SAFE SURGERY: EVALUATION OF CHECKLIST ADHERENCE IN A TEACHING HOSPITAL

Cirurgia segura: avaliação da adesão ao checklist em hospital de ensino

Cirugía segura: evaluación de la adhesión al checklist en un hospital de enseñanza

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ABSTRACT: Objective: To estimate adherence to the safe surgery checklist in a medium-sized teaching hospital. **Method**: A cross-sectional study with a sample of 334 patients submitted to surgery in the year 2015. Data were collected using an instrument based on the World Health Organization's standard checklist. The sample was described by frequency distribution. The prevalence of adherence to the checklist was estimated considering the presence of the instrument of check in the medical records. The bivariate analysis investigated the association of the outcome with the independent variables. The strength of this association was evidenced through Logistic Regression. **Results**: The checklist was verified in 90.72% of the medical records. No surgery had a fully filled checklist. The complete filling of the three surgical moments was found in no instrument. The existence of the checklist in the medical record was associated with the classification of the surgery for urgency (OR=4.3; 95%CI, 1.88–8.73). **Conclusion**: Although the checklist has already been introduced in the surgical practice, the results reveal that its adequate use still presents itself as a great challenge, which may compromise the expected results in surgical safety.

Keywords: Patient safety. Checklist. Surgical procedures, operative.

RESUMO: Objetivo: Estimar a adesão ao *checklist* de cirurgia segura em um hospital de ensino de médio porte. **Método**: Estudo transversal com uma amostra de 334 pacientes submetidos à cirurgia no ano de 2015. Os dados foram coletados com auxílio de um instrumento baseado no *checklist* padrão da Organização Mundial da Saúde. A amostra foi descrita por distribuição de frequências. A prevalência de adesão ao *checklist* foi estimada considerando a presença do instrumento de checagem nos prontuários. A análise bivariada investigou a associação do desfecho com as variáveis independentes. A força dessa associação foi evidenciada por meio da Regressão Logística. **Resultados**: Verificou-se a existência do *checklist* em 90,72% dos prontuários. Nenhuma cirurgia apresentou *checklist* totalmente preenchido. Em nenhum instrumento foi encontrado o preenchimento completo dos três momentos cirúrgicos. A existência do *checklist* no prontuário foi associada à classificação da cirurgia quanto à urgência (OR=4,3; IC95% 1,88–8,73). **Conclusão**: Mesmo que o *checklist* já tenha sido introduzido na prática cirúrgica, os resultados revelam que sua adequada utilização ainda se configura como um grande desafio, podendo comprometer os resultados esperados na segurança cirúrgica.

Palavras-chave: Segurança do paciente. Lista de checagem. Procedimentos cirúrgicos operatórios.

RESUMEN: Objetivo: Estimar la adhesión al *checklist* de cirugía segura en un hospital de enseñanza de mediano porte. **Método**: Estudio transversal con una muestra de 334 pacientes sometidos a la cirugía en el año 2015. Los datos fueron recolectados con ayuda de un instrumento basado en el *checklist* estándar de la Organización Mundial de la Salud. La muestra fue descrita por distribución de frecuencias. La prevalencia de adhesión al *checklist* fue estimada considerando la presencia del instrumento de chequeo en los prontuarios. El análisis bivariado investigó la asociación del desenlace con las variables independientes. La fuerza de esta asociación fue evidenciada por medio de la Regresión Logística. **Resultados**: Se verificó la existencia del *checklist* en el 90,72% de los prontuarios. Ninguna cirugía presentó *checklist* totalmente llenado. En ningún instrumento se encontró el llenado completo de los tres

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momentos quirúrgicos. La existencia del *checklist* en el prontuario fue asociada a la clasificación de la cirugía en cuanto a la urgencia (OR=4,3, IC95% 1,88–8,73). **Conclusión**: Aunque el *checklist* ya se ha introducido en la práctica quirúrgica, los resultados revelan que su adecuada utilización todavía se configura como un gran desafío, pudiendo comprometer los resultados esperados en la seguridad quirúrgica.

Palabras clave: Seguridad del paciente. Lista de verificación. Procedimientos quirúrgicos operativos.

