



Medication errors in Europe

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<p>Sammandrag:</p> <p>Avhandlingen är en kvalitativ studie om medicineringsfel som förekommer i Europa. Syftet med studien är att få en djupare förståelse för den rådande situationen samt betrakta gemensamma trender inom medicineringsfel i olika europeiska länder. Materialet har analyserats inom ramen för patientsäkerhet, vilket även utgör den teoretiska referensramen för att förstå centrala begrepp inom felmedicinering. Texter från olika europeiska länder har analyserats utgående från innehållsanalys som metod. Resultaten visar att medicineringsfel är ett vanligt problem bland patienter. En av tio européer drabbas av en incident på grund av medicinering inom hälso- och sjukvården och liknande riskfaktorer existerar oberoende av land. Resultatet som uppnått i denna litteraturstudie står i samklang med vad som publicerats av Världshälsoorganisationen och den Europeiska Kommissionen. Felmedicinering är en viktig fråga och rekommendationerna utgående från denna studie är fortsatt utveckling av program och att främja medvetenheten om problemet, där syftet är att uppnå ett nollresultat i förekomsten av incidenter relaterad till medicinering i Europa i framtiden.</p>	
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<p>Abstract:</p> <p>The present thesis is a qualitative study about Medication errors in that occur in Europe. The aim of the study is to get a deeper understanding on what is the current situation and if there exists common trends or patterns on the medication errors that take place in European countries. The material is observed through the eyes of Patient Safety, which is the framework chosen for understanding the concepts that relate to medication errors. For the research, texts from different European countries are gathered and studied using content analysis as methodology. The analysis of the findings reveal that medication errors are a common threat for patients. One in ten European is suffering from an incident related to medication when receiving health care and there exists risk factors that are similar regardless of the country of study. The results obtained through this literature review are in concordance with what has been published by the World Health organization and the European Commission. Medication errors are an important issue and the recommendations of this work is to continue developing programs and awareness of the problem in order to achieve a zero prevalence of incidents related to medication in Europe for the future.</p> <p>This thesis is commissioned by Arcada as part of the project Medication administration qualification project (MAQ) , which intends to investigate about medication errors globally and their relation to the nursing field.</p>	
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<p>Tiivistelmä:</p> <p>Tämä oppinäytetyö on kvalitatiivinen tutkimus lääkitysvirheistä euroopassa. Tutkimuksen tarkoitus on saada syvempää ymmärrystä nykytilanteeseen ja samalla tarkistaa yhteisiä suuntauksia tai yhtäläisyyksiä lääkitysvirheistä jotka tapahtuvat eri maissa euroopassa. Aineisto on analysoitu potilasturvallisuuden kautta, mikä samalla muodostaa tutkimuksen teoreettisen viitekehyksen ymmärtääkseen keskeiset käsitteet lääkitysvirheistä. Tekstejä eri euroopan maista on tutkittu käyttäen sisällysanalyysi metoodina. Tulokset osoittavat että virhelääkitys on yleinen ongelma potilaille. Yksi kymmenestä eurooppalaisesta kärsii virhelääkitystapauksesta terveydenhuollon yhteydessä ja riskitekijät ovat samanlaiset riippumatta maasta.</p> <p>Tulokset ovat sopusoinnussa tuloksiin mitkä Maailman terveysjärjestön ja Euroopan kommissio ovat aikaisemmin julkaisseet. Lääkityspoikkeamat on pidettävä tärkeänä kysymyksenä ja tämän tutkimuksen perusteella suositellaan jatkuvaa ohjelmien kehtiystä sekä edistää tietoisuutta ongelmasta jotta tapauksia jotka liittyvät virhelääkitykseen ei enää tapauhtuisi euroopassa tulevaisuudessa.</p>	
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1 INTRODUCTION

Primum Non Nocere, the famous Latin expression generally attributed to Hippocrates and that in English translates to the well-known phrase: *First, do not harm*” resumes a fundamental principle in medicine: that patients should not be hurt.

The idea of not causing harm to patients is frequently assumed, both in medical and popular environments as so simple and clear that it almost would not deserve to be reflected upon, but in reality it conceals a hard truth: that medical care could result in harm, and that patients are at risk of being hurt when they receive some form of medical treatment (Cedric&Smith, 2005).

In a press release in 2007, the World Health Organization, estimated that medical mistakes were the cause of death of tens of millions of patients around the globe. At the time when that information was given, it was stated that the data from Europe indicated that one in ten patients that had been treated in some European hospital had being suffering from a medical mistake or being harmed because of some incident that was in fact preventable (WHO, 2007).

In the last years, awareness of the importance of patient safety seems to have grown and new organizations, alliances and research groups have been created and are working in different levels, in order to prevent, investigate and introduce systems and control mechanisms to minimize medical mistakes and improve patient safety.

The aim of this paper was to through a literature review and content analysis, obtain information regarding medical mistakes in Europe, and specifically about medication errors, and get a better understanding on the medical error prevalence in the European countries in the actual days.

2 BACKGROUND

“It may seem a strange principle to enunciate as the very first requirement in a Hospital that it should do the sick no harm”

Florence Nightingale, Notes on Hospitals, 1863.

The aim of Medicine is to cure, not to harm patients. Medication errors have always occurred, and so patient safety is not a new topic. Independently of to whom could be credited the phrase “First, do not harm”, it has been for centuries in the mind of many physicians as one important issue as patients going to hospitals or to receive medical attention and suffering from it is not new either. The author of the quote that opens this chapter, Florence Nightingale (1820-1910), already realized that patients were not being necessary cured by being in the hospital. She was working in a hospital and registered her findings her book “Notes on Hospitals”, where she recognizes that mortality in hospital patients was very high compared with those that did not receive medical attention and that hygiene measures were crucial to ensure patient safety (Agrab& Aranaz, 2010).

It seems, that it was not until the end of the XX century when patient safety has become an important global issue. 1999 was the year when the Institute of Medicine (IOM) of the United States of America published a “To Err is Human”, a study focused on investigating medical mistakes. The study reported that approximately 98000 hospitalized patients were dying each year in the United States of America due to preventable medical mistakes. That situated medical errors as the 8th cause of mortality globally at the time, and was the first time that patient safety was put on the focus as a global worrying issue (Vázquez Frías, *et. al.* 2011).

In 2002, during the 55th annual World Health Assembly, held in Geneva, Switzerland, the World Health Organization urged its members to attend the patient safety problem in individual states, and to try to develop strategies and control mechanisms to reduce medical errors. (Espinal Garcia, M.T. *et. al.* 2010).

The World Alliance for Patient Safety was created in 2004 with the aim of integrate and unite international efforts to develop better policies for patient safety (Espinal Garcia, M.T. *et. al.* 2010).

Plenty of initiatives and new measurements have been appearing and growing over the last decade in Europe in order to improve patient safety reduce medication risks. The European Commission, as an example, together with the DG Health and Consumer Protection developed in 2005: *“Patient safety-making it happen -the European perspective”*, which became the 1st declaration on patient safety (Espinal Garcia, M.T. *et. al.* 2010).

