



ORIGINAL ARTICLE

## Performance Assessment Tool of the Surgical Technologists in Patient Safety: A Validation Study

Mohadesehsadat Mehrdad<sup>1</sup>, Fatemeh Keshmiri<sup>2</sup>, Sara Jambarsang<sup>3</sup>, Hosseinali Sadeghian<sup>4\*</sup>, Fatemeh Jabinian<sup>1</sup>

<sup>1</sup> Operating Room Technology Department, Paramedical School, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

<sup>2</sup> Medical Education Departments, Education Development Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

<sup>3</sup> Center for Healthcare Data Modeling, Department of Bio-Statistics and Epidemiology, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

<sup>4</sup> Health Education and Promotion Department, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

### ABSTRACT

**Background:** Operating room technologists are crucial in ensuring patient safety in surgical units. The study aims to assess the validation of the observational performance assessment tool related to patient safety using a tool, the World Health Organization Behaviorally Anchored Rating Scale (WHOBARS), among operating room technologists in Iran.

**Methods:** The cross-sectional study was conducted at Shahid Sadoughi University of Medical Sciences. The WHOBARS tool was designed based on the surgical safety checklist of the World Health Organization. In the first step, the translation-back translation process was done and the external validity of the tool was confirmed. In the next step, content and face validity were evaluated qualitatively. Quantitative content validity was evaluated through two indices: content validity ratio (CVR) and content validity index (CVI). The reliability of the tool was measured by two methods of internal consistency and test-retest. Data were analyzed using descriptive statistics (mean, percentage, standard deviation) by SPSS<sub>26</sub> software.

**Results:** With the agreement of all experts in the first phase of the study, the face and content validity of the tool was confirmed. All items of the tool obtained CVR higher than 0.49 and CVI higher than 0.79 which were retained in the tool. Finally, the quantitative and qualitative validity of the 15-item performance measurement tool was confirmed. The Cronbach's Alpha coefficient was 0.86.

**Conclusion:** According to the findings, the Iranian version of WHOBARS is a reliable and valid tool for the evaluation of safety performance among operating room technologists.

**Keywords:** Patient safety, Checklist, Surgery, World Health Organization, Operating rooms

### Introduction

Patient safety during surgery is one of the most important concerns of operating room teams. Providing safe and high-quality care is the ethical, professional, and legal duty of medical staff (1). Patient safety includes reducing the risk of additional injury by predicting errors and avoidable

side effects to protect patients from harm (2). According to the report "Patient Safety 2030" published by the National Institute of Health Research, the lack of guarantee for patient safety is a significant challenge in providing healthcare services (3). The World Health Organization

Corresponding Author: Hosseinali Sadeghian  
Email: [sadeghian.hossein@gmail.com](mailto:sadeghian.hossein@gmail.com)  
Tel: +98 35 31682131

Health Education and Promotion Department,  
School of Public Health, Shahid Sadoughi  
University of Medical Sciences, Yazd, Iran

**Copyright:** ©2024 The Author(s); Published by Shahid Sadoughi University of Medical Sciences. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

(WHO) has reported that about 134 million unwanted events and 2.6 million related deaths occur annually in low- and middle-income countries due to unsafe services provided by hospitals (4). Unwanted events are common in hospitalized patients (5-7) and can lead to irreversible complications, mortality, and increased healthcare costs (6, 8-10). Studies have shown that many safety errors and unwanted complications occur in the operating room (11, 12). In addition, about half of these errors and complications are preventable (9, 10).

Operating room technologists play an important role in patient safety. They are responsible for performing a wide range of tasks, including patient preparation, patient positioning, and preparation of operating room, equipment, and medications during surgery. They also help surgeons, anesthesiologists, and other operating room personnel during surgery. Any mistake or omission in performing these tasks can have serious consequences for patients. Regular performance evaluations help identify areas where operating room technologists need more training or support. This information can be used to develop purposeful interventions to improve patient safety (13). The following recommendations may improve safety in the operating room: checking the effectiveness of performance by standard checklists (14), teamwork (15), and providing training programs about safety-related functions (16, 17). One of the effective and significant interventions is the formulation and application of the World Health Organization Surgical Safety Checklist (WHOSSC) based on Safe Surgery guideline (18). The purpose of SSC is to improve safety by promoting information sharing between members of operating room teams, strengthening teamwork, encouraging safety, identifying human errors before an incident, and verifying the completion of necessary steps and critical actions for the safety of surgery. This checklist is implemented at three key moments during each surgery, including: before the induction of anesthesia (sign in), before the skin is cut (time

out), and before the patient leaves the operating room (sign out). Each area of the observational tool of performance evaluation contains 5 items. The first item in each area includes the evaluation of the preparation of the operating room and team members (setting the stage) to start the process of the safety checklist. The second item in each area deals with the evaluation of the committed and accurate support and participation of the team members (Team engagement). The third item deals with the activation of personnel engagement by implementing purposeful communications and encouraging engagement in the process (Communication: activation). The fourth item in each area deals with the assessment of problem anticipation and their handling and checking of important patient information (Communication: problem anticipation). The fifth item in each area deals with confirming the completion of the safety process (Communication: process completion). Considering the validity and reliability of the tool, all the processes emphasized in the tool are necessary to be used in the patient safety management process.

