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ANTIBIOTIC RESISTANCE IN PEADIATRIC NURSING.

A literature review concerning the action of nurses in antimicrobial stewardship and the challenges which follow.

LAHTI UNIVERSITY OF APPLIED SCIENCES
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Abstract

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Abstract

It cannot be denied how much benefit antibiotic treatment brings about in controlling infectious diseases; however, in parallel with the antibiotic development, antibiotic resistance becomes a serious issue. Thus, a literature review was conducted to gather information about the nursing actions, that include evaluating, performing, educating and managing, which will be sort out in a catalogue of four nursing interventions of coordination of care, health behaviours, medication and safety. In this thesis, family-centered care could be considered to have a vital role in paediatric nursing, what emphasizes the parents' role in collaboration treatment along with the position of nurse, that allows to see the matter under multiple perspectives.

The purpose of the thesis was to provide information on the actions of nurses and the challenges following to improve health care service delivery for children and enhance patient satisfaction according to the family-centered care framework. Meanwhile, the thesis aims at finding out the effective nursing interventions along with mission for the future career of nurse. A narrative literature review was used as the research method and content analyzing was done by thorough reading through the research data in order to answer the research questions.

The findings of the thesis indicated that coordination of care had been emphasized along with the improving day by day of health behaviours from nurses and patients' family. However, the role of nurse in antibiotic resistance stewardship should be given more attention. Then it is necessary to find out the more effective way to control antibiotic using as well as reduce antibiotic need. Medication understanding had been one of the most challenging subjects, in addition, safety or preventing infection should be as well taken into consideration.

Keywords

antibiotic, antibiotic resistance, children, stewardship, nurse, family-centered care, nursing intervention.

CONTENTS

1 INTRODUCTION

> *When antibiotics first came out, nobody could have imagined we'd have the resistance problem we face today. We didn't give bacteria credit for being able to change and adapt so fact. (Bonnie Bassler, 1962)*

Since the day the first agent of antibiotics, penicillin, was discovered in 1928, it has opened a new era in health care. It cannot be denied that, that is the emphasis move to fight with microbes and infectious diseases, which bother around day in and out. However, the antibiotic resistance appears in the very early stage of medical development that almost simultaneously appeared in the golden age of antibiotics, then they accompany along with the development of medicine until the present time. As mentioning in a report of Centres for Disease Control and Prevention (CDC) of United State in 2013, they estimated that each year more than 2 million of illnesses and 23 thousand deaths were caused by antibiotic resistance (CDC. 2013). According to World Health Organization (WHO), antibiotic resistance seriously threatens the public health care systems in every country all over the world (WHO. 2016). In the European Union (EU), Norway and Iceland, every year, there is an estimated average of 400 000 occurrences with a resistant strain, of whom 25 000 people die (WHO. 2017).

That means, as consequences of antimicrobial resistance, not only increasing treatment cost but also the urgent demand in the healthcare quality service. The patients, who are suffering from a common inflammatory disease, have to face poor clinical outcomes or even a life-threatening risk. In other words, it can be said that treating many types of infectious diseases nowadays becomes more and more difficult; as a result, it is leading to a prolonged illness, disabilities as well as morbidity. Underneath the light of evidence, a worldwide action needs to be done immediately, so that our next generations will have better living environment to develop without suffering. (WHO. 2016)

In this thesis, paediatric nurses and children are the target group which will be put into a relationship with patient's family as the studying environment. With the help of those keywords which include "children", "nurse", antibiotic resistance" and "stewardship", twelve articles will be analyzed based on the family-centered care theory, so that nursing actions along with the challenges during the treatment with antibiotics will be discussed; hence, the readers can partly see what the nurses have done as well as which problems still remain.

The basic knowledge and information will be illustrated in the background part (chapter 2) as the foundation to create the research questions. In chapter 3, the research questions will be delivered along with the methodology of this thesis, so that the findings will be illustrated

in chapter 4. Then the matters will be discussed more in the later part of thesis as chapter 5. After all, the antibiotic stewardship will be mentioned as the way to resolve or reduce the matter, respectively.

2 BACKGROUND.

In this chapter, the beginning basic knowledge about antimicrobial medicine and antibiotic resistance will be researched to contribute to an initial picture of the topic. Besides, the author would like to mention a little bit about nursing actions and the catalogue of nursing interventions as well as family-centered caring philosophy.

> *In fairy tales, the children are saved by caring adults. We need more caring adults in the lives of children. (Donna E. Shalala 1941)*

2.1 Antibiotic therapy.

2.1.1 History and antibiotic.

The ancient Chinese, Greeks and Egyptians are all known to have used moulds and plants to treat inflammation problems. The first discovery was done by Ernest Duchesne, describing the antibacterial properties of penicillium glaucum mould to cure typhoid in guinea pigs in 1897. Then, 31 years later, Sir Fleming incidentally found out penicillium notatum as a substance that was inhibiting bacterial growth. However, Salvarsan, beside its toxic, the first form of antibacterial medication, which was used in syphilis treatment, was found out by Paul Ehrlich in Germany 1909 opening the antibiotic era. It cannot be denied here how many lives they have saved and how significant their contribution was in controlling infectious diseases.

There are several versions of antibiotic definition. For example, the American Heritage Medical Dictionary says antibiotic is a substance that produced by or derives from certain fungi, bacterial, and other organisms, that can destroy or inhibit the growth of other microorganisms. Besides, Saunders Comprehensive Veterinary Dictionary as well as Dorland's Medical Dictionary for Health Consumers have pointed out that antibiotics are sufficiently nontoxic to the host, are used as chemotherapeutic agents in the treatment of infectious diseases.

Starting from September 3rd1928 with the accidental discovery of penicillin by Alexander Fleming, the research and development of antibacterial substances was paid attention by numerous scientists all over the world. The identification of three first generations of antimicrobial medicine, including salvarsan (1909), sulfonamidochrysoidine (1932) and penicillin (1943), set up the pathway that lead other researchers to find out new antibiotics in parallel with promoting them to the patient's bedside. It can be said that the period from 1940s to 1970s was the golden age of antibiotics, when human life expectancy increased by eight years. However, the antibacterial medicine resistance had been cautioned by Sir Fleming

(1945) and many other professionals at the same time when the patients use too little amount or in too short time during treatment. (Aminov. R. I. 2010)

2.1.2 Principles of antibiotic therapy.

It is an advantage that the nurse partly understands what the benefits of antimicrobial medication are, along with how they deal with bacteria but not virus. Generally, that medicine action can be classified into four mechanisms, three of which get involved the restriction of cell wall, protein and folate synthesis. For instance, the beta-lactam ring that is the nucleus of penicillins as well as cephalosporins suppresses cell wall synthesis of bacteria. That leads to cell wall inability to be formed and the new cell at that moment is easily destroyed or disintegrated. Another example is that trimethoprim and sulphonamides inhibit the bacterial synthesis of tetrahydrofolate which primary stops purine composition and deoxyribonucleic acid (DNA) construction. The last set-up stops the DNA replication by inhibiting the DNA gyrase, so that the bacterial cannot develop any longer.

Talking further about antibiotic therapy, the discussion leads to the therapeutic principles or the matter of antibiotic prescription, which seems to be applied in a different way over the world depending upon the real circumstance. According to the report of Center for disease dynamics, economics and policy (CDDEP) United States of America 2015, the antibacterial drugs usage in the world increased more than 30 percent in 10 years (2000-2010) from approximately 50 billion up to 70 billion standard units (SU). And this tends to grow up globally day by day. As a saying of Ms Zsuzsanna Jakab, WHO Regional Director for Europe, 2012, the healthcare providers should understand the mechanism of antibiotics so that they act accordingly. She also claimed that antibiotic prescription should be considered by individual, from authorities, doctors, health care professionals to the patients. (WHO. 2012).

Indeed, there are many factors that should be considered in prescribing antimicrobial medication, including the pharmacology of antibiotic agents, side effects or allergic reaction risks, resistance, diagnosis, route of administration, duration of treatment, patients' medical history as well as the real circumstance of them at that time (Varley. AJ. et al. 2009). However, one of the most important matters is that the patient should act in accordance with the doctor's prescription, especially the dosage and duration of antimicrobial drug. For instance, even if they could feel better after 3 days in round of antibiotic treatment, it would be the best that they take 2 more days to complete the whole course of the medicine given. As a recommendation from many resources, the narrow-spectrum agents could be preferable in many cases, such as the acute otitis media diagnosed patients have been suggested the dose of primary antibiotic *amoxicillin 40 mg/kg per day* or *V-penicillin 66 mg/kg per day*.