INTRODUCTION

Currently, surgery has been considered an essential therapeutic modality in the health area, being an integral part of health care and becoming the treatment of choice against many complex diseases, increasing the possibilities of cure. The World Health Organization (WHO), based on data from 56 member countries, estimated that 234 million operations are performed worldwide annually at a ratio of 1 procedure for every 25 people alive[1,2].

However, complications related to surgical procedures have been frequently reported in the literature, in studies that seek to estimate the occurrence of adverse events (AE) among surgical patients[2-4]. In addition to the severity of AE, which includes temporary or permanent physical damage, incapacity, suffering and death, it is necessary to consider the excessive increase of costs related to treatment, becoming a major public health problem today[5,6].

AE is understood to mean any unintentional incident related to health care that leads to unnecessary impairment of bodily function, including illness, injury, suffering and death[7]. It should be noted that surgical AE contribute to half or three quarters of all damages associated with health care[8,9].

With the goal of improving patient safety and qualifying care in health services, WHO launched the Global Patient Safety Alliance in 2004. As part of it, the Safe Surgery Survival Program was instituted in 2008, recommending the use of a checklist, which aims to help surgical teams to systematically follow critical safety steps, contributing for the reduction of complications among surgical patients[2].

The standard checklist proposed by the WHO includes basic safety procedures and tasks, consisting of 19 check items. The instrument should be applied at three moments of surgery: Sign in (before anesthetic induction – entrance), Time out (before surgical incision – surgical pause) and Sign out (before the patient leaves the surgical room – exit)[2]. The recommendation is that a single and any member of the team participating in the surgical procedure conducts the checklist application. Studies show that the nursing team has assumed a leading role in conducting the safe surgery checklist[2,10,11].

In Brazil, the government mobilized, in 2013, through the National Agency of Sanitary Surveillance (*Agência Nacional de Vigilância Sanitária* – ANVISA), establishing the Protocol for Safe Surgery, attached to the Resolution of the Collegiate Board of Directors (RDC) No. 36/2013. This protocol describes, encourages and makes official the use of the checklist as a strategy to reduce the risk of surgical incidents[12].

Studies have shown that the use of the checklist in surgical procedures reduces mortality and complication rates, as well as the number of errors due to communication failure among the team[13-15]. In Brazil, the use of the WHO safe surgery checklist is a recent implantation technology. The studies regarding adhesion and impact brought about by the application of this instrument are still scarce[16,17]. Thus, the results brought by this study contribute to elucidate the way the checklist has been used in surgical practice, subsidizing the evaluation regarding the need for adjustments and adequacy so that its impact on the safety of the surgical patient is reached.

OBJECTIVE

The present study aimed to verify the adherence to the safe surgery checklist in a medium-sized teaching hospital.

METHOD

Cross-sectional study carried out in a teaching hospital, located in a municipality of Minas Gerais. The surgical center (SC) of this institution has five operating rooms, performing about 350 monthly surgeries, in the specialties of gynecology and obstetrics, general surgery, urology, ophthalmology, orthopedics, otorhinolaryngology, vascular surgery and plastic surgery.

In 2014, the checklist was implemented through the articulation between nursing academics of a public university in the city and the nursing coordination of this unit. The checklist used in the institution contemplates the three moments of the standard instrument proposed by the WHO. However, in the third moment, the items "professional confirms patient name", "problems with equipment to be resolved" and "essential concerns for patient recovery" were excluded. Also, additional information previously collected in another form were added that, seeking to optimize the records related to the surgical procedure. This information refers to the anesthetic technique used, the position of the patient during surgery, the invasive procedures performed and the location of the surgical wound.

To calculate the sample, the population size of 4,200 surgical patients was considered, corresponding to the total number of patients undergoing surgery in all specialties in 2015. Of the 4,200 surgeries, 1,890 were performed by the Unified Health System (*Sistema Único de Saúde* – SUS) and the remainder by insurance/private sources. Inclusion criterion was defined as all surgeries, of all specialties (without equivalence among them), performed by the SUS in the year 2015. Surgeries performed by insurance were excluded due to the operational difficulty to find the medical records in the institution's file, as these are archived separately.

The expected proportion of checklist completion was 61%, based on a pioneering Brazilian study conducted in two university hospitals in Rio Grande do Norte[16]. Error of 0.05 and confidence level of 95% were considered. Thus, the sample size established for this study was 334 patients who underwent surgery in the year 2015. For sample selection, systematic sampling was used. From the institution's surgical record book, the first medical record was randomly selected and, subsequently, the others were selected using fixed intervals.