In 2008, EUNetPas was born, European Union Network for Patient Safety, which intended to improve the collaboration between the Member States and work on such areas as training and working on improving reporting (European Patients Forum).

In 2009 a strategy was on how to implement improvements on patient safety was made by the Council Recommendation on patient safety and healthcare associated infections. Follows ups on this recommendations are carried out constantly and new surveys on the situation and guidelines on how to improve it are constantly being suggested (European Commission).

Despite the efforts on organizing and improving patient safety measurements, medical errors do occur and they have a great impact in many patients around the globe.

In the 2010 publication from the World Health Organization Regional office for Europe, *“A brief synopsis on patient safety”* information about the European situation and strategies is explained. European data estimates that 8-12 % of the patients that are hospitalized suffer some form of preventable harm related to their hospitalization. Different reports from diverse countries show similar results, and the general thought is that every tenth European patient suffer some harm during to her/his medical treatment (WHO, Regional office for Europe, 2010).

The medical mistakes or preventable harms suffered for the patients vary and occur mostly at the same level in different areas of medical care. Hence, they include health care associated infections, drug interactions, medication mistakes, hospital-acquired infections...

The World Health Organization brief on patient safety indicates that different researches showed that prevention could lead to reduce the harm to a 30-50 % of the cases. Research also showed that the introduction of patient safety strategies into the European Union would bring approximately 95,000 less cases of deadly medical mistakes, amongst other improvements (WHO, Regional office for Europe, 2010).

In 2006, The European Commission published the results of a Eurobarometer survey on the perception of medical errors where European citizens were consulted about the matter. Approximately 80% of the citizens showed to be concerned and found medical errors in their country to be a worrying issue. All the citizens, except those from Finland, found it to be an important issue. Almost one fourth admitted have been victim (directly or through some close relative) of some type of medical error. Incidents in hospitals were shown to happen more often than to be prescribed the wrong medication. It was also clear that half of European citizens believed that it is possible and not very rare to suffer from a medical error in a hospital in their country (Special Eurobarometer 214, European Commission, 2006).

Errors in prescribing, administering or dispensing medication represent an important part of those medical errors, and they can occur in different settings and situations during the care process. According to the World Health Organization, the cost of medication errors were estimated to be up to 21.8 billions globally in 2010. (World Alliance for Patient Safety, 2010).

Medication errors prevalence is significant around the globe. The Council of Europe Expert Group on Safe Medication Practices estimated in a report in 2006 that up to 56 % of the adverse drug episodes in hospitalized patients in Europe were caused by medication errors (Council of Europe, 2006), and they occur in the different stages of the medication use system (Table1).

Stage in the medication use system	Ambulatory care	Hospital settings	Comments
Prescribing	7.5%	0.3 - 9.1%	% of medication orders
Dispensing	0.08%	1.6 - 2.1%	
Administration	Not available	49.3%	Direct observation studies
		5.1 - 47.5%	- intravenous medicine doses prepared on wards
		2.4 - 8.6%	- traditional floor stock or ward stock systems
			- ward stock system with original prescription and daily ward visits by pharmacists
		7.2 - 9.1%	- patient prescription distribution systems
		10.5%	- unit dose drug distribution manual system
		2.4 - 9.7%	- unit dose drug distribution computerised or automated systems

Table 1. The incidence of medication errors in Europe, Source:

Creation of a better medication safety culture in Europe: Building up safe medication practices. Council of Europe Expert Group on Safe Medication Practices (2006).

Besides the human costs, the economic burden that this mistakes represents to the countries is considerable, and not always necessary, as this medication errors are, according to EMA” *the most common preventable cause of undesired adverse events in medication practice and present a major public health burden*”(EMA).

Medication errors are an important issue for the Nursing field as well, since nurses are in many cases the last barrier before patients gets the medicines, and in many cases the ones dispensing them, and as Florence Nightingale stated patients visit the hospital to get cured, not sick.

3 CONCEPTUAL FRAMEWORK

3.1 Patient safety

Medical mistakes and medication errors are important because they have repercussions on patients. If an error in medication would have no consequences, it would not also be a concern. Besides economical costs, patient's harm and well-being are the main reasons why medical mistakes and medication errors should be avoided. In order to frame the present work and to get a deeper understanding on what is researched, patient safety was the chosen theoretical framework from where medication mistakes are understood.

The world health organization created a program in order to develop an international framework for patient safety, in an effort to be able to understand and analyze it globally. Experts from different disciplines worked together during three years in creating a conceptual framework for an International Classification for Patient Safety based on the idea that it was important to have an understanding on patient safety that it would be globally applicable (ICPS, WHO, 2009). The present work intends to analyze medical mistakes in different countries that integrate Europe, in concrete medication errors so a common conceptual framework as the World Health Organization conceptual framework for patient safety was found to be very suitable to understand and define the concepts that are used in the present work.

According to the Royal College of Nurses, Patient safety is *"the prevention of avoidable errors and adverse effects to patients associated with health care"* (RCN, 2015). In the Canadian Patient Safety Dictionary (2003) patient safety is defined as *"the reduction and mitigation of unsafe acts within the healthcare system, as well as through the use of best practices shown to lead to optimal patient outcomes"* (Canadian patient safety institute). And in the International Classification for Patient Safety that is used here as a conceptual framework, patient safety is *"the reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum"* and *"An acceptable minimum refers to the collective notions of given current knowledge, resources available and the context in which care was delivered weighed against the risk of non-treatment or other treatment"* (ICPS, WHO, 2009).

Based on these definitions it is possible to extract that medical mistakes or preventable errors including medication errors, are a threat to patient safety and that the focus when speaking about patient safety relies on avoiding them.

3.2 WHO conceptual framework for patient safety

According to the conceptual model developed in the project developed by the World Health Organization, exist “10 higher classes that comprises the conceptual framework for the International Classification for Patient Safety” (Figure 1). Under these 10 higher classes of concepts, all the main definitions and different characteristics of patient safety could be understood and their sub-divisions and interrelations draw a model that gives the form to the conceptual framework (*ICPS*, WHO, 2009).

The ten higher classes under which all the concepts of patient safety are included are, according to WHO :Incident type, patient outcomes, patient characteristics, incident characteristics, class contributing factors, organizational outcomes, detention, mitigating factors, ameliorating actions and actions taken to reduce risks (*ICPS*, WHO, 2009).