Patients should take enough amount of drug that was prescribed in the right period (Käypä hoito. 2010).

2.2 Antimicrobial resistance.

2.2.1 Definition and reasons of antibiotic resistance.

One way to understand, “antibiotic resistance” is that microbial “superbug” changes itself to adapt and keep multiply in the presence of antibiotic drugs. So that, those medications turn ineffective along with the increasing risk of severe consequences and also spread to others (WHO, 2016). Starting with the same point of view, others mentioned that antibiotic resistance happens when microbes have the ability to resist the medical effects (CDC, 2016). In addition, CDC also mentioned about the variety way in changing of microbes that it depends upon the individual health statement and living environment.

It is a fact that it is hard for the scientist until now to answer the question which one exists first, the antibiotic that Sir Alexander Fleming found out or the resistance bacterial penicillinases (β-lactamases) was identified in 1940. The picture below shows part of antimicrobial resistance history from the very early time until recent time. It also shows that it took amazingly little time from a discovery of an antibiotic to a discovery of its resistant agent.

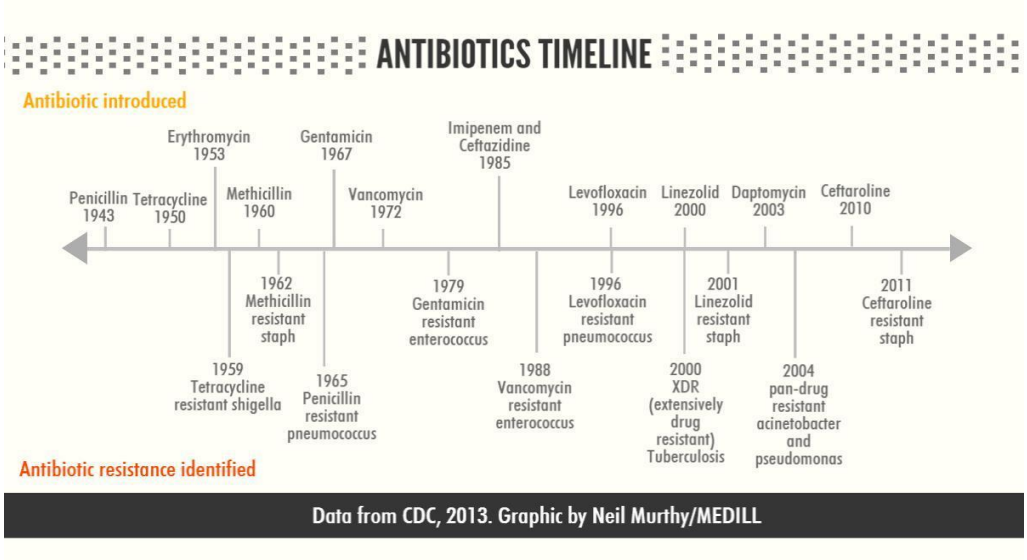

Figure 1: Antimicrobial resistance history

It is obvious that so many studies had been done in the present time that point out many reasons for this matter. However, they are different from country to country and culture to culture. To answer that question, in C. Lee Ventola’s research about antibiotic resistance climax, the author listed five reasons, including antibiotic overuse, inappropriate prescribing,

extensive agricultural use, availability of few new antibiotics and finally regulatory barriers (C. Lee Ventola. et al. 2015). In another article, several reasons were pointed out that include antibiotic therapy expectation and stress during prescribing process, drugs over- and misuse as well as lack of education (Panagakou. SG. et al 2012). Other causes were found out in a research from Vietnam, that admitted that antibiotic demand, lack of knowledge, time constraints, and self-medicating are the main factors bringing about medication maltreatment (Nguyen. K. et al 2013 and Le.H et al 2011).

2.2.2 Antibiotic resistance tackling or antimicrobial stewardship and the role of nurse.

As mentioned in a workshop summary, the authors said that there could be three categories to reduce resistance status that is lowering the antibiotic usage, alternatives to antibiotic and better infection control. According to them, antimicrobial drug therapy is a unique phenomenon, that every single dose is applied can contribute to “narrow- and wide-impact”. For instance, a small amount of those antibiotics used in hospital can leak into sewage system, then affect the whole living environment around. Those papers also point out three keys, which are managing antimicrobial drugs prescription, reducing stress while considering antibiotic therapy as well as applying framework in use, have the most effectiveness with highly developed healthcare systems. (David. A. et al. 2009)

Moreover, Bush. K and her colleagues wrote in their work that antibiotic resistance is life-threatening in the same level as cancer, therefore we need to carry out urgent actions to tackle this issue. Public education is mentioned first owing to the fact that knowledge about those drugs was not emphasized in school structure and real action of nursing. They did a research about knowledge and beliefs on antimicrobial resistance among nurses in 13 hospitals in Amhara region Ethiopia 2014. The surprising result was that 205 out of 210 nurses need more education on that matter, and 48 people of those had exposures to local antibiogram data. Secondly, they talked about the noncontrolling of drug usage had be stopped, that means self-medical treatment and also free pharmaceutical market should be reduced. (Bush.K et al. 2014)

2.3 Family-centered care in paediatric ward and nursing interventions.

In paediatric nursing nowadays, Family-centered Care is commonly used as a framework because it presents more and more benefits in the treatment process, and also in the working environment with under mature age person as the impacted object. According to the framework, nurses can easily set up and follow the nursing plan in the decision-making process every working day; moreover, that helps to find out the required nursing

actions as well as interventions (Saleeba. A. 2008). This part will talk a little bit about family-centered care and try to illustrate paediatric nursing interventions.

2.3.1 Family-centred care

Family-centred care (FCC) is a partnership approach to health care decision making between the family and health care provider. In other words, that is the relationship between families and healthcare professionals. Also, Harrison's work mentioned the idea of Florence Blake 1954 in "The child, his parents and the nurse" that following FCC the paediatric nurses will set the nursing target not only to back up and enhance children's physical health but also the healthy emotional and psychological growth, which merge during the nursing process in the context of family (Harrison. 2010). That also means the nurses, who take care of the children should understand and consider the emotional needs and perspectives of children during the healthcare process. It's believed that children are part of caregiving team and critical information source, besides, confident and informed family members reinforce patients' strength and courage.

Florence Blake in her paper (1954) emphasized the deliberating effort from nurses to create relationship with the parents, as a result, the patients' and families' needs will be collected step by step. She also mentioned many current FCC concerning factors, which are the first step for nurse in FCC practice, for instance, (1)taking care of children in their family condition along with development; (2)enabling parents participation in treatment; (3)recognizing and emphasizing family intensities, unique; (4)delivering information to patient and family members; (5)creating responsively flexible health care plan (Harrison. 2010). In addition, Ashley Saleeba described in her work the importance of FCC, that also pointed out three similar actions of nurses, such as (1)acknowledging and honouring family diversity, includes the understanding the various influences of social, cultural, economic, and spiritual aspects; (2)informing complete and unbiased information between family and health care team; (3)supporting family by enabling their participation in treatment as well as empowering them in the decision making process (Saleeba. 2008). As described in an approach 2012, Dennis Z.Kuo and colleagues bring up five principles of FCC, that are information sharing, respect and honouring differences, partnership and collaboration, negotiation, care in context of family and community (Kuo et al. 2012).

All of those principles seem to be evidence of conclusion that FCC is comprised of collaboration, respecting and supporting (Mitchell.M. et al. 2009). A family that holds the vital part in FCC concept can be considered as supportive living environment, with that the children are taken care of and are affected day by day. It's obvious that family content comes in all different shapes and sizes, still the parents always are the ones closest with their children,

therefore all their opinions should be considered during treatment process. It has been suggested that families are invited to be a part of the decision-making process, planning and provision of health care to the extent they choose. So that healthcare givers should have an attitude and practice of respect, collaboration, and support to patients' families. Moreover, healthcare systems should provide support for staff, adequate facilities (Harrison. 2010). That means FCC concept brings about the big change in healthcare behaviours not only for nurses but also the patients' families after all.

