increasingly complex process, influenced by the number of medications available on the market, the number of medications prescribed for each individual or patient on admission, and the numerous policies and procedures established for their administration. (Mayo & Duncan, 2004).They also argued that a "single client can receive up to 18-20 medications per day, and a nurse can as well administer averagely as many as 50 medications per shift" (p. 209). While some researchers indicated that the solution is more nurse education or training.

In practice, nurses may need to administer medications by various routes and methods that were not included in the experiences of their basic educational program. While nurses will have to learn the main competencies associated with safe medication practices, they may need additional knowledge to competently take up these responsibilities. Kozier et al,(2004). A better understanding of medication and how it can be administered appropriately with ease is therefore, an essential aspect of all categories of nursing education since it goes a long way in helping nurses avoid grave errors that could lead to complications or death in the process of rending care to clients.

This bachelor's thesis is part of the bigger project of Laurea University of applied Sciences, Otaniemi (Espoo) which is titled "Facilitating learning of pharmacology and medication in Degree programme in Nursing". It is to help the school set up an improved curriculum for its future students through evidence based literature. The topic of this thesis is relevant to the nursing field of study. Most students are presented with challenges on appropriate ways of learning medication during the period of studies and the present study advances knowledge on the issue by throwing more light on methods used.

The study among others, aims at providing the student with information on how students learn medication during the period of their studies which would go a long way in building up the student's competency and practical skills. It will also help in the achievement of new

knowledge through the student's skills and abilities in nursing and contributing towards curriculum development.

2 Purpose statement and Research Question:

The purpose of this study is to describe the learning of medication in bachelor's nursing education on the basis of Systematic literature review. This review examines evidence related to the topic for the study and the knowledge gained is essential for the understanding and appropriate learning of medication by student nurses, but particularly those in the degree nursing education. It explores appropriate ways by which students can best learn medication and also to be able to apply them in the nursing profession before and after graduation. Systematic literature review is one of the important methods used by researches in arriving at solutions to problems in health care and it is with this reason that is it used in this thesis work.

The research question for this study is:

How do students learn medication in bachelor's nursing education?

3 Definition of Concepts

The title of this study which is "Learning of medication in bachelor nursing education" and the research question raised "How students learn medication in the bachelors nursing education?" brought to light some important concepts which had to be addressed. The main concepts raised during this study were: learning, medication and nursing education. There is a continual use of certain medical terms which might be new to the reader and for that matter might raise some confusion or make it a bit difficult for better understanding. It is therefore, important for the reader to understand these concepts. In order to make this possible for the reader and for other students who would use this study as a source of reference in the future, the study provides some brief definitions of the concepts mentioned above.

3.1 Learning

Burns, (1995) defines learning as a relatively permanent change in behavior with behavior including both observable activity and other internal processes such as thinking, attitudes and emotions of the individual. Learning might not be clearly evident in observable behavior until sometime after the educational program has taken place in the individual. In seeking to give a good definition of learning, it is very important to identify and determine what happens to

the individual as a learner. For instance, an individual or a student's way of perceiving, thinking, feeling and doing may change as a result of learning experience or the learning process.

The ability to therefore, apply knowledge to practice is fundamental in creating competent and highly skilled nursing practitioners. Nurses, like other professionals bring a broad of experiences and qualities to training which includes various known learning styles and approaches. Thus, institutions and educators must recognize this and facilitate training courses that aim to accommodate individual learning preferences. Dunn et al (1984). In helping students learn medication better, it is important to understand that learning styles are particular to individuals or students, and these are thought to allow that person learn best. Each student or individual has some particular preferred technique of interacting with and processing information. One of the most widely known theories on learning is the auditory, visual, kinesthetic learning model of Dunn et al (1984)

3.2 Medication

A medicine or drug is defined as a substance taken to cure and or alleviate any symptoms of an illness or medical condition experienced by an individual, or may be used as a preventive means that has future benefits but does not treat any existing or pre-existing diseases or symptoms. It can also be defined as the scientific study or practice of diagnosing, treating, and preventing diseases or disorders of the body and mind of a person or an animal. Medicine or drugs come in numerous forms and shapes such as tablets, liquids, inhalers (as in asthmatic situations) drops, patches, cream, lotions, suppositories and injections.www.thefreedictionary.com/medicine.

Medication administration is one of the responsibilities of the registered nurse in rendering care to clients and it is a requirement that nurses study medication and pharmacology in order to gain adequate knowledge and understanding on medication. An in-depth knowledge or understanding of it helps build up the competence level in nurses and for that matter helps to eliminate or decrease the tendency of making grave mistakes that could lead to complications or even sometimes, death .Kozier et al, (2004.p 510-514).An important aspect of medication is to ensure that it is administered safely without any complications. Medication safety refers to the safety in relation to the handling and use of drugs in the health care setting and it is important to note that creation of the "Drug safety culture" aids at promoting and ensuring that health care providers are constantly reminded of clients' safety when administering the prescribed drugs. The term as used in this text covers the principles and operations of the social welfare and health care units which is focused at ensuring the safety of pharmacotherapy and protecting the clients from harm in the process of rendering care. www.stm.fi/en.

3.3 Nursing education

Nursing, as a profession is based on the ideal of service and rendering care to humanity. The practice of nursing involves kind or unselfish behavior, which is guided by nursing research or evidence, and is also governed by well established code of ethics. Nursing as a profession continues to expand to a wide body of knowledge and associated skills. Olsson & Gullberg,(1991).

Salvage, (1993) states that, nursing is an art and science that requires the understanding, application of the knowledge and skills that are precise to the discipline or field. It functions on knowledge and techniques developed from the humanities, physical, social, medical and biological sciences. The four distinct functions of nursing are: providing and managing nursing care, whether promoting, preventive, healing, rehabilitative or supportive to individuals, families or groups. It is important to note that the authority for the practice of nursing is established upon a social contract that outlines professional rights and responsibilities as well as mechanisms for public accountability. In almost all countries, nursing practice is defined and controlled by law, and entrance to the profession is regulated by national, state or territorial boards of nursing.

Nursing education refers to the formal learning and training in the science of nursing. It involves the functions and duties in the physical care of clients, and combinations of different disciplines that both promote the clients return to good health and to help maintain it. Nursing education is made up of theoretical and practical training that is provided to nurses with the main aim of preparing them for their duties as healthcare professionals and to be able to provide quality care to clients. This education is therefore provided to nursing students by experienced nurses and other medical professionals who are qualified or gained experience for educational tasks. Olsson & Gullberg,(1991)

In Finland, nurses receive their education at universities of applied sciences (also called polytechnics) that are officially recognized to provide training to students. Public health nurses, midwives and paramedics also qualify through the same schooling which is termed (Ammattikorkeakoulu in Finnish). The degree includes the registered nurses qualification. For a student to be able to work as a nurse, it is required that the student completes a specified number of credits. Therefore, one has to complete the studies which consist of 210-270 ECTS credits and the duration of studies last from 3.5 to 4.5 years. Registered nurses require 210 credits, public health nurses and paramedics 240 and midwives 270 credits. Respectively, pharmacology and medication is an essential part of the study curriculum for the various fields of study mentioned above. www.nurses.fi.

4 Methodology and material

Methodology refers to a perspective or immense theoretical informed approach to research, which stems from the researcher's grounds of knowledge, stance or philosophical position. It is how researches make their epistemology and theoretical stance work for them in their research Ryan, (2006).The method used in this research is systematic literature review which is widely used by researchers in their endeavor to come out with evidence based solutions to existing problems. It is a summary of available researches or studies carried out on the same topic being studied by the new researcher. The search for this study was conducted and the articles for the study were identified through a literature search of some of the well known internet databases, available journals and books that covered issues on the topic under study.

