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Correlation between the rate of adherence to the safe surgery checklist by healthcare professionals and the appearance of surgical complications

Correlação entre o índice de adesão ao checklist da cirurgia segura pelos profissionais de saúde e a ocorrência de complicações cirúrgicas

Correlación entre la tasa de adherencia a la lista de verificación de cirugía segura por parte de los profesionales de la salud y la aparición de complicaciones quirúrgicas

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ABSTRACT

Introduction: The aim is to investigate whether there is a direct correlation between the rate at which healthcare professionals adhere to the Safe Surgery Checklist (SSC) and the occurrence of surgical complications. To examine the current rates of application of the CCS, as well as to analyze how the use of the CCS contributes to the hospital's administrative and financial management. A cross-sectional, documentary, retrospective study with a quantitative approach. Non-experimental design and descriptive statistical analysis, using information collected from sectors related to patient safety, 240 surgical records *(n=240)* and the contract signed between the research setting and the city hall. The correlation value between the use of CCS and the occurrence of surgical complications was 0.006, which is considered low as the *phi correlation* coefficient (Φ) varies between -1 and +1. The highest rate of use of the checklist was 88.2% of the operations carried out and the lowest, 58.8%. The surgical checklist makes a significant contribution to the management of the hospital in question, because the more it is used, the greater the amount of funds transferred via the Unified Health System. Although the correlation found between adherence to the CCS and the occurrence of surgical complications was low, it is possible to defend its use as a tool that provides greater safety

for surgical patients, since each item on the checklist represents the chance of avoiding a harmful episode for the patient undergoing an operation. There is a need to improve the rate of application of the CCS, which is still a challenge for hospital management.

RESUMO

Palavras chave:

Segurança do Paciente; Cirurgia Segura; Qualidade em Saúde; Complicações Cirúrgicas; Checklist

Introdução: o objetivo é investigar a existência de correlação direta entre o índice de adesão dos profissionais de saúde ao Checklist da Cirurgia Segura (CCS) e a ocorrência de complicações cirúrgicas. Examinar os índices atuais de aplicação do CCS, bem como analisar de que maneira o uso do CCS contribui com a gestão administrativa e financeira do hospital. Pesquisa transversal, documental, retrospectiva com abordagem quantitativa. Desenho não experimental e análise estatística descritiva, sendo usadas informações coletadas nos setores relacionados à segurança do paciente, nos 240 prontuários cirúrgicos *(n=240)* e no contrato firmado entre o cenário da pesquisa e a prefeitura da cidade. O valor da correlação entre o uso do CCS e a ocorrência de complicações cirúrgicas foi de 0,006, considerado baixo, pois, o coeficiente de *correlação phi (Φ)* varia entre -1 e +1. O maior índice de utilização do checklist foi 88,2% das operações realizadas e o menor, 58,8%. O checklist cirúrgico contribui sensivelmente para a gestão do hospital pesquisado, pois, quanto maior é seu uso, maior o quantitativo de recursos repassados via Sistema Único de Saúde. Apesar de a correlação encontrada entre a adesão ao CCS e a ocorrência de complicações cirúrgicas ter sido baixa, é possível defender sua utilização como uma ferramenta que proporciona maior segurança aos pacientes cirúrgicos, pois, cada item do checklist representa a chance de evitar um episódio prejudicial ao paciente submetido a uma operação. É preciso melhorar o índice de aplicação do CCS, representando ainda um desafio à gestão hospitalar.

Introduction

It cannot be said that addressing the *quality of health services* and one of its dimensions, *patient safety*, is something new. Although it is a topic that has gained relevance more recently in Brazil, historical accounts show that healthcare-related infections (HAIs) and other related (non-infectious) problems are as old as the very emergence of hospitals (325 A.D.). For many centuries, patients were treated in hospitals with precarious sanitary conditions, which aggravated their health due to the proliferation of diseases. Often, they died from an illness contracted in hospital, rather than from the one that led to their hospitalization. This situation began to worry health care workers and organizations (1).

Hippocrates (460 B.C.), considered the father of medicine, is credited with the postulate *"Primum non nocere"*, which in free translation from Latin means, "First do no harm", i.e. the concern not to cause harm to the person who needs to use the health service is already quite old, as it was also already admitted that the execution of this service could cause some kind of harm (1-2).