As a conclusion, family-centered care should be considered to have a vital role in paediatric nursing. That emphasizes the parents' role in collaboration treatment along with professional nursing skills that day by day develops the quality of caring for children in particular and for the society in general. The key for all healthcare staff is creating the action plan thoughtfully in order to alter healthcare attitude.

2.3.2 Nursing interventions in family-centered care (FCC).

Clinical Care Classification System (CCC) is a standardized framework and a unique coding structure for assessing, documenting and classifying patient care. The CCC System version 2.5 of Dr Saba presents sorting of 201 nursing interventions, 804 nursing actions by code. Identified nursing intervention is an individual nursing action, treatment, procedure or activity, service is made to achieve an expected outcome of nursing and improve the quality of caring (Saba, 2007). When the nurses take care of the patient, they follow the nursing process, starting with setting a plan and goals for the patient. In other words, nursing interventions are the actual treatments and actions that are performed to help the patient reach the goal that the nurses set for them. The nurse uses his/her knowledge, experiences, critical thinking skills to decide which intervention is the most effective to the patient. As a matter of fact, nursing interventions are often confused with nursing actions, although both are essential aspects of a nurse's work. According to Saba, the CCC uses four action types of nursing, one of them is required for each of those 201 nursing interventions (Saba, 2007).

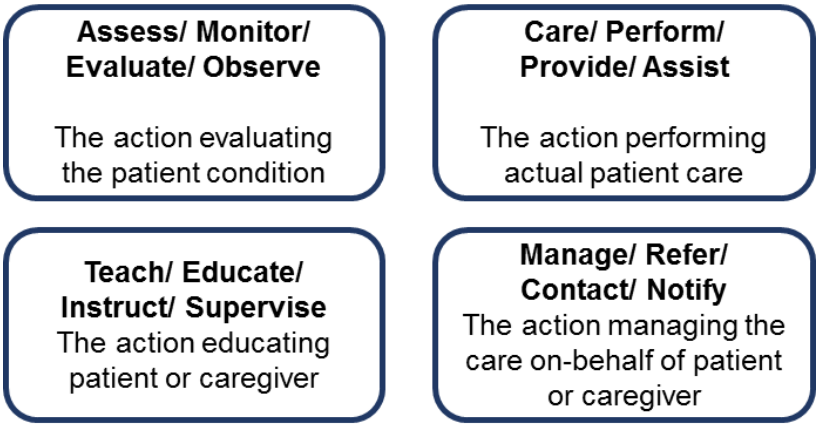

Figure 2: Four types of Nursing Actions

In this thesis, the Finnish Classification of Nursing interventions (FiCNI) will be used as the guideline for nursing interventions. In version 3.0 of the system, FiCNI can be classified by 17 components that have in total 127 main categories and 180 sub-categories (FinCC-luokituskokonaisuuden käyttöopas. 2012). Generally, there are so many actions of nurses that can be listed out; however, Anneli Ensio and her partners of the Finnish Care Classification (FinCC) expert group suggested that those nursing interventions could be sorted by four care patterns, including health behaviours, psychological, functional and physiological components, in which contents several different categories (Anneli. E et al. 2012). Then the question here is which category will be taken into consideration underneath family-centered care term in paediatric nursing.

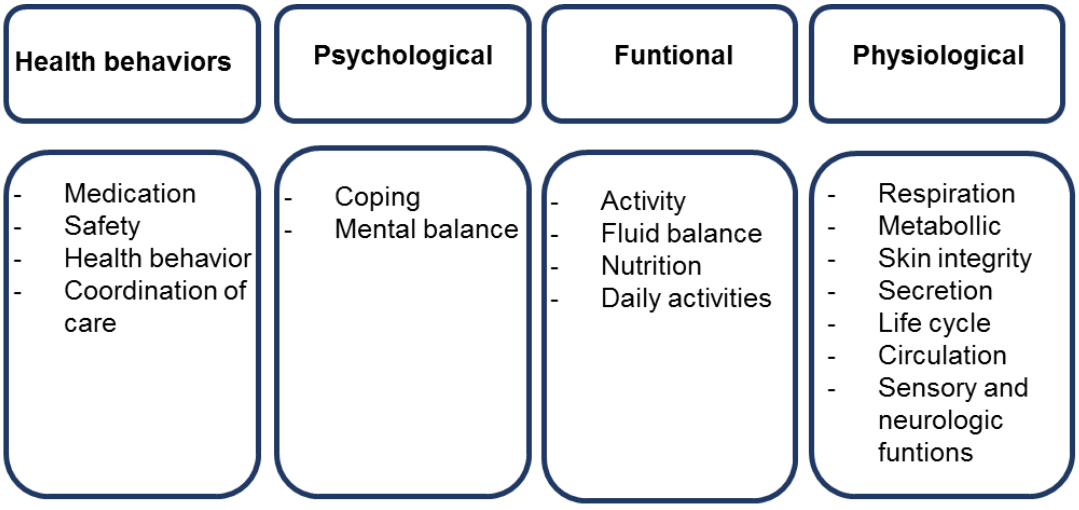

Figure 3: Nursing Interventions sorting by Anneli. E. et al.

As Parul Datta wrote in her book “Pediatric Nursing”, nurses have a vital role in caring and curing, which can be primary caregivers, health educator, nurse-counsellor, team coordinator and collaborator, nurse consultant, and finally child care advocate, which assist the child

to obtain best care (Parul Datta. 2007). Paediatric nurses play many parts during the treatment process as well as perform various tasks of nursing interventions; however, the question here is that we need to find out actions of nurses in paediatric term and especially taking FCC as a framework to act. It is easy to recognize that the requirement for family-orientated nursing is acting of nurses on health behaviours changing, which according to the Finnish Clinical Care Classification system guideline includes four nursing interventions: medication, safety, health behaviours, coordination of care (Anneli. E. 2015).

In this thesis, the author maps out four types of nursing action into that refined nursing intervention classification, including four terms: coordination of care, health behaviours, medication and safety.

3 TARGETS AND RESEARCH QUESTIONS.

3.1 Research questions

Chapter two introduced the background of antibiotic resistance and family-centered care framework. It also gave an introduction to the classification system for nursing actions as well as the relationship between the nursing action and the nursing intervention. To research antibiotic resistance in family-centered care in peadiatric nursing, two research questions were formulated:

- What are the challenges, that have been identified, in settling of antibiotic resistance?
- Which nursing actions have been recorded in tackling of antibiotic resistance?

3.2 Targets

The target of this thesis was to gather and deliver information about nursing actions and challenges in tackling antibiotic resistance in paediatric care. This thesis will pay attention to the antibiotic resistance under the perspective of nurses and take family-centered care approach as a framework. As mentioned in chapter 2, the author considers four types of nursing action in that refined nursing intervention classification, including four terms: coordination of care, health behaviours, medication and safety. In this way, the nursing actions that have been done are revealed to answer the research questions, in addition, the main nursing interventions that the nurse should pay attention to are emphasized. Besides, the undeniable challenges with antibiotic resistance and antibiotic using management that the nurses have to deal with are also drawn out.

As a member of a healthcare provider system, the nurse should consider own self as a part of global effort to control the antibiotic resistance crisis. Especially, when taking care of the young generation, the nurses play a key role so that they have many abilities giving their patient better treatment, improving knowledge about antibiotic and also promoting themselves. On the contrary, it cannot be denied those challenges they will have in their future career. This thesis can be considered as the small own effort of the writer as a future registered nurse to help in tackling those microorganisms resistant to antibiotics. That is hope to increase the awareness among nurses and nursing students so far about the healthcare crisis that the world has to handle at that moment of developing.

3.3 Literature review and narrative review style.

In this chapter, I will talk about the researching method, which will be considered as written self-contained review focused on “nursing interventions” and “challenges”, which are found out, in parallel with interventions in treatment for “children” with “antibiotic resistance” in the family concept as “family-centered care”. As a matter of fact, I am using narrative literature review approach with content analysis as the method to combine all information as well as researching statistic that I got from the chosen published resources.