Data collection took place in August and September 2016, from the review of medical records and observation of the completion of the checklist. To do so, the researchers constructed an instrument based on the standard checklist proposed by the WHO with fields that allowed the "Yes" or "No" answers for each of the check items.

The dependent variable was adherence to the checklist, defined as the presence of the instrument in the medical record, with complete, incomplete and blank instruments. The independent variables investigated from the checklist were:

- related to the surgical procedure: month, shift (morning, afternoon and night); operating room where the surgery was performed, surgical specialty, type of anesthesia (local, regional, general), surgery classification regarding urgency (elective, urgency, emergency), surgery classification regarding potential contamination (clean, contaminated, potentially contaminated, infected) and patient's destination after surgery (post-anesthetic care unit (PACU), hospitalization units, intensive care unit (ICU));
- related to the patient: age, gender, origin (internal or external).

These variables were chosen because they are available in the medical records and because they have already been studied in previous researches[16,17].

The data were coded, typed and analyzed using Epi info version 7.1. The initial analysis included a description of the study sample through frequency distribution. Subsequently, the prevalence of adherence to the safe surgery checklist was estimated. A bivariate analysis was performed to investigate the association of the outcome with the independent variables, using the Pearson χ^2 test, with a significance level of 5%. The strength of the association between the outcome and the independent variables was assessed through the Logistic Regression with the presentation of the results as *odds ratio* (OR), with their respective 95% confidence intervals (95%CI).

The research was approved by the Committee of Ethics and Research with Human Beings of a university of Minas Gerais, under the opinion No. 1.708.651. The ethical standards for research involving human beings were rigorously followed in accordance with Resolution No. 466/2012 of the National Health Council (*Conselho Nacional de Saúde* – CNS).

RESULTS

A total of 334 medical records of patients with varied specialties, submitted to surgery in the year 2015, were analyzed. The checklist was verified in 90.72% of the medical records. There was predominance of female patients (48.20%), aged between 21 and 40 years (30.53%). Among the surgical specialties found, the most frequent ones were: general (36.8%), gynecological (20.9%) and orthopedic surgeries (21.2%). Elective surgeries were the predominant ones (56.9%), classified as clean, performed in the morning shift, with regional anesthesia being the most used in the analyzed procedures. The characteristics of the sample regarding adhesion to the checklist and the variables related to the surgical procedures performed are shown in Table 1.

No surgery had a fully filled out checklist. The complete filling of each of the three surgical moments was also not found in the sample of medical records analyzed. Three blank instruments were found, with only the patient identification data filled out.

In the first surgical moment, the items less filled out were: "confirmation of the surgical site by the patient" (5%), "difficult airway / risk of aspiration" (24%) and "risk of blood loss" (24%). On the other hand, other items that are also part of the anesthesiologist's evaluation were the most filled: "anesthesia equipment checked" (71%) and "working pulse oximeter in the patient" (86%). There was an increasing frequency of filling of the items during the first surgical moment (Figure 1).

At the second surgical moment, when most of the check items are confirmed by the surgeon, the items "critical steps", "patient-specific concerns", "equipment issues" and "imaging tests availability" were the least checked ones (with only 22, 23, 26 and 38% of filled out items, respectively). The percentage of filled out check items also increased during the second surgical moment (Figure 2).

In the third step, the items "professional confirms patient's name", "problems with equipment to be solved" and "essential concerns for patient recovery" were not assessed because they were not present in the instrument adapted and used by the institution. Among the items evaluated, the "instrument count, compresses, gauzes and needles" was checked in 55% of the surgeries and the "identification of material for anatomopathological samples" in 80% of them (Figure 3).

The association between the outcome and the independent variables included in the study was tested by bivariate analysis. Only the variable "classification of the surgery for urgency" was associated with the presence of the checklist in the medical chart ($p<0.05$). The Logistic Regression evidenced the strength of the association between the adhesion to the checklist and the classification of the surgery regarding its urgency, identifying that, in elective surgeries, there is a four-times higher chance of using the instrument (OR=4.0262, 95%CI: 1.8571–8.728) when compared to urgency and emergency surgeries (Table 2).

