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Assessment of adherence to safe surgery checklist in a university hospital

Avaliação da adesão ao *checklist* de cirurgia segura em um hospital universitário

Evaluación de la adherencia a la lista de verificación de cirugía segura en un hospital universitario

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Abstract: Objective: To assess adherence of the safe surgery checklist in a university hospital in the South of Brazil. **Method**: a descriptive retrospective cross-sectional study conducted in the care units and operating room of a university hospital in Rio Grande do Sul, Brazil. Data were collected from medical records of patients undergoing elective surgery between September and December 2016. The adherence rate was measured by the existence and quality of filling the checklist items, using descriptive statistics. **Results:** the rate of adherence to the checklist in the care units ranged from 23.3 to 74.4% and in the operating room, from 55.2 to 61.2%. **Conclusion:** there was low adherence to filling of the checklist, being important the implementation of strategies that can assist in its filling.
Descriptors: Patient Safety; Checklist; Surgicenters, Nursing

Resumo: Objetivo: avaliar a adesão ao *checklist* de cirurgia segura em um hospital universitário do Sul do Brasil. **Método:** estudo transversal descritivo, retrospectivo, realizado nas unidades de internação e centro cirúrgico de um hospital universitário do Rio Grande do Sul, Brasil. A coleta foi feita nos prontuários de pacientes submetidos a cirurgias eletivas entre os meses de setembro e dezembro de 2016. A mensuração da taxa de adesão foi mediante a existência e qualidade do preenchimento dos itens do *checklist*, empregando-se estatística descritiva. **Resultados:** a taxa de adesão ao *checklist* nas unidades de internação variou de 23,3 a 74,4% e no centro cirúrgico, de 55,2 a 61,2%.

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Conclusão: evidenciou-se baixa adesão ao preenchimento do *checklist,* sendo importante a implementação de estratégias que possam auxiliar em seu preenchimento.
Descritores: Segurança do Paciente; Lista de Checagem; Centros Cirúrgicos; Enfermagem

Resumen: **Objetivo:** evaluar la adhesión al checklist de cirugía segura en un hospital universitario en el sur de Brasil. **Método:** estudio transversal descriptivo, retrospectivo, realizado en las unidades de internación y centro quirúrgico de un hospital universitario en Rio Grande do Sul, Brasil. La colecta fue realizada en los prontuarios de pacientes sometidos a cirugías electivas entre los meses de septiembre y diciembre de 2016. La verificación de la tasa de adhesión fue por medio de la existencia y la calidad de la cumplimentación de los ítems del checklist, utilizando estadística descriptiva. **Resultados:** la tasa de adhesión al checklist en las unidades de internación osciló entre 23,3 y 74,4% y en el centro quirúrgico, de 55,2 a 61,2%. **Conclusión:** se evidenció baja adhesión a la cumplimentación del checklist, siendo importante la implementación de estrategias que puedan ayudar en su cumplimentación.
Descriptores: Seguridad del Paciente; Lista de Verificación; Centros Quirúrgicos; Enfermería

Introduction

The implications associated with surgical procedures are frequent and represent a health problem worldwide,[1-2] wherein one every three hundred hospitalized patients dies and over 50% of these is related to preventable adverse effects.[3] In Brazil, data concerning this are still scarce, however alarming. A study performed in a university hospital in the South region of Brazil verified the occurrence of 98.7% (n=2,396) incidents without damage to patients in a surgical clinical unit, whereas 1.3% (n=27) did suffer such damage.[4]

With the aim of informing health professionals concerning safe assistance, the second global challenge titled “Safe Surgery Saves Lives” was launched in 2007 and 2008 by the Global Health Alliance.[1] During this challenge, the Guidelines for Safe Surgery was proposed with the objective of reducing mortality by preventable adverse events in surgical patients. It includes a checklist constituted by a set of actions which must be performed, verified and recorded during the entire surgical process.[1]

This checklist helps the team conduct surgical actions and contributes in the reduction of risk of damage to patients, providing professionals with a safer praxis.[5-6] For such, the team is required to fully fill the items of this instrument, adhering to this standard procedure. These

items are separated into phases: before anesthesia, before surgical incision and before removing the patient from the operating room.[1]

The hospital used for this study implemented the checklist for safe surgery in February 2016 with manual filling. It was necessary to perform an institutional diagnosis in order to identify the adherence of professionals to the checklist and subsequently signal the advantages and weaknesses of its filling.[7] Given the aforementioned, we have the following research question: "What is the rate of adherence to the checklist of safe surgery in a university hospital in the South region of Brazil?" To respond this, we evaluated the adherence to the safe surgery checklist in a university hospital in the South region of Brazil.

