Assessing the hospital survey of patient safety culture.

A review of the assumptions, methods and data analysis protocol [1]

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Resumo

O tema segurança do paciente está a tornar-se num dos tópicos mais discutidos nas instituições de saúde, nomeadamente ao nível dos hospitais. O objetivo deste artigo é apresentar uma revisão da estrutura do modelo de questionário Hospital Survey on Patient Safety Culture (HSOPSC) e analisar sumariamente as principais investigações que foram desenvolvidas utilizando este modelo de questionário para explicar as dimensões da cultura de segurança do doente. Este instrumento foi criado pela Agency for Healthcare Research and Quality (AHRQ), dos Estados Unidos da América e tornou-se num modelo comumente usado neste país bem como internacionalmente, com ou sem adaptações.

Palavras-chave: Segurança do doente, hospital, questionário, qualidade, cultura.

Abstract

Patient safety theme is becoming one of the most discussed theme in healthcare facilities, mainly at hospitals. The main aim of this paper was to present a review of the structure Hospital Survey on Patient Safety Culture model (HSOPSC) and analyze in a brief summary of the main researches that were developed recently using this survey model to explain the patient safety culture dimensions. This instrument was created by the Agency for Healthcare Research and Quality (AHRQ) and became a survey commonly used in the United States of America and increasingly used internationally, with or without adaptations.

Keywords: Patient safety, hospital, survey, quality, culture.

Introduction

Unsafe healthcare provided to patients results in numerous millions of patients suffering injuries or even death, worldwide (Baker et al. 2004).

A patient can be defined as a person *"who is a recipient of healthcare, itself defined as services received by individuals or communities to promote, maintain, monitor or restore health. Patients are referred to rather than clients, tenants or consumers, although it is recognized that many recipients such as a health pregnant woman or a child undergoing immunization may not be regarded, or regard themselves, as patients. Healthcare includes self-care"* (World Health Organization, 2009). The definition of this concept has a great importance, because all this research is based on the most important element of healthcare – the patient. The patient is the center of each healthcare process, such as simple plain x-ray or a more complex magnetic resonance examination.

According to the World Health Organization (2009), safety can be defined as the *"reduction of risk*

of unnecessary harm to an acceptable minimum. 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". Due to the human nature of the healthcare professionals, the presence of unnecessary harm will occur at some point in the healthcare processes, however, the probability of so, should be kept as minimal as possible. To maintain this possibility as low as possible, it is of greater importance to keep each healthcare process (such as a plain radiography or the intravenous catheterization of a patient) updated, according to the current national or international standards. Also, the continuous professional development, which is mandatory in some developed countries, is a good way for healthcare professionals to continue to learn and grow throughout their careers, allowing them to keep their skills and knowledge updated and to work safely, legally and effectively (Health and Care Professions Council, 2014).

Adverse events related to healthcare are a frequent circumstance of healthcare provided at hospitals (Vries et al. 2008). This is an undesirable fact that evolved as a serious problem, being responsible for the death of more patients per year than breast cancer or acquired immunodeficiency syndrome (AIDS) (Vries et al. 2008). The occurrence of adverse events is one important indicator of patient safety. Adverse events are defined "*as unintended injuries or complications that are caused by healthcare, rather than by the patient's underlying disease, and that lead to death, disability at the time of discharge or pro-longed hospital stays*" (Baker et al. 2004).

The sum of two concepts stated above, namely patient and safety, results in the concept of patient safety, which can be defined as "*the reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum. 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*" (World Health Organization, 2009).

In other words, patient safety can be regarded as the result or outcome of safe healthcare processes developed by the professionals. This is the ultimate

goal of the whole healthcare staff, however, each process is always dependent on the safe care environment of the department (Kristensen et al. 2007).

Adverse events can occur in all places where healthcare is delivered. Most of the knowledge developed on this theme derive from research in hospitals, because the risks involved are higher for the patient. However, many adverse events occur in other healthcare settings such as private medical offices, nursing homes, pharmacies, community clinics or even the homes of patients (World Health Organization, 2004).

Patient safety theme is becoming one of the most discussed theme in healthcare facilities, mainly at hospitals. This topic is regarded as a structural and structuring component of the health processes developed and a very important variable of the holistic concept of quality in healthcare (Fernandes & Queirós, 2011).

Healthcare is a very complex field of practice, where professionals from very different areas (multidisciplinary) work together. Despite the strong dependence on self-acting, where the team factors and the organizational factors have a very important role (Fragata, 2010) the need to check safety culture from the inside assumes a very important role (Chen & Li, 2010), mainly when the institutions are making the effort for improving the quality of healthcare provided.

The complexity and magnitude of this problem, at the hospital level, was systematically evaluated. The majority of damage caused to patients could have been avoided (by more than a half). The number of adverse events (unintended damage that may result in patient suffering or even death and is related with the healthcare process and not the underlying disease) occurring in inpatients was 3.7%, and 13.6% of these adverse events resulted in death of the patient (Brennan et al. 1991).

If the professionals share a patient safety culture, with a positive result of increasing it at the healthcare institutions, a way to reduce the occurrence of adverse events as much as possible emerges. By learning from the outcomes of the errors and by the restructure of the processes, all aiming to

avoid errors or incidents, it is possible to create a culture where patient safety is regarded as an achievable main goal (Handler et al. 2006).

The safety culture develops as a result of values, attitudes, competences and patterns of individual or group behaviour, determining the compromise, the style and the expertise of safety healthcare (Health and Safety Comission, 1993).

To establish and develop a safety culture in the whole healthcare, such as a hospital, or in a specific department, the first step is to determine their current level of safety culture (Provonost et al. 2004).

All the healthcare facilities, including the Radiology Departments aim to deliver a high quality examination at the lowest possible risk of harm to the patient. Unfortunately, this goal is difficult to be achieved completely, and errors will happen in the processes developed. It is very important that healthcare professionals and managers are aware that the possibility of error is always present and thus should create the need to identify weak areas of the healthcare processes that require close attention in order to intervene and reduce the occurrence of errors as much as possible.

To address areas of potential weakness, where errors can easily happen, several measuring tools, such as surveys made to the professionals, can be used. Much of these tools allow to access the patient safety culture of an entire institution or department. Most of the research worldwide uses quantitative surveys to measure safety culture, and at the same time propose changes in the patient safety by implementing interventions, targeting several dimensions of safety accessed in those surveys.

The main aim of this paper was to present a review of the structure Hospital Survey on Patient Safety Culture model (HSOPSC) and analyze in a brief summary of the main recent researches that were developed recently using this survey model to explain the patient safety culture dimensions.

1- The emergence of Safety as an Organizational Culture

Some industries with potential hazardous environment like the aviation or the nuclear power plants assess consistently their general safety and some of the historical ways to measure it were based on reported data of employee injuries or fatalities (Colla et al. 2005). Nowadays, this idea of safety has changed in a way that not only technical failures are causes of accidents, but organization, management and human factors all together are considered the causes of accidents (Weick et al. 1999).

Based on this new opinion of safety, these industries started to use predictive measures to evaluate safety, with emphasis to the concept of safety climate, which usually refers to the quantifiable constituents of the safety culture. This safety culture structure depends on management behaviours, safety systems implemented and, maybe the most important, the employee perception about safety and its importance (Guldenmund, 2000).

There is a commonly accepted rule that states that each person, when performing one task, regardless the task, will, in some point of that task, commit a mistake or, also named, an error (Fragata, 2011).

Errors can be avoided through the conception of systems which hinder their occurrence and that enable the correct procedures to be carried out. For example, some modern vehicles are designed in a way that drivers cannot start them without depressing the clutch or, another example, airplane pilots are scheduled in a way that they do not fly many hours uninterruptedly, to not compromise their focus and consequently their performance (Kohn et al. 2000).

Derived from the previous human related rule that at some point an error will be made, every human being that work with the same complex systems may do similar types of errors, if subjected to similar conditions. This rule brings more emphasis to learn from errors that happened in other high risk industries, as the design of error preventing systems and the need of a cultural change inside healthcare organizations (Department of Health, 2002).