These interrelated classes gives different attributes to patient safety and frame the concepts that are related to it:

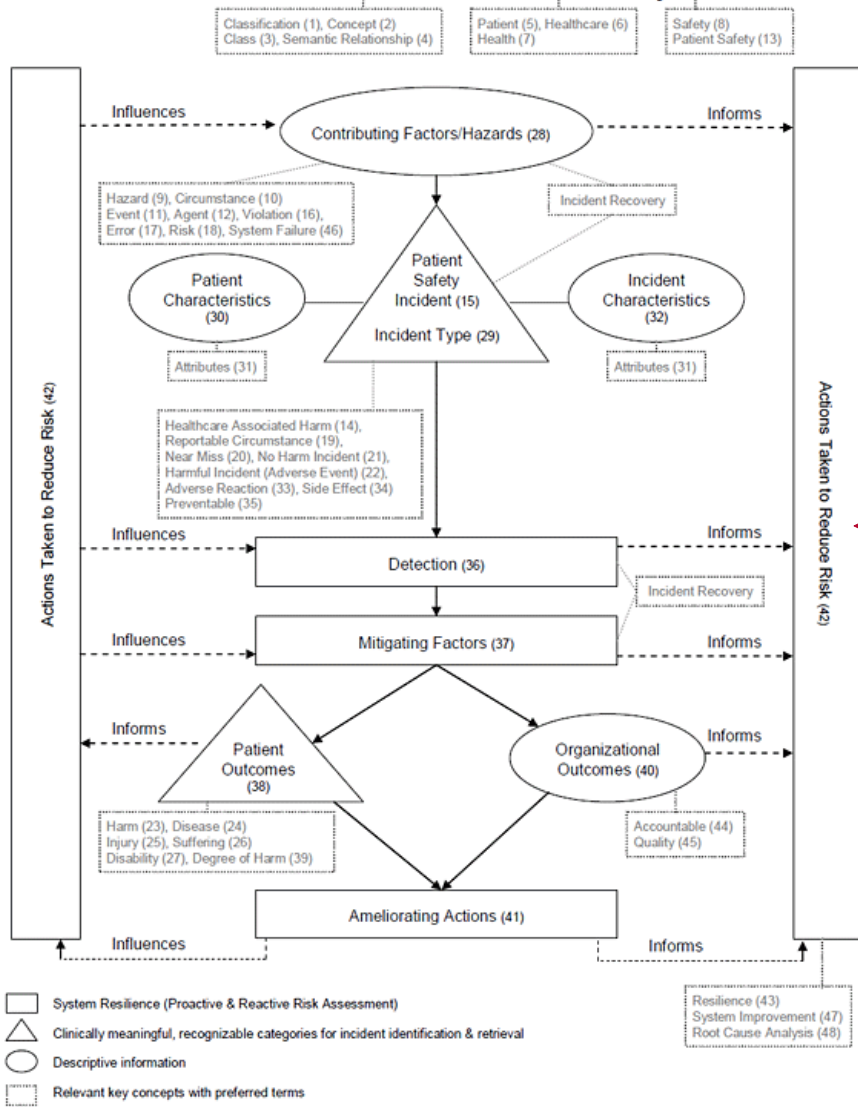
Within the class *Incident type* is gathered events that are related to patient’s safety. Under *Patient outcomes* is included all those concepts that reflects the impacts that incidents have in patients, while the class *patient characteristics* includes features and aspects that define and describe the actual patient. In the latter class is included the patients’ medical background and their personal medically history, such as different diagnoses and the reason why they are receiving treatment or care. In the *incident characteristics* class is included and described the different features of the incidents, and in the class *contributing factors/hazards* are included all the circumstances that caused or created the situation in which the incident could or can occur (*ICPS*, WHO, 2009).

Within the ten higher classes we find also a class for *organizational outcomes* which includes all the different results that incidents can have in a health care setting or perhaps in the organizations that are responsible for the received or planned healthcare. On

the other hand there is the class *detention* which in this case refers to all the actual actions and the throughout measures that are taken to react or perhaps to avoid that an actual incident occurs or can occur. There are also *mitigating factors* that explains and classifies all the different actions that could be taken or put into place when an incident has already occurred, in order to avoid that the patient would be harmed. *Ameliorating actions*, on the other hand is that class that includes all the actions that have as a purpose to diminish the consequences that an occurred incident can have. Finally there are the *actions taken to reduce risk* and hereby refers to actual measures taken to avoid future recurrence of the incident or similar incidents (ICPS, WHO, 2009).

These higher classes cannot be considered as independent factors or seen as individual parts of patient safety. They are rather related and/or affected one by another and it is shown in the graphic (Figure 1):

Conceptual Framework for the International Classification for Patient Safety



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Figure 1 : International classification for patient safety, WHO, 2009.

3.3 Definition of terms

The International classification for patient safety of the world health organization contains 48 definitions of terms that were consider relevant to understand patient safety from a global perspective. Due to the fact that patient safety is a rather extensive area of study, that includes prevention and analysing the consequences of an error, for the present work, in order to frame medication errors conceptually, only some of the terms are considered necessary.

Medical errors and patient safety are very broad and global subjects and so can be studied from different perspectives. Medication errors or mistakes are the focus of this work, so here are listed and defined the terms that were considered directly related to medication errors.

It has been discussed previously that medication errors have an importance because they have repercussions in patients so a definition patient is of great importance to understand frame medication errors. The Oxford Dictionary defines *patient* as “*A person receiving or registered to receive medical treatment*” (Oxford Dictionaries). The definition in the International Classification for Patient Safety of the World Health Organization, states that a patient is “*a person who is recipient of health care*” (ICPS, WHO, 2009). In both definitions, patient is not defined as a person that is sick, which implies that those that are not necessarily sick but receive medical care are also considered patients, and so are subjected to suffer medical mistakes, and from medication errors. It is rather a much broader concept than what is generally assumed.

Health care is defined in the International Classification for Patient Safety as “*all the services received to maintain, promote or restore health, including self-care*” (ICPS, WHO, 2009). And the definition found in the Oxford Dictionary states that health care is “*The maintenance and improvement of physical and mental health, especially through the provision of medical services:*” (Oxford Dictionaries).

According to these two definitions, health care is more than simply treatments in a hospital or ambulatory setting, which broader the aspects and perspectives of medical mistakes in general, and medication errors in particular, since by these definition, medica-

tion errors in health care would be considered also those that would take place in the patient's own home, if it is following some treatment to restore or promote his/her own health.

The World Health Organization defines *Health* as “*state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*” (Regional office for Europe, WHO).

In the International Classification of Patient Safety we have also the term *Hazard*, which is defined as “*anything that can cause harm*” (ICPS, WHO, 2009). In this present work the hazard terminology refers to medications, since medications are clear substances that have a potential risk of causing harm to the patient.

Medical mistake, or *patient safety incident*: is on the other hand defined as “*an event or circumstance that could have resulted, or did result, in unnecessary harm to a patient*” (ICPS, WHO, 2009). Within this present work it is the medication errors that are the patient safety incidents discussed.

The attribute *unnecessary* stands as a crucial part of the definition, since medication can cause necessary harm to patients (side effects) that are not considered a mistake, but an inherent cost of the treatment.

We have also the term *error* which according to the international Classification for Patient Safety of the World Health organization is defined as “*a failure to carry out a planned action as intended or application of an incorrect plan*” (ICPS, WHO, 2009).