Following this idea of not causing harm to users in health facilities, Ernest Codman, a doctor from the United States (Massachusetts), advocated improving the conditions of health facilities in order to achieve efficient results in the treatment of patients. He created the first method for monitoring the outcome of care in order to guarantee the quality of the medical services provided. And in 1917 Codman created a set of hospital standards (minimum standards) that form the basis of the mechanisms for evaluating health services known as *Accreditation*. These minimum standards refer, for example, to the need for every hospital to have a clinical laboratory unit and an X-ray unit (3).

The work entitled "*Diseases of Medical Progress*", carried out by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) in 1918, showed the frequent occurrence of *iatrogenic* diseases in healthcare centers, which are ailments caused to patients by *poor medical practice*, not stemming from their underlying disease, and are therefore *preventable*. Given this fact, the need to incorporate a *safety culture* in care institutions that sees failures and adverse events (AEs) as the consequence of a *poorly designed system* that produces bad results, and not as the result of the actions of *bad* people, was already confirmed. Therefore, it must be considered that errors result from the interaction of various factors and the whole situation must be approached holistically (integrally). It's also important to see these mistakes as a chance to learn, to improve the whole (the system) and to avoid harm by finding ways to prevent them from happening again, for example through *safe clinical practices,* risk management and root cause analysis of adverse events. Possible damages include illness, injury, disability and death (3-4).

It is clear, therefore, that there is a need for a systematic debate to improve healthcare processes, considering the numerous and rapid changes that have taken place in procedures and equipment aimed at the care area, the awareness of users about their right to access healthcare, which is considered a "good", and also society's growing questioning of the *quality* and *safety* offered by care institutions, since cases of adverse events occurring in patients are not uncommon in the press around the world (3-5).

Among the procedures needed to prevent and reduce the occurrence of EVs are the adoption of standards and procedures aimed at user safety, through good practices, and the acceptance of a *patient safety culture* by healthcare establishments. Another

action would be the compulsory inclusion of this topic in training courses for health professionals, at all levels: technical, undergraduate and postgraduate (4).

In order to build safe user care, it is necessary to understand the risks, admit that they exist, study the relationship between the health service and the occurrence of harmful incidents, and also monitor and manage episodes that could be harmful to patients (5).

At the 57th World Health Assembly in 2004, the World Health Organization (WHO) launched a program called the "Global Alliance for Patient Safety". Among the important actions of this alliance aimed at improving the care provided is the "Safe Surgery Saves Lives" campaign, the aim of which is to reduce the morbidity and mortality caused by surgical procedures, seeking to raise awareness in health units about the importance of safe surgery and the application of safe procedures in operations (6). Brazil is a member of this alliance. As a way of reducing risks and mitigating adverse events, the WHO included the use of *checklists* for *healthcare* as a whole after confirming the success of the Safe Surgery Checklist (SCC) (7).

With this in mind, the World Alliance for Patient Safety has developed the "International Safety Targets" to improve the most worrying non-conformities within healthcare institutions. Among the six goals created is *Goal 4*, which refers to ensuring that surgeries are performed on the correct site, procedure and patient (3-7).

It is in the *Surgical Center* that the most complex procedures in a health institution are carried out, because many rules must be followed. Workers are required to have up-to-date technical and scientific skills, responsibility, the ability to work as part of a team, as well as effective communication and interpersonal relationships. And the application of the checklist in surgeries in its three stages: *before induction of anesthesia; before the surgical incision; and before the patient leaves the operating room,* can help reduce surgical complications and thus contribute to patient safety (8). Complications arising from surgery can occur in the preoperative, operative and postoperative periods, and in some more critical situations, a harmful event can lead to the surgical patient's death. Considering the international context, studies show that in the United States, surgical adverse events are the third leading cause of death, surpassing even heart disease and cancer (9).

Studies on the effects of using the surgical checklist have shown that this tool prevents perioperative errors and complications, and have also found that the CCS helps to reduce the rates of complications and mortality from operations, as well as promoting greater patient safety and optimizing the work and communication of the care team (5-8).