A systematic literature review is a means of evaluating and interpreting all available research relevant to a particular research question, topic area, or phenomenon of interest. It aims to present a fair evaluation of a research topic by using a trustworthy, rigorous, and auditable methodology. Individual studies contributing to a systematic review are called primary studies; a systematic review is a form of secondary study. Kitchenham et al,(2007).

Kitchenham et al,(2007), goes on further to clarify on that need to apply systematic review in carrying out researches in the field of healthcare. Systematic literature review has become known as a point of interests for two main reasons**.** First, it is sometimes suggested that many review of the literature tends to "lack thoroughness" and reflect the biases of the researcher. It has also been suggested that adopting explicit procedures makes such biases less likely to surface. Second, in the field of healthcare, there has been a need or growing movement geared towards coming up with evidence based solutions to illnesses and treatment.

4.1 Data search and strategy

One important task for a researcher is to identify the various strategies and techniques through which the required literature can be searched for. In order to arrive at the exact information for the topic of study, the research must be able access the available known options and how best to apply these options. Howard J,(2007),defines literature search as a well thought out and organized search for all of the available literature written on a particular topic. A well-structured literature search is the most effective and efficient way to locate substantial evidence on the subject being researched. Evidence may be found in books, journals, government documents and the internet.

The aim was to find relevant articles that discussed the learning of medication in bachelors nursing education and with regards to the research question raised. This was to help answer the research question in its best way. The process of finding these articles was a bit difficult in the earlier stages since there was the need to determine and identify the right search engines, right keywords to be used in order to increase the possibility of arriving at numerous articles that have been written concerning learning of medication in nursing education. However, only few of the huge number of articles seemingly answered the research question raised in this review. A detailed process of searching, collecting and selecting the needed articles has been outlined as shown in (Table 1, page 11). The initial search for research articles took place between February, 2012 and April, 2012. This was to allow enough time for the collection of data. Many database search engines were sorted for but seven of them were used. Five produced the potential articles needed for the review and the remaining two came up with non potential or incomplete data. The various search engines used in this review were: PudMed, EBSCO Academic search elite, Elsivier science direct, Ovid (MEDLINE), Scirus, CINAHL and SAGE.

The literature search included identifying the available and potential articles, journals, books and research reports that were related to the students learning of medication in nursing education. Depending on the source, different variations of key terms were employed. The terms used were as follows: “Learning of medication” and “nursing education” or “Students learning of medication” in “bachelors nursing education” or “How student nurses learn medication and “nursing” or “Nursing education” and “medication” or “Medication” and “nursing education”. This was done in order to gather adequate articles around the thesis topic and to be able to select the relevant ones needed for this review. The goal of the data search strategy was to locate the major resources on the topic and additional scholarly and professional resources on closely related topic.

Search word	SAGE	Ovid	Scirus	EBSCO academic search elite	CINAHL	Elsevier Science direct	PudMed
"Nursing education and medication"	0	2	0	19	3	62	0
"Medication" and "nursing education"	1	0	0	11	0	27	3
"Learning medication" and "nursing education"	0	2	1	92	8	13	0
"Nursing education" and "learning of medication"	0	4	0	9	0	7	9
"How students learn medication" and "nursing education"	0	3	0	0	0	6	1

Table 1. Showing the data search, the various search database engines used and the number of articles generated.

The table above gives the representation of the search engines used and the number of hits they produced based on combination of the search key terms. The search engines SAGE and Scirus came up with the lowest of hits. They produced articles which mostly had different titles from the search terms. Those that came up with good titles could not be assessed. EBSCO academic search elite and Elsevier science direct gave the highest number of hits. The total relevant hits for the various search engines collected were: Ovid (MEDLINE) =3, SAGE=0, Scirus=0, EBSCO academic search elite =61, CINAHL=4, Elsevier science direct=33 and PubMed=3. In all, a total of number of 104 articles was collected based on the combination of key search words used. Most of the articles appeared in almost all the search engines used and for that matter, it was necessary to identify and exclude them from the number of hits. The collected articles were saved on the memory stick and also on my laptop for reference.

4.2 Data screening

In order to achieve the aim of arriving at the main target of finding good research articles for this research, there was the need to screen the data collected and this stage of presented with some challenges since there were more articles out of which most related to the purpose of this study. The total number of articles gathered for the review was 104 as indicated above. The inclusion and exclusion criterion provided the means by which the final articles for this review were selected.

According to Randolph (2009), "the inclusion/exclusion criteria should be plain and comprehensive enough so that any article that comes to light could be included or excluded solely based on the laid down criterion. Further, the criterion should include enough detail so that when two people or researchers, given the same set of articles, would find virtually the same subset of articles" This phase therefore aided in outlining the requirements by which an article was considered as relevant or not and if it should be added to the final articles required for the analysis.

After the first screening process, the number of articles gathered was 104 based on the combination of keywords employed in the data search. A second screening was carried out limiting it mainly to the purpose statement and the research question for this study. This was to ensure that, the articles selected had rich data and was relevant to the thesis topic. This led again to the reduction of the articles to 43. The inclusion and exclusion criterion as indicated below was applied during the third screening and this led to a total number of 20 articles. Further screening through the critically appraised quality for the study brought the final number to 7.

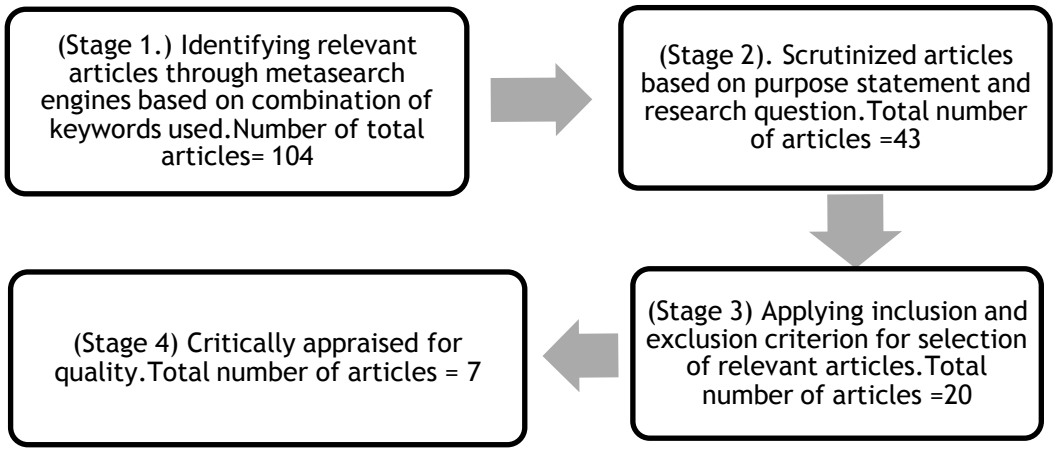

Figure 1. Flowchart of the data screening process

The criterion used for selecting the final articles for this study was based on the following:

- The article or research was conducted in English
- Studies based on actual evidence (Empirical research)
- The article was published between the periods of 2000-2011
- The article was relevant to the review topic
- Articles had relevant abstracts and findings to the study
- The article fully or partially answered the purpose of study and research question

4.3 Data extraction

The aim was to give a general outline and view of the study and to extract the exact findings from the articles used in relation to the thesis topic and research statement. The main focus was to read through the contents of the articles though most of the articles retrieved for the review that met the inclusion criterion covered a broader scope than that of the thesis topic. This led to a second screening of the articles concentrating solely therefore on the abstracts and findings of the articles. These areas were reconsidered as potentially more relevant and provided the information needed for this study. The inclusion criterion was to ensure that studies reviewed addressed both studies specific to learning of medication and its relation to nursing education.