From this definition, a medication error situation would appear when the processes of medication's prescribing, dispensing or administering instructions are not followed or when the instructions/indications followed are not correct. It is therefore depending on both the caregivers and the patients actions.

“*The probability than an incident will occur*” is classified as *risk* (ICPS, WHO, 2009). Here it is important to point out that there are situations where the possibility of a medication error to occur is greater than in some other ones. We could for instance consider a hospital setting where a nurse has to administer medicines to many patients at the

same time which could represent a higher risk than a similar hospital setting where a nurse has to administer medication to only one patient.

Incidents are graded according to the level of harm caused, so a situation where an incident could have occurred but did not is defined as a *reportable circumstance* (ICPS, WHO, 2009).

A *near miss incident* would be a situation where the wrong medication was prepared for the patient, but it was never administered. If the wrong medication was given to a patient but it did not cause harm, as in a patient received an unnecessary paracetamol dosage, without consequences, the situation is defined as a *no harm incident*. Finally an *adverse event* would be the one in which the wrong medication have been given to the patient, and it has cause some harm (ICPS, WHO, 2009).

In this conceptual framework, harm “*implies impairment of structure or function of the body and/or any deleterious effect arising there from, including disease, injury, suffering, disability and death, and may be physical, social or psychological*” (ICPS, WHO, 2009). And in relation with medication, *adverse reactions* and *side effects* are also defined. Both are defined as harmful responses caused by medication, but the difference relies on the fact that side effects could be expected, while adverse reactions are not necessarily known (ICPS, WHO, 2009).

3.3.4 **Other considerations**

Other definitions apart from those included in the International Classification for patient safety are necessary to better frame and delimit the present work. Medication errors are the subject of research, but the research is limited to Europe. For this work, European Union member countries are decided representative of Europe and so the definition of Europe is not geographical, and includes :Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark ,Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom (European Union, 2015). For their similarities with the mentioned countries, for this research Norway and Switzerland were also included.

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4 METHODOLOGY

4.1 Aim

The aim of this study is to gather enough information to be able to find answers to the main research question:

What is the current situation regarding medication errors in Europe? , or in a more concrete level: Is there a common trend or a possibility to draw similarities in between medication errors that occur in different European countries?

4.2 Methodology

In order to answer the research questions proposed, a literature review on publications regarding medication errors was conducted, and the information was extracted and studied using content analysis as a method.

Since the aim of this thesis is to gain a deeper understanding on the subject content analysis was founded to be a very suitable method for this purpose.

Content analysis refers to a general set of techniques useful for analysing and understanding collections of text (Meyer, Eric T.).

The focus of content analysis is then to understand the information contained in the texts, but the different ways of performing it depends on the researcher and the techniques chosen for the process. For the present work the guidelines of Elo&Kyngäs published on their work: "The qualitative content analysis process" were founded useful and used (Elo&Kyngäs, 2007).

They describe the process of content analysis as a 3 phase's analysis process. First a collection of the material, then organizing and getting familiar with the data and finally writing the findings and conclusions (Elo&Kyngäs, 2007).

The research process of this thesis has been then according to those guidelines: an electronic search was conducted until what was considered satisfactory material was ob-

tained. The material was then read through many times until it was completely understood and all headings and side notes were collected from each text. After that a selection of the contents highlighted from each articles was written. From that information, headings were extracted into a table. The headings were then organized into categories, then new categories to map the information where created until the material organization was considered satisfactory to get a clear picture of the contents.

The findings in the organized information were then discussed and giving as a result the conclusions of this work

4.3 Limitations

The work presented has some limitations: The work is a bachelor degree's thesis work, with an author with limited research knowledge, resources and time. The languages used for searching and reading articles are English and Spanish, which are only 2 of the over 20 official languages of the European countries here discussed (European Commission official site, 2015). This could have limited the access to information, since more articles and discussions about patient safety and medication errors may have been written in the official languages of the different countries.

This work is as well limited by the fact that despite the on-going efforts to create a more international or universal system for promoting patient safety, health care is still organize differently within European countries and so exist different methods for reporting medication errors, which could have as a result that a comparison or analyzing of them as a whole is not totally accurate.

More articles and information were found of interest during the searching process, but the limited access to certain databases may have as well cause in some level lack of relevant information

4.4 Material selection

In order to collect information for this thesis work, an electronic search was conducted in EBSCO, and PubMed. Medication and errors and Europe were used as searching words.

When conducting the search for information, the aim was finding as broad sample as possible where different European countries would be represented, so the goal was to find articles that analyse the situation or prevalence of medication errors in a hospital or unit of any European country.

Due to the fact that medication errors, as it has previously already been discussed, is a subject that has during the last years reached increased awareness, plenty of new research articles on how to avoid, minimize or develop new methods to control the consequences of medication errors have been written. They were all excluded of the material for this research, where the focus is on the prevalence and characteristics of medication errors in Europe.

Information from countries not included in the defined Europe list were also not considered and writings about the health care professional's perceptions of medication errors in their unit were not considered relevant for this work. After this selection, 10 articles were selected to further analysis. A more detailed information on the selection process, with hits and including and excluding is available in the following table (*Table 2*):

PubMed. March 2015	
Medication AND errors AND Europe	1821 hits
Full text.	349 hits
Language: English, Spanish. Last 10 years. Peer reviewed.	172 hits
Including factors : <ul style="list-style-type: none">Articles from different European countries.Articles that analyse the situation of medication	Applying this including and excluding factors reading the summary of the articles:

<p>errors in a European country, European country hospital.</p> <ul style="list-style-type: none"> • Prevalence of medication errors in an European country/unit/hospital <p>Excluding factors:</p> <ul style="list-style-type: none"> • Information from outside non-European countries. • Methods to reduce medication errors. • Methods for reporting medication errors • Health care professional's perception of medication errors. • Methods for preventing medication errors. 	<ul style="list-style-type: none"> • 28 articles selected.
<p>New excluding factors:</p> <ul style="list-style-type: none"> • Analysis of effectiveness of electronic methods for reducing medication errors: • Economical costs of medication errors: • Interventions to reduce med. errors: • Medication errors etymology. 	<ul style="list-style-type: none"> • 5 articles excluded • 2 articles excluded • 2 articles excluded. • 2 articles excluded <p>17 articles left.</p>
<p>New excluding factors:</p> <ul style="list-style-type: none"> • Classification of medication errors. • Characteristics of medication errors with parenteral cytotoxic drugs. • Barriers to medication safety. • Risks caused by medication errors. 	<ul style="list-style-type: none"> • 13 articles left.
<p>After the last search, reading through the abstracts of the articles:</p> <p>Articles about drug interactions or one specific drug were not included</p>	<p>7 articles for analysing</p>
<p>EBSCO.</p>	
<p>Medication AND errors in subject.</p> <p>Europe in all</p>	

Full text. English, Spanish Last 10 years Peer reviewed.	4 hits
Excluding and including factors	3 articles saved for analysing.
Total articles saved for analysis.	10

Table 2. Selection process.