In Brazil, the National Patient Safety Program (PNSP) was established with the publication of Ordinance No. 529 on April 1, 2013, representing recognition of the worldwide needs and the urgency that this issue requires. The PNSP includes *basic patient safety* protocols, including the *Safe Surgery Protocol*. Their aim is to *standardize* the practices carried out by care professionals in their activities, preventing and reducing the occurrence of events that result in harm to the user (10).

Given the importance that checklists have been gaining worldwide, including because they are a mechanism that measures the quality of care provided by a health organization, the aim of this research is to analyze the effectiveness of implementing the Safe Surgery Checklist, checking whether there is a relationship between its *use* and the *reduction* of postoperative complications, i.e. its objective is to investigate the existence of a direct correlation between the rate of adherence to the *Safe Surgery Checklist* and the occurrence of surgical complications in patients treated at a public teaching hospital.

Method

Study Design

Cross-sectional, documentary, retrospective study with a quantitative approach. Its design is non-experimental with descriptive statistical analysis. Data and information obtained from the hospital's patient safety departments, surgical records, considering surgeries performed between January/2022 and October/2022, and Contract No. 46/2021 signed by the hospital where the research was carried out and the municipality's management were used.

Place of Research and Period of Data Collection

The research was carried out at the University Hospital of the Federal University of Sergipe/HU/UFS, located in the city of Aracaju/SE, Brazil. This hospital is managed by the Brazilian Hospital Services Company (EBSERH). All the information was collected between June/2023 and September/2023.

Research Focus Population

The population consisted of the medical records of the 4297 surgeries *performed* between January/2022 and October/2022.

Sample Selection Criteria

The sample *included* the medical records of patients who had undergone an operative procedure and *excluded* the medical records of patients seen for outpatient consultations, examinations and hospitalization for clinical treatment.

Sample Definition

The sample is probabilistic, since the population (or universe) is known and has a known and finite size, and the surgical records have the same possibility of being chosen to make up the sample. The sampling strategy used to choose the members of the sample was *systematic probability,* without replacement of the elements of the population (11).

Study Variables

The following *operational* variables were analyzed: total number of surgeries performed in the period; total number of surgeries that had complications/readmissions; rate (%) of surgeries in which complications/readmissions occurred; total number of adverse events officially reported. These variables have a *discrete scale* and the *Ratio* scale is applied, as they are quantitative data with absolute zero, so there is no negative numerical value. The following *qualitative* variables were also examined: occurrence of complication/readmission; use of the checklist; checklist completely filled in. These variables have a *Nominal scale* that only recognizes equality and inequality operations between the elements, for example, $A = A$, $A \neq B$.

Instruments Used to Collect Information

In order to collect, store, organize and analyse the information, two data collection tools were used, built by the researcher. In the first instrument, data was collected to show the current situation of the surgeries carried out within the scope of the research, and in the second, the information collected is aimed at providing data for statistical analysis. *Excel*® spreadsheet software was used to create the two instruments.

Data Collection

All the documentation provided by the hospital departments responsible for patient safety was analyzed *on site* and on working days. The first part of the data was obtained from files and spreadsheets containing the information requested, from the control and organization mechanisms and from the hospital's statistical reports. In the case of medical records, which correspond to the second part of the data, their physical version was studied, as the CCS form is also in physical format. This second piece of information was obtained through an *active search* of medical records.

To access the current monthly rates (considering the study period) of CCS utilization, the statistics report from the Health Care Related Infection Control Service (SCIRAS) was researched, considering surgeries performed between January/2022 and October/2022.

In order to understand how the application of the surgical checklist cooperates with the hospital's administrative and financial management, the clauses of the contract signed with the municipality's management were studied. The contract was made available by the Health Regulation and Evaluation Sector (SRAS). According to the contractual instrument, compliance with the *qualitative targets*, which includes the use of the CCS, totals 72 points. And according to the rate of adherence to the CCS, the hospital achieves a certain score which is distributed as follows: CCS adherence ≥ 85% = **3** points; 70% ≤ CCS adherence **<** 85% = **2** points; 60% ≤ CCS adherence **<** 70% = **1** point; CCS adherence **<** 60% = **0** point.

Thus, the score achieved through the application of the CCS contributes to the formation of the 72 points, and this score, when fully achieved, enables the hospital to receive the *total monthly* contracted amount. If it is not fully achieved in a given month, the amount received is proportional to the points achieved.