Michael Coughlan et al mentioned in their book that literature review is a critical evaluation and summary of the academic writings, which are used for research purposes, policy and practice development and for critical analysis of theoretical and conceptual frameworks. It is also said that the literature review delivers a demanding evaluating as well as summarizing by pointing out the similarities and dissimilarities about that discussed topic in the existing relevant literature. Professionals use literature review as a critical discussion to keep updating new information about one certain field of knowledge. In other word, this method shows the depth of understanding of the topic of interest that the researchers or scholars would love to public. The idea behind literature review is revealing the problem base on the delivered information and those chosen data resources, including online sources; in addition, with the supporting of qualitative or quantitative data collecting and serious analyzing process, the author can find the answers, including similarities and inconsistencies in collected relevant academic writing. (Coughlan. M. et al 2013)

Cronin. P et al presents two types of literature review, including traditional or narrative review and systematic review (Cronin et al. 2008). My thesis is using traditional or narrative reviewing that will clearly help to present a part of existing science knowledge on the chosen topic. Narrative literature review describes and discusses the state of science of a specific topic from a theoretical and contextual point of view (Rother. 2007). Therefore, this style plays a vital position in continuing education consists of critical analysis of the literature published in books and electronic resources. The research questions could be not addressed from the beginning of studying process, as well as the selection criteria for inclusion articles may not be defined clearly. (Ferrari. R 2015) The common way to capture the research matter is a qualitative approach, with that the researchers have chance critically analyze the literature published in books and electronic or paper-based journal articles. (Rother. 2007) When analyzing literature with a qualitative method, these research data are not numerical, but the interviewing collection using words and descriptions given by the random selected participants (Aveyard. H. 2014).

3.4 Data collection.

The study resources of my thesis were collected from available nursing databases that are the Cumulative Index to Nursing and Allied Health Literature (Cinahl); a premier international biomedical bibliographic database (PubMed); the theses and publications collection from Finnish Universities of Applied Sciences (Theseus); the multidisciplinary database, including full texts and reference databases of humanities and social sciences Academic Search Elite (EBSCO); the Evidence Based Medicine databases Cochrane library and Sage journals; also from Google Scholar. As a matter of fact, there is no public scientific database resource system in Vietnam, thus, the Vietnamese information is collected from the local hospital's guidelines, handbooks as well as announcements. Therefore, other Vietnamese paper-based reports and articles are not taken into consideration.

Firstly, writer used these keywords that directed concern about the research questions, such as "challenge", "nursing action", "antibiotic resistance", "children", "family-centered care". However, those brought poor and unsuitable results. Then, the keywords help me answer research questions, including "antibiotic", "antibiotic resistance", "children", "stewardship" and "nurse", that author used as individual word as well as combination, such as ("antibiotic resistance" and "children"); ("antibiotic resistance" and "stewardship" and "nurse"). The searching results have to be in free full texts that were published in the last 10 years (2007-2017). It is, in addition, essential that those were written in English language about antibiotic resistance in paediatric term were considered. According to that, the inclusion and exclusion criteria of research data is illustrated in the table below:

Inclusion criteria	Exclusion criteria
- Free full text available. - Language: English. - Publication year: 2007-2017 - Relevance to the topic and concerning nursing perspective. - Matches keywords 'antibiotic', 'resistance', 'children', 'nurse' and 'stewardship'	- Abstract only, full text unavailable. - The other languages. - The articles were older than 10 years old. - No relevance to the topic.

Figure 4: Criteria of research data.

The qualitative data collecting method will be used in this thesis to capture the non-statistic sources from available data, for instance, the feeling, the impression as well as the interpretative understanding of human experiences approach to its subject (McLeoh. S. 2017). Qualitative research data collection method requires time consuming, however the benefits that it brings about are the naturalistic advanced information and deeper insight, cannot be denied. There are four main ways for assembling qualitative data, which include individual interviews, focus groups, observations and review of documents, in which the forth suggestion or the content evaluation will be used in this thesis. To be clear, all the non-statistic information relevant to “antibiotic resistance” in “paediatric nursing” will be carefully assessed following the catalogue of four nursing interventions (chapter 2.3): medication, safety, health behaviours and coordination of care.

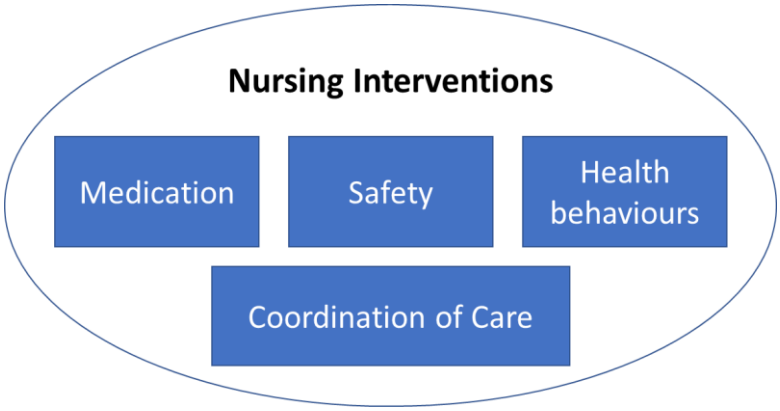

Figure 5: Catalogue of research data collection.

3.5 Data analysis.

Analysing data is the process considering how those studies will be presented to the reader; therefore, the reviewer should read the data with caution while also considering the strengths and weaknesses of each research paper. As Coughlan’s reminding, analysing in a literature review is paying attention to researches’ findings along with those emphasized issues (Coughlan. M. et al 2013). In my thesis, inductive analysis is used to study the problem and find out the answers to the research questions. The main aims of this method are summarizing those extensive raw data into a brief, summary format, to establish clear links between the research objectives and the summary findings derived from the raw data and to develop of model or theory about the underlying structure of experiences or processes which are evident in the raw data.

By those combination of keywords, eight hundred seventy-one (871) articles were found out from different electronic resources. There are several same results which came from different resources, in which, there are two same articles from Cinahl and Academic Search Elite

resources. Besides, an article from PubMed is also found out in the Academic Search Elite resources.

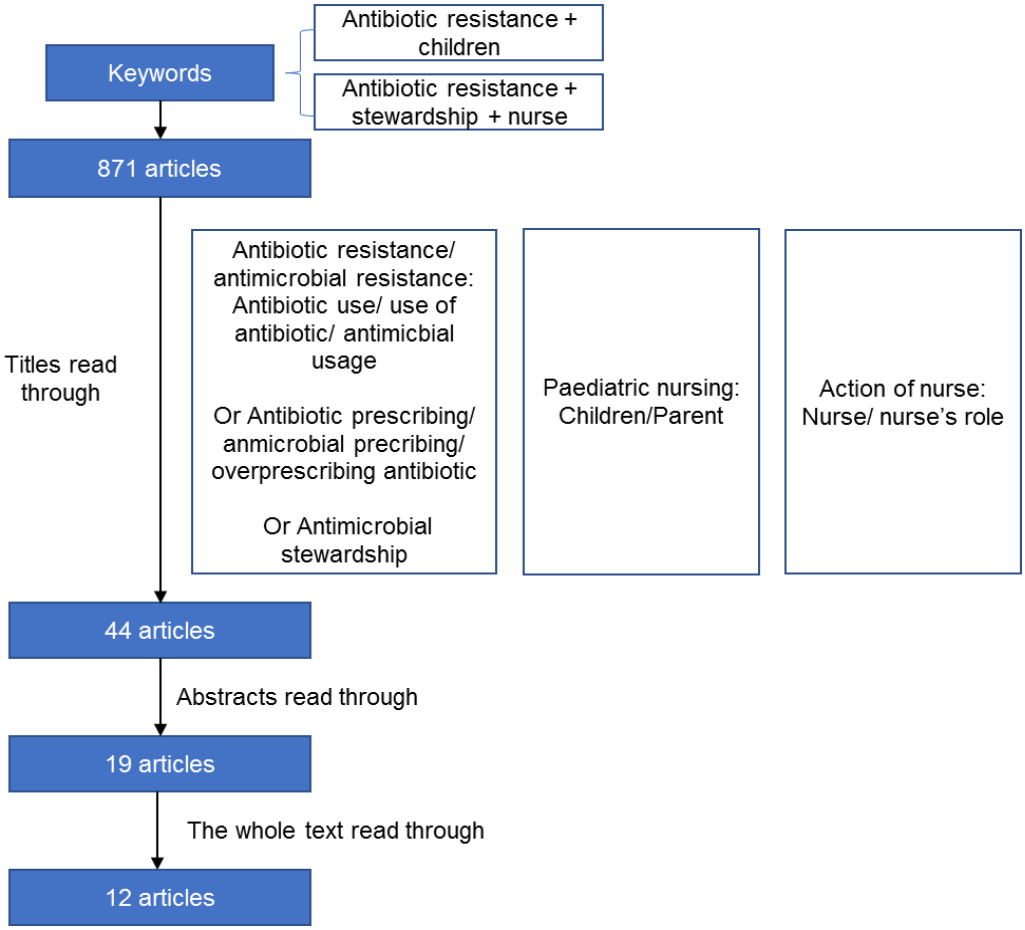

Figure 6: Analyzing process.