4.5 Analysis and findings

The selection was followed with the content analysis of the material chosen according to the process explained by Elo&Kyngäs: The selected material was read thoroughly and repeatedly in order to get familiar with the information that contained. Side notes were written thorough the successive readings in order to get a full understanding of the data and to be able to extract all the relevant information. After that step, contents were highlighted and moved to a table that functions as a coding sheet in this case, for being organized into categories (Elo&Kyngäs, 2007).

The ten articles chosen for analysing listed in chronological order are:

1: Stausberg J, Hasford J. *Drug-related admissions and hospital-acquired adverse drug events in Germany: a longitudinal analysis from 2003 to 2007 of ICD-10-coded routine data*. BMC Health Serv Res. 2011 May 29;11:134. doi: 10.1186/1472-6963-11-134. PubMed PMID: 21619706; PubMed Central PMCID: PMC3116475.

Summary: A study identifying the frequency of hospital admissions due to medical errors of drug use. The method used was to routinely collect hospital data during the period 2003 and 2007. The study was performed in Germany.

Contents highlighted: Around 5% of hospitals admissions in Germany are due to drug related problems. Medication errors and adverse drugs reactions are difficult to differentiate. Possibility that this is covering the amount of medication errors reported. Lack of patients' information united databases makes it easier for medication errors to occur and

to be unreported. Missing patients' data increases the possibility for medication errors to occur. Patients with multi morbidity and > 80 years old are more like to suffer a medication related incident. Increase reported medication problems in the last years.

2: Cousins DH, Gerrett D, Warner B. **A review of medication incidents reported to the National Reporting and Learning System in England and Wales over 6 years.** (2005-2010). Br J Clin Pharmacol. 2012 Oct;74(4):597-604. Doi: 10.1111/j.1365-2125.2011.04166.x. Review. PubMed PMID: 22188210; PubMed Central PMCID: PMC3477327.

Summary: An analysis of Data form the National reporting and Learning system in England and Wales regarding reported medication errors from the years 2005-2010. Where do they have a higher incidence, what are the most common medication errors.

Contents highlighted: Number of medication errors reported increasing during the time of study. Errors in medication are the second most reported incidents after patients' incidents. Acute settings seems to have more medication errors reported that primary care. Administration of medication in hospital highest reported, followed by prescription errors. 1-10% of errors in all the process of medication prescribing, dispensing and administering in UK reported. Intravenous administering higher reported errors. Under-reporting medication errors.

3: Gallagher P; Barry P; O'Mahony D, **Inappropriate prescribing in the elderly.** Journal of Clinical Pharmacy & Therapeutics (J CLIN PHARM THER), 2007 Apr; 32 (2): 113-121. (65 ref)

Summary: A literature review over inappropriate medication prescriptions in elderly patient and looking at criteria that have been developed to detect potentially inappropriate prescribing in the elderly. Study performed through electronic search of articles published between 1991 and 2006.

Contents highlighted: Importance of taking into account the patient characteristics for safe-prescribing. (Elderly patients in this study). Polypharmacy as a risk factor for medication errors in the prescribing phase. Prescribing similar medication due to lack of knowledge or misinformation about the patient. Adverse drugs reaction due to medication difficult to recognize and more difficult in elderly patients. Increase of adverse drug reactions prevalence in patients over 65 years old. Possibility that prescription of wrong medication does not show directly reaction and so it goes unreported. Different tools to evaluate medication in prescribing amongst European countries. Some drugs have more prevalence of being wrong prescribed than others. Living alone and >85 years have less risk for suffering an error in their medication prescription. Higher use of health care implies a higher risk to suffer a medication error Medication errors related to health care professionals training

4: Bell, Dominic. **Recurrent wrong-route drug error - a professional shame.** Anaesthesia (ANAESTHESIA), 2007 Jun; 62 (6): 541-5. ISSN: 0003-2409.

Summary: A reflection over the medical errors occurring in an anaesthesia setting in UK and Ireland. Highlighting the errors that are re-occurring and discussing the underlying factors and risk for medication errors to occur.

Contents highlighted: High incidence of errors in anaesthesia settings as in the wards settings. High recurrence. Low harmful cases may go unreported. Wrong route administration frequent error. IV administration error frequent. Professionals training and education important factor for avoiding medication errors. Difficult settings and multiple machines represent a higher risk situation for medication errors to occur. Methods for reporting medication errors in anaesthesia settings not easy or clear in the UK.

5: Wawruch M; Fialova D; Zikavska M; Wsolova L; Jezova D; Kuzelova M; Liskova S; Krajcik S. **Factors influencing the use of potentially inappropriate medication in older patients in Slovakia.** Journal of Clinical Pharmacy & Therapeutics (J CLIN PHARM THER), 2008 Aug; 33 (4): 381-92.

Summary: Study aiming to find risk factors involved in using inappropriate medications in hospitalized older patients. The study was made within the Slovak health system in order to make a comparison with other European Union member countries. 600 patients was studied.

Contents highlighted: 21% of 600 patients studied suffered a prescription incident in hospital admission. Certain medications are most likely to be wrong prescribed than others. Risk for suffering an incident in prescription: polypharmacy followed by immobilisation, depression and heart failure. Different studies and tools from different European countries makes difficult the comparison. Southern Europe incidence or errors in prescriptions higher than northern European countries. Higher prevalence in older patients till 75 where the risk diminishes. Importance of checking patients' medications and background to avoid medication errors.

6: Berdot S, Sabatier B, Gillaizeau F, Caruba T, Prognon P, Durieux P. **Evaluation of drug administration errors in a teaching hospital.** BMC Health Serv Res. 2012 Mar 12;12:60. doi: 10.1186/1472-6963-12-60. PubMed PMID: 22409837; PubMed Central PMCID: PMC3364158.

Summary: An evaluation aimed to study the impact of drug administration errors and to evaluate and identify risk factors included. Study based on observation in a hospital in Paris France.

Contents highlighted: Error rate in the unit of study of 27.6 %. The most common incident were wrong time error, omission and finally unauthorized drug error. Some drugs were more frequently part of an incident. Administration route related to the incidence of errors, injections higher prevalence. Nurses' workload associated with medication errors. Increased awareness and new measurements to control medication errors.

7: Hartel MJ, Staub LP, Röder C, Egli S. **High incidence of medication documentation errors in a Swiss university hospital due to the handwritten prescription pro-**

cess. BMC Health Serv Res. 2011 Aug 18;11:199. doi: 10.1186/1472-6963-11-199. PubMed PMID: 21851620; PubMed Central PMCID: PMC3180357.

Summary: Study focusing on hospitalized patients and medical errors leading to death. The focus in the study is the handwritten prescription process and errors arising from this process. The study was performed in a university hospital in Switzerland.

Contents highlighted: High incidence of errors 3, 5% in manual prescriptions, documentation and administration of medication. Transcribing patients' information's to patients' sheets, and written orders results in high incidence of errors. Wrong time errors, overdose or wrong medication are the most common errors in the case studied. Transcription of doctors' orders by nurses resulted in higher incidence of errors. Electronic systems shown to decrease the amount of medication errors caused by transcribing data, but presents new challenges as staff training, higher knowledge.