In this review, the data extraction phase was done by focusing on the purpose of the study and the research question. The retrieved final articles for this review were carefully studied by reading the abstracts and findings of the articles since they contained the most relevant information needed. Contents of the articles were also read to help gain supporting evidence for the findings of the articles. The data for this study was therefore, extracted from the ab-

stracts, findings and discussions of the final 7 articles. A table is provided which gives an analysis of the articles used. This included the author's name, title of article, year of publication, type of publication, purpose of the study, method of data collection and the articles relevance to this current review. (See Appendix 1, page 34)

4.4 Data analysis

The analysis of data is a very important phase of the review and its main purpose is to organize, provide structure and extract meaning from the data gathered (Polit & Beck, 2004).The studies taken into account were those specifically within the range of keywords which included; "learning of medication in nursing education", "nursing education and medication", and "medication in nursing education" and "how students nurses learn medication and nursing education" as stated in the previous section. During this phase of the review, the data selection was completed and qualitative content analysis approach was applied. (Krippendoff, 1980) states that, content analysis is a research method for producing replicable and well grounded inferences from date to their context, with the main purpose of establishing or showing new knowledge, new insights, a representation of facts and a practical guide to action.

One important aspect of the qualitative content analysis is that the method, to a great extent, focuses on the subject, context, and stresses on difference between and similarities within categories. Another importance is that the method deals with manifest as well as apparent content in a text. The manifest content, that is what the text says, is often presented in categories, while themes are seen as expressions of the apparent content that is what the text is talking about. Graneheim & Lundman, (2003)

Firstly, a grid was created for the final articles chosen for the review and this was done in order to aid in the organization of the actual combination of the data. This process involved a thorough qualitative analysis of content, but focusing mainly on the abstracts and findings of the articles of which expressions and ideas that repeated as well as the contradictions were noted at the end of each article. A list of keywords that the articles answered were also noted ensuring that the answers accounted for both contradictions and repetitions discovered were in relation to the research question of this review. This was done by highlighting the major issues answered by the various articles. These ideas were grouped as "categorized themes" (main categories). Millar,(2004: 143) based on qualitative content analysis, research synthesis is often done in a form of summary tables or illustrations which provides an overview of the key characteristics of the studies reviewed.

According to Hseish & Shannon (2005), the inductive content analysis is an important process which includes open coding, developing categories and abstraction, where open coding means that notes and heading are written in the text while reading through the literature. The written material is read through again, and as many headings as necessary are written down in the margins to describe all aspects of the content. Secondly, the ideas and concepts presented in the various reviews were noted and grouped under the major themes presented. The most noted ideas and issues that were presented in the chosen articles were grouped together in order to aid in backing the categorized themes. These findings were grouped as sub-categories.

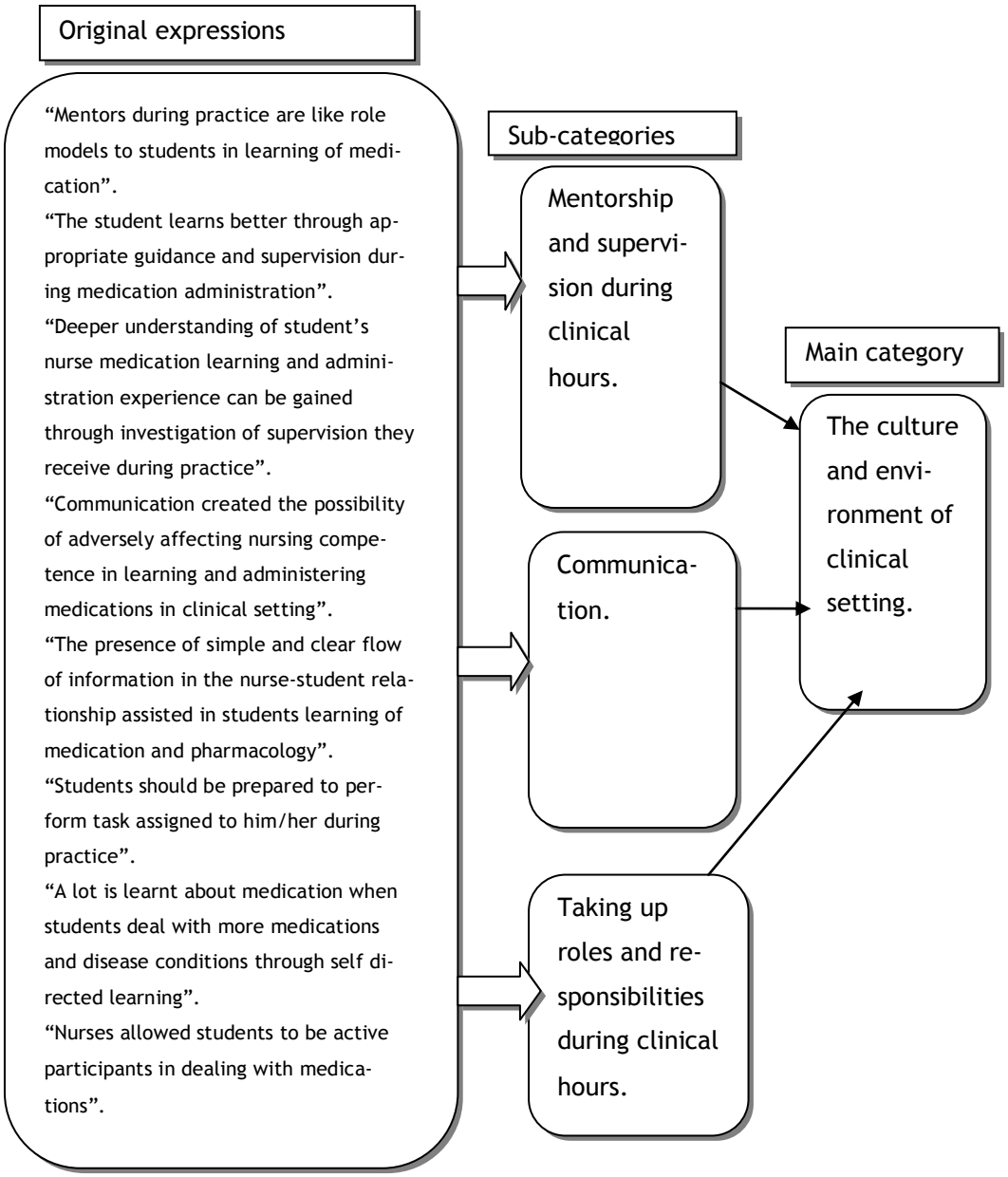

Figure 2. An analysis illustration of culture and environment of clinical setting