The immediate causes of accidents are frequently identified as human error or technical failure, but the research and analysis on the circumstances around major accidents for instance, the space shuttle "Challenger" or "Columbia", several accidents with buildings and vehicles such as planes or trains or even nuclear incidents, show that besides the immediate causes, there are several questions related to more extensive aspects. These aspects are related to the whole organization (The Institution of Engineering and Technology, 2012).

It becomes clear that basic failures in organizational structure, culture and procedures may induce an accident in an organization. This environment is being more and more described in terms of perceptions, beliefs and behaviours that are generally shared inside the organization.

Safety culture is defined as "*the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's health and safety management*" (Sorra & Nieva, 2004).

1.1- The emergence of Patient Safety concept

It is a paradox to note that patients may suffer any type of harm while they are under a healthcare procedure.

In the Radiology Department, a possible severe consequence to the patient is the administration of iodinated contrast material. This procedure is used in x-ray based techniques and aims to improve the diagnostic accuracy of that technique. However, this procedure as an inherent risk of develop an allergic reaction that might become fatal despite it is very low, less than one in 130,000 at most (Bettmann, 2004). It is clear that a risk versus benefit must be done by the healthcare team regarding this procedure to each patient, however, healthcare is very complex and the results of each procedure are influenced by several factors.

It is unavoidable that inside any healthcare organization, patients may be negatively affected, and in each encounter between the patient with the healthcare provider, the possibility of damage is present (Sandars & Cook, 2007).

"*Primum non nocere*" is a Latin adage attributed to Hippocrates and means a simple, but at the same time, very important concern that must be remembered "first do no harm".

This has been the axiom of healthcare professionals for the past decades, and in the last few years, society had paid close attention to this subject (Harmsen et al. 2010; Nagel & Nagel, 2007).

In 1854, during the Second World War, a nurse named Florence Nightingale collected data on soldiers' deaths, and she realized that many of them were dying due to health problems acquired after their admittance into the hospital, at a higher rate than from the lesions the lead them to the hospital.

This nurse introduced actions to increase the hygiene and the standardization of healthcare procedures and she accomplished her goal to decrease the dead rate among soldiers in the hospital (Shell & Karen, 2008).

Healthcare can be seen in many ways as an industry, it involves a high risk of causing some kind of morbidity or even mortality, which makes it an industry that is prone to hazard (Kohn et al. 2000).

Patients seek healthcare to reduce their suffering associated to health problems. From this statement, it is important to define what the meaning of health is.

"*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*" (World Health Organization, 1948). Despite this definition has been written more than sixty years ago, this has not changed since then.

This definition has in its core the whole human being, since it does not restrict health to the organic state alone, but says for example, that the human being is required to have good mental and social conditions, such as a balanced psychological state or employment and a house to live.

Nevertheless, while the healthcare system or service is provided with the capability to cure disease or relieve suffering, it can also origin greatly unnecessary harm to the patients. This potential to cause harm to patients, should not be regarded as a suitable, or common, consequence of providing healthcare.

Nowadays there exists a large acceptance and awareness of the problem on the clinical error and a determination, in some sectors at least, to face them. But, despite the awareness and the efforts made to avoid them, they are as old as medicine itself (Vincent, 2010).

Since the report of the Institute of Medicine entitled *"To Err is Human: Building a Safer Health System"* in 1999, healthcare organizations spent tremendous attention on this theme (Blendon et al. 2002; Health et al. 2000) and developed a wide range of patient safety efforts (Altman et al. 2004; Leape & Berwick, 2005). The healthcare organizations should adopt organizational models and strategies of other high risk industries to minimize the errors and reduce the damage to patients, as much as possible, appealing to a consistent pattern of safety and improving the patient safety (Kohn et al. 2000).

Some numbers about errors are presented, to better understand the magnitude of this problem. Errors cause between 44000 and 98000 deceases every year in American hospitals and over 1000000 injuries (Kohn et al. 2000).

Other patients are daily exposed to possible errors, but are fortunate to suffer no noticeable damage (Aron & Headrick, 2002).

Preventable harm that can result in severe disability can occur in 1 in every 10 patients admitted to a hospital, and 1 in every 3000 patients may die due to an adverse event (Nagel & Nagel, 2007).

Baker et al. (2004) found that medical errors are the eighth more important cause of death in the USA. They also state that data on this subject, from other countries, are similar.

Jha et al (2010) suggested that damage due to the intervention of healthcare happens too frequently

and that a considerable part of this damage is preventable. These authors states that to reduce harm caused to patients requires a directed, ingenious and properly managed research. Also, the authors claim that this is the way to achieve a better understanding of its sources and contributing elements.

The multidisciplinary approach with which this subject has been understood, rapidly emerged a change in paradigm and soon a new subject was introduced – Patient Safety. Most of the attention regarding patient safety has been placed to hospitals, because at this level of the healthcare there is an evident presence of high-risk procedures and is always in a potentially hazardous setting.

The publication from Harvard Medical Practice Study alerted the healthcare professionals and the governing entities to the extent of clinical errors. More than 30000 hospital records of patients, in a random selection of 51 hospitals in the New York state, carefully were analysed. The adverse events observed were long term hospitalization due to other causes than the base pathology, physical debility when discharged or death due to healthcare procedures. The percentage of admissions that resulted in an adverse event was 3.7%. The proportion of adverse events that could have been prevented was 58% (Sandars & Cook, 2007).

These results were confirmed in a similar study carried out in intensive care units in Colorado and Utah, with 2.9% of the admissions resulting in adverse events, 53% of them were avoidable (Vincent, 2010).

One of the largest researches was carried out in Australia, where 805 incidents of 324 general practitioners were analysed. The estimated rate of adverse events was 40-80 by 100000 appointments, 76% were avoidable and 27% had the potential to cause severe damage to patients. In a study conducted in the United Kingdom about prescriptions emitted by general practitioners and then analysed by pharmacists, 0.13% were identified as potential causes of adverse reactions (Sandars & Cook, 2007).

This last rate may seem insignificant, but it is important to consider that more than a million appointments take place every day and 1.5 million pre-

scriptions are generated on a daily basis (Vincent, 2010).

In a revision of 4031 adult admittances in a hospital, from 11 medical and surgical departments of two hospitals in United States of America, there were 6.5 adverse events derived from medication recorded, for each 100 admissions, and 28% of these medication errors were avoidable (Wilson et al. 1995).

Medication related adverse events are also common in primary healthcare, with 13-51% of all reported incidents being related to medication. In two studies done in the United Kingdom about the reason for admission in hospitals, about 6% were considered as a result of a medication related adverse event that was avoidable (Sandars & Cook, 2007). Others types of adverse events are avoidable infections, surgical and diagnosis errors and the events that include medical equipment (Wilson, et al., 1995).

Several studies that have been examined, point to similar numbers (10 adverse events by 100 admissions). In 65% of these cases, there is no harm to patient, in 30% damage occurs, 5% severe damage happens, including death, and 50% can be avoided (Fragata, 2011).

1.2- Patient Safety and medical erros?

The majorities of medical errors are preventable (Leape et al. 1991). These errors are due to a set of several contributing elements such as poor processes, poor methods, improper setting, fading equipment's and/or poor management.

According to what has been said, Patient Safety can be understood as the delivery of healthcare without any kind of error.

Patient safety represents a worldwide public healthcare problematic which affects countries and levels of development. World Health Organization (WHO) Patient Safety, known as the World Alliance for Patient Safety was established in 27th October 2004 and intended to gather global efforts to increase the healthcare safety for patients in all WHO

state members, by reducing the number of disease, damages and deceases caused to patients throughout therapeutic or diagnostic procedures (World Health Organization, 2008; Shermam et al. 2009; Nagel & Nagel, 2007).

There are various fences to understand the nature of human error. There is an inherent possibility to fail just because of being a human. In fact, the price of this humanity is the reliability. From the Latin axiom *errare humanos est* it is possible to understand that this an ancient awareness that keeps very actual since there is no known area where humans work that does not present flaws of process or result (Fragata 2011).

Some contributing factors to fail may be fear of retaliations and absence of comment after errors are reported (Jeffe et al. 2004), not fully distributing and working with error reports (Farley et al. 2008) and a perceived lack of system changes subsequent to errors that occurred (Harper & Helmreich, 2005).

In an ageing population, healthcare consumers are presenting more and more complex and chronic diseases and patients are becoming active participants rather than passive receivers of care (Lizarondo et al. 2010).