8: Schwappach DL. **Frequency of and predictors for patient-reported medical and medication errors in Switzerland.** Swiss Med Wkly. 2011 Oct 4;141:w13262. Doi: 10.4414/smw.2011.13262. PubMed PMID: 21971822.

Summary: A study looking at the frequency of patient-reported medical errors in Switzerland. The study is also highlighting and trying to identify risk factors involved. Study was made based on a population sample of Swiss citizens.

Contents highlighted: More than 1 in 10 Swiss citizens reported to have suffered a medication error. Medication errors incidents reported showed that hospital setting & emergency care were places where the risk of medication errors to occur is higher. Poor coordination reported as a cause. Young patients more likely to reported more medication errors and sicker patients also.

9: Kaufmann J, Laschat M, Wappler F. **Medication errors in paediatric emergencies: a systematic analysis.** Dtsch Arztebl Int. 2012 Sep;109(38):609-16. Doi:

10.3238/arztebl.2012.0609. Epub 2012 Sep 21. Review. PubMed PMID: 23093991; PubMed Central PMCID: PMC3471264.

Summary: A review on the medication errors that occur in a pediatric care unit. Possible causes and reasons for medication errors that occur in the different phases of pediatric care and analysis of the possible ways of avoiding them.

Contents highlighted: The prescription and preparation of medication sometimes does not take into consideration the individual patient, dosage is sometimes calculated on estimated body measurements values, which could differ very much from patient to patient. High incidence of errors in determining/calculating the dosage. Communication problems, patient-doctor, incomplete prescriptions. On site preparation problems due maybe to lack of experience/knowledge. High incidence of errors in intensive care.

10 : Merino P, Martín MC, Alonso A, Gutiérrez I, Alvarez J, Becerril F; coordinadores del estudio SYREC. **Medication errors in Spanish intensive care units**, *Med Intensiva*. 2013 Aug -Sep;37(6):391-9. Doi: 10.1016/j.medin.2012.11.002. Epub 2013 Jan 9. Spanish. PubMed PMID: 23312908.

Summary: A study identifying the frequency of medication errors occurring in intensive care in Spain. Investigating where the medication errors have a higher prevalence and what are the settings where they are more likely to occur. Study performed through observation.

Contents highlighted: ¼ of the incidents reported were related to medication. More frequent in prescription process and administration. Not so harmful. Medical errors considered avoidable by health care professionals. More participation related to the increased awareness of the importance of reporting medical mistakes. In Spain errors in medication is the most reported medical mistake. More prevalence in intensive care units. Medication errors related to polypharmacy and lack of information of the patient's history. Intravenous via more incidence of medication errors. Problems in prescription caused by misunderstandings. Administration problems: wrong time or omis-

sion. Possibility that medication errors are unreported because their consequences or harms not show directly after the error has occurred.

After collecting the information, contents were organized in two different ways. To answer the first research question, information about incidence of medication errors was separated in order to analyse similarities and differences (*Table 3*). This first information extracted about prevalence of patient safety incidents related to medication:

Information about incidence of medication errors
<ul style="list-style-type: none">• 25% of incidents reported related to medication in a Spanish intensive unit.• >10% Swiss citizens have suffered a medication error.• 3.5% of medication errors due to manual prescription.• 27, 6 % error date in a French teaching hospital.• Approx. 10% of all the medical errors that occur in UK are during prescribing, dispensing or administering medication.• 5 % Germany admissions due to drug-related problems.• 21% of patients studied suffered a prescription incident in hospital admission in Slovakia.

Table 3. Information extracted regarding incidence of medication errors.

On a second analysis, first similar concepts are simply united into groups (*Table 5 in appendix*). The groups were revised to simplify and extract main concepts and writing headings (Elo&Kyngäs, 2007). Headings were written beside in a table to simplify duplicate information and get the crucial concepts in a clear way. A new table was then created where headings were organized into categories. To name the new categories, the classes established by the WHO, already explained and used to frame this work (ICPS, WHO, 2009) were tested, and headings were related to them. Since medication errors are directly related to patient safety, this way of organizing the information was founded suitable to obtain a broader picture of the findings. The analysing of this new map (*Table 4*) intended to provide with an answer on the second research question; if similarities or trends could be establish within different writings from different European countries

regarding medication errors. The headings were classified into one category or class, but as mentioned before, in patient safety and when one incident occur, classification is not independent, so concepts are related one to another. In this case, the class incident type, from where every other class emerges (*Figure 1*) is a medication error.

Headings.	Class/categories and relations.
<ul style="list-style-type: none"> • Some medications are more likely to be part of an incident than others. 	<ul style="list-style-type: none"> • Contributing factors/hazards. Related to the agent that causes harm.
<p>Higher probability/incidence of medication errors:</p> <ul style="list-style-type: none"> • Intensive care units • Emergency care • Hospital settings. • Difficult technical settings with multiple machines. 	<ul style="list-style-type: none"> • Contributing factors/hazards. Related to the incident characteristics.
<ul style="list-style-type: none"> • Administration and prescription the most common errors. • Administration problems: <ul style="list-style-type: none"> ○ Route of administration risk factor. (IV & injections higher prevalence) ○ Wrong time ○ Omission ○ Wrong medication. • Prescription 	<ul style="list-style-type: none"> • Incident characteristics.

<ul style="list-style-type: none"> • Younger&sicker patients report more medication errors. • Patients lesser incidences: <ul style="list-style-type: none"> ○ >75 years old ○ >85 years old&living alone • Patients that are reported to have a higher risk to suffer medication related incident: <ul style="list-style-type: none"> ○ Multi morbidity/polypharmacy. ○ >80 years old ○ Depression ○ Heart failure/immobilisation ○ Sicker patients ○ >65 more adverse drug reactions. 	<ul style="list-style-type: none"> • Contributing factors, hazards. Related to patients characteristics.
<ul style="list-style-type: none"> • Patients' characteristics not taken into account lead to medication errors. • Missing information on patients' background leads to medication errors. • Adverse drugs reactions due to misinformation on patients' history. • Missing information on patients' medical situation leads to medication errors. 	<ul style="list-style-type: none"> • Contributing factors/Hazards. Related to incident characteristics and patients characteristics.

<ul style="list-style-type: none"> • Misunderstanding within h.c.professionals leads to medication errors. • Communication problems. • Coordination in health care settings leads to medication errors. • Transcription of orders is a problem. • Nurses' workload is a problem. 	<ul style="list-style-type: none"> • Contributing factors/hazards. Related to the attributes of the incident. In this case related to the health care professionals.
<ul style="list-style-type: none"> • Missing errors due to late onset of manifestations of the consequences. • Missing errors that are not harmful. • Possibility of under reporting. • Difficult to differentiate medication errors and adverse drug reactions. • Missing adequate tools for reporting medication errors / different systems between different countries. 	<ul style="list-style-type: none"> • Contributing factors. Related to detention.
<ul style="list-style-type: none"> • Healthcare professionals' education and training important. • Increased awareness increases reporting. • Increased awareness in the last years and increase of effective systems to report and control medication errors. (Electronic systems). 	<ul style="list-style-type: none"> • Possible actions taking to reduce risks/ Mitigating factors

Table 4 Step 2 of categorization process.