Method

This is a descriptive, retrospective cross-sectional study developed in a surgical center and hospitalization units of a large university hospital situated in the state of Rio Grande do Sul, Brazil. The hospital includes 403 hospitalization beds and 100% of services are performed by the Unified Health System (SUS). The surgical center is composed of seven rooms and receives patients from 18 hospitalization units as well as the institution's first-aid-post. In 2016, 7,376 surgeries were performed (615 surgeries/month on average).

All records of patients subjected to elective surgery in the period between September and December 2016 were included in the population of this study. For statistical purposes, a minimum sample was calculated using a finite sampling formula. Taking into account a total of 1767 elective surgeries performed between September and December 2016, a sampling error of 5% and an estimated proportion of 50% filled checklist, we defined 317 checklists as a minimum for analysis.

By using the surgery schedule list, the following inclusion criteria were adopted: records of patients subjected to elective surgery between September and December 2016. All records not situated in the archive sector were excluded as they were located in the administration section.

The **checklist adopted in the institution analyzed** is an adaptation of the model prescribed by the World Health Organization (WHO). In addition to the items prescribed by WHO for "before anesthesia", "before surgery" and "before leaving the operating room", some items pertaining to the pre-operation period and the arrival of the patient in the surgical center were added. It is a printed form which, after being filled by the nursing technician or float nurse, is paired with the patient's record.

Data collection was performed during December 2016 at the morning and on weekdays by two previously qualified samplers. The data collection instrument was prepared in accordance with the institution's checklist, composed of four stages: 1st) Pre-surgery checklist (performed at the hospitalization unit); 2nd) Reception of patient in surgical center; 3rd) Before anesthesia and before surgery; and 4th) Before patient leaves the room (last step of surgery).

The data was entered in *Microsoft Excel*®, with subsequent verification of errors and inconsistencies during typing. Data analysis was subsequently performed in *PASW* version 18.0 for *Windows*. The categorical variables were analyzed according to absolute (N) and relative frequency (%).

Adherence calculation was performed by the ratio between the number o checklists filled in full and the total number of checklists in each month. Expressed by the following formula:

$$\textbf{Adherence (\%)} = \frac{\text{number of checklists filled in full in month}}{\text{Number of elective surgeries in the month}} * 100$$

This study was approved by the Research Ethics Committee (CEP): 1.812.525; and by Certificado de Apresentação para Apresentação Ética (CAAE) No. 61553616.6.0000.5346, in 21 October 2016. Ethical parameters were respected in accordance with Resolution No. 466/2012 of the Brazilian National Health Council (CNS), ensuring the anonymity and privacy of participants.[9]

RESULTS

Between September and December, a total of 2310 surgeries were performed, of which 574 occurred in September, 556 in October, 588 in November and 592 in December 2016. The checklists were only applied in elective surgery, and 76%4 (n=1767) were performed from September to December, thus constituting the population of this study, as per Table 1.

Table 1 - Distribution of checklists applied in elective surgeries and adherence rate according to month of evaluation. 2016

Month	Total surgeries performed	Total checklists from elective surgery		Adherence rate to checklist*			
				Hospitalization unit		Surgical center	
	N	N	%	N**	%**	N**	%**
September	574	409	71.3	100	24.4	234	55.2
October	556	425	76.6	316	74.4	260	61.2
November	588	470	80.1	318	67.7	271	57.7
December	592	463	78.2	108	23.3	281	60.7
Total	2310	1767	76.4	842	47.7	1046	59.3

*Checklists fully filled in the corresponding unit; **Matches the number of *checklists* analyzed of the month.
Source: Authors.

The adherence rate to the checklist in the hospitalization units varied between 23.3 and 74.4%, whereas it varied between 55.2 and 61.2% in the surgical center. Adherence to filling the items of the checklist was assessed in the hospitalization unit. The four-year average (FYA) and standard deviation (SD) are presented in Table 2.

Table 2 - Adherence to the checklist for each item in the hospitalization units during the pre-operative period. 2016

Variables	Sep		Oct		Nov		Dec		Average	SD	FYA
	N	%	N	%	N	%	N	%	-	-	%
Identification Bracelet	319	78	333	78.4	368	78.3	363	78.4	346	20.4	78.3
Medical records verified	238	58.2	239	56.2	270	57.4	258	55.7	251	13.4	56.9
Printed Imaging Exams	202	49.4	246	57.9	287	61.1	271	58.5	252	32.1	56.7
Fasting patient	333	81.4	339	79.8	377	80.2	378	81.6	357	20.9	80.8
Uses anticoagulant	289	70.7	320	75.3	350	74.5	355	76.7	329	26.4	74.3
Marked site	250	61.1	256	60.2	308	65.5	310	67	281	28.1	63.5
Accessories removed	209	51.1	249	58.6	260	55.3	246	53.1	241	19.2	54.5
Uses dental prosthesis	327	80	329	77.4	360	76.6	369	79.7	346	18.5	78.4
Removal of dental prosthesis	141	34.5	120	28.2	124	26.4	141	30.5	132	9.6	29.9
Body hygiene	301	73.6	309	72.7	347	73.8	340	73.4	324	19.6	73.4
Gown-only usage	216	52.8	249	58.6	255	54.3	227	49	237	15.9	53.7
Allergic to medication	301	73.6	315	74.1	427	90.9	354	76.5	349	48.9	78.8

FYA: Four-year adherence; Sep: September; Oct: October; Nov: November; Dec: December.
Source: Authors.