The several types of errors and harm to the patient are classified regarding domain, or where they occurred, along the spectrum of healthcare processes and facilities.

The error is defined as the deviation of a result from a pre-established plan or the use of a wrong plan to achieve a given goal, both impossible to achieve. The error supposes that there was a plan and that the error was involuntary.

According to Fragata and Martins (2006), it is possible to err actively, or by commission, and passively, or by omission. Lapses or flaws are considered automatic and due to the lack of agility or attention, while mistakes are errors due to poor planning, poor use of the rules or poor rationale of the professional.

According to the same authors, honest errors are done by persons that follow the rules, the processes

and that accomplish their obligations and they still error due to their human condition. There might be some responsibility of the professional, but there is no liability possible, while in the negligence cases, where errors happen due to disrespect of the rules and good practices, there must be direct liability of the professional.

At last, according to the same authors, a near miss is an error that could have caused physical, or other type of damage to the patient. The possibility did not occur because the patient physiologically resisted to the error or some other barrier to the error prevented it, just in time, allowing recovery of the accident trajectory and aborting it without consequences.

According to Leape et al (1993) there are typically four types of errors in the healthcare area, that can even happen simultaneously:

- Diagnostic errors that include error or delay in diagnosis of a pathology in the patient;
- Failure to employ indicated tests to detect the pathology in a patient;
- Use of outdated tests or therapy due to lack of continuous profession al development and;
- Failure in the performance expected, based on the outcomes of monitoring or testing the patient.

According to Jha et al (2010), experts examined evidence and identified (table 1) important breaches concerning developing, transitional and developed countries. These topics were divided in three quality domains:

- Structural factors

   An important cause of unsafe care is the collapse of intricate processes, also known as organizational accidents. These failures derive from several factors from different system levels and may include latent failures (Reason, 2005). Worldwide, lack of healthcare professionals properly trained is a fact that impairs safety. In 2006, WHO released the notice that in 57 countries, there was a lack of 2.4 million general practitioners, nurses and midwives

(World Health Organization, 2006);

- Processes

   Lack of diagnosis is not enough studied, but is the base of an important kind of error in healthcare. It presents broadly rates of delayed and/or mistaken diagnosis. This happens also in developed countries regardless of their available technology. In these countries, at least 10% to 15% of diagnoses are inappropriate (Graber et al. 2005).

- Outcomes

   At all interactions between professionals and patients there is a chance of an adverse event to occur, affecting the result of the healthcare system. For example, in Canada, 7.5% to 10.4% of inpatients suffer damage due to medication errors (The Canadian Adverse Events Study, 2004).

Table 1: Major Patient Safety Topics

Quality domain	Patient Safety Topic
Structure	Organizational determinants and latent failures Structural accountability: the use of accreditation and regulation to advance patient safety Safety culture Inadequate training and education, manpower issues Stress and fatigue Production pressures Lack of appropriate knowledge, availability of knowledge and transfer of knowledge Devices, procedures without human factors engineering
Process	Errors in process of care through misdiagnosis Errors in the process of care through poor test follow-up Errors in the structure and process of care: counterfeit and substandard drugs Measures of patient safety Errors in process: unsafe injection practices
Outcomes	Adverse events and injuries due to medical devices Adverse events due to medications Adverse events: injury to patients due to surgical errors Adverse events due to healthcare associated infections Adverse events due to unsafe blood products Patient safety among pregnant women and newborns Patient safety concerns among older adults Adverse events due to falls in the hospital Injury due to pressure sores and decubitus ulcers How to bring the patients' voices into the patient safety agenda

Source: Based on Jha, et al. (2010)

1.3- Patient Unsafety

Patient unsafety occurs when errors take place and could be divided as acts of omission (failing to do the right thing) or commission (doing something wrong), as mentioned before. Any of this acts result in dangerous healthcare circumstances and/or unintentional damage to the patient (World Health Organization World Alliance for Patient Safety, 2006). Patient outcome is the impact upon a patient, which is totally, or partially attributable to unsafety (Shermam et al. 2009).

According do World Health Organization, each time a patient is harmed by the health system, it is a betrayal of trust. These so-called adverse events are actually reverse events. Instead of advancing people's health and well-being, medical errors send them backwards, causing more harm than good (World Alliance for Patient Safety, 2006)

Incident: A Patient incident is an episode or situation that could have, or did produced, a needless damage to a patient that Wagner and Van der Wal (2005) defined as an unintentional episode during the healthcare process that produces, could have produced or still might end in damage to the patient. A patient incident can be as simple as a reportable circumstance, a near miss explained before, a no harm incident or a harmful incident (adverse event) (Shermam et al. 2009). An incident type is a descriptive word for a class formed of a group of incidents with a common origin.

Accident: An accident was defined by Fragata (2011) as an undesirable occurrence that affected the healthcare process and that comprmised, in a complete manner, the final intended outcome, resulting disturbances or major consequences that will be permanent.

Adverse Event: Zegers et al. (2007) defined an adverse event as an unintended damage that resulted in momentary or perpetual incapacity, decease or extended hospital stay, and is caused by healthcare processes instead of patient's primary disease. The adverse events are not mandotorily caused by errors or negligency attitudes, could

avoidable or unavoidable and surely cause loss of eficiency and increase of monetary costs (Fragata, 2011). According to the same author, events can be divided in major events and minor events:

- Major events occur during a diagnostic or interventional procedure and threatens the patient's life immediately, imposing immediate life saving actions. Usually, these events cause relevant physical damage.
- Minor events also occur during a diagnostic or interventional procedures but, unlike the major events, do not threaten patient's life immediately and directly. The most frequent minor events are called flux disturbances and they could be as simple as a phone ringing. However, these events seem to have a cumulative effect and can end in a major event.

Never Event: The Department of Health's Patient Safety Policy team also has described what a never event is. Never events are defined as "serious, largely preventable patient safety incidents that should not occur if the available preventative measures have been implemented by healthcare providers" (Department of Health, 2011). Fragata (2011) defined a never event as severe adverse events that cause damage to patient or even death, occuring always in an unexpecred way and are isolated in time. This type of event suggests the need for a research to identify processes or organizational flaws that could reveal the cause of that accident. These events define an organization's risk and safety and usually have close mediatic attention due to their outcomes. These events are those that never should have happened. To be a never event, an incident must include the following criteria:

- The incident has strong probability for, or has caused severe harm or death;
- There is proof of the similar happening in the past;
- There is existing national international recommendations to prevent this event from happening;
- Happening is easy to define, identify and can be accessed continually.

The occurrence of this type of events indicate the organisation may not have put in place the right systems and processes to prevent the incidents from happening and thereby prevent harmful outcomes. It is also an indicator of how safe the organisation is and the patient safety culture within that setting.

Danger, Risk and Error Chain: Danger is present when there is chance for potential adversity, that propiciates the occurrence of adverse events with damage as the outcome. Danger could also be seen as an agravating to the initial risk of a given procedure (Fragata, 2011). According to the same author, the inherent risk is an unavoidable risk, associated to a procedure, such as a given diagnositic or treatment, that is present even when done in ideal conditions, with the best equipment and best team possible. The aditional risk is what patients will be exposed, besides the inherent risk, when victims of safety errors or avoidable circumstances. The error chain designates that a accident usually is consequence of a sequence of errors, involving the complex organizational causes such as the blun end and the sharp end. The only way to study these sequence of causes is the technique of root cause analysis.

2- The Hospital Survey on Patient Safety Culture

The patient safety culture as a dimension on healthcare quality, is crucial as a way to add value to the organizational culture. The Hospital Survey on Patient Safety Culture (HSOPSC) is an instrument to access patient safety culture commonly used worldwide and, consequently, in countries with inhomogeneous levels of development in regards to the healthcare.

The HSOPSC was developed by a research organization that was contracted by the Agency for Healthcare Research and Quality (AHRQ), from the United States of America. This research was subsidised by the Medical Errors Workgroup of the Quality Interagency Coordination Task Force (QuIC) (Sorra & Nieva, 2004).

The goal of the authors of this survey was: *"To develop a reliable, public-use safety culture instrument that hospitals could administer on their own to assess patient safety culture from the perspective of their employees and staff"* (Agency for Healthcare Research and Quality, 2004).