After uniting the contents into classes, they were organized again into two big categories that describe the situation or trends on writings about Medication errors in Europe. The two new categories are *Risk factors for medication errors incidents to occur*, which

is subdivided in *patient's factors, settings, phases of the medication process, and system problems, and Challenges for reducing medication errors.*

The four subcategories are frequently mentioned in the articles and many similarities are founded amongst them: As per *Patient's factors*, age is repeatedly considered as an important factor to take into account, with some differences related to from which age the risk is higher, as well as sicker patients and those that were treated with more medicines (polypharmacy).

Settings is another repeatedly mentioned factor that increases the prevalence or the possibility for medication errors: The incidence was founded to be higher in hospitals rather than in ambulatory care, and to be treated in an acute/emergency settings increased the risk.

According to the articles, medication errors seems to occur more during the phases of prescription and administering, with administering as the most common step where they happen. Amongst the different possibilities, errors of giving medication in the wrong time and errors by omission are mentioned as the most common, followed by administering the wrong medication. Errors in prescribing seem to be more related to missing information on the patient's medication or to the actual prescription process, where information is missing or not properly explained.

Finally, the subdivision healthcare systems problems as a risk includes the information about situations or characteristics of the healthcare systems that were discussed to higher the incidence of medication errors. In this direction, repeatedly mentioned in the articles is the direct relation between missing information on patient's background or not taken into account all the patients' characteristics with a higher prevalence of medication errors.

In the second category are united all the factors named in the articles about the challenges that healthcare professionals face regarding medication errors. To solve the often mentioned miscommunication between healthcare professionals (both oral and writing), coordination problems and workload are united into *challenges*, as well as the need for healthcare professionals education, the importance of awareness and reporting and the

implementation of systems and tools in the European countries that reduce the medication errors prevalence.

5 DISCUSSION

Seven of the ten articles selected presented some data about prevalence of medication errors or incidents with medication (*Table 5*). Settings studied were different but the data obtained showed that the numbers are in concordance with the data presented in the background: Two articles that presented data from a national level, showed that around 10 % of the population suffers from medication errors, which coincide with the information that the WHO gave in the “A brief synopsis on patient safety” (WHO, 2010). The same document from the WHO stated that 8-12% of European that stayed in a hospital would suffer from some form of medication error, which in this work is showed to be higher (WHO, 2010). The three articles that have information from hospitals are showing numbers of 20-26% of prevalence of medication errors, an alarming number that means that every fourth person that stays in a hospital would be suffering from some kind of incident, related to his/her medication.

On the analysis of the trends, many similarities were founded within the articles. Wholeness of the patient is a well discussed topic amongst the medical and nursing communities as well as patient-centred care (Pelzang, R. 2010) and in this context, appears to be as important. There can be noted the fact that with independence of whether the study was based on a pediatric, elderly or an acute ward, the significance of understanding the patient as a whole, having his/her medical background information and taking into account personal patient’s characteristics, its crucial to minimize the risk for medication errors.

Regarding patient’s characteristics as a risk factor for suffering medication errors, sicker patients seemed to be on a higher risk, which it is connected with the fact that polypharmacy was founded to be as well a risk factor. The relationship here seems to be simple: patients that are consuming a higher amount of drugs regularly have it easier to suffer from a medication error. This is connected also with the age of the patient, since usually older patients are sicker than the young ones, and they consume more drugs and therefore they have a higher risk.

This was almost the common trend but in two of the ten articles analysed it was presented that older patients, older than 75 and 80 presented a lower risk and it was dis-

cussed that could be caused by the increase awareness from the medical community about the risk of that drugs represent for elderly people (Wawruch M et al, 2008).

The results obtained about the risk on the different phases of the medical process and settings are in concordance with the World Health Organization study from 2010 (WHO, 2010) where hospital settings seems to be more likely for medication errors to occur and prescription and administration of medication the moments where the risk is higher.

As it was mentioned in the background of this work, an increase awareness of the importance of medication errors and on their reporting seems to have grown in the last years and healthcare professionals and organizations are taken a more active position on it. This awareness is considered crucial, since in general lines it could be discussed that medication errors are more likely caused by medical professionals, either by direct mistakes or because of miscommunication or misinformation.

The findings on the possibility that some drugs were more likely to be part of an incident were not conclusive so it cannot be discussed no trend on that level, just highlighted the fact that intravenous and injected medications seem to be the most frequent via where mistakes occur.

6 CONCLUSION/RECOMMENDATIONS

The two research questions proposed in the beginning of the present work are considered answered on some level. To the question: What is the current situation regarding medication errors in Europe? , the answer found is that the situation seems in concordance with the information presented by the WHO and the European commission, where almost one fourth of patients that undergo a medical treatment are at risk or suffer a medical mistake related to medication.

The second research question: Is there a common trend or a possibility to draw similarities in between medication errors that occur in different European countries? has a positive answer. Medication errors in European countries seems to be more prevalent in

hospital settings and in those settings where the workload or the demand is higher as in acute or emergency care. The medication errors seem to be more common during the processes of prescribing and administering the drugs, and the reason for this may vary but miscommunication or lack of information on the patient's background seems to have a high impact on the prevalence of incidents. Older and sicker patients are on a higher risk of suffering from an error related to their medication and intravenous or injected medications are more likely to be part of a medication incident.

The conclusions obtained from this results are of great importance for the nursing field as well. . Nurses are, in most European Countries, the ones administering the medicines to the patients, which means that they are directly responsible for an alarming amount of preventable medication errors in patients. Nurses' implication is clear and so from this work would be recommended to focus during the Nursing studies in explaining this situation to the future professionals... Educating, training and increase awareness of the problem to both student and practising nurses.

Due to the fact that the results obtained from this work are in the same line as those presented by the WHO and the European Commission, and many actions and programmes are being implemented, the recommendation from this work would be to continue in the same direction. To increase awareness of the problem and training for the healthcare professionals and for the patients, and to aim for that the prevalence of medication related incidences would be close to zero in a near future.

7 ETHICAL CONSIDERATIONS

Ethical considerations regarding this work are related to the material handling. Mentioning of author's names and references are written through the text to avoid inappropriate presenting information of others as one's own. Academic fraud, which "*involves the intentional misrepresentation of what has been done*" (Polonsky&Waller, 2014) has therefore being avoided by an extensive explanation of the research process and its steps.