At first, all the titles that mention “antibiotic resistance” and children” are counted into, due to the fact that was mentioned before that the information about nursing as well as nursing action is indeed limited. The matter of “antibiotic resistance” is widened in searching with those words are linked with antibiotic* or antimicrobial*. Along with that the “paediatric nursing” subject that considers taking care of children in the concept of family-centered care, the result with children* and parent* is accepted. Then, the “nurse” and “nurse’s role” are also taken as an addition. The result turned out with forty-four (44) articles, in which these abstracts are read with emphasized attitude about nursing perspectives. The findings based on the abstracts later on are nineteen (19) articles that are read through the whole and finally end up with twelve (12) researched articles that have the acceptable contents. The articles that focus only on medication therapy but the caring of children from nurses and parents do not respond the expectation of author and are disqualified. Those twelve articles will be carefully read and analyzed to answer the studying matters.

Database	Keyword(s)	Findings	Finding based on the title	Finding based on the abstract	Full text available
Pubmed [Title/Abstract]	antibiotic resistance AND children	245	5	4	2
Cinahl with full text	antibiotic resistance AND children	24	5	0	0
Cochrane Library	antibiotic resistance AND children	40	3	0	0
Sage journals (open access content only)	antibiotic resistance AND children	38	2	0	0
Academic Search Elite (EBSCO) (Scholarly journals)	antibiotic resistance AND children antibiotic resistance AND stewardship AND nurse	355 5	23 3	11 3	6 3
Theseus	antibiotic resistance	164	3	1	1

Table 1: Results by database searching.

To answer the research questions, the reading of twelve articles starts with skimming and scanning those words and phrases that related with nurse and nursing actions, such as “education”, “knowledge”, “educating/ teaching”, “communicate/ contact”, “manage”,

“collaborate/ cooperate”, “provide”, “instruct/ inform”. Chapter 2.3 explained so far the FCC, therefore, all nursing actions by healthcare providers, parents and children themselves are taken into account. Those nursing actions have been done by nurses as well parents and patients are listed as the subcategories, after that they are sorted out under the catalogue of nursing interventions. As a result, the writer has the relationship between nursing actions and nursing interventions as table below shows (table 2.).

Subcategories	**Main categories**
Nursing actions	**Nursing interventions**
Public education and Information sharing (a1) Improving nurses’ education (a2) Teamworking in healthcare (a3)	Coordination of care (a)
Antibiotic administrating (b1) Parents’ opinion interviewing (b2)	Health behaviours (b)
Pharmacology and side effects understanding (c)	Medication (c)
Hand hygiene (d1) Infectious factors preventing (d2)	Safety (d)

Table 2: The relationship between nursing interventions and nursing actions.

4 FINDINGS.

After the content analysis, the results will be listed as in table 3. below according to the research catalogue that was mentioned once in chapter 3.5. The findings could be seen in detail in the tables 6 and 7 in Appendices part.

It shows that the challenges that come from health behaviours (b) and medication (c) related subjects have been reviewed in six different articles, that give the most frequent finding number. Meanwhile, in five articles people talked about coordination in caring (a). Lately, the safety matter (d) was discussed in three articles, that give the smallest number in frequency but not the less importance issue. These challenges will be discussed more in chapter 4.1.

Then, the matter of public education and information sharing has been mentioned four times (a1=4), also improving nursing education issue has been seen in three articles (a2=3), along with three articles delivered the teamworking in healthcare matter (a3=3). In total, we could see coordination of care subjects in seven articles (a=7). Besides, it is obvious that antibiotic administrating related information has been discussed in three articles (b1=3) as well as another article illustrated parents 'opinions (b2=1); as a result, we had health behaviours problem in four articles (b=4). Medication subject that has been defined more clearly as pharmacology and side effects understanding of nurses, patients and parents could be seen in two research material (c=2). Last but not least, only one article talked about the safety subject that as well defined as hand hygiene and infectious factors preventing (d=1). These nursing actions and nursing interventions following will be described more in chapter 4.2.

Name of Article.	**Authors.**	**Journal and Year**	**Findings**	
			Nursing actions	**Challenges**
Changing parents' opinions regarding antibiotic use in primary care	Maor. Y, Raz. M, Rubinstein. E, Derazne. E, Ringel. S, Roizin. H, Rahav. G, Regev-Yochay. G	European Journal of Pediatrics 2010	Public education and Information sharing Improving nursing education	Medication
Educational effectiveness, target, and content for prudent antibiotic use	Lee. C; Lee. J; Kang. L; Joeng. B; Lee. S.	Hindawi Publishing Corporation, BioMed Research International 2015	Public education and Information sharing Improving nursing education Antibiotic administrating	Coordination of care Medication

Overprescribing antibiotic in children: An enduring public health concern	Murray. J; Amin. P	Pediatric Nursing 2014	Public education and Information sharing Hand hygiene Infectious factors	Health behaviours Medication
Using Interactive Family Science shows to improve public knowledge on antibiotic resistance: Does it work?	Donna M. Lecky, Meredith K. D. Hawking, Neville Q. Verlander, Cliodna A. M. McNulty	PLoS ONE 9(8) 2014	Public education and information sharing	Health behaviours Medication Safety
The critical role of the staff nurse in antimicrobial stewardship- unrecognized, but already there	Olans Richard; Olans Rita; DeMaria. A.	Clinical Infectious diseases, Clinical practice 2016	Improving nursing education Teamwork in healthcare Antibiotic administrating	Coordination of care
The urgent need for nurse practitioners to lead antimicrobial stewardship in ambulatory health care	Manning. M.	Journal of the American Association of Nurse Practitioners 2014	Antibiotic administrating	
Antimicrobial stewardship: the role of the nurse	Ladenheim. D. Rosembert. D, Hallam. C, Micallef. C.	Nursing standard 2013	Teamwork in healthcare. Pharmacology and side effects understanding.	Coordination of care
Antimicrobial resistance and the nurse's role	Diminskyte. A	Arcada AMK Department of Health and Welfare 2016	Teamwork in healthcare	
Descriptive Study on Parents' Knowledge, Attitudes and Practices on Antibiotic Use and Misuse in Children with Upper Respiratory Tract Infections in Cyprus	Rousounidis. A, Papaevangelou. V, Hadjipanayis. A, Panagakou. S, Theodoridou. M, Syrogiannopoulos. G, Hadjichristodoulo. C.	International Journal of Environmental Research and Public Health 2011	Parents' opinion interviewing	Health behaviours

Antibiotic resistance and irrational prescribing in paediatric clinics in Greece	Toska. A, Geitona. M.	British Journal of Nursing 24(1) 2015	Pharmacology and side effects understanding	Coordination of care Health behaviours
Improving antibiotic prescribing for children in the resource-poor setting	Doare. K; Barker.C; Irwin. A; Sharland. M.	British Journal of Clinical Pharmacology 2014		Coordination of care Medication Safety
Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia	Togoobaatar. G; Ikeda. N; Ali. M; Sonamjamts. M; Dashdemberel. S; Mori. R; Shibuya. K.	Bull World Health Organ 2010		Health behaviours Medication Safety

Table 3: Findings base on the research catalogues.

4.1 Challenges in talking antibiotic resistance.

Medication	6 articles
Safety	3 articles
Health behaviours	6 articles
Coordination of care	5 articles

Table 4: Challenges.

The results reveal that while handling with antimicrobial stewardship the most challenging subject is medication or how to administer antibiotic in practice of healthcare providers as well as family members and patients that is discussed in six articles. As a matter of fact, either of them has the completed and updated knowledge about tackling antibiotics (Lee. C. et al. 2015; Maor. Y. et al. 2010; Lecky. D. M. et al. 2014). It starts with the misunderstanding about the influence of antibiotic, thus they wrongly use and incorrectly apply it in practice, such as using the antibiotic leftover, using antibiotic to treat cold symptoms. In addition, it cannot be denied either that financial burden brings about antibiotic misusing (Doare. K et al. 2014). Besides, inconsequential prescribing or wide spreading of prescription for children is also reported as one of the challenging matters (Murray. J. et al. 2014; Togoobaatar. G. et al. 2010; Doare. K. et al. 2014).