The researchers started the development of this survey by reviewing the literature related to patient safety. Then, several surveys on patient safety were reviewed and hospital staff was contacted about this topic.

The pre-test to initial survey was carried out with hospital professionals with the aim of confirming if all the items were understandable. The authors used two techniques to pre-test the survey: the cognitive testing and the external review of the survey.

The purpose of cognitive testing is to investigate the adherence of participants to respond questions. At the same time, it is intended to know if respondents comprehend the question and if they provide truthful responses. The cognitive testing technique guarantees that a survey question successfully detects the holistic scientific intent of the question and, at the same time, makes sense to the respondents (Centers for Disease Control and Prevention, 2005).

The performance of a question skimmed with cognitive testing can be summarized in the following four stage question-response process:

1. Comprehension
2. Retrieval
3. Judgment
4. Response

To execute cognitive testing, semi-structured interviews are usually conducted, with a small number of participants, similar to the participants that the survey is intend to be used with. The authors will unambiguously check how participants understood a question and how they formulated an answer. Unlike a field test, the primary goal of a cognitive test is to provide an in-depth exploration of particular concepts, processes and patterns of interpretation

instead of produce statistical data that can be universal for an entire population.

As a result, cognitive testing is done to a selected and small intentional sample (Centers for Disease Control and Prevention, 2005).

Cognitive interviews were conducted by the authors, with the following staff (Agency for Healthcare Research and Quality, 2004):

- A nurse supervisor.
- A risk supervisor.
- A section clerk.
- A dietician.
- A food services member.
- A respiratory therapist.
- A pharmacist
- A pathologist
- Several nursing, resident and general practitioners from different Unites States of America hospitals.

The authors also requested for evaluations of the draft survey from other investigators that were familiarised with safety culture issues, a hospital manager, a group of general practitioners, as well as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

The final pilot survey included of 79 items assessing 14 dimensions of patient safety culture (Agency for Healthcare Research and Quality, 2004a,b).

2.1- Draft HSOPSC Pilot Survey

The draft HSOPSC pilot survey evaluated the several dimensions in a five point Likert answer scale, stating degrees of agreement, ranging from strongly disagree to strongly agree, or frequency, ranging from never to always (Agency for Healthcare Research and Quality, 2004a,b).

2.1.1- Review of methodology and statistical analyses of draft HSOPSC

The sampling technique used by the authors of the survey, to carry out the pilot study, was purposive sampling, in order to ensure that all of the job categories were included.

The pilot survey was administered to a sample of 21 hospitals from six different United States of America states. The authors gathered information from ten different hospitals.

Additionally, information from one Veterans Health Administration (VHA) hospital and ten hospitals from Georgia were sent to researchers by the VHA and the Emory Center on Health Outcomes and Quality.

The hospitals sample was designated in order to be the most inhomogeneous possible, including several regions, teaching levels of the hospital, sizes of the hospitals. This inhomogeneity is essential to guarantee that the most different types of healthcare facilities are represented in the results of the pilot survey, thus enhancing the strength of data.

In addition, two organizations were hospitals that aim to get profit, one organizations was a veterans' hospital, and one was a geriatric hospital.

For the ten hospitals that were part of the sample, the researchers delivered a cover letter presenting the research, the survey itself, a envelope to return the completed survey.

Researchers also arranged contact elements in each hospital that helped them to distribute and to collect surveys in the hospitals. There were one hospital that the envelope was sent to the home of the participants, instead of their workplace.

The results from the pilot survey were statistically analysed. The statistics aimed to check the consistency, the validity and the factor structure of the survey, using exploratory factor analysis and confirmatory factor analysis. The final version of HSOPSC was made by keeping the best items.

A total of 1437 surveys were returned, from the

4983 sent to several healthcare institutions, resulting in a 29% response rate. The survey used in the pilot study, as the final version of Hospital Survey on Patient Safety Culture, includes few demographic questions to prevent that confidentiality problems arise.

Most of the respondents were female (81%) and 84% of the participants had direct interaction with patients. The average age of the participants was 43 years old and they worked for about 10 years on that healthcare facility.

About the statistical analyses done to the items in the Hospital Survey on Patient Safety Culture, the main goal was to obtain "a shorter, revised survey instrument, based on conceptually meaningful, independent, and reliable safety culture dimensions, with three to five items measuring each dimension" (Sorra & Nieva, 2004).

Sorra and Nieva (2004) used exploratory factor analyses on the data obtained from the survey to explore the dimensionality. The main components extraction was used and the varimax rotation, to maximize the independence of the factors.

The exploratory factor analysis showed the existence of multiple factors (that can also be considered as dimensions of the survey). Almost all of these distinct factors were the same as the groupings made during the construction of the survey with eigenvalues equal to 1.0, or greater.

The total variance explained by the 14 components or factors is 64.5%, with almost all items loading highly on only one factor (with a factor loading greater than or equal to 0.40).

To further examine the dimensionality of the survey, Sorra and Nieva (2004), took into account the previous culture dimensions, and carried out a confirmatory factor analysis (CFA). The CFA is used to analyse all the variables simultaneously, intending to find the subjacent structure to the whole variables group (Hair, et al., 2006). So, CFA allowed to test the fit of a model with a number of factors suggested and additionally specified the items that account for each factor given, based on the exploratory factor analysis.

The authors achieved, after CFA, a final model with 12 dimensions:

- Two outcome dimensions.
- Ten safety culture dimensions composed by three or four items each, with a total of 42 items. These safety culture dimensions are split in three groups, the internal context, the external context and the outcome or result variables.

The authors of this survey used several model fit indices. They found that all fit indices met the criterion for good conformance with indices at 0.90 or above (Sorra & Nieva, 2004). The closer each of these indices is to 1.00, the better the fit of the model to the data, as shown and explained below:

- *The comparative fit index* (**CFI**): The fit of a model refers to the ability of that model to replicate the data. So, a well-fitting model is one that is equitably consistent with the hypothesized one. Also a good-fitting measurement model is required before inferring the causal pathways of the structural model. Nowadays, there are several fit indices. In the Incremental Fit Index (IFI), also called Relative Fit Index (RFI), the value of zero indicates the worst possible model (null or independence model) to the value of 1 indicates the best possible model. The Absolute Fit Index (AFI) supposes that the best fit model has a fit of 0. So, the measure of fit then defines how far the model is from perfect fit. Finally, after reviewing the fit indices, the CFI is only interpretable when comparing two different models. In this case, the value of 0 indicates a non-fitting model while the value of 1 indicates a perfectly adjusted model (Pestana & Gageiro, 2014). It is helpful to distinguish CFI from AFI, because this last one does not need a comparison between two models.

- *The goodness-of-fit index* (**GFI**): The GFI gives information on the proportion of correlations between the original variables that can be explained by the model. The GFI varies between 0 and 1, where 0 indicates no ad-

justment of factorial analyses to the data and the closer to 1, the higher the proportion of data explained by the model. As indicators of the adjustment quality, it is suggested by Pestana and Gageiro (2014) that for the interval between 0.90 and 0.95 (excluded) the GFI should be considered reasonable, or adequate and for the interval between 0.95 (included) and 1 the GFI should be considered good. Values below 0.5 are nor acceptable.

- *The adjusted GFI* (**AGFI**): The AGFI is the GFI (explained above) adjusted to the degrees of freedom (df) relative to the number of observed variables and therefore can be used in less complex models with fewer parameters (Schermelleh-Engel et al. 2003). AGFI values range between 0 and 1 with larger values indicating a better fit. Usually for this index, values above 0.90 indicate a good fit relative to the baseline model, while values greater than 0.85 may be considered as an acceptable fit. Values below 0.5 are nor acceptable.

- *The normalized fit index* (**NFI**): The NFI, or also known as Bentler-Bonett Index (BBI), is an incremental measure of fit. The best possible model is defined as model with a chi-square ($\chi2$) of zero and the worst model by the $\chi2$ of the null model. A NFI value between 0.90 and 0.95 is considered to show acceptable fit, above 0.95 is considered a good fit. Values below 0.5 are considered to be a poor fitting model. When NFI equals one, the target model is the best possible improvement over the independence model (Schermelleh-Engel et al. 2003).