DISCUSSION

The purpose of the implementation of the checklist is to prevent the occurrence of errors and AEs and, consequently, to improve the quality and safety of the surgical assistance[18]. The results of the present study demonstrated the interest of the team in using the checklist, being verified the existence of the instrument in most of the charts analyzed. In contrast, no fully completed instrument was

Table 1. Characteristics of the sample of surgical patients regarding the adhesion to the checklist and the variables related to the surgeries performed.

Variable	n (334)	%
Use of checklist		
Yes	303	90.72
No	31	09.28
Surgical specialty		
General	123	36.82
Orthopedic	71	21.25
Gynecological/obstetrical	70	20.96
Vascular	42	12.57
Urological	15	4.5
Head / Neck	06	1.8
Thoracic	05	1.5
Plastic	02	0.6
Shift		
Morning	186	55.69
Afternoon	72	21.56
Evening	08	2.40
Not filled out	68	20.35
Type of anesthesia		
General	34	10.18
Regional	189	56.59
Local	20	5.99
Not filled out	91	27.24
Classification of surgery regarding potential for contamination		
Clean	101	30.24
Contaminated	78	23.35
Potentially contaminated	10	2.99
Infected	6	1.80
Not filled out	139	41.62
Classification of surgery regarding urgency		
Elective	190	56.89
Urgency	80	23.95
Emergency	9	2.69
Not filled out	55	16.47

Source: the authors.

found. Corroborating this finding, a recent survey conducted in a public teaching hospital located in Belo Horizonte, Minas Gerais, also found a low completeness of the instrument. Of the 24,421 surgeries performed in the 5 year period, only 58.5% of them presented the checklist completely filled out[17]. These findings suggest that the reflexes expected from the use of the checklist in the safety of the surgical patient may not be achieved.

In the present study, the existence of the checklist on the patient's medical chart was associated with the classification of the surgery regarding urgency, showing that patients submitted to elective surgery had a greater chance of having the checklist on the patient's chart. In agreement with these findings, a survey conducted at a Canadian obstetric hospital revealed that the checklist may be difficult to use in an emergency/urgency situation and that three months after its implantation, 30% of professionals believed that its use was an inconvenience in these cases. However, the instrument was equally applicable to emergency/urgency surgeries, improving compliance with standard safety measures[19].