Filling of the checklist was performed in the hospitalization units during the pre-operatory period before the patient was referred to the surgical center. According to Table 2, the item “fasting patient” achieved the highest adherence average (357; SD=20.9) with 80.8% of items filled, and the item with the least adherence was “removal of dental prosthesis” (132; SD=9.6) with 29.9%.

Assessment of adherence to filling the items of the checklist at the surgical center entrance door and the operating room as well as the four-year-average and SD are presented in Table 3.

Table 3 - Adherence to checklist for each item at the door of the surgical center and the operating room. 2016

Variables	Sep		Oct		Nov		Dec		Average	SD	FYA
	N	%	N	%	N	%	N	%	-		%
Surgical center entrance door											
Procedure and surgical site confirmed with patient and team	388	94.9	380	89.4	424	90.4	461	99	413	32.2	93.4
Operating room											
Team in room without accessories	308	75.3	378	88.9	412	96.9	448	96.8	387	51.6	89.5
Surgical consent	386	94.4	414	97.4	457	97.2	453	97.8	428	29.3	96.7
Preanesthetic evaluation	396	96.8	415	97.6	461	98	451	97.4	431	26.4	97.5
Marked surgical site	389	95.1	411	96.7	462	98.3	450	97.2	428	29.4	96.8
Verification of anesthesiology equipment and medication	395	96.6	422	99.3	455	96.8	447	96.5	430	23.5	97.3
Risk of airway complications	392	95.8	422	99.3	463	98.5	450	97.2	432	27.3	97.7
Risk of aspiration	389	95.1	418	98.4	459	97.7	452	97.6	430	28.1	97.2
The patient is allergic.	379	92.7	410	96.5	455	96.8	448	96.8	423	30.6	95.7
Uses anticoagulants	391	95.6	415	97.6	456	97	454	98.1	429	27.4	97.1
Risk of blood loss: adult > 500ml, child 7ml/kg	392	95.8	421	99.1	459	97.7	455	98.3	432	27.3	97.7
Hemocomponent storage	390	95.4	417	98.1	461	98.1	450	97.2	430	28	97.2
Imaging exams available	394	96.3	413	97.2	465	98.9	450	97.2	431	28.3	97.4
Surgical material necessary for the procedure in the room	394	96.3	409	96.2	459	97.7	455	98.3	429	28.3	97.1
Review by the nursing team: sterilization (including indicators), equipment, both reviewed and assembled	382	93.4	398	93.6	439	93.4	449	97	417	27.8	94.4
Electrocautery plate	374	91.4	409	96.2	449	95.5	442	95.5	419	29.8	94.7
Antimicrobial prophylaxis performed in the last 60 min.	372	91	398	93.6	434	92.3	434	93.7	410	26.2	92.7

FYA: Four-year adherence; Sep: September; Oct: October; Nov: November; Dec: December.
Source: Authors.

Adherence to filling the item “procedure and surgical site confirmed with patient and team” at the surgical center entrance door was 93.4%. At the operating room, a higher rate of adherence (97.7%) in the items “risk of airway complications” and “risk of blood loss”, which showed filling averages of 432 (SD=27.3) forms. On the other hand, a lower rate of adherence

(89.5%) was found for the item “team in room without accessories”, with a lower average of 387 (SD=51.6).

Discussion

The adherence rate to the checklist in the hospitalization units varied between 23.3 and 74.4%, whereas it varied between 55.2 and 61.2% in the surgical center. Adherence to the safe surgery instrument is still a challenge, considering several publications have reported its incomplete and inefficient filling.[2,10-13]

Each checklist item works as a warning and shows the possibility of preventing mistakes that might harm patients. According to the literature, a study in Australia observed that, after the implementation of the checklist, mortality rates post-operation decreased from 1.2 to 0.92% and hospitalization time decreased from 5.2 to 4.7 days.[14] This is consistent with our study in that more and more precise verification of the items occurred which, otherwise, could cause major damage to patients.