- *The non-normalized fit index* (**NNFI**): The NNFI, or also known as Tucker-Lewis Index (TLI) is another incremental fit index that, unlike the NFI (or BBI) has no penalty for adding parameters. If the index is greater than one, it is set at one. It is interpreted as the BBI, meaning that the best possible model is defined as model with a chi-square ($\chi2$) of zero and the worst model by the $\chi2$ of the null model. Also, in the same way as BBI, a

TLI value between 0.90 and 0.95 is considered to show acceptable fit, above 0.95 is considered to have a good fit and below 0.50 is considered to be a poor fitting model.

- The *Root-Mean-Square Error of Approximation* (**RMSEA**) achieved in the pilot survey was 0.04 (Sorra & Nieva, 2004). This is an amount of approximate fit of the model to the population and is therefore concerned with the discrepancy due to approximation, per degree of freedom. This measure is limited below by zero and the fit is better when the value of RMSEA is closer to 0. It is said the model has a good fit to the data if the RMSEA value is 0.05 or less. Values between 0.05 (excluded) and 0.08 can be considered as an adequate fit, and values between 0.08 (excluded) and 0.10 as a poor fit. RMSEA values above 0.1 are not acceptable, because the model does not fit to the data achieved and therefore the model should be excluded. This measure is regarded as relatively independent of sample size, and additionally favours parsimonious models (Schermelleh-Engel et al. 2003).

Furthermore, the composite scores are calculated by obtaining the mean of responses to the items in each dimension, varying from 1 (low score) to 5 (high score). These scores were originated from the five point Likert scale. It is important to take in to account that some items should be reverse coded, since some questions were negatively worded (Sorra & Nieva, 2004).

The authors Sorra and Nieva (2004) calculated the correlation between the dimensions based on the composite scores estimated. The construct validity can be evaluated by the relation between composite scores and it is proposed to have moderate correlations (between 0.20 and 0.40) or weak correlations (less than 0.2). If the correlation between two dimensions is high (equal or above 0.85) these dimensions are considered to measure the same construct, so they should be linked and some items can be eliminated. In the pilot survey of HSOPSC, correlations between the safety culture composites or scales ranged from 0.23 (Nonpunitive Response to

Error and Frequency of Event Reporting) to 0.60 (between Hospital Management Support for Patient Safety and Overall Perceptions of Safety).

Moreover, the authors, in the pilot survey of HSOPSC performed an ANOVA by hospitals to check if there was greater response variability on the safety culture dimensions between hospitals. Remember that the One-Way Anova explores the effect of one factor in the endogenous, or dependent, variable, testing if the means in each category of the respective factor are the same or not between themselves. The use of this test in independent samples demands the following assumptions (Pestana & Gageiro, 2014). The observations in each group have normal distribution or, at least, symmetric; the variance of each group is the same between themselves, thus being homocedastic. They found that all these test results on each of the 12 composites had statistical significance, supporting the hypothesis that hospitals have differentiated scores on each dimension. This means that different hospitals have different composite scores on regards to safety culture outcome variables and dimensions (Sorra & Nieva, 2004).

3- From Dimensions and Outcome Variables of HSOPSC to Items and Reliability Analysis of each dimension of HSOPSC

The Hospital Survey on Patient Safety Culture survey emphasizes the patient safety characteristics as well as error and event reporting.

This survey measures seven unit-level dimensions of safety culture, also called internal context. These dimensions together compose what can be classified as the internal context, when referring to a given unit or department:

- Supervisor/Manager Expectations & Actions Promoting Safety (4 items);
- Organizational Learning – Continuous Improvement (3 items);
- Teamwork within Units (4 items);
- Communication Openness (3 items);
- Feedback and Communication about Error (3 items);
- Nonpunitive Response to Error (3 items);
- Staffing (4 items).

In addition, this survey measures three hospital-level dimensions of safety culture, also called external context. These dimensions together compose what can be classified as the external context, when referring to a given unit or department:

- Hospital Management Support for Patient Safety (3 items);
- Teamwork Across Hospital Units (4 items);
- Hospital Handoffs and Transitions (4 items).

Additionally, this survey measures two outcome dimensions, also called result variables, which were included in the final format. These dimensions together compose what can be classified as the results of type 1:

- Overall Perceptions of Safety (4 items);
- Frequency of Event Reporting (3 items);

Finally, this survey also measures the following outcome single item variables. These two variables can be named as the results of type 2:

- Patient Safety Grade (of the Hospital Unit or Department) (1 item);
- Number of Events Reported (1 item);

In Fig. 2 it is possible to observe a schematic interpretation of the final Hospital Survey on Patient Safety Culture in a more comprehensive way.

The Hospital Survey on Patient Safety Culture, as stated above, is composed of twelve dimensions and two outcome variables.

In total, the HSOPSC presents 42 items, numbered and divided by letters from A to G. Some of the items, as explained below, are negatively worded. This means that, when computing the scores of these items, these answers should be reverse coded. This is of major importance, for example, to calculate the percentage of positive answers to each item.

Fig. 2: Safety culture dimensions and outcome measures of HSOPSC
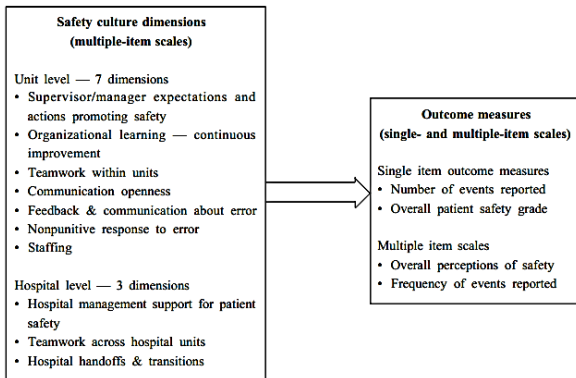
Source: Based on Jha, et al. (2010)

In tables in annex it is possible to observe the groups of dimensions (divided by internal context, external context and outcome or result or type two variables), their respective items, the outcome variables and the possible answers along a five point Likert scale are presented. The Likert scale used, as mentioned above, is composed by response scales of agreement ("Strongly Disagree", "Disagree", "neither Agree nor Disagree", "Agree" and "Strongly Agree") or frequency ("Never", "Rarely", "Sometimes", "Most of the time" and "Always") In addition, the reliability statistics, using the Cronbach's α, based on the pilot test data from 21 hospitals and more than 1,400 professionals (Agency for Healthcare Research and Quality, 2014) are provided for each one of the dimensions.

This survey has also two more single-items designated as outcome or result or type one variables. These single items are presented in the table in annex.

4- Worldwide Psychometric Validation of HSOPSC

Several researchers worldwide dedicated to the psychometric validation of Hospital Survey on Patient Safety Culture to their countries, with the aim of checking the accuracy of this instrument. After its translation and adaptation to the semantic of the respective country, the researchers have written and published peer reviewed papers of results about the cultural context in which this instrument is intended to be used.

In table 2 it is presented a brief summary of the main recent researches that were developed recently using the Hospital Survey on Patient Safety Culture.

In the study entitled "Cultura de seguridad del paciente y factores asociados en una red de hospitales públicos españoles" developed by Gama et al (2013), the percentage of positive perceptions regarding patient safety was 73.5% for the dimension "Teamwork within units" and 63.2% for the dimension "Supervisor/Manager expectations & Actions promoting patient safety". None of the participants' perceptions on the dimensions that affect patient safety achieved the threshold limit of 75%, meaning that no strengthened areas of patient safety exist. The dimension "Staffing" obtained 61.0% of negative responses, this one being very important area to improve. In this research, 90% of the participants have direct contact with patients, which is an original characteristic of this study. Other professional categories such as clerks or porters were not included since they do not need a university level degree to develop their duties and, because of that, may not be able to fully understand the patient safety concept. This research was done with a sample of 1113 healthcare workers from several areas and from 8 different Hospitals. 62.3% of the participants were nurses and 30.8% were physicians. The response rate of this research was 35.4%.