According to Elo&Kyngäs, the trustworthiness of the content analysis process is achieved through “*dissection of the analysis process and validity of the results*” (Elo&Kyngäs, 2007), where the validity criteria are basically common for all qualitative researches and have to do with, amongst other things, the quality and representativity of the material, and on how well the results can be connected with the work (Elo&Kyngäs, 2007).

In the present work, the quality and representativity of the research material was intended to achieve through an explanatory selection process report, and by having a sample as representative as possible. The articles chosen were from diverse European countries and from different settings, so it is considered that the representativity of the material is acceptable. Maybe in future researches, a bigger sample should be studied, with documents from each one of the countries analysed, to get a more accurate result on trends and prevalence of medication errors. For this bachelor degree thesis ten articles were considered sufficient.

The results are connected with the rest of the work, background and theoretical framework of the thesis, they are applicable and in concordance with previous researches, so their validity is as well considered to be acceptable.

The result representation has been transparent and the author has no conflict of interests.

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APPENDICES.

Table 4. First categorisation process.

Similar concepts highlighted	Headings.
<ul style="list-style-type: none"> • Some drugs were more frequently part of an incident. • Certain medications are most likely to be wrong prescribed than others. • Some drugs have more prevalence of being wrong prescribed than others. 	<ul style="list-style-type: none"> • Some medications are more likely to be part of an incident than others.
<ul style="list-style-type: none"> • More prevalence in intensive care units. • High incidence of errors in intensive care. • Medication errors incidents reported showed that hospital setting & emergency care were places where the risk of medication errors to occur is higher. • Acute settings seems to have more medication errors reported than primary care. 	<p>Higher probability/incidence of medication errors.</p> <ul style="list-style-type: none"> • Intensive care units • Emergency care • Hospital settings. • Difficult technical settings with multiple machines.

<ul style="list-style-type: none"> • Difficult settings and multiple machines represent a higher risk situation for medication errors to occur. 	
<ul style="list-style-type: none"> • Administration of medication in hospital highest reported, followed by prescription errors. • Intravenous administering higher reported errors. • Wrong route administration frequent error. IV administration error frequent. • More frequent in prescription process and administration • High incidence of errors in determining/calculating the dosage. • Intravenous via more incidence of medication errors. • Wrong time errors, overdose or wrong medication are the most common errors in the case studied. • Administration problems: wrong time or omission. • The most common incident were wrong time error, omission and finally unauthorized drug error. • Administration route related to the incidence of errors, injections higher prevalence. 	<ul style="list-style-type: none"> • Administration and prescription the most common errors. • Administration problems: <ul style="list-style-type: none"> ◦ Route of administration risk factor. (IV & injections higher prevalence) ◦ Wrong time ◦ Omission ◦ Wrong medication. • Prescription
<ul style="list-style-type: none"> • Young patients more likely to reported more medication errors and sicker patients also. 	<ul style="list-style-type: none"> • Younger & sicker patients report more medication errors. • Patients lesser incidences:

<ul style="list-style-type: none"> • Multi morbidity and > 80 years old more like to suffer a medication related incident. • Medication errors related to polypharmacy • Risk for suffering an incident in prescription: polypharmacy followed by immobilisation, depression and heart failure. • Older patients higher prevalence till 75 where the risk diminishes. • Polypharmacy as a risk factor for medication errors in the prescribing phase. • Adverse drugs reaction due to medication difficult to recognize and more difficult in elderly patients. • Increase of adverse drug reactions prevalence in patients over 65 years old. • Living alone and >85 years have less risk for suffering an error in their medication prescription. • Higher use of health care higher the risk to suffer a medication error 	<ul style="list-style-type: none"> ◦ >75 years old ◦ >85 years old&living alone • Patients that are reported to have a higher risk to suffer medication related incident: <ul style="list-style-type: none"> ◦ Multi morbidity/polypharmacy. ◦ >80 years old ◦ Depression ◦ Heart failure/immobilisation ◦ Sicker patients ◦ >65 more adverse drug reactions.
<ul style="list-style-type: none"> • Importance of taking into account the patient characteristics for safe-prescribing. • Importance of checking patient's medications and background to avoid medication errors. 	<ul style="list-style-type: none"> • Patients' characteristics not taken into account lead to medication errors. • Missing information on patients' background leads to medication errors. • Adverse drugs reactions due to misinformation on patients' history.

<ul style="list-style-type: none"> • Medication errors related to lack of information of the patient's history. • The prescription and preparation of medication sometimes does not take into consideration the individual patient, dosage is sometimes calculated on estimated body measurements values, which could differ very much from patient to patient. • Lack of united patients' information databases makes it easier for medication errors to occur and to be unreported. Missing patients' data increases the possibility for medication errors to occur. • Prescribing similar medication due to lack of knowledge or misinformation about the patient. 	<ul style="list-style-type: none"> • Missing information on patients' medical situation leads to medication errors.
<ul style="list-style-type: none"> • Problems in prescription caused by misunderstandings. • Communication problems, patient-doctor, incomplete prescriptions. • Poor coordination reported as a cause. • On site preparation problems-lack of experience/knowledge. • Transcribing patients' information's to patients' sheets, and written orders results in high incidence of errors. • Transcription of doctors' orders by nurses resulted in higher incidence of 	<ul style="list-style-type: none"> • Misunderstanding within h.c. Professionals leads to medication errors. • Communication problems. • Coordination in health care settings leads to medication errors. • Transcription of orders is a problem. • Nurses' workload is a problem.

<p>errors.</p> <ul style="list-style-type: none"> Nurses' workload associated with medication errors. 	
<ul style="list-style-type: none"> Possibility that prescription of wrong medication does not show directly reaction and so it goes unreported. Possibility that medication errors are unreported because their consequences or harms not show directly after the error has occurred. Under-reporting medication errors. Medication errors and adverse drugs reactions difficult to differentiate. Possibility that this is covering the amount of medication errors reported. Low harmful cases may go unreported. Methods for reporting medication errors in anaesthesia settings not easy or clear in the UK. Different studies and tools from different European countries makes difficult the comparison. Southern Europe incidence or errors in prescriptions higher than northern European countries. 	<ul style="list-style-type: none"> Missing errors due to late onset of manifestations of the consequences. Missing errors that are not harmful. Possibility of under reporting. Difficult to differentiate medication errors and adverse drug reactions. Missing adequate tools for reporting medication errors / different systems between different countries.
<ul style="list-style-type: none"> Professionals training and education important factor for avoiding medication errors Increase reported medication problems in the last years. Medical errors considered avoidable by health care professionals. More participation related to the increased 	<ul style="list-style-type: none"> Healthcare professionals' education and training important. Increased awareness increases reporting. Increased awareness in the last years and increase of effective systems to report and control medication errors. (Electronic systems).

<p>awareness of the importance of reporting medical mistakes. .</p> <ul style="list-style-type: none">• Increased awareness and new measurements to control medication errors.• Electronic systems shown to decrease the amount of medication errors caused by transcribing data, but presents new challenges as staff training, higher knowledge.• Medication errors related to health care professionals training.	
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Table 5. First categorization process.