Then, the health behaviours are considered in six articles like the second challenging issue that directly concerns putting antibiotic therapy into practice. That starts with parents' expectation for antibiotic prescription when that drug is unnecessary or ineffective (Toska. A. et al. 2015; Murray. J. et al. 2014; Togoobaatar. G. et al. 2010; Rousounidis. A. et al. 2011; Lecky. D. M. et al. 2014). Following with that, the attitude of parents and family toward antibiotic usage is questioned as well (Lecky. D. M. et al. 2014; Togoobaatar. G. et al. 2010). It is a fact that some people store antibiotic leftover at home like a backup treatment for the next time with the same symptoms (Togoobaatar. G. et al. 2010). Likewise, parents' behaviours directly influenced the attitude of the next generation (Lecky. D. M. et al. 2014).

There are many demanding tasks when taking about coordination of care that concerns not only healthcare providers but also authorities. Some argue that really limited consideration has been given to nurses although they play an important role in nursing relationship (Lee. C. et al 2015; Toska. A. et al 2015; Richard. O. et al. 2016; Diminskyte. A. 2016). Meanwhile, Doare. K et al said the available data concerning children in the resource-poor settings and in the low- and middle-income countries is significantly limited to date (Doare. K. et al. 2014).

Last but not least, safety issues are questioned that relate to the safety in antibiotic use as well as management. The self-medicating behaviour of patients and parents, especially from the residents from the urban areas, the resource-poor settings and in the low- and middle-income countries significantly affects antibiotic administration since they purchase and use these drugs without doctor's concerning (Doare. K. et al. 2014; Lecky. D. M. et al. 2014; Togoobaatar. G. et al. 2010). As a matter of fact, there are counterfeit drugs on the shelves, hence, some question the quality of antibiotics on the market (Doare. K. et al. 2014).

4.2 Antibiotic resistance in paediatric nursing.

Medication	2 articles
Safety	1 article
Health behaviours	4 articles
Coordination of care	7 articles

Table 5: Nursing actions.

Admittedly, many nursing actions have been recorded as the effort to ameliorate antibiotic resistance in practice as well as antimicrobial resistance in general. They arrange many educational interventions, for instance a hand-on interventional program and close collaboration along with various national campaigns through several media targeted at children, family members (Lee. C. et al. 2015; Lecky. D. M. et al. 2014; Murray. J. et al. 2014). Apart from, a series of postgraduate courses and workshops have been created for health carers

(Lee. C. et al. 2015). A simple and inexpensive educational intervention is emphasized as an effective tool for public education and improving quality of nurse. A further aspect of educating is to teach and share continually (Lee. C. et al. 2015; Maor. Y. et al. 2010). Many people support the view that nurses have an important role as the bridge that links other health care professionals and patients, family members as well, as a result, they can correct the errors then ensure medication compliance (Richard. O. et al. 2016; Ladenheim. D et al. 2013; Diminskyte. A. 2016).

After, talking about health behaviours, people should consider both aspects from nurses as well as from patients and family. Lee.C and colleagues mention in their work that plenty of educational programmes targeted at clinician and their clients to promote antibiotic knowledge and quality of nursing (Lee. C et al. 2015). Some articles emphasize the primary role of nurse in treatment process, for example by advancing nurses' performance and co-ordinating with other health carers they can administer antibiotic practices (Manning M. 2014; Richard. O. et al. 2016). Beside the effort of the nurses, many families and their children are willing to learn and get more information about antibiotic treatment to avoid misusing and unnecessary anxious (Rousounidis. A. et al. 2011). Both nurses and patients, families are trying day in and day out on the judicious use of antibiotics in parallel with preventing antibiotic resistance.

While it is true to say that the medication related issue is one of the most challenging so far, in fact there is not much action that has been recorded as the improving effort. As mentioned in two articles, the nurses realize those factors leading to antibiotic resistance, such as irrational prescribing, self-medicating and misusing antibiotics, along with the importance in protocols and guideline in antibiotic treatment (Toska. A. et al. 2015). Furthermore, despite of the fact that not much source claims the importance of nurses in the antimicrobial resistance stewardship, the nurses start recognizing themselves as a vital link in the whole chain of healthcare (Ladenheim. D et al. 2013). A different point of view has been delivered that preventing infectious factors and hygiene guarantee remains the most effective way to reduce the consumption of antibiotic for children (Murray. J. et al. 2014).

5 CONCLUSION.

5.1 Scope.

As became clear from this study, information about antibiotic resistance in children care with the nurse's consideration is limited, so that the author chose to use the narrative literature review. This allows the author to investigate the wide topic of antibiotic resistance and make certain about the availableness of information for the studied topic. Moreover, the author also used the family-centered care method as a framework, that helped widen the searching range to get more information. It means that firstly the antibiotic resistance in paediatric nursing has been seen under many perspectives, such as from the eyes of nurses, parents and children, then, the findings were listed following the catalogue of nursing actions and interventions.

In order to provide answers to the research questions, the author gathered information from available full text studies which are in English only. As a result, it is obvious that many proper resources in other different languages have been overlooked. It is needed to say that there could be much better way to approach the discussed topic and find out the answers to the research questions, that the author has to promote the own self in professional theme to achieve.

During the whole process of writing, the author upheld the ethical principles of integrity, accountability and transparency. A clear predetermination of research criteria was constituted to minimize biased information during the data collection phase. The criteria which limiting only to available free full texts made sure that all the information was legally acquired. Accountability and transparency were achieved by illustrating and explaining every step of thesis researching.

5.2 Discussion.

It is the fact that there are many actions which have been recorded as an effort of preventing antibiotic resistance, in which coordination of care has been emphasized along with the attempt in changing health behaviours. Many educating programmes and campaigns about antibiotic resistance have been arranged all over the world, still in the resource-poor settings and in the low- and middle-income countries there should be simpler and cheaper way to approach residents' antibiotic therapy understanding so as antibiotic demanding (Maor. Y et al. 2010).

Besides, the nurses challenge themselves to become involved in and to advance professional skills in antimicrobial resistance stewardship; however, it cannot be denied that they

are struggling to get more attention from authorities and in order to improve antibiotic using behaviours in practice. Family-centered care model allows us to see that matter from many perspectives, such as nurse's role, patients' mind and family members' eyes. Hence, it contributes a significantly useful trigger that the nurses should apply in practicing thoroughly.

Some people argue that antibiotic resistance administration is the hardship of prescribers such as doctors and special registered nurses, who has license to prescribe antibiotics; however, nurses should start tackling to benefit the future generations' health. It is a good start that the nurses recognize their abilities in the whole healthcare process and unsolved problems in nursing (Ladenheim. D et al. 2013, Toska. A. et al. 2015). That becomes more and more effective when they are open and willing to discuss the antibiotic resistances to support the idea of antimicrobial stewardship. More research could be conducted in the future to explore how much the nurses understand and are willing to do in the fight with "super bug", to gain the nurse perspective.

The role of nurse in antimicrobial resistance stewardship should be given more attention. Beside the explanation of doctors about antibiotic's necessity, the nurses should be the one to give advices about antibiotics use, such as using the right drug in the correct route and period, eliminating the antibiotic leftover as well as refraining from disposing of unused drugs into the environment (Faoagali. J. 2016, Carlson. K. 2017). What is more than handling antibiotics with care, the nurses should be the active factors to encourage preventing infection and avoiding prescription at the outset (WHO Europe. 2016). Nurses play an important role as 24-hour monitors of inpatient status, safety, and response to antibiotic therapy, moreover, they are the first ones to respond to antibiotic, central communicators, coordinators of care (Richard. O. et al. 2016).

Then, the idea about medication understanding and safety should also receive more interest in in the future. It emphasizes the fact that even small children should be told about the effect of the drug that they take, in parallel with guiding parents and healthcare professionals. The practices of hand hygiene and infectious factors prevention should be well popularized in hospitals, in public places and at home also (Carlson. K. 2017). The author recommends further study to be implemented on this subject, by using a family-centered care method, because infection prevention is not only in the hands of health professionals.