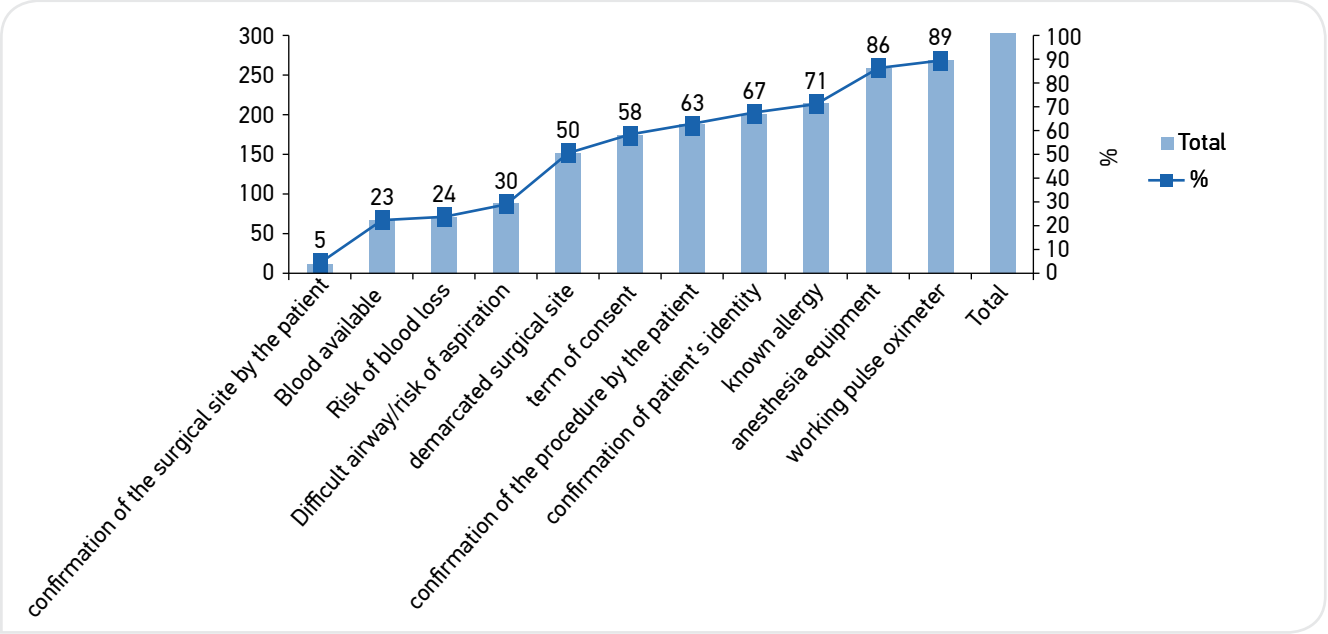

Figure 1. Percentage of items filled out in the first surgical moment of the safe surgery checklist in the sample analyzed.

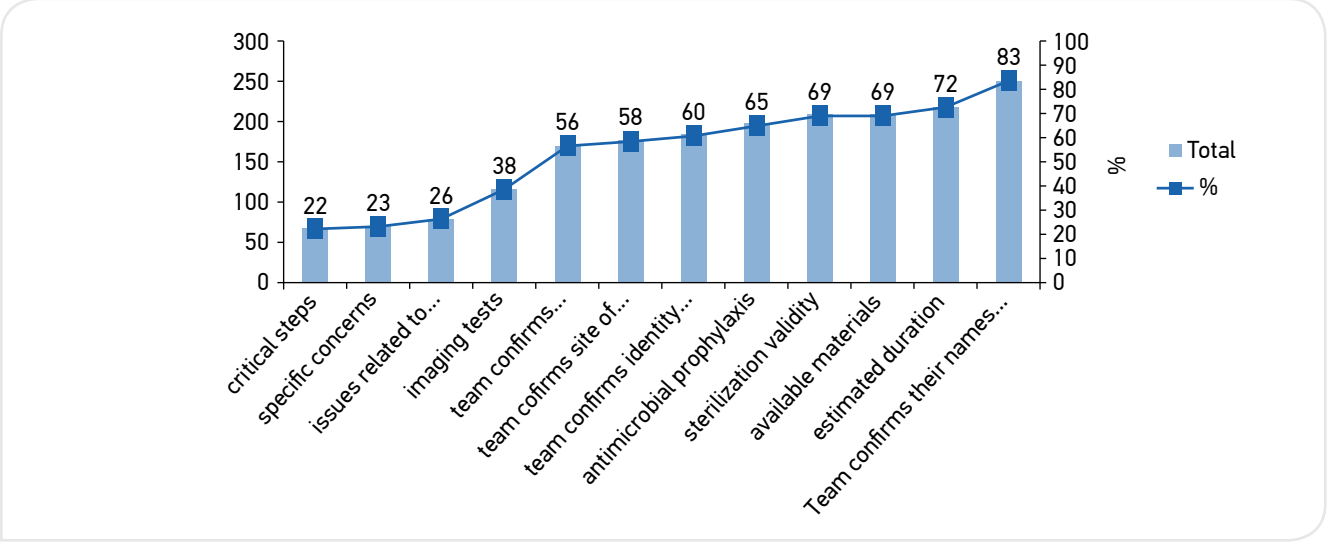

Figure 2. Percentage of items filled out in the second surgical moment of the safe surgery checklist in the analyzed sample.

In practice, it is clear that an emergency/urgency service requires more agility of the team in a short time. However, patients who require this type of treatment have a higher risk of complications. Also, stress and hurry at those times are greater, increasing the likelihood of some error going unnoticed. Thus, in emergency/urgency situations, the checklist can act as a valuable tool to help the team to follow safety steps in a systematic way[19].

In the present study, it was observed a higher frequency of filled out items in the first moment when compared to the following two moments. A study on the completion of the checklist stages in a university hospital in Ethiopia also revealed that the first moment was the most filled out one (69.5%)[18]. In addition, the results obtained here also revealed an increase in filled out percentage over time. Two studies in Brazil have identified similar results when they demonstrate that the percentage of filled out items increased progressively over the three surgical moments[16,17].