Treatment and Statistical Analysis of Data Collected from Surgical Records

To calculate the minimum necessary sample size (n) and to estimate the correlation coefficient between the variables to be correlated, a *pilot sample of 55* surgical records was used. The formula for determining the sample size in a study that correlates two nominal continuous parametric variables such as “occurrence of complication” and “use of the checklist”, for example, which can only have the results “YES” or “NO”, represented by the values 1 and 0, respectively, is shown below in figure 1:

$$nA = \frac{(1-r^2) \times (t_{\alpha;gl})^2}{r^2}$$

Figure 1. Formula for calculating the sample size in a study relating two continuous parametric variables (12)

where $gl = n_p - 2$, where:
n_A = the calculated sample, i.e. the minimum sample required;
r = correlation of the pilot sample;
t = the value of the *Student's t-test* (this is a tabulated value found in the *Student's t Distribution* Table, according to the values of the parameters α and gl);
α = significance level (which was 0.05 or 5%, it is the maximum admissible error, so the Confidence Interval - CI is 95%);
gl = degrees of freedom, since it was necessary to calculate the sample mean (X) and the sample variance (S^2);
n_p = pilot sample size (which was 55).

The researcher must assume a specific value for the correlation, which can be obtained from the literature or through a pilot study, as was the case in this research, since information from 55 medical records was initially used. In addition, it is important to establish the *alpha* α level beforehand (12).

The value of n_A calculated using the above formula was 191.0005 ~ 191. However, it was decided to search a larger number of records, so a total of 240 records were searched, so *n = 240.*

In the statistical analysis, the frequencies of the variables "use of the checklist" (variable X) and "occurrence of complication/readmission" (variable Y) were studied. These are dichotomous variables, so they can only take on two values/results, and in this specific case, they take on the results "yes", represented by the value 1, and "no", represented by the value 0. Under these conditions, the most appropriate method for calculating the correlation between the variables studied in the statistical analysis of this research is the *PHI Correlation Coefficient (Φ)* also known as the *Matthews Cor* relation (13), and this correlation coefficient estimator is derived from the *Pearson Linear Coefficient* estimator, provided that the variable X is also dichotomous and has the following distribution, as shown in figure 2 below:

		Variable		
		X (Yes =1; No = 0)		
Variable	**Y** (Yes =1; No = 0)	a	b	a+b
		c	d	c+d
		a+c	b+d	

Figure 2. Contingency table of the frequency distribution of the variables analyzed (13)

Where a, b, c and d are the frequencies in the contingency table. By equating, we obtain the phi (Φ) equation below, according to figure 3, which calculates the correlation between the variables evaluated.

$$\phi = \frac{(ad-bc)}{\sqrt{(a+b)(a+c)(b+d)(c+d)}}$$

Figure 3. Correlation coefficient equation phi (Φ) (13)

The software used to calculate the correlation between the variables studied statistically was *R - Software , version 4.3.2,* widely used by statisticians and data analysts.

Ethical Considerations

The research was carried out in accordance with ethical precepts and the project was approved by the Research Ethics Committee of the Federal University of Sergipe/UFS, according to the *Consubstantiated Opinion of the Research Ethics Committee* No. 6.064.013 of May 17, 2023, in accordance with Resolution No. 466/2012 of the National Health Council, with the Certificate of Presentation for Ethical Appreciation (CAAE) registered under the number 68814223.5.0000.5546.

Results

When investigating the correlation between the use of the CCS and the occurrence of surgical complications, it was hoped that the *negative correspondence* between these two variables would be confirmed, i.e. that the *greater* the adherence to the surgical checklist, the *lower* the occurrence of complications. In practice, a negative correspondence would represent a positive situation for surgical patients. This correspondence is represented by the graph below, which shows a decreasing *function*, where cases of complications and/or readmissions decrease as the application of the checklist increases (Figure 4).