Table 2: Recent researches using the HSOPSC

Authors and date	Country	Sample size	Main findings
Gama, *et al.* 2013	Spain	1113	None of the perceptions on the dimensions that affect patient safety achieve the threshold limit of 75%.
Alahmadi 2010	Saudi Arabia	1224	Positive responses ranged from 22% to 87%.
Waterson, *et al.* 2010	United Kingdom	1017	The Cronbach's α for dimensions ranged between 0.58 and 0.83. CFI=0.91, NNFI=0.89, RMSEA=0.04 and standardized root mean square residual = 0.05.
Nordin, *et al.* 2013	Sweden	1023	The Cronbach's α of dimensions ranged from 0.60 and 0.87. CFA presented a χ^2=4162.741 p=0.00, GFI was 0.616, CFI=0.603, TLI=0.582 and RMSEA=0.085.
Ito, *et al.* 2011	Japan	6395	Cronbach's α was 0.92. CFA presented a χ^2=11035 df=753, CFI=0.89, TLI=0.88, RMSEA=0.046, and SRMR=0.044.
Najjar, *et al.* 2013	Palestine	1960	The Cronbach's α for dimensions ranged between 0.41 and 0.87. CFA presented a χ^2=2294 df=753, CFI=0.91, TLI=0.90 and RMSEA=0.04, SRMR=0.05.
Reis, *et al.* 2012	Brazil	31	70% of the items that compose the original HSOPSC were considered unaltered and 30% were considered some modified.
El-Jardali, *et al.* 2010	Lebanon	6807	The Cronbach's α ranged between 0.45 and 0.80. The dimension with highest positive score was Teamwork within units (82.3%), and the dimensions with lowest Non-punitive response to error (24.3%).
Nie, *et al.* 2013	China	1160	Cronbach's α was 0.84. The inter-item correlation was sufficient (χ^2=2163.578 *df*=1159 *p*<0.01. The KMO test showed a satisfactory sample adequacy with a value of 0.829.
Pfeiffer & Manser 2010	Switzerland	2989	The Cronbach's α ranged between 0.64 and 0.83. RMSEA=0.047, while GFI=0.878, NFI=0.859 and TLI was 0.901.
Smits, *et al.* 2008	Netherlands	583	The Cronbach's α ranged between 0.49 and 0.84. No exceptionally high inter-dimension correlations were detected in this research.
Bodur & Filiz. 2010	Turkey	309	Cronbach's α was 0.88. The factor loading of each item was above 0.40. The overall patient safety score was 44%.
Moghri, *et al.* 2012	Iran	343	Cronbach's α was 0.82. GFI value was 0.96 and the AGFI was 0.98. The factor loadings to all factors, except two, ranged between 0.93 and 0.87.
Fajardo-Dolci, *et al.* 2010	Mexico	174	The Cronbach's α ranged between 0.12 and 0.90. The overall patient safety score was 49%.
Chen & Li, 2010	China	788	The Cronbach's α ranged between 0.35 and 0.78. CFA presented a χ^2=63.65 (*p*=0.002), CFI=0.989, TLI=0.979 and RMSEA=0.033.

CFI – Comparative Fit Index; **NNFI** – Non-Normed Fit Index; **RMSEA** – Root Mean Square Error of Approximation; **CFA** – Confirmatory Factor Analysis; χ^2 – Chi square test; **GFI** – Goodness-of-Fit Index; **TLI** – Tucker Lewis Index; **SRMR** – Standardized Root Mean square Residual; **HSOPSC** – Hospital Survey on Patient Safety Culture; *df* – degrees of freedom; **KMO** – Kaiser-Meyer-Olkin test; **AGFI** – Adjusted (to the *df*) Goodness-of-Fit Index

In another research entitled "Assessment of patient safety culture in Saudi Arabian hospitals" developed by Alahmadi (2010), the rate of positive responses ranged from 22% to 87%. Strengthened areas of patient safety were "Organizational learning – Continuous improvement" (87%), "Teamwork within units" (84%) and "Feedback and communication about errors" (77%). Areas with potential of being enhanced were "Number of events reported" (43% of the participants did not reported any event in the past twelve months), "Non-punitive response to error" (22%), "Staffing" (22%) and "Teamwork across units" (27%). In addition, it was found that management interest in patient safety is only triggered after the occurrence of an adverse event. Leadership should view errors as an opportunity to improve, because a blame culture influences the ability to evaluate errors negatively. This research was done with a sample of 1224 professionals, from several professional categories in 13 general hospitals. In this research, the sample was composed by 60% of nurses, 8.3% of physicians and 7.6% of allied health professionals in hospitals. The response rate of this research was 47.4%.

In the study entitled "Psychometric properties of the Hospital Survey on Patient Safety Culture: findings from the UK" developed by Waterson et al. (2010), the main findings show a positive opinion with regard to the safety culture of the participants workplace. From all the surveys distributed, 1461 were returned, from which only 1017 had given valid responses to the 40 items. The response rate of this research was 37%. The Cronbach's α for dimensions ranged between 0.58 and 0.83. The confirmatory factor analysis (CFA) proved poor level of adequacy, the comparative fit index (CFI) was 0.91, the non-normed fit index (NNFI) was 0.89, and the root mean square error of approximation (RMSEA) was 0.04 and standardized root mean square residual (SRMR) was 0.05.

The SRMR is an absolute measure of fit and is defined as the standardized difference between the observed correlation and the predicted correlation. Because the SRMR is an absolute measure of fit, a value of 0 indicates perfect fit and the SRMR has no penalty for model complexity. This measure indicates the quality of the adjustment of the model to

the factorial analysis and values lower than 0.05 indicate very good fit, values between 0.05 (included) and 0.1 (excluded) indicate good fit and values equal or higher than 0.1 are unacceptable. The sociodemographic data present a sample composed by 60% of nursing staff, 21% of allied health professionals, 11% of management staff and 8% of medical staff. Less than half of the sample worked in their current hospital for more than 5 years.

The research entitled "Swedish Hospital Survey on Patient Safety Culture – Psychometric properties and healthcare staff's perception" developed by Nordin et al. (2013), had a response rate of 48%. The sample was composed by 64% of registered nurses, 29% of enrolled nurses and 7% of physicians. Two more dimensions were added to the original HSOPSC survey. Two dimensions showed positive responses with scores above 75%. The Cronbach's α of dimensions ranged from 0.60 and 0.87 and to the new dimensions ranged between 0.81 and 0.72. The translated HSOPSC had CFA with a chi square test (χ2) of 4162.741 significance value (p) of 0.00, goodness-of-fit index (GFI) was 0.616, CFI was 0.603, Tucker Lewis index (TLI) was 0.582 and RMSEA was 0.085. This cross-sectional research was done based on 1117 returned surveys, from which 1023 were valid. The sample was composed by 3 hospitals. The inclusion criteria was to be a registered nurse, enrolled nurse or physician. Also, they had to be working for more than 3 months, servicing grade of 50% or more and not have had one extended absence from work. The overall response rate was 48%.

The study entitled "Development and applicability of Hospital Survey on Patient Safety Culture (HSOPS) in Japan" developed by Ito et al. (2011), had a Cronbach's α of 0.92, with scores ranging from 0.46 and 0.88 in several dimensions. The translated HSOPSC to Japanese language presented, in a twelve factor model, a CFA with χ2=11035, 753 degrees of freedom (df), CFI was 0.89, TLI was 0.88 and RMSEA was 0.046 and SRMR. Polychoric correlations were calculated for the 12 dimensions. The highest correlation was between "Communication Openness and Feedback" and "Communication about Error". The lowest correlation was between "Frequency of Event Reporting" and "Staff-

ing". "Frequency of Event Reporting" also showed small correlations to other dimensions, ranging between 0.04 and 0.37. "Overall Perceptions of Safety" had medium correlations, ranging from 0.39 to 0.54. The 12 dimensions Japanese HSOPSC had a valuable role to access patient safety culture in Japan. This research was done with a sample of 6395 professionals, from 13 acute care general hospitals. Different professional groups participated. 61% were nurses, 10.7% were clerks, 8.4% were physicians, 7.5% were allied health professionals and the remaining were other professional groups in hospitals. The response rate was 74.9%.