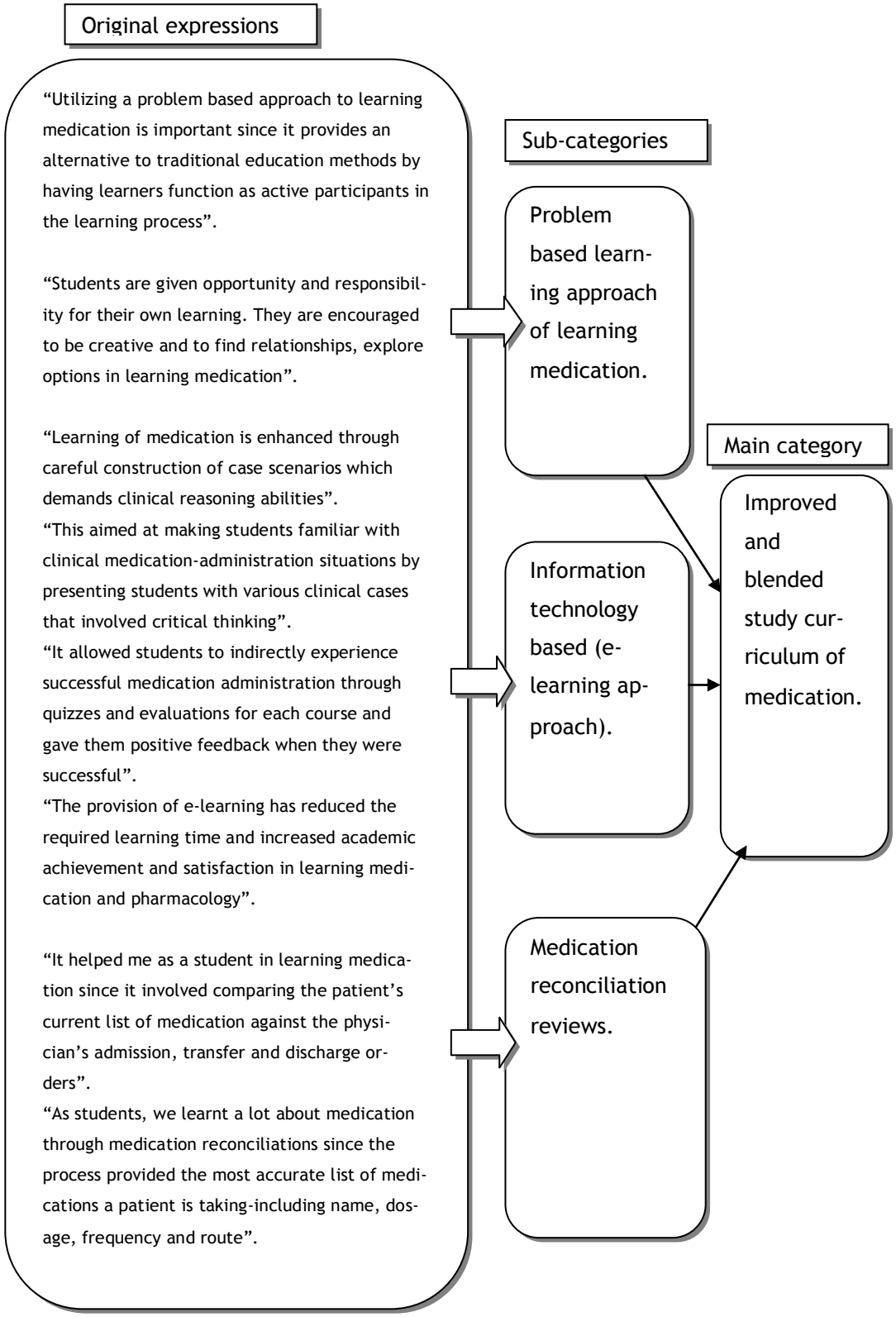

Figure 3. An analysis illustration of improved and blended study curriculum for learning medication

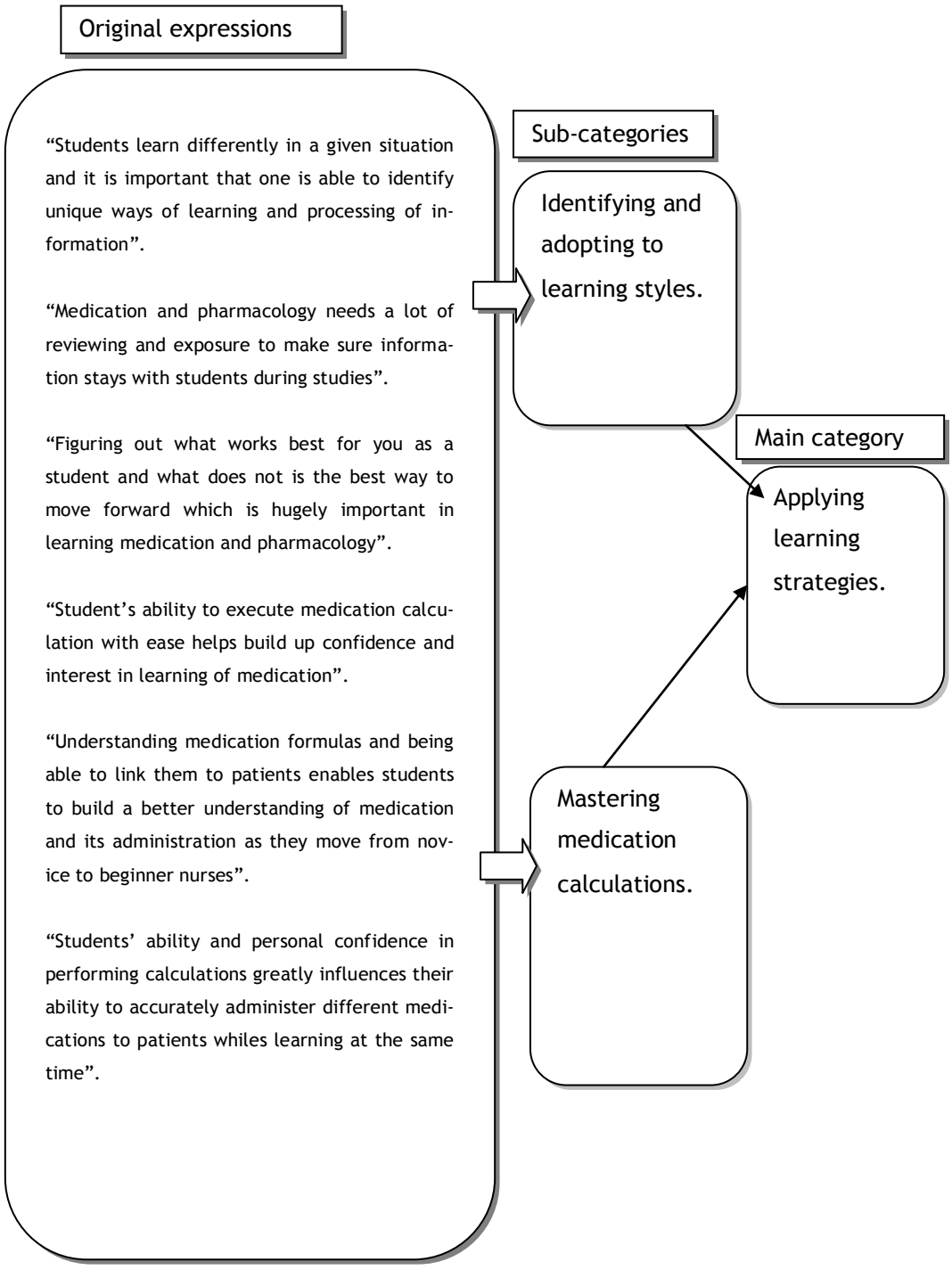

Figure 4. An analysis illustration of identifying and applying learning strategies in learning medication

5 Findings

The final selected articles for the articles were reviewed for the purpose of this report. In this section, the major findings related to the research question are explored. Content analysis of the articles resulted in descriptive categories of "learning of medication in bachelors nursing education" in relation to the main research question "How do students learn medication in bachelors nursing education?" The findings of the articles were presented in the 3 descriptive categories as shown below:

- ❖ The culture and environment of clinical setting
- ❖ Improved and blended curriculum for medication and pharmacology
- ❖ Applying learning strategies

The categories above resulted in subcategories with regards to the various ideas presented by the authors. It is on the basis of these findings that the research question raised is answered. The subcategories are:

- Mentorship and supervision during clinical hours
- Communication
- Taking up responsibilities and initiatives during practice
- Problem based learning approach
- Information technology based (e-learning approach)
- Medication reconciliation reviews
- Identifying and adopting to learning styles
- Mastering medication calculation

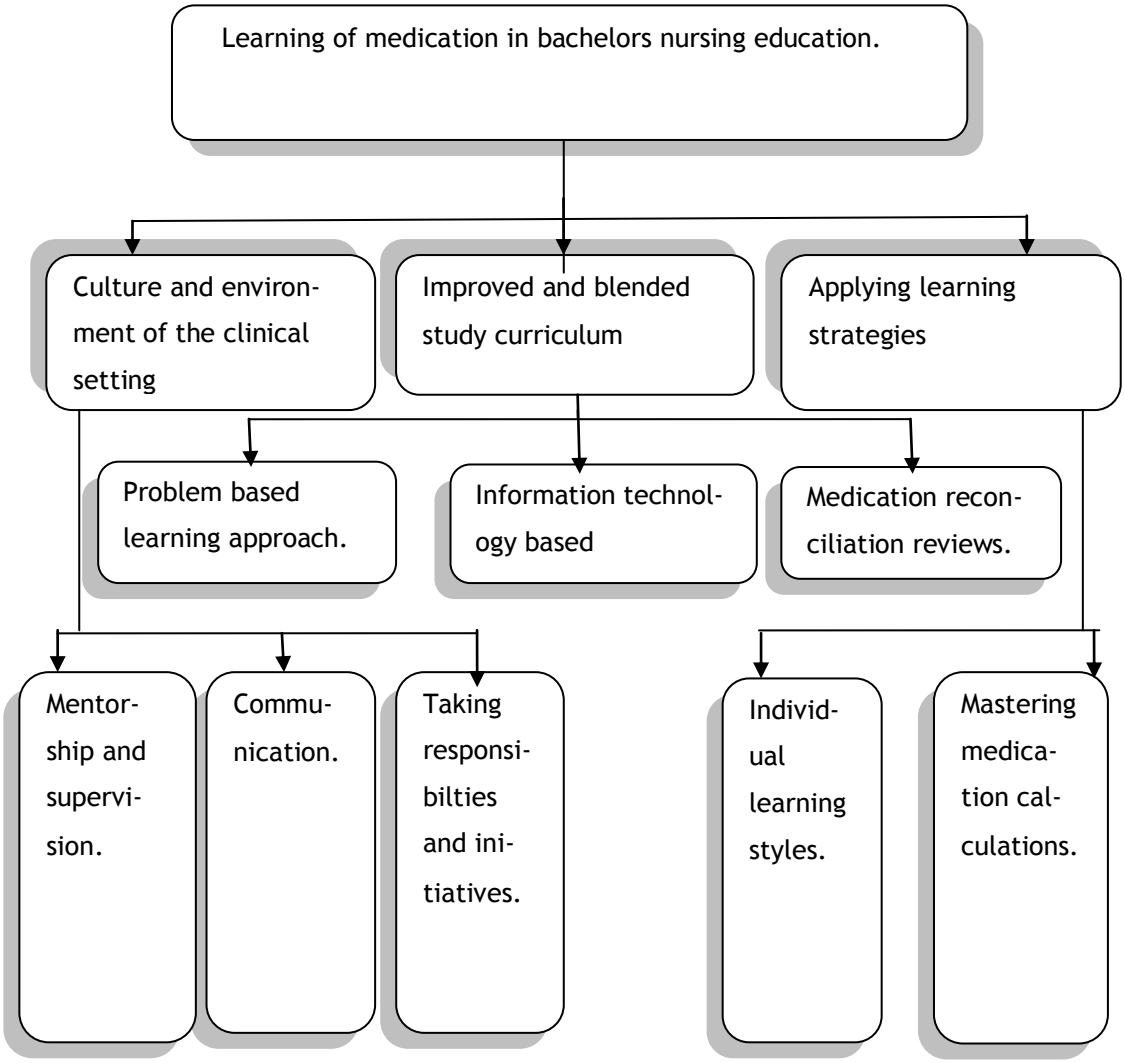

Figure 5. An overview of the findings illustrating the sub-categories and main categories

5.1 The culture and environment of clinical setting

The authors of the articles argued on the importance and a need to create and maintain a better clinical practice environment which is channeled at helping the student's needs of learning medication and its administration in its best way. The importance of a culture that takes in account direct supervision as relevant enables students to feel comfortable in asking questions and challenging practices on the ward. Reid-Searl et al, (2010) Again they argued that most students are adequately or well prepared theoretically when it comes to medication and pharmacology. However, the theoretical knowledge alone cannot prepare nursing students for every nursing duty and unit when it comes to medication. Certain variables in the clinical setting go a long way in helping students learn medication and must therefore be

made possible and available in order to facilitate the learning of medication. These factors are the extent of mentorship and supervision offered to the students, presence of effective communication, the learning environment and the roles employed by the students as emphasized by Bullock & Manias, (2002).

5.1.1 Mentorship and supervision during clinical placements

According to the articles, it is very important to consider the type of mentorship and supervision provided to nursing students during their clinical hours in order to ensure that students meet the medication needs by the end of their placements. Education providers and healthcare organizations have moral and legal duty to provide the appropriate support to students during their clinical placements and through this support, the student is constantly made aware of the set objectives. The clinical setting provides the platform and offers students the opportunity to apply the principles of medication administration with real clients and numerous medications while adhering to the correct processes, while paying much attention to the five rights of medication which are right client, right medication, right dosage, right time and right route. (Reid-Searl et al,2010) .In addition, the study, pointed out that students constantly come into contact with disease conditions and the actual drugs used in managing and treating these diseases. The type of supervision offered was therefore stressed as a core means of learning medication especially when it is geared towards the student's interest. (Reid-Searl et al,2010).The student's participation in the treatment plan designed for these clients and in the process of handling the prescribed drugs is able to learn a lot about medications. This is made possible with the type of supervision and mentorship offered to the student. Clinical tutors are viewed as role models and they have responsibility of ensuring that students learn medication in its best way since it is an important aspect of nursing and a responsibility of the nurse as well.

5.1.2 Communication

Communication problems between health care providers and students were identified as one of the things that impaired the students learning process during clinical placements. The student's ability to effectively communicate with the staff on each working shift during clinical placements helps in identifying his capabilities and learning needs.(Rycroft-Malone et al, 2000).The facilitator or the clinical tutor reminds other nurses on the ward about where the students are at in terms of medication and its administration. This clarification enables the nurses and students on the ward to work according to the laid down plans or learning objectives of the student with much emphasize placed on medication. Again, clear and simple laid down instructions help to reduce the anxiety levels experienced by students during the learning process. Students learn a lot when they are able to interact freely with patients during

practice placements.(Hapell et al,2011). In addition to these, effective communication was identified as crucial in providing nurses with information about what students were able to do to ensure safe and effective learning experiences. The pharmacist on the ward is practically one of the best sources through which students learn more about medications and when there is free flow of simple and clear information, the student is able to express his or her worries by asking questions and getting clarifications. Students are also able to interact among themselves and address issues that are of importance to their learning process while learning from each other and other healthcare professionals at the same time in a better way.(Rycroft-Malone et al,2000).