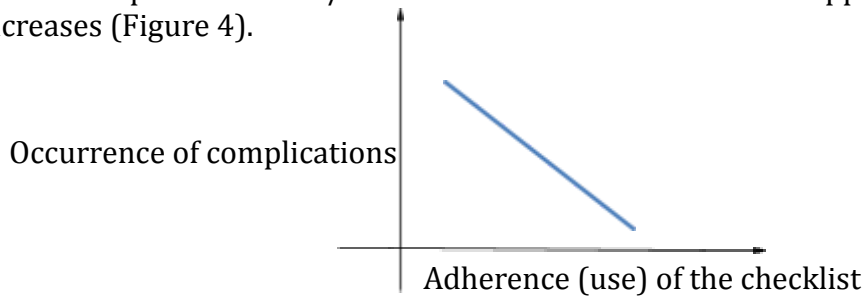

Figure 4. Graph of the relationship between the use of the checklist and the occurrence of surgical complications

With the pilot sample of 55 surgical records, the correlation value between these two variables was calculated using the PHI Correlation Coefficient (Φ), and the value was 0.08. After collecting the information from the 240 medical records, the aforementioned calculation was carried out and the result was 0.006, which shows that the correlation between the variables analyzed statistically was *low (weak)*, considering that *phi* (ϕ) varies between -1 and +1(13).

Based on the data provided by the Health Regulation and Evaluation Sector (SRAS)/HU/UFS/EBSERH, the main information on the situation of surgeries performed at the hospital, the setting for this research, is highlighted. These are: the total number of surgeries performed in the period was 4,297; the number of surgeries that resulted in complication/readmission was 443; the rate (%) of surgeries that resulted in complication/readmission was 10.3%; and the total number of adverse events officially reported was 14.

Table 1 below shows the information found after surveying the sample's medical records.

Table 1. Results found in the active search of surgical records (*n=240*)

Variable/Information	Value/index
Total surgeries *with* complications/readmission	26
Complication/readmission rate (%)	10,83%
Total surgery *with* complications/readmission and *using* the checklist	25
Total surgeries *without* complication/readmission	214
Index (%) of surgeries *without* complication/readmission	89,16%
Total surgery *without* complication/readmission and *using* the checklist	205
Total surgeries *using* the checklist	230
Overall rate (%) of checklist *use*	95,83%
Index (%) of checklist use in surgeries *with* complications/readmission	96,15%
Index (%) of checklist use in surgeries *without* complication/readmission	95,79%
Total number of surgeries with a *fully* completed checklist	132
Index (%) of surgeries with *completely* filled cheklist	57,39%
Type of surgery with the highest complication/readmission rate (%)	Hysterectomy (19,23%)

Source: prepared by the author based on data collected from the surgical records surveyed

It is important to note that in terms of absolute values, the total number of surgeries *without complications and with the use of CCS* (205 surgeries) was much higher than the number of operations *with complications and with the use of CCS* (25 surgeries).

Analyzing the current adherence to the surgical checklist by care professionals, considering the months defined for the survey, the highest rate of application of the surgical checklist was 88.2% of the operations performed and the lowest was 58.8%.

After investigating the cases of surgical adverse events reported in an official instrument by the hospital, risk situations similar to those occurring in other parts of the world were found. Examples include: an object forgotten in the patient's body; when the patient was already anaesthetized, there was a lack of essential supplies for the operation; the surgery was suspended due to a lack of equipment and/or supplies; post-operative dehiscence (opening). These are incidents that have caused or could have caused harm to the patient in their operation, which could result in readmission, prolonged hospitalization, emotional stress and disability.

A total of 64 patients had their hospitalization extended by up to two (2) days longer than expected due to some harmful event, and in the case of readmission of

patients due to some post-operative complication, the average number of days that passed between discharge and return to hospital was twelve (12) days.

With regard to the risks to which patients are exposed in the hospital studied, it was possible to see: failure to supply surgical and examination materials; failure to check the supplies and equipment needed for the operation; failure to comply with the care practices defined by the institution; lack of training for professionals in procedures that guarantee patient safety. These are threats similar to those found in the operating rooms of hospitals in other countries.

The CCS has a positive impact on hospital management, since adherence to this patient safety tool is one of the indicators of quality of care. According to the contract signed with the city, the hospital receives a monthly amount of funds to maintain itself and invest according to the rate of adherence to the surgical checklist and other indicators. Thus, the greater the adherence to these indicators, the greater the amount of resources received via the Unified Health System (SUS), since in Brazil the health service is municipalized (14).