In the study entitled "The Arabic version of the hospital survey on patient safety culture: a psychometric evaluation in a Palestinian sample" developed by Najjar et al. (2013), was found that only the dimension "Frequency of Event Reporting" scored a reliability coefficient higher than 0.8 (0.87). The global Cronbach's α was not specified. The lower reliability coefficient was 0.41 in the dimension "Communication Openness". The translated HSOPSC to Arabic language presented, in a twelve factor model, a CFA presented a χ^2 of 2294 with df=753, CFI of 0.91, a TLI of 0.90 a RMSEA of 0.04 and a SRMR of 0.05. This research was done with a sample of 2022 returned surveys, from which 1960 were valid to be used. 13 Palestinian hospitals participated in this research. Most of the respondents were nurses (51.3%), followed by physicians (17.7%), management and administrative staff (10.5%), allied health professionals (9.4%), related healthcare professionals (5.4%) and others (4.7%).

The study entitled "Adaptação transcultural da versão brasileira do Hospital Survey on Patient Safety Culture: etapa inicial" developed by Reis, et al. (2012), showed that, in accordance to the translation team experts and the target population in Brazil, 70% of the items that compose the original HSOPSC were considered unaltered and 30% were considered somewhat modified. No researches on transcultural adaptation and psychometric evaluation of HSOPSC to the Portuguese language were found. This research was done with a sample of 31 professionals, from different hospitals in Rio de Janeiro, which answered the pre-test designed to evaluate the verbal comprehension and clarity of each question.

In the study entitled "The current state of patient safety culture in Lebanese hospitals: A study at baseline" developed by El-Jardali et al. (2010), was found that the dimensions with highest positive score were "Teamwork within units" (82.3%), "Hospital management support for patient safety" (78.4%) and "Organizational learning and continuous improvement" (78.3%). Dimensions that scored the lowest were "Handoffs and transitions" (49.7%), "Staffing" (36.8%) and "Non-punitive response to error" (24.3%). 60% of the participants reported that they had not completed any report on adverse events in the last year and 70% graded the patient safety of their hospital as Excellent. The reliability coefficient ranged from 0.45 in dimension 5 "Overall perception of patient safety" and 0.80 in dimension 8 "Frequency of events reporting". This research was done with a sample of 6807 returned surveys, from the 12250 surveys sent to 68 Lebanese hospitals. About the composition of the participants group, 57% were nurses, 13.7% were clerks and allied health professionals and 3.7% were physicians. The remaining were other professional groups from the hospitals including pharmacists and administration.

In the study entitled "Hospital survey on patient safety culture in China" developed by Nie et al. (2013), was found that the positive response rate for 10 dimensions of patient safety culture ranged between 45% and 88%. The lowest positive score was to the dimension Staffing and the highest score was to the dimension Organizational learning-Continuous improvement. The dimension Overall perception of patient safety scored 45% of positive response rate and Feedback and communication about error scored 50% of positive response rate. The internal consistency was measured by the Cronbach's α and ranged between 0.40 and 0.75. The overall reliability was 0.84. The inter-item correlation was sufficient (χ^2=2163.578 df=1159 p<0.01. The Kaiser-Meyer-Olkin (KMO) test showed a satisfactory sample adequacy with a value of 0.829. The KMO is a measurement on the variables homogeneity, which compares simple correlations with partial correlations between variables. Partial correlations between two variables is the cor-

relation that exists between these two variables after the elimination of the influence of other variables, which may affect the first ones (Maroco, 2007). This research was done with a sample of 1160 valid surveys were returned from participants working in 32 hospitals in 15 cities across China. 66% of all participants were nurses, 33% were surgical clinicians, and 30% were internal medicine clinicians. 94% of all the participants work directly with patients in hospitals. The response rate was 77%.

In the study entitled "Development of the German version of the Hospital Survey on Patient Safety Culture: Dimensionality and psychometric properties" developed by (Pfeiffer & Manser 2010), was found that the global fit was not satisfactory. Three criteria indicated an adequate fit with the RMSEA=0.047, while GFI was 0.878, NFI was 0.859 and TLI was 0.901. These values showed that the fit is not sufficiently accurate to confirm the proposed factor structure. In the exploratory factor analysis, eight underlying factors explained 59.8% of the items variation. Overall, the scales showed satisfactory to good internal consistency. The Cronbach's α ranged between 0.64 in the dimension "Communication openness" and 0.83 in the dimension "Hospital management support for patient safety". This research was done with a sample of 3005 returned surveys, from which 2989 were valid, applied to the employees of a large University Hospital. This survey was developed to German speaking countries and the name was changed to PaSKI. About the participants on this research, 36.8% were registered nurses, 15% were managers and administrators, 13.7% were physicians, 11.5% were medical and technical staff, 6.5% were nurse-assistants and the remaining were others. Response rate was 47%.

In the study entitled "The psychometric properties of the 'Hospital Survey on Patient Safety Culture' in Dutch hospitals" developed by Smits et al. (2008), was found that the internal consistency measured by the Cronbach's α ranged between 0.49 in the dimension "Staffing" and 0.84 in the dimension "Frequency of event reporting". Other dimensions that scored unacceptable reliability coefficients were "Organizational learning – continuous improvement" (α=0.57) and "Teamwork across hospital units" (α=0.59). The highest inter-dimension corre-

lations was between Feedback about and learning from error/Supervisor managers expectations and actions (r=0.47) and between Feedback about and learning from error/Hospital management support (r=0.47). No exceptionally high correlations were detected in this research. This research was done with a sample of 583 participants completed the survey. 59.8% of them were registered nurses, 6.8% were medical consultants, 6% were resident physicians, 4.3% were clerks, 2.6% were nurse in training and 2.4% were managers. Four hospitals were general hospitals, three were teaching hospitals and one was a university hospital.

In the study entitled "Validity and reliability of Turkish version of "Hospital Survey on Patient Safety Culture" and perception of patient safety in public hospitals in Turkey" developed by (Bodur & Filiz 2010), was found that the response rate varied from 51% for physicians, 64% for temporary nurses and 91% for registered nurses. The internal consistency, assessed by the Cronbach's α, for all items was high (0.88). The factor loading of each item was above 0.40, so the Turkish version of this survey was considered to be appropriate. The overall patient safety score was 44%. The highest percentage of positive response rates was in the dimension "Teamwork within units", while the dimension "Frequency of events reported" received the lowest rate of positive responses. About the error reporting of the sample, 84% of the healthcare workers never reported errors related to patient safety. This research was done with a sample of 309 participants fulfilling the survey, from which 135 were nurses, 102 were physicians and 72 were temporary nurses from three public hospitals.

In the study entitled "The psychometric properties of the Farsi version of "Hospital survey on patient safety culture" in Iranian hospitals" developed by (Moghri et al. 2012), was found that the internal consistency, assessed by the Cronbach's α, ranged between 0.57 in dimension two and 0.8 in dimension three. The general internal consistency for all items of the survey was 0.82. The GFI value was 0.96 and the AGFI was 0.98. The factor loadings to all factors, except two, ranged between 0.93 and 0.87, which shows the appropriate structure of this survey. This research was done with a sample of 343

completed surveys returned. The professional work in four different hospitals and the professional groups presented in the sample were physicians, nurses and allied health in hospitals. The response rate was 81.6%

In the study entitled "Cultura sobre seguridad del paciente en profesionales de la salud" developed by Fajardo-dolci et al. (2010), was found that the patient safety grade given by the professionals when classifying their workplace varied from Excellent (4.6%), to Failing (1.7%). The majority of the professionals classified the patient safety as good (23.6%) or acceptable (46.6%). Almost half of the sample (46%) declared that during the past twelve months no event report was made, regarding any situation that may have occurred. The general perception of patient safety scored 49%. The dimension with the lowest percentage of positive responses was "Non-punitive response to error" (26%). On the other hand, the dimension with the highest percentage of positive responses was "Organizational learning" (66%). In this research, it is show that none of the responses reached the threshold of 75% of positive responses, meaning that there was not found strengthened areas of patient safety in this research. The reliability coefficient, obtained through the Cronbach's α were low to the dimensions of "Global safety perception" (0.35), "Non-punitive response to errors" (0.55) and "Staffing" (0.12). This research was done with a sample of 174 healthcare professionals, which attended a symposium about patient safety organized by the Comisión Nacional de Arbitraje Médico in México.