5.1.3 Student taking responsibilities and initiatives

The authors point out that, another method of learning medication and its administration is for students to take up the initiatives and responsibilities during the clinical placements. During clinical hours, students have to learn how to manage the administration of medication in situations for which they may not have been well prepared for. While the theoretical and laboratory sessions provided in school may help equip or a skill student in particular procedures, the actual or real exposure to the clinical setting is therefore, essential to their understanding of the development of their competencies in learning medication.(Reid-Searl et al 2010, 533).According to the authors, the student nurse learns a lot by taking up responsibilities and executing tasks assigned to him during clinical hours. The student learns a lot about medication through this process since they are expected to read patients charts, calculate medications, interpret given drug prescriptions, handle real equipments, and interact with clients and other healthcare professionals. Therefore, for the student nurse to have a better understanding and a good knowledge of medication there is the need for students to develop a greater sense of responsibility in monitoring and accountability in administering of medications. (Rycroft-Malone et al,2000).Again, most students are of the idea that they are only on practice and for that matter only need to observe procedures been done or carried out by nurses on the ward. They should rather be reminded that medication is an essential part of nursing and that they need to be accountable and responsible for every pill administered. Students who make good use of the practical environment as a reliable learning setting are able to identify their strengths and weaknesses through the entire learning process while at the same time upgrading their knowledge on medications used on the ward.

5.2 Improved and blended curriculum of medication and pharmacology

Two of the reviewed articles, Latter et al,(2000) ;Sung et al,(2008) stressed on the importance of establishing a blended and improved study curriculum geared at supporting the learning needs of the students in learning medication. They argued that the theoretical framework only creates the baseline foundation upon which the student nurse builds up his or her understanding of medication in bachelors nursing education. The study curriculum should be focused towards increasing the substantiality of learning by helping the students to actively review the educational content of the learning program and by connecting medication administration to the content of an educational program. The studies argued that it is important to draw up a program which would aim at improving the medication knowledge of students which would in turn help build their confidence in handling issues related to medication during the period of studies. There is the need for a continues emphasis on the use of e-learning (ICT),medication reconciliation reviews and adopting the problem based approach of learning medication as effective methods of learning medication in the nursing education.

5.2.1 Problem based learning approach

The need to adopt the problem based approach of learning medication is an important aspect of the nursing education. It was emphasized by the authors as one of the best approaches by which students learn medication. Problem based learning provides a possibility of choice to the traditional educational methods by having learners function as active participants in learning process, rather than passive recipients of information. Sung et al, (2008). The authors further explore that learning of medication requires an interactive approach to critical thinking based on student's current knowledge which provides the foundation for the establishment of new concepts and reasoning. Critical thinking becomes a requirement because it is integrated firmly in the problem solving process. Students learn best when they become masters of their own learning process. This is relevant in learning medication

Medication is an essential part of nursing field of study and students will need the knowledge throughout the working life. In emphasizing this point, it is important to note that by sharing information among group members, students are engaged in variety of research skills. Through this method, the students are presented with both the opportunity and to take up responsibilities for their learning process. They are encouraged to be creative, find relationships, explore options during studies, develop hypotheses, identify learning needs and produce solutions to problems presented. (Sung et al, 2008.)

5.2.2 Information technology based (e-learning approach)

It is easier to impact knowledge on students in learning medication through e-learning than using the traditional lecture type of education. Integrating the e-learning into the study curriculum makes it easy for students to learn medication since it is web-based, and allows students to access information on medication and pharmacology at any time and place.(Sung et al,2008, 944). Moreover, the websites are designed in an interactive format and included learning support features such as animations (to facilitate explanations about medicines and pharmacological actions), numerous case studies for students to practice what they had just learned, and computing modules for calculating drug dosages. It provided students with the opportunity to practice quizzes on medications and had feedbacks on how they performed after each session. Through the e-learning program, it is easier for students to be able to communicate with fellow student nurses from other institutions across the globe, pharmacists and other health care professionals through online forums and other organized educational sessions in order to help them ask pertinent questions regarding medication in order to upgrade their understanding of medication and its administration. Meechan et al(,2010, 383-389).

5.2.3 Medication reconciliation reviews

The authors emphasized on the importance of medication reconciliation as a good approach of learning medication in nursing education. Traditionally, nurses have been taught to practice administration of medication by operating on the bases of the 5 R's of medication which are: the right client, right medication, right dose, right time and right route. It is important to note that, medication goes beyond these already established rights and for that matter, the authors stressed on the need for healthcare providers, stakeholders and decision makers in the health care sector such doctors, pharmacists and nurses, to continually work towards upgrading information on medication. (Meechan et,2010). Additional rights have been proposed by some researches and one example being the right "documentation". Medication reviews helps in identifying and raising awareness of issues related to medication and its administration and in so doing contributing to the students understanding on medications. (Meechan et al,2010).They further discussed the importance of including student nurses in the medication reconciliation reviews or programs, since it makes the student an active team member and in the process of contributing to the review, the student learns more and is able to make the new knowledge gained part of the continues learning process.

The continuing progress and changes in medical research and the increased severity and complications of patients ailments proves to the fact that countless new drugs are constantly being developed and introduced into clinical nursing practice as time goes on. Students through

the medication reviews are able to identify why certain drugs in the clients list had to be changed, the reasons for the change and why new drugs were prescribed out of the numerous options available. (Meechan et al,2010)

5.3 Learning strategies

According to the authors, Bullock & Manias (2002); Meechan et al (2010), students are presented with numerous challenges in learning medication and other subjects as well. Medication is an essential part of the nursing field of study which demands a better understanding and knowledge level in order to ensure its safe administration. There is well established and evidence base associated with the learning of medication. Different learning styles and strategic approaches have been stressed and proven to be effective. Some of them being cognitive, constructivist, and behavioral. The authors further elaborate on the fact that depending on the student's ability, there is an increasing emphasis on collaborative learning styles strategies. Each student therefore, has a unique learning style which best aids in the understanding of a particular given subject when put to use. It is important to note that, students use appropriate methods that they are familiar with and it helped in retention of medications learnt during period of studies.

5.3.1 Mastering medication calculation as a baseline foundation

Safe administration of medication and interest in medication relies not only on nurses' knowledge of drug pharmacology, drug interactions, contraindications and the correct route of administration but also requires them to accurately calculate the required dose when applicable. (Rycroft Malone et al,2000).The authors, again emphasized that mastering medication calculation is one of the best approaches by which students can effectively learn medication during the duration of their studies since it helps to build up the confidence level in dealing with medication. Most students demonstrate difficulties with not only basic mathematical operations, but also the conceptual skills required to undertake and interpret clinical medication calculations. (Meechan et al,2010).Furthermore, when the administration of prescribed medications requires mathematical calculation it is expected that nurses are able to accurately carry out such calculations and are confident in their ability to perform these tasks. This helps in eliminating or decreasing the anxiety levels experienced by students in studying medication. (Rycroft -Malone et al,2000).

5.3.2 Appropriate individual learning styles

According to the authors, students tend to use superficial approaches to learning medication rather than application of deep learning approaches. In learning medication and pharmacology, it is important to note that each student has a particular and preferred method of interacting and processing information. Again, medication regimens are constantly changing and new drugs are been introduced to replace old ones.(Bullock & Manias,2002). As students apply unique learning strategies in learning medication, it helps to develop a better understanding of the drug family framework and at the same time establishes powerful approach for life-long learning. Students most often have difficulties identifying their unique learning styles be it visual, auditory and kinetic. (Latter et al, 2000).Visual learners learn much better with the use of images, diagrams, and videos. They need to make good use of these features in helping them gain a better understanding of medication. The auditory learner benefits more from class lectures and group discussions though active listening. A combination of learning styles in most cases has been proven to be effective. (Bullock & Manias,2002).The authors stressed on the fact that learning styles is important in learning medication since student nurses need to integrate knowledge of medication and pharmacology (such as drug mechanisms of action, pharmacokinetics and drug effects) with the nursing knowledge such as drug calculation and drug administration.(Latter et al,2000).