Evaluating the CCS currently in force at the hospital studied, it was confirmed that it is in line with the surgical checklist recommended by the National Health Surveillance Agency (ANVISA), which in turn is based on the one validated by the World Health Organization (6). As well as containing the *essential* items according to the WHO, the hospital's CCS also checks other important items such as: the removal of orthoses, prostheses and adornments before surgery; confirmation of the use of the patient's identification bracelet and that of its location; and the existence of an allergy identification bracelet.

Discussion and Conclusions

The main purpose of the CCS is to reduce the rates of Adverse Events (AE) in surgeries (15). Its application increased the chances of the patient receiving surgical care with adequate and safe practices by almost 50% (16).

This study showed that, although there was a correlation between the use of CCS by healthcare professionals and the occurrence of post-operative complications and/or readmission of patients, this relationship was low (0.006). It was possible to see this in the sample *(n=240)*, as it was expected that adherence to the checklist would be low among operations with complications, but adherence was high (96.15%). In surgeries without AE, the rate of SCC use was also high (95.79%), confirming what was expected for surgeries without harmful episodes.

These results lead to the fact that a harmful event that occurs in a surgical intervention is also related to factors other than the *lack of application* of the CCS, such as pre-existing diseases, the presentation of an allergic process by the patient or the poor application of the checklist due to the resistance of some professional to use it (17). It is true that the checklist alone cannot remedy all the flaws that occur in surgical procedures; all professionals need to be aware of the need to improve their work processes and follow the planning defined by the WHO and the hospital unit in order to achieve real improvements and safe processes in surgeries (18).

The hospital surveyed still has some problems with recording the information linked to the checklist because there is still no systematic monitoring of the use of the CCS in all the procedures carried out, which could provide more precise information on its use. For example, there is a lack of data on the rate of adherence to the checklist in

surgeries *with complications* and in surgeries *without a harmful event.* They would be very important to compare with the results found in the sample of medical records.

The hospital's surgical complication rate was 10.3% and in the sample of surgical records this rate was 10.83%. These figures, therefore, reflect the reality of the world, as they are within the 3% to 16% range in which the rates of complications resulting from surgical procedures occur around the world (3-19).

In the sample, in only 57.39% of the surgeries was the CCS *completely* filled in, a rate considered very low by the experiences already obtained, since the scientific literature advocates that 100% of the items on the surgical checklist should be checked because this completeness is fundamental to guarantee a high standard of safety in the interventions. Scientific writings argue that *no* item on the CCS can go unconfirmed/unverified (20).

During the period of surgery considered in this study, the lowest rate of adherence to the CCS was 58.8% and the highest was 88.2%. In the sample, the checklist was applied in 95.83% of surgeries, which is closer to the WHO recommendation of applying it in 100% of procedures, including less invasive ones (21).

During this period, 14 (fourteen) surgical adverse events were reported in an official instrument, a figure lower than the 26 found in the sample surveyed. It can be inferred that within the universe of 4297 surgeries, the number of cases of VS was much higher than reported. This underreporting is a reflection of various factors, such as the culture of fear that comes from individualizing mistakes, shame at being condemned by colleagues, fear of being penalized and loss of professional credibility (22).

In addition to causing physical and psychological harm to patients and their families, EVs can cause prolonged hospitalization and readmission to the hospital. In this study's scenario, 64 patients spent up to 2 days longer in hospital than expected, and 12 was the average number of days that passed between the patient's discharge and their readmission. These situations increase the expenditure of resources (financial, material, human), increasing the institution's costs, which is yet another negative consequence of an EA. The health sector is very complex and its resources are generally scarce, so existing resources need to be used rationally (23).

The risks to which the patients treated at the hospital are exposed are similar to those found in surgical centers in the rest of the world, although the political and economic conditions are better in the so-called developed countries. Harmful events to patients and their families are an important negative indicator of the quality of the health service because they compromise patient safety (24).

Adherence to the CCS has become so important at the hospital under study that it has become one of the elements contributing to its administrative and financial management. This contribution has become a way of encouraging their use. The points achieved with the application of the surgical checklist help to obtain the monthly amount contracted with the city council, in accordance with Contract No. 46/2021 signed by the parties.

Some studies have identified a lack of support from hospital management in implementing/applying the surgical checklist, but it is essential that managers set an example and encourage its use. In reality, all professionals in the care, administrative and leadership spheres must collaborate on initiatives that can mitigate the risks to which patients are exposed in surgery as well as in any hospital environment (25).