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APPENDICES

Table 6: Nursing actions from research articles

Category of intervention	Nursing Actions	In articles	Notes
Coordination of care	Public education and Information sharing	A **simple educational intervention** was effective in reducing parents' expectation for antibiotics but was significantly more effective when parents reported they noticed the campaign.	Changing parents' opinion regarding antibiotic use in primary care. (page 1)
		educational interventions were effective in changing parents' attitudes towards antibiotic use	Changing parents' opinion regarding antibiotic use in primary care. (page 4)
		a **hands-on interventional program** containing a set of wet and dry laboratory activities was developed for high school students	Educational effectiveness, target, and content for prudent antibiotic use. (p. 3)
		a **close collaboration with behavioral and social sciences** is required when developing an educational intervention program the **educational messages** are repeated routinely	Educational effectiveness, target, and content for prudent antibiotic use. (p. 3)
		an **open-access curriculum** containing a series of postgraduate courses and workshops has been developed in the context of the European Union funded research project "Genomics to combat resistance against antibiotics in community-acquired lower respiratory tract infections in Europe (GRACE)"	Educational effectiveness, target, and content for prudent antibiotic use. (p. 5)
		In 2010, the European Centre for Disease Prevention and Control (ECDC) chose hospital prescribers as target for the **European Antibiotic Awareness Day** and provided the **toolkit** containing template materials and evidence-based educational key messages	Educational effectiveness, target, and content for prudent antibiotic use. (p. 5)
		various **national campaigns** through several media (TV, radio, newspapers, posters, websites, etc.) have been directed to educate the	Educational effectiveness, target, and content for prudent antibiotic

		public - the ECDC has annually conducted the European Antibiotic Awareness Day since 2008 - In the United States, the CDC's Get Smart: Know When Antibiotics Work has been conducted	use. (p. 7)
		Programs directed to children education have been developed as follows: e-Bug in Europe, Do Bugs Need Drugs? in Canada, and the Microbes en question in French - The e-Bug resource aims not only to educate children about prudent antibiotic use, but also to educate them about hygiene and the spread of infection	Educational effectiveness, target, and content for prudent antibiotic use. (p. 7)
		Peer-education, defined as "the teaching or sharing of health information, values and behaviors by members of similar age or status Peer-education initiatives are currently being taken forward as **a joint research project** between Public Health England and the Environmental Health Department	Educational effectiveness, target, and content for prudent antibiotic use. (p. 8)
		patient and family education programs regarding the appropriate use of antibiotics are effective in reducing both the direct and indirect pressures on providers to prescribe antibiotic - CDC's (2013a) Get Smart: Know When Antibiotics Work website (http://www.cdc.gov/getsmart/antibiotic-use/uri/sore-throat.html) makes available information aimed at educating parents, healthcare professionals, and program providers, as well as the media, regarding understanding when antibiotics work	Overprescribing antibiotics in children: An enduring public health concern (p. 3)
		pediatric healthcare professionals be **proactive in teaching** patients and parents about managing	Overprescribing antibiotics in children: An enduring

		symptoms of nonbacterial infections, such as symptomatic relief, potential side effects of antibiotic use and what to expect during the course of a viral illness **providing education** on what to expect over the course of a viral illness will help parents feel at ease if they understand that cough, congestion and fever may take a few days to resolve	public health concern (p. 3)
		Most physicians felt that **educating parents** would be the most important program for reducing inappropriate antibiotic use, and half indicated that parental pressure, in contrast to concerns about legal liability, contributed most to inappropriate antibiotic use	Changing parents' opinion regarding antibiotic use in primary care. (page 4)
		e-Bug science show can be viewed as a success in **improving parents and children's knowledge** of antibiotic use thereby highlighting the importance of educating the public through interaction	Using interactive family science shows to improve public knowledge on antibiotic resistance: Does it work? (p. 5)
	Improving nurses' education	a **simple and inexpensive educational intervention** was able to change parents' opinions and attitudes regarding the necessity of antibiotic treatment for their children, and that the effect was even higher when the intervention was memorable by the parents. Methods should be developed to improve parents' awareness and assimilation of educational interventions.	Changing parents' opinion regarding antibiotic use in primary care. (page 5)
		All healthcare professionals in contact with patients, including junior doctors, nurses, pharmacists, and midwives, must receive continual education about antimicrobial resistance the veterinarians, farmers, and aqua culturists should also receive education about antimicrobial resistance	Educational effectiveness, target, and content for prudent antibiotic use. (p. 4)
		Rather the goal if nursing stewardship education is to recognize and utilize established nursing functions to synergize with optimal	The critical role of the staff nurse in antimicrobial stewardship –

		Antimicrobial stewardship programme ASP goals and outcomes. The focus of such antibiotic education would be centered on how best to assess patient response to therapy and to evaluate the safe and appropriate transition to oral antibiotic therapy and outpatient management.	Unrecognized, but already there (p. 4)
	Teamworking in healthcare	Throughout the in-patient stay, the **staff nurse is the central communicator** among ordering physicians, the pharmacy, the laboratory, discharge planners, and consultants. The nurse is also a primary information source for patients and families, reinforcing and updating information from physicians, and providing education about medications and their appropriate use	The critical role of the staff nurse in antimicrobial stewardship – Unrecognized, but already there (p. 2)
		In collaboration with doctors and pharmacists, nurses can ensure antimicrobials are prescribed at the appropriate time and for the appropriate duration.	Antimicrobial stewardship: the role of the nurse. (p. 3)
		Nurses are in ideal position to **collaborate with physicians and pharmacists** due to the information they behold Nurses are in a key position in contributing to **multidisciplinary management of antibiotics** as they work at different levels within health care settings and also are main patient's carers who are always present Even though nurses are not directly involved in prescribing of the medicines, they can **cooperate with other health care professionals** when supervising prescription decisions, reducing prescribing errors and ensuring medication compliance	Antimicrobial resistance and the nurse's role (p.26)
Health behaviours	Antibiotic administrating	To minimize misuse or overuse of antibiotics in hospital, besides clinician education, there are a number of intervention programs, such as **patient education, delayed prescriptions, audit and feedback,**	Educational effectiveness, target, and content for prudent antibiotic use. (p. 3)

		clinician reminder and decision support system, and financial and regulatory incentives or disincentive	
		Listed are five stewardship activities nurse practitioners NPs can do immediately. - Advance your knowledge - Optimize your antibiotic prescribing performance and practice - Advocate for the adoption of at least one antimicrobial stewardship recommended action in your practice setting. - Reach out and connect with NPs in your local region.	The urgent need for nurse practitioners to lead antimicrobial stewardship in ambulatory health care
		Because all changes in orders by inpatient providers are directed through the bedside nurse, antibiotic timeout and de-escalation need to be routine components of antimicrobial stewardship rounds with nurses. Discontinuation of unneeded antibiotics may not occur without such review. **Quality and safety** measures are already identified as **core nursing** responsibilities by The Joint Commission and by the Institute of Medicine. These organizations have identified the staff nurse as the primary bedside patient advocate and the monitor for healthcare-associated infections and antimicrobial adverse event	The critical role of the staff nurse in antimicrobial stewardship – Unrecognized, but already there (p. 2)
	Parents' opinion interviewing	the vast majority of parents (98%) agree that **education** of both parents and pediatricians on the judicious use of antibiotics is necessary. A significant proportion of parents (90%) believe they have been well **informed** on the judicious use of antibiotics, admit their doctor has spent time explaining the child's disease and whether he should or not administer antibiotics and more importantly, 97% stated they precisely follow pediatricians' i**nstructions**.	Descriptive study on parents' knowledge, attitudes and practices on antibiotic use and misuse in children with upper respiratory tract infections in Cyprus (p. 7)
		parents that have good access to	Descriptive study

		the health system consider themselves to be less anxious about their child's health	on parents' knowledge, attitudes and practices on antibiotic use and misuse in children with upper respiratory tract infections in Cyprus (p. 7)
Medication	Pharmacology and side effects understanding	Greek nurses appear to **be aware** of irrational prescribing, extended duration of antimicrobial therapy and self-medication as the primary causes of AMR Nurses **recognize** the diagnostic uncertainty and parental/ patient demand as the main factors contributing to irrational prescribing, and the use of protocols and international guidelines as the most important measures for controlling irrational prescribing	Antibiotic resistance and irrational prescribing in peadiatric clinics in Greece (p. 4)
		nurses have a **vital role** in ensuring prompt administration of antibiotics the nurse has a role in ensuring appropriate administration and continuation of the drug.	Antimicrobial stewardship: the role of the nurse. (p. 3)
Safety	Hand hygiene	simple hand washing with soap (without medications) and water remains the most effective way to reduce the spread of infection, thereby reducing the number of antibiotics prescribed to children	Overprescribing antibiotics in children: An enduring public health concern (p. 3)
	Infectious factors preventing	Another approach to preventing illness and minimizing the unwarranted use of antibiotics is through the promotion and use of vaccination	Overprescribing antibiotics in children: An enduring public health concern (p. 3)

Table 7: Challenges found out.