At the hospitalization units, the item “fasting patient” showed higher adherence rate (80.8%) due its requirement of being verified during the pre-operatory period in order to avoid intercurrences concerning the aspiration of gastric juices during the procedure,[1] in addition to canceling the surgery. In other hospitals, favorable adherence could be observed to this practice (96.1%), demonstrating how necessary this verification is in order to promote the safety of the patient.[15]

Regarding the item "allergic to medication", there was a reasonable adherence to filling (78.8%). This contrasted with what was observed in an African country, where filling of this item did not occur.[16] The patient manifesting allergic reactions during surgery increases the chances of severe complications, such as hypoxia during surgery and having their recovery during the post-operatory period affected. As such, the team in the operating room must be conscious and

confirm with the anesthesiologist all information concerning allergic reactions the patient might present.[1]

At the hospitalization units, the adherence rate to filling the item "Uses identification bracelet" was 78.3%. This percentage was lower to that found in a Brazilian documentary study which showed rates between 89.1 and 98% concerning the correct verification of the patient's identification.[15] Filling the patient's name incorrectly in their identification bracelet and/or forgetting to apply it to them can lead to patient mixing and/or procedure mistakes. These professionals must understand the importance of the correct identification and how severe such problems can affect patients without this safe practice.[1]

The removal of dental prostheses showed lower adherence rate in the hospitalization units, followed by the items "gown-only usage"and "accessories removed", favoring the chance of patient-related accidents during surgery.[17] The low adherence to the filling of such items may be related to the work overload generated by the high activity demand of professionals and the lack of sufficient professionals,[18] which might compromise the patient's safety.

Prosthesis removal prevents lesions in the oral cavity during intubation, as well as nausea and vomiting. Additionally, the use of the adequate clothing determined by the institution and, especially, the removal of accessories must be verified, since during the surgery this can lead to skin burns caused by the use of the electrocautery device.[1]

At the surgical center entrance door, the procedure is confirmed and the patient's body site is marked. This verification avoids mixing patients, in addition to preventing scenarios in which the patient is sent to the wrong place or has the incorrect procedure performed.[1] In our study, a high adherence rate (93.4%) to its filling, which confirms the patient's safety and the safe and correct procedure of the surgery.[15]

As for the adherence to filling the checklist in the operating room, reviewing the risk of blood loss occurred in 97.7% of patients. This adherence may be related to the risk of

hemorrhage and hypovolemic shock, which is always present during surgery. By using this assessment, the blood storage team can provide and store blood bags in advance. A Brazilian study demonstrated this verification in 99.1% of surgical procedures.[11] In agreement with the importance of this verification, a study in the Republic of the Congo showed acute blood loss occurs in 86% of surgeries.[19]

Other important factors filled by professionals in the surgical center were as follows: aspiration rate and airway complications (97.7%) and pre-anesthesia assessment (97.4%). In this study, all items directly related to the anesthesia team showed a higher adherence rate, perhaps due to the fact that this team is historically known to include the systematic verification of essential items to the anesthetic procedure as part of their routine. Pediatrics patients in a London hospital showed a plan for the verification of the upper respiratory tract in 89% of cases, which signaled the concern of professionals with regard to possible complications related to this item.[20]

The maintenance of the respiratory function during the anesthetic induction period is a complex factor. Currently the anesthetic components act differently in the decrease of muscle tone in the upper respiratory tract region. This helps mitigate the reflexes and hinder the patient's ability to breath, which might cause hypoxia while under the effects of anesthesia.[1]

In order to reduce the complications originated by the surgery, particularly that of the respiratory tract and of blood loss, it is necessary for the team to review the management of patients and their transference to the recovery room. This also helps implement interventions that make professionals aware of management and that improve the adherence to filling the questionnaire, as happened in a hospital situated in the United Kingdom, which achieved an increase in adherence to concerns related to the patient's recovery from 58 to 72%.[20]

The institutional checklist includes the conference of instruments and verification of surgical material. Contrary to most situations, low indices of instrument counting were found,

similar to a study situated in Distrito Federal, Brazil, which showed only 2% of adherence.[21]Counting surgery materials is extremely important given the complexity of the damage that may occur if any surgical instrument is forgotten inside the patient.[15]

Conclusion

The adherence rate to the checklist for safe surgery was low, varying between 23.3 and 74.4% in the hospitalization units, and of 55.2 to 61.2% in the surgical center. At the hospitalization units, the item "fasting patient" achieved the highest adherence rate (357; SD=20.9), namely 80.8%. At the surgical center entrance door, adherence to filling the item "procedure and surgical site confirmed with patient and team" showed average of 413 (SD=32.2) and adherence rate of 93.4%. At the operating room, the items "risk of upper respiratory tract complications" and "risk of blood loss" showed average filling of the checklist of 432 (27.3) and adherence rate of 97.7%. Given the low adherence rate to the checklist, we verified the importance of new studies that create and implement strategies that may help in its filling, with the aim of promoting and improving the patient's quality and safety in surgical procedures.

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