After analyzing the CCS currently applied in the hospital studied, it was found that it complies with WHO and ANVISA recommendations and with the current needs detected, such as *confirming the correct identification of the patient, the surgical site and*

the procedure. Thus, there is no need to include other items or propose improvements. However, new situations that have not yet been dealt with may arise in the future, which makes it important to frequently monitor this security instrument in order to meet the needs of each era.

It is true that the items on a surgical safety checklist may, in some cases, fail to prevent harm to the surgical patient, as it may be linked to a factor that is difficult to predict. On the other hand, several studies have proven the benefits of this list, as it has been associated with a statistically significant reduction in mortality and length of stay. It is common to find experiences in the scientific literature which also show that the implementation of the surgical checklist promotes changes in the surgical culture (26).

A study similar to the one carried out at HU/UFS/EBSERH confirmed that the Safe Surgery Checklist is efficient in verifying the essential items of an operation, bringing a higher level of safety to the surgical patient. However, the low level of adherence to this instrument, its incomplete completion, inefficient communication between care professionals and deficiencies in team training have compromised the desired results, and the implementation of the SCC has not resulted in significant improvements in the communication and participation of surgical workers (27).

There are some limitations to this study, such as the fact that it was carried out in a single hospital, which makes it difficult to generalize its results. In many cases, the professional's handwriting was illegible, so there could be some mistake in interpreting the information accessed. Another weakness is that it is not possible to know if there is missing information or if the data is incomplete. These are inherent limitations of retrospective studies, so we are forced to rely on what was entered on the *Nursing Care Record (RAE)* title form, the CCS form, and the medical record as a whole. Omission or incompleteness of information may interfere with the results of the study.

Despite these weaknesses, the research has strengths, such as the fact that it alerts us to the importance of studying the subject of *patient safety* in health professional training courses, especially in the medical field, since the medical profession has shown greater resistance to the use of CCS in surgeries, because they don't believe in its effectiveness. In addition, the way in which adherence to the checklist contributes to the administrative and financial management of the hospital studied was analyzed in detail. This is a very important issue, since the health service is very expensive, and for a hospital to offer all the care services with the quality required and demanded by society, it needs a fairly large volume of financial resources. Another strong point was the *opportunity for improvement* identified in terms of the need for the hospital to carry out more direct, detailed and organized monitoring of the application of the CCS in all the surgical interventions carried out. This study may encourage more targeted tracking of the surgical checklist in order to record precise and in-depth information on its use and on the various situations linked to its use and what happens in surgeries.

In view of the information and evidence acquired through this study, it was possible to see that the importance of applying the checklist as an *error prevention* tool is clear within hospitals. Proof of this is that in the context of this research, other checklists are used in various environments and at various times during care, not just in operating rooms. It's important to note that the surgical checklist is low-cost and the average time to apply it during the three phases of surgery is three minutes.

Although the *correlation* between the use of the CCS and the occurrence of complications was weak, since the rate of its application was also high in surgeries that *resulted in a harmful event*, it must be understood that EVs, especially surgical EVs, are caused by various factors, so the use of a surgical process checklist can result in a

reduction in harm to patients, but the checklist cannot yet be considered a definitive element in this reduction. However, according to all the scientific literature researched, it is possible to *defend* its application because it has been verified that each item on this list represents the chance of avoiding a harmful episode for the person being assisted, and this tool, in addition to providing a higher level of safety for surgical patients by standardizing activities and avoiding reliance on memory, at the very least provides an opportunity to reflect on safe practices in surgeries.

It is true that the hospital studied needs to improve adherence to the CCS in order to reach 100% of procedures performed, as recommended by the WHO, but this is still a challenge for its management, as achieving this rate also depends on raising awareness among professionals and a continuing education program on the subject of patient safety and the proper application of the surgical checklist.

We hope that this research will encourage the development of new studies in other hospitals in the city, both public and private, with different realities, investigating the effect of the safe surgery checklist, because it would be very valuable for society as a whole to know in greater depth the extent to which the SCC reduces the occurrence of post-operative complications.

Thanks

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Conflicts of Interest

The authors declare no conflicts of interest in relation to this scientific text.

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