6 Discussion of findings

The main purpose of the review was to explore methods or ways that students use in learning medication and its administration in bachelors nursing education. This topic is of great importance to the nursing field of study since medication is an essential part of rendering care to clients. In order to achieve the aim of arriving or coming out with some of the approaches, there was the need to search for available researched articles concerning the area under review. Out of the numerous articles collected for the review, seven research articles were considered relevant to the topic of study upon which the findings of these articles were carefully studied and analyzed. The main ideas and expressions presented in the selected articles were grouped into main categories and subcategories.

This phase of the review is based on my views and opinions from the findings gathered from the articles used for this review. It is also based on my personal understanding of materials used, taking into account the various criteria, methods and approaches employed in answering the research question raised. The discussion is therefore centered and conducted based on the findings of the selected articles used for the review taking into consideration the research question raised “How do students learn medication in bachelor’s nursing education”?

The findings of the articles used for this review shows that there are different approaches by which students learn medication in nursing education. However, one of the major issues which emerged was the importance of the clinical setting in the learning of medication by nursing students. Student nurses go through various series of organized clinical throughout the duration of their studies. The clinical setting provides the platform by which students put their theoretical knowledge into practice and in so doing identify their strengths and weaknesses as they proceed with the learning process. It is very important to create and establish a clinical environment which aims at equipping and providing the student or learner with the necessary and available techniques in learning medication.

The clinical setting when organized in a manner which is aimed at providing the student with the necessary opportunities provides the appropriate means through which student's best learn a lot about medication and its administration. As Happell et al, (2011) points out, providing the student with the necessary and right supervision on medication and its administration, is one important method by which students learn medication during studies. Students are faced with challenges of dealing with different disease conditions and the various medications used in the treating these diseases. The student coming into contact with the processes and with the right supervision and mentorship is able to learn a lot about medication by getting involved in the treatment plan designed for clients.

Another important point was the fact that effective communication during clinical placements provided a better means of ensuring the learning of medication by students. Students learn more from the various health care providers who together make up the health care team and some of them being the physician, the pharmacist and the nurses are constantly in contacts with clients. These health care providers are with enough experience and knowledge on medication. Clear communication between the health care providers and students on placements ensures the better flow of information which is deemed very important in rendering care to clients. The facilitator is able to feed student with the appropriate information. Students are also able to learn a lot through their interaction with clients by asking questions for clarification on issues that seemed confusing. This is one important aspect which was stressed by Rycroft-Malone et al,(2000). In addition to these, the findings also support the fact that students learn a lot about medication and its administration by taking up initiatives and roles during clinical hours. The authors pointed out the tendency of students going through their practice placements by solely observing procedures without actively participating in them.

The actual real exposure is the appropriate method of learning since students are faced with challenges and different situations which demands critical thinking. Reid-Searl et al,(2010), states that during clinical hours, the students nurse has to learn how to manage the admin-

istration of medication in situations for which they may not have been prepared for and in carrying out these roles, helps in building up their confidence level and knowledge base on medication at the same time. There are several ways by which students learn medication in nursing education as suggested by numerous researches carried out concerning the area of review. However, these approaches vary with the resources available to the students and the study curriculum designed for the students. The findings of the articles in this study taking into account the availability of numerous options also support the fact the providing a study curriculum integrated with e-learning approach (ICT) makes it easy for students to learn medication since it is web-based and allows students to access all the information on medication and pharmacology at any time and place. (Sung et al, 2008). Nonetheless, the findings support the fact the ICT has been a powerful tool of learning medication for it provides students with various opportunities. It is easier for students to communicate with fellow nursing students from other institutions across the globe, pharmacists, physicians and other health care professionals through online forums and other educational sessions.

Sung et al, (2008) also demonstrates the effectiveness of using the problem based learning approach in learning medication in nursing education. This was emphasized as one of the best methods by which students learn medication since it provided an alternative to the traditional educational methods being used. This approach provides students with the opportunity to function as active participants in the learning process instead of being passive recipients of information given by the lecturer. The students are constantly in search of answers to real situations in the process of learning and are presented with the opportunity to take up challenges and responsibilities of their own learning.

Another issue that emerged from the findings was the importance of involving student nurses in the medication reconciliation reviews or programs since it also served as one of the means of learning and upgrading of students knowledge on medication in nursing education. As discussed earlier, raising awareness of issues related to medication and its administration provides student nurses with the opportunity to learn more and to also upgrade their knowledge on medication.(Latter et al,2000, 469-479). The student, as a team member and in the process of contributing to the review, learns more about medication and is able to make the new knowledge gained as part of him/her during studies and in the working life. Again, new medicines are constantly been introduced to replace old ones. Through this, students are able to identify and learn more about these medicines. (Latter et al,2000, 469-479).

The study findings also pointing to the importance of identifying and use of learning strategies as means of learning medication in the nursing education is one interesting issue raised. Students are faced with the challenge of identifying their actual learning styles. As indicated above, when students apply unique learning strategies in learning medication, it helps them

to develop a better understanding of the drug family framework and at the same time establishing powerful approach for life- long learning. (Bullock & Manias, 2002).In addition, it is important to note that each student has a unique approach of learning and for that matter once the student is able to identify his or her style, it is easier to associate it with the learning process.

Latter et al, (2000),raised a similar point in their study that adopting to unique learning strategies and styles in an important aspect of learning medication since students constantly need to integrate their knowledge of medication and pharmacology (such as drug mechanisms of action, pharmacokinetics and drug effects) with the nursing knowledge such as drug calculation and drug administration. Finally, another issue which emerged was the importance of mastering medication calculation as discussed by the authors. Mastering medication calculation was identified as one of the ways which helps build up the confidence and interest levels of students in learning and administering of medication. When the administration of prescribed medications demands mathematical calculations, it is required that nurses or students nurses are able to accurately carry out such calculations and are confident in their ability to execute these calculations.(Meechan et al, 2010).It is therefore, important for student nurses to overcome this problem during studies in order to be able to develop the interest in learning medication and administering them without much difficulty or anxiety.

7 Ethical considerations and trustworthiness

In this research the method of data collection was solely the Systematic literature review. This means articles concerning the topic were searched for through some of the well known and reliable internet search engines. The methodology for this review did not in any way involve or include structured interviews, any form of questionnaires and or observations in which human beings are part of the data collection process, and for that matter, the need to obtain a written consent and privacy were not considered in this study. There was no need for any signed documentation for use of any material. From the researcher's point of view of knowledge, there was no risk of harm to anyone. However, ethical consideration contributed greatly in the process of data collection, analyzing and reporting of the findings. The data collected and used for this review was reported and backed by appropriate referencing meaning the articles used can as well be searched for through the right sources.

This review as stated earlier was to help students explore and upgrade their knowledge on learning medication and pharmacology during the period of their studies. Medication and its administration is an important aspect of the nursing field of study. Nurses constantly come into contact with numerous drugs in the process of rendering care to clients and it is im-

portant that they know the type of medications they are dealing with, the appropriate ways of handling them and how to deal with complications when they arise.