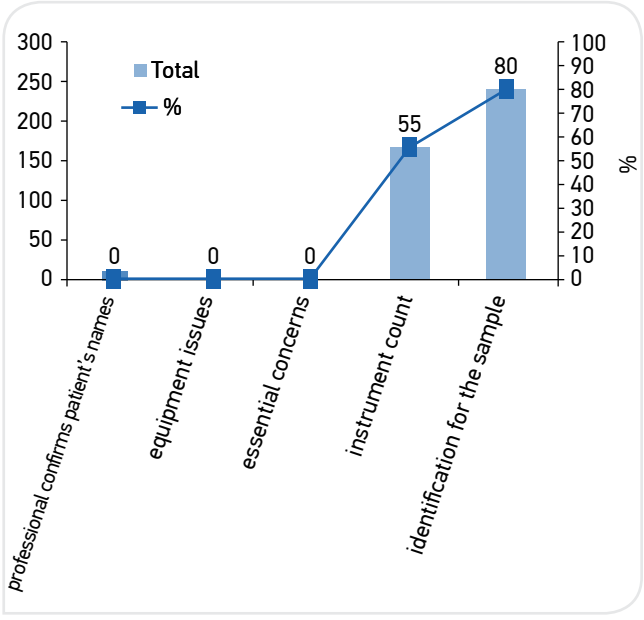

Figure 3. Percentage of items filled out in the third surgical moment of the safe surgery checklist in the analyzed sample.

Table 2. Bivariate analysis of the association between the variable "classification of the surgery regarding urgency" and adherence to the checklist in the sample analyzed.

Classification regarding urgency	Checklist		OR (95%CI)	p-value*
	Yes	No		
Elective	178 (58.75%)	12 (38.7%)	4.3 (1.88–8.73)	<0.001
Urgency/ Emergency	70 (23.1%)	19 (61.3%)		
Not filled out	55 (18.15%)	0 (0%)		
Total	303 (100%)	31 (100%)		

It should be noted that the team's adherence to the filling of the check items throughout the anesthetic-surgical act is essential to reach the goal of achieving a reduction in the rates of complications and death, improving safety in surgical care. In this context, it is necessary that all the professionals who participate in the checking process know the purpose and importance of each proposed item, avoiding inconsistencies in filling out and limitations in obtaining the proposed information[17].

After "confirmation of the surgical site by the patient", the items that are part of the medical evaluation ("difficult airway/risk of aspiration" and "risk of blood loss/blood available") were the least checked. It is noteworthy that the identification of a difficult airway and the risk of bleeding in the preoperative period is fundamental, since occurrences related to ventilation, oxygenation and perfusion are significant causes of morbidity and mortality[2]. Thus, the evaluation and confirmation of such items are essential to anticipate unexpected situations and provide adequate planning, contributing to the reduction of complications[10]. Regarding the possibility of blood loss, a study conducted at a teaching hospital in Ireland showed that 30% of patients requiring transfusion had underestimated blood loss by more than 500 mL, showing difficulty in evaluating the risk of blood loss by part of the medical team[20].

A research carried out in Northeast Brazil showed high verification levels of important aspects to patient safety, such as "patient identification and consent", and "known allergy", with more than 90% of the items filled out. Some of the most checked items were those directly related to the risk of death, such as "allergies", "difficult airway" and "risk of blood loss"[16]. In addition, studies indicate that the items interpreted as more important or of greater risk to the patient tend to have better adherence by the professional responsible for their verification[16,17].

In the second surgical moment, this study showed that most of the team members were presented by names and functions, considering the filling of this item in the checklist. Although the evaluation is limited to completing the checklist, these findings suggest adequate communication among

team members, a factor considered essential for the success of the procedure and the prevention of errors. Results of a study that included orthopedic surgeries in a teaching hospital in the southern region of Brazil showed that, at the second moment, the verification items were checked. However, the confirmation was not conducted verbally, as advocated by the WHO[21]. Another research conducted in Thailand also showed that most of the surgical team professionals were unable to introduce their name and function to others, and in 22% of cases, communication failure was the main factor responsible for the occurrence of AE in patients[22].

Surgical pause should be performed with verbal checking of the entire team to ensure that the patient, location, and procedure are correct, as well as ensuring that all patient equipment, documents, and information are accessible[2]. In the present study, although most of the items were checked, it is not known if the confirmation was verbal, which could compromise the veracity of the records. It is important to emphasize that filling out the items without verification implies legal and ethical aspects implied to all the professionals of the surgical team[21]. In addition, if surgery staff only ticks the check items without committing themselves to the actual goals of using the checklist, the expected patient safety impacts will not be achieved[23].