Category of intervention	Nursing challenges	In articles
Coordination of care	most of the effort has been put into the development and assessment of educational programs for physicians in hospitals	Educational effectiveness, target, and content for prudent antibiotic use. (p. 4)
	a **lack** of national and international neonatal- and paediatric-specific AMR surveillance data, which limits the development of evidence-based guidelines and the implementation of effective prevention measures	Improving antibiotic prescribing for children in the resource-poor setting (p.1)
	The WHO study encountered significant methodological and logistical challenges in collecting data, and there were **no data** specifically relating to children the available data are very **limited to date**	Improving antibiotic prescribing for children in the resource-poor setting (p.2)
	very little consideration has been given to nurses' perceptions of AMR and antibiotic use, or to nurses' contribution to antimicrobial management and the impact this may have on the development of AMR and hospital-acquired infections	Antibiotic resistance and irrational prescribing in peadiatric clinics in Greece (p. 1)
	international literature is focused mainly on nurse practitioners, who have the authority to prescribe	Antibiotic resistance and irrational prescribing in peadiatric clinics in Greece (p. 2)
	The sector currently absent from the formal organizational chart of antimicrobial stewardship programs is nursing. The **unintentional mischaracterization** of the participation of nurses in ASPs as only potential rather than actual has the additional unintended consequence of divorcing nursing from those very activities that nurses need to understand as critical attributes of antimicrobial stewardship	The critical role of the staff nurse in antimicrobial stewardship – Unrecognized, but already there (p. 1)
	although nurses are the most consistent providers of care at the bedside, their involvement in antimicrobial stewardship programmes has often been **limited**	Antimicrobial stewardship: the role of the nurse. (p. 2)
Health behaviours	**antibiotic request** included **decreased knowledge** of parents regarding antibiotic use, pressure from day-care settings, **lack** of alternatives offered by clinicians, and **lack** of access to information	Changing parents' opinion regarding antibiotic use in primary care. (page 2)
	A total of 52% of nurses (301 nurses in participant) reported that **parental demand for antibiotics** in hospitals has increased.	Antibiotic resistance and irrational prescribing

		in peadiatric clinics in Greece (p. 3)
	One of the greatest challenges in delivering care is the **demand by parents for antibiotic prescriptions**, hoping that the medications will help their child to feel better as well as shorten the duration of illness	Overprescribing antibiotics in children: An enduring public health concern (p. 1)
	parents had very **little understanding** regarding what illnesses required antibiotics. Lack of information led to parents **requesting antibiotics** when unnecessary	Overprescribing antibiotics in children: An enduring public health concern (p. 3)
	Children are particularly prone to high rates of antibiotic use. Many parents **ask paediatricians for antibiotics** for conditions such as viral upper respiratory tract infections, non-specific diarrhoea or sore throat	Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia (p. 1)
	Keeping antibiotics at home was another important factor linked to the non-prescription use of antibiotics for children. Leftover antibiotics may be available because of over-prescription or patient non-compliance with a course of treatment.	Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia (p. 4)
	Most **parents' expectation for antibiotic prescription** is high, therefore, further parental education is needed concerning when to visit a doctor during uncomplicated URTIs, as well as on the recent guidelines for the symptomatic treatment of otitis media in children over 2 years old although the parents' view supports that antibiotic prescription is not parental driven, the small substudy on pediatricians view showed that pediatricians (66%) feel that indeed **parents expect them to administer antibiotic**	Descriptive study on parents' knowledge, attitudes and practices on antibiotic use and misuse in children with upper respiratory tract infections in Cyprus (p. 12)
	children's **misconceptions about antibiotics** start at an early age and may be influenced by their parents' health seeking behaviour and expectations for antibiotics	Using interactive family science shows to improve public knowledge on antibiotic resistance: Does it work? (p. 3)
Medication	Parents' attitudes towards antibiotics are often coupled to **poor knowledge** regarding the appropriate use of antibiotics	Changing parents' opinion regarding antibiotic use in primary care. (page 1)
	misuse or overuse of antimicrobial agents is still prevalent and acts as a significant contributor to the emergence of antibiotic resistance	Educational effectiveness, target, and content for

		prudent antibiotic use. (p. 1)
	Many adult people still have serious **misunderstandings about antibiotics** (e.g., antibiotics are useful for colds). Children's elementary knowledge of antibiotic use is also poor	Educational effectiveness, target, and content for prudent antibiotic use. (p. 2)
	the adult public remains unaware of elementary knowledge of antibiotic use and frequently engages in **misinformed behavior**	Educational effectiveness, target, and content for prudent antibiotic use. (p. 5)
	In Italy, **only 9.8%** of the respondents knew the definition of antibiotic resistance 30% of English adults **wrongly believe** that antibiotics cure common colds more quickly	Educational effectiveness, target, and content for prudent antibiotic use. (p. 7)
	quantifying antibiotic consumption in low- and middle-income countries (LMICs) is itself challenging, particularly so in children	Improving antibiotic prescribing for children in the resource-poor setting (p. 2)
	Financial pressures often mean that patients may purchase medicines on a daily basis, so **courses of treatment are frequently not completed or not even started** at all.	Improving antibiotic prescribing for children in the resource-poor setting (p. 3)
	The practice of prescribing antibiotics unnecessarily promotes drug resistance and adverse reactions. It is estimated that over 50 million ineffective and **unnecessary antibiotic prescriptions** are written for children each year in the United States.	Overprescribing antibiotics in children: An enduring public health concern (p. 2)
	In Mongolia, the **prescription of antibiotics** is widespread and often **inappropriate**	Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia (p. 1)
	Children are the largest consumers of antibiotics but research has suggested that their **knowledge** of medicine is **poor**	Using interactive family science shows to improve public knowledge on antibiotic resistance: Does it work? (p. 3)
Safety	Patients may **store antibiotics** from uncompleted courses, well beyond the expiry date, and later take them for self-diagnosed conditions or give them to family members and friend	Improving antibiotic prescribing for children in the resource-poor setting (p. 3)

	- 60% of Chinese parents had administered unprescribed antibiotics to their children The **overuse** of cheap, broad-spectrum antibiotics in addition to poverty and overcrowding will continue to foster antimicrobial resistance in this setting.	
	Two-thirds of antibiotics are sold over the counter,**without written prescriptions** consumers can purchase antibiotics for self-diagnosed problems without any medical consultation	Improving antibiotic prescribing for children in the resource-poor setting (p. 3)
	Counterfeit medicines in LMICs - expired drugs accessible to patients - improper storage drugs - inadvertently manufactured at substandard quality	Improving antibiotic prescribing for children in the resource-poor setting (p. 3)
	It is estimated that more than 50% of antibiotics worldwide are purchased privately **without a prescription**, from pharmacies or street vendors in the informal sector.	Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia (p. 1)
	In all, 42.3% of the 503 children were given **non-prescribed antibiotics** Of the non-prescribed antibiotics, 31% were given on the advice of pharmacists, 35% on the advice of family members and 8% on the advice of friends. Reasons for **not seeking a physician's advice** included the belief that the illness was not severe (70%) and previous experience with the doctor always prescribing the same antibiotics for similar conditions (15%)	Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia (p. 2)
	an increase in the percentage of people **retaining leftover antibiotics** in England between 2008 and 2009 although the public are aware of the dangers of antibiotic misuse to their own health, their behaviour and practice **don't always reflect** this awareness	Using interactive family science shows to improve public knowledge on antibiotic resistance: Does it work? (p. 4)