Trustworthiness was given a greater consideration while conducting this review. The main aim of the trustworthiness of this thesis was to support the argument that information expressed or reports of this study is worth paying attention to since the method of data collection used was Systematic literature review which is considered as one of the reliable sources of data collection. The various stages or processes under systematic literature review were carefully followed and applied in this thesis. Again, the selected articles for this study were from different countries and different authors which show that, findings were not based on only one location or information source. Owing to the fact that, reliable sources of data search was used in this review and with regards to the search terms used, it is important to state that some articles may have been left out which could have also helped in coming out with the more findings. Most were excluded from the review due to the inclusion and exclusion criteria applied. Studies which discussed issues centered on the thesis topic were given much consideration. However, the use of a small sample size for the review one way or the other limits the generalization of this issue.

In addition to these, it was important to also consider the process of systematic literature review as applied in this thesis. The articles used in this study were from reliable and trusted academic databases which can be searched for and downloaded from the Nelli portal of Laurea University of Applied Sciences online search tool. The various search engines used are indicated in Table 1(see page 11). Finally, in order to also ensure the trustworthiness of the information and articles used for this review, a table is provided in (Appendix 1,page 34) which gives a representation of the authors' name, year of publication, topic of the article, type of publication and the methods of data collection.

8 Conclusion and recommendations

Medication is an important aspect of the nursing field of study. It is one of the main responsibilities of the nurses in rendering care to clients and for this reason, it is required that nurses have a better understanding of medication and its administration in order to be able to handle them effectively without encountering complications. Most student nurses are faced with the challenges of learning medication and pharmacology during the period of study and for that matter find it difficult to handle issues related to medication administration in the working life. It is important to note that, nurses in practice may need to administer numerous medications through various routes and methods. This demands that they learn the competencies associated with safe and ethical medication practices throughout the duration of their

studies. As mentioned earlier, a better understanding of medication and how it can appropriately be administered is therefore, an essential aspect of all categories of nursing education.

This bachelor's thesis employed the method of Systematic literature review to explore how student learn medication and its administration during the periods of their studies in the bachelors nursing education. This topic was deemed important since most students are presented with challenges of learning medication and pharmacology and for that matter the Laurea University of Applied introduced a larger project entitled "Facilitating learning of pharmacology and medication in degree programme in nursing" with the aim of helping the school to set up an improved curriculum for its future students through evidence based literature.

Numerous articles were searched for through reliable and well known data base search engines. A huge number of articles were finally selected after which seven was finally chosen for the review based on the inclusion and exclusion criteria used. The results and findings were discussed based on these articles. (See Appendix 1 page 34). Mentorship and supervision during clinical hours, Communication, students learning through taking up initiatives and responsibilities during clinical, Problem based learning approach, the e-learning approach of learning medication, medication review/programs, medication calculation and identifying and learning with appropriate learning styles were the findings that evolved. However, it is important to state that there are various ways on how students learn medication in bachelors nursing education aside the ones outlined in this research.

One important recommendation is the need to involve nurses or student nurses in more researches on facilitating the learning of medication and pharmacology during the period of their studies in order to support the students learning process and to be able to come out with solutions that are constantly encountered by students. Carrying out this review as a student nurse it has broadened my knowledge and understanding on medication and its administration. I have learnt a lot through this which I believe would be of great importance in my working life as a nurse. Medication is an essential aspect of the nursing field of study and for that matter, its importance has to be stressed and students offered with appropriate and necessary support in having a better understanding of it. Clients encounter many complications and even, sometimes death due to inappropriate administration of medication.

Another recommendation is to carry out more studies on this topic concentrating on developing or third world countries. Owing to personal experience and being a student from Africa where some institutions are faced with the challenge of providing students with the necessary resources, it would be challenging factor to carry out further studies on how students in those areas learn medication and its administration. Unfortunately, articles used for this review was

mainly from developed countries such as USA, Canada, Australia and United Kingdom. This makes it a bit difficult to generalize. Other researches, within the bigger project probably came out with other methods of facilitating the learning of medication and pharmacology. However, I wish to state that there is still more information about learning of medication that could be enlightened using a larger number of articles and other research methods.

To conclude, this research has shown using a three categorized prolonged analysis of findings (see figure 5 page 19) that several key issues need to be dealt with when considering the issue of learning medication in bachelors nursing education. The clinical setting was discussed and highlighted as a vital setting in learning medication and its administration in its best and effective way. The lectures or classroom provides the student with the baseline information and the theoretical knowledge needed but the practical setting provides the platform for students to execute and put into action what they have learnt. It is important to ensure that students are provided with the appropriate guidance, supervision and mentorship during practical hours and concentrating on helping students overcome challenges of learning and administering medication.

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Appendices

Appendix 1. Table 2. Showing the data used for this review.

Author(s) and year of publication.	**Title of article**	**Type of publication**	**Aim & Purpose.**	**Research method**	**Main results/Findings**
Rycroft-Malone et al (2000)	Nursing and medication education.	Nursing Standard.	To explore nurses contribution to medication education.	Case study approach and a review of literature was also undertaken in order to establish what was known about nurses' current practice in medication education.	Findings indicate that nurses' contribution to medication education is commonly limited to communication.
Latter et al (2000)	Nursing and medication education: the preparation and role of nurses' clients' and carers' medication education.	International Journal of Nursing Studies.	This study set out to explore nurse's current contribution to medication education and clinical contextual factors that influence current practice.	Case study approach and Systematic review. A case study design was used to evaluate nurse's contribution to medication education and illuminate the factors which operate to facilitate or inhibit this contribution in clinical contexts.	Findings indicate that nurses have a major responsibility in the preparation of student nurses and clients in medication education.
Happell et al (2011)	Nursing students and the supervision of medication administration.	International Journal of Nursing Stud-	Aim was to investigate student nurses experiences of supervi-	Quantitative analysis.	Findings indicate the importance of adequate

		ies.	sion in medication administration.		supervision in medication administration.
Reid-Searl et al (2010)	Nursing students administering medication:appreciating and seeking appropriate supervision.	Journal of Advance Nursing.	To explore undergraduate nursing students' experience of administering medication in clinical setting.	Grounded theory method.	Supervision emerged as central category. The need for and importance of supervision in enhancing learning.
Sung et al (2008)	Blended learning on medication administration for new nurses.	Nurse Education Today.	The study analyzed the effect of blended learning program on medication administration.	A quasi-experimental study with non equivalent groups design.	The experimental, blended learning group showed a significant higher level of knowledge on medication.
Bullock S & Manias E (2002)	The educational preparation of undergraduate nursing students in pharmacology and medication.	International Journal of Nursing Studies.	To explore the perceptions and experiences of lecturers & undergraduate nursing students relating to teaching & learning is-	Focus group interview method was used. A total of 14 focus group interviews were conducted at 10 universities. The "framework" method was used for data analysis, which involved the following stages:	Findings indicate that there is still much scope for educational initiatives to improve students' knowledge

			sues in medication.	familiarization, identifying a thematic framework,indexing,charting and finally,mapping and interpretation.	of pharmacology and medication management.
Meechan et al(2010)	The impact of an integrated pharmacology and medicines management curriculum for undergraduate nursing students on acquisition of applied drug/pharmacology knowledge.	Nurse Education Today.	To investigate the efficacy of integrated pharmacology and medicines management curriculum for undergraduate nursing students on the acquisition of applied drug/pharmacology knowledge.	A comparative design was used for this study. A questionnaire used to gather the data focused on the student's knowledge of medication.	Findings shows students exposed to an integrated approach to pharmacology and medication demonstrated pharmacokinetic knowledge and were more able to apply drug knowledge to practice.