Still in the second moment, the less checked items were "critical steps", "patient-specific concerns", "equipment issues", and "imaging tests availability". In anticipation of critical events, the checklist coordinator conducts a quick discussion between the team about critical situations and safety planning. If there is nothing specific to be said, the professional can simply state that there is nothing outside the routine to be remembered[3]. It was verified in the present study that this item was simply checked without specifying the critical event or was not checked, with nothing stated.

Regarding the third surgical moment, it is important to mention that the instrument used by the institution was adapted and excluded essential items included in the standard checklist proposed by the WHO, making it difficult to evaluate the completion and analysis of the results. On this issue, the WHO recommends that the standard checklist be adapted to include items considering the needs for each service. However, there is no recommendation for the exclusion of items already recommended and with favorable scientific evidence[16,17].

Compared to the two other previous surgical moments, the third was the least executed. This finding is in agreement with the results of research carried out in hospitals in Ethiopia[18] and in Thailand[22]. The low completion rate of the third moment may be associated with the team's concern with technical issues, such as the final count of the instruments, the preparation of the PACU room, the preparation of the patient to leave the room and the preparation of the operating room for the procedure[12]. A systematic review in Canada related the low adherence to the third moment with the fatigue of the team and the fact that the surgeon in charge is no longer present in the operating room, reinforcing the idea that the absence of some professionals before the completion of the filling this instrument makes it difficult to finalize it[24].

At this stage, the item related to the counting of gauzes, compresses, needles and surgical instruments was not checked in 44% of the surgeries, a relatively high percentage given the complexity of the damage caused by the forgetfulness of any material inside the patient after the end of the surgery. A study carried out in Paraná reported cases of laparotomies in which surgical compresses were retained inside the patient, causing abdominal pain and intestinal occlusion. Foreign body diagnosis was performed only during reoperation. One of the patients developed a perforation of the terminal ileum and died of sepsis[25]. The counting of surgical materials should be performed in a careful and methodical manner, preferably by two professionals, to reduce the chance of erros[2].

Studies show that one of the greatest barriers to the implementation of the checklist is the lack of capacity of the team to reflect on potential errors and to avoid them[8,25]. Moreover, the non-adherence of the professionals to the protocol and the non-commitment of the institution also constitute important barriers[19]. New evidence suggests that good checklist usage depends on how this tool is used[26,27].

Thus, time should be devoted to the training of surgical teams, to emphasize the relevance of the instrument's use, enabling professionals to use it correctly[26]. Studies suggest that individual perceptions of the professionals about the importance of each checklist item directly influence their implementation[16,27]. For this reason, periodic assessment of adherence is also recommended, providing feedback to surgical teams about indicators of checklist effectiveness in reducing complications, sensitizing them through local evidence of their positive impact[16].

This study brings important contributions in order to elucidate aspects related to adherence to the safe surgery checklist in a context not previously explored. Nevertheless, some limitations must be considered in the comparison/generalization of results. It should be emphasized that the analysis was restricted to the surgeries performed by SUS. In addition, the research portrays the regional reality of a teaching hospital. Another

limitation refers to the use of secondary data (medical chart) to observe the completion of the checklist, and a direct observation of this action is not done, which does not allow to confirm if the information was shared by the whole team or if the steps that require checking them out loud were actually performed. Another issue to be considered is that the implementation of the checklist in the institution is recent, with a short time for the use of this technology to be consolidated with greater effectiveness.

CONCLUSION

Although the checklist was found in most surgeries analyzed, no fully completed instrument was found. As a result, its utilization rate was satisfactory, but the overall compliance rate of the check items was below ideal. The third moment was clearly seen as the most difficult and with the lowest completeness when compared to the first two moments. Since each step carries check items related to potential risks to the surgical patient, the results of the study suggest that the checklist may not be producing the expected impact in order to raise safety standards and decrease the occurrence of AE.

The need for a change in the organizational culture of managers and the team involved in surgical care for the recognition of the checklist as an instrument capable of contributing to the incorporation of safety elements into daily practice is evident, bringing positive results not only to patients, but also for teamwork. In addition to developing strategies to improve adherence to the checklist, conducting a regular audit of completing the instrument is important to provide information on the positive impacts on care, ensuring that this valuable tool is used effectively.

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