In the study entitled "Measuring patient safety culture in Taiwan using the Hospital Survey on Patient Safety Culture (HSOPSC)" developed by Chen and Li (2010), it was based on three different levels: the unit level, the hospital level and the outcome level. At the unit level, the average of positive responses to the dimensions "Teamwork within units" reached a score of 94%. The dimension "Supervisor/manager expectations and actions promoting patient safety" scored 83% of positive answers. At the hospital level, the average of positive responses to the dimension "Hospital management support for patient safety" was 62%, while the dimension "Teamwork across hospital units" scored a positive

response rate of 72%. In regards to the outcome-level aspects of patient safety culture, the dimension "Overall perceptions of safety" scored a rate of positive responses of 65% as for the dimension "Frequency of event reporting" scored 56%. The reliability coefficient, obtained through the Cronbach's α ranged from 0.35 in dimension 7 "Communication openness", and 0.78 in dimension 1 "Teamwork within units". This research was done with a sample of 1000 professionals from 23 medical centers, 20 regional hospitals and 306 community hospitals, in Taiwan. The sample was composed by 600 nurses, 300 physicians and 100 hospital administrators.

Final Remarks

The importance of using a common set of definitions and dimensions, enables information to be shared in a more comprehensive and generalized way. This builds the possibility to share strategies that improve safety culture in healthcare organizations, such as hospitals (Halligan & Zecevic, 2011).

One of the several surveys to access the patient safety culture was produced due to the need for a measuring tool identified by The Medical Errors Workgroup, part of the Quality Interagency Coordination Task Force (QuIC). This national task force covers the whole territory of the United States and was established in 1998 in accordance with a Presidential directive.

This organization had funded the development of Hospital Survey on Patient Safety Culture (HSOPSC), a hospital applicable survey focusing on the organizational culture of patient safety, to the Agency for Healthcare Research and Quality (AHRQ) by contract with a private research organization (Sorra & Nieva, 2004).

This instrument, property of the AHRQ, became a survey instrument commonly used, firstly in the United States of America and later and increasingly at the international level, with or without modifications or adaptations to the needs of the researchers (Hedsköld et al. 2013).

The authors in charge for the validation research of the original survey, provided a comprehensive report on the development of HSOPSC. About the statistical exploration of the HSOPSC, an exploratory factor analysis was conducted in order to discover the dimensionality of the survey through their fit to the data collected. The results of the exploratory factor analysis revealed the existence of fourteen distinct factors in the original survey (Sorra & Nieva, 2004).

A confirmatory factor analysis was then performed by the authors. The final model achieved through this technique was composed by forty two items distributed by twelve factors. Two factors access outcomes or results and ten factors access the safety climate of the organization. The authors stated that the model fit satisfactorily the data collected, and has good reliability coefficients accessed by the measure of Cronbach's α (Sorra & Nieva, 2003).

As stated before, a healthcare organization can always improve when applying surveys to access the level of patient safety and the culture surrounding it. These surveys can help to identify areas that require close attention in need of improvement, by the management.

If the evaluation is done in several different times at the same organization, or at the same department, it enables to evaluate safety initiatives related to the current culture on patient safety. Also, as allowing to check the evolution, it enables to make comparisons with external or even international data on the same theme, if using the same, transculturally validated instrument (Sorra & Nieva, 2003).

The resulting data from the application of scientifically recognized tools about patient safety culture offer managers an accurate perspective on the state of their safety management systems (Mearns et al. 2001). Because the HSOPSC is a world know instrument, used in several researches worldwide, healthcare managers can use the results achieved through application of this survey for benchmarking purposes.

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Nota:

[1] This paper is part of Kevin Azevedo thesis developed as a requisite for completing the Health Sciences PhD on Patient Safety in a Radiology Department at University of Cranfield, with new conceptual elements reviewed and rewrited with Carlos da Silva and António Abrantes, as co-author. The supervisors of Kevin Azevedo thesis were Jeff Newman (Univ. Cranfield), Carlos Alberto da Silva (Univ Évora) and António Abrantes (Univ. Algarve).

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Table Annex 1: Groups, Dimensions, Items, Types of Answer and Reliability

	Dimension	Items	Type of Answer	Cronbach's α
Unit Level or Internal Context	**1** *Teamwork within Units*	A1.People support one another in this unit. A3.When a lot of work needs to be done quickly, we work together as a team to get the work done. A4.In this unit, people treat each other with respect. A11.When one area in this unit gets really busy, others help out.	Agreement	0.83
Unit Level or Internal Context	**2** Supervisor/Manager Expectations & Actions Promoting Patient Safety	B1.My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures. B2.My supervisor/manager seriously considers staff suggestions for improving patient safety. B3.Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts. (negatively worded) B4.My supervisor/manager overlooks patient safety problems that happen over and over. (negatively worded)	Agreement	0.75
Unit Level or Internal Context	**3** Organizational Learning – Continuous Improvement	A6.We are actively doing things to improve patient safety. A9.Mistakes have led to positive changes here. A13.After we make changes to improve patient safety, we evaluate their effectiveness.	Agreement	0.76
Unit Level or Internal Context	**6** Feedback & Communication About Error	C1.We are given feedback about changes put into place based on event reports. C3.We are informed about errors that happen in this unit. C5.In this unit, we discuss ways to prevent errors from happening again.	Agreement	0.78
Unit Level or Internal Context	**7** Communication Openness	C2.Staff will freely speak up if they see something that may negatively affect patient care. C4.Staff feel free to question the decisions or actions of those with more authority. C6.Staff are afraid to ask questions when something does not seem right. (negatively worded)	Frequency	0.72
Unit Level or Internal Context	**10** Staffing	A2.We have enough staff to handle the workload. A5.Staff in this unit work longer hours than is best for patient care. (negatively worded) A7.We use more agency/temporary staff than is best for patient care. (negatively worded) A14.We work in "crisis mode" trying to do too much, too quickly. (negatively worded)	Agreement	0.63
Unit Level or Internal Context	**12** Nonpunitive Response to Errors	A8.Staff feel like their mistakes are held against them. (negatively worded) A12.When an event is reported, it feels like the person is being written up, not the problem. (negatively worded) A16.Staff worry that mistakes they make are kept in their personnel file. (negatively worded)	Agreement	0.79
Hospital Level or External Context	**4** Management Support for Patient Safety	F1.Hospital management provides a work climate that promotes patient safety. F8.The actions of hospital management show that patient safety is a top priority. F9.Hospital management seems interested in patient safety only after an adverse event happens. (negatively worded)	Agreement	0.83
Hospital Level or External Context	**9** Teamwork Across Units	F4.There is good cooperation among hospital units that need to work together. F10.Hospital units work well together to provide the best care for patients. F2.Hospital units do not coordinate well with each other. (negatively worded) F6.It is often unpleasant to work with staff from other hospital units. (negatively worded)	Agreement	0.80

Source: Adapted from Sorra and Nieva, 2004

Table Annex 1: Groups, Dimensions, Items, Types of Answer and Reliability (cont.)

	Dimension	Items	Type of Answer	Cronbach's α
Hospital Level or External Context	**11** Handoffs & Transitions	F3.Things "fall between the cracks" when transferring patients from one unit to another. (negatively worded) F5.Important patient care information is often lost during shift changes. (negatively worded) F7.Problems often occur in the exchange of information across hospital units. (negatively worded) F11.Shift changes are problematic for patients in this hospital. (negatively worded)	Agreement	0.80
Outcome or Result or Type Two Variables	**5** Overall Perceptions of Patient Safety	A15.Patient safety is never sacrificed to get more work done. A18.Our procedures and systems are good at preventing errors from happening. A10.It is just by chance that more serious mistakes don't happen around here. (negatively worded) A17.We have patient safety problems in this unit. (negatively worded)	Agreement	0.74
Outcome or Result or Type Two Variables	**8** Frequency of Events Reported	D1.When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported? D2.When a mistake is made, but has no potential to harm the patient, how often is this reported? D3.When a mistake is made that could harm the patient, but does not, how often is this reported?	Frequency	0.84

Source: Adapted from Sorra and Nieva, 2004

Table Annex 2: Outcome or Result or Type One Variables

	Item	Answer
Patient Safety Grade	E1. Please give your work area/unit in this hospital an overall grade on patient safety	Excellent Very Good Acceptable Poor Failing
Number of Events Reported	G1. In the past 12 months, how many event reports have you filled out and submitted?	No event reports 1 to 2 event reports 3 to 5 event report 6 to 10 event reports 11 to 20 event reports 21 event reports, or more

Source: Adapted from Sorra and Nieva, 2004