So far, there have been many reports of a significant reduction in morbidity and mortality after the introduction of SSC (19, 20). The introduction of WHOSSC (2008) was a guideline about patient safety in hospital operating rooms. Recent studies have shown that SCC is incompletely implemented in many hospitals, and it is necessary to take measures to improve the way this checklist is used (21-23). Considering the role of operating room technologists constantly in contact with patients, they are considered the first-line personnel in patient safety. Therefore, in order to create a safe environment in the operating room, it is necessary to evaluate the safety performance of operating room technologists and implement measures to improve their performance.

In our country, patient safety has been discussed for a long time, but practical measures for monitoring and conducting patient safety programs, and giving feedback to people to develop safety activities have received less

attention. The use of valid assessment tools can ensure a consistent and objective evaluation of the performance of operating room technologists. This helps identify individual strengths and weaknesses and promotes a fair evaluation process. Also, operating room managers' awareness of the clinical competence of employees provides them with valuable information for better human resource management (24). The recommended WHO Behaviorally Anchored Rating Scale (WHOBARS) checklist is one of the tools for monitoring patient safety, especially for operating room technologists, which has been designed according to WHO guidelines. The current study was conducted to investigate the validity and reliability of WHOBARS as a performance measurement tool for patient safety among operating room technologists in Iran.

### Materials and methods

This was a cross-sectional study conducted in 2023 at Shahid Sadougi University of Medical Sciences, in order to validate WHOBARS related to patient safety.

The tool used in this research was WHOBARS, which was first designed in 2016 by Devcich et al. (25) as a behavioral rating scale in three strategic times. This tool was designed based on WHOSCC. This observational tool includes 15 questions in 3 areas including before induction of anesthesia (sign in) (5 items), before cutting the skin (time out) (5 items), and before the patient leaves the operating room (sign out) (5 items). The answers were graded on a 7-point scale from poor (1) to excellent (7). The maximum score obtained from the tool was 105 points.

In the first step, the tool was translated into Farsi by three translators; in the second stage, the tool was back-translated into English by two professional English-speaking translators familiar with the Persian language. Then, in the expert panel (with the presence of 5 experts from the fields of operating room technology, surgery, and medical education), it was matched with the main tool, and in a joint meeting between researchers

and translators, the controversies were resolved and the Persian version of the tool was finalized.

Content and face validity of the tool were evaluated. At this stage, the Persian tool was evaluated for compliance with local laws, culture, and principles in the operating rooms from the point of view of 15 experts. This process was carried out in three Delphi rounds the opinions were reviewed in the expert panel and the content validity of the tool was qualitatively confirmed. In the next step, quantitative content validity was used using content validity ratio (CVR) and content validity index (CVI). For confirming CVR, the necessity and usefulness of the questions, and for CVI, the simplicity, transparency, and relevance of the questions were examined.

To determine CVR according to Lawsche's method, the necessity of the tool items was checked using a Likert scale, consisting of the following items: a) necessary, b) not necessary, but useful, c) completely unnecessary (26). Fifteen people participated in the process of content validity evaluation. Based on the number of participants in Lawsche's table, the minimum acceptable value for CVR was determined to be 0.49. Therefore, if the calculated value of CVR for each question was greater than 0.49, the validity of the content of that item was accepted (26). To measure CVI, participants should determine the "relation", "simplicity" and "clarity" of each item in the form of a 4-point Likert scale (e.g. completely related, related, needs fundamental correction, and completely unrelated) (28).

In this research, the CVI score for each statement was obtained by dividing the number of people who agreed on the statements with a score of 3 or 4 by the total number of participants (29), and according to the recommendation by Hirkas et al., a score higher than 0.79 was determined for accepting the items based on CVI score (30). In the next step, the average scores of the CVI were determined for each item and then for all items, .

After confirming content validity, the reliability of the tool was measured by two methods of internal

consistency and test-retest. Cronbach's alpha was used for the assessment of the reliability of the internal consistency dimension through an observational evaluation of 30 operating room technologists. Cronbach's alpha  $\geq 0.7$  was considered as an acceptable level. Two weeks later, reliability was checked by test-retest method. Qualified people were tested the Intra-Class Correlation (ICC) index was calculated, and the accepted value for the reliability of the tool was considered to be higher than 0.8 (31). Data were analyzed using descriptive tests (mean, percentage, standard deviation) in SPSS<sub>26</sub> software.

**Results**

In the psychometric phase, the faculty members of the operating room technology and clinical specialists (15 people) participated. Of all participants, 13 were females (86.66%) and 2 were

males (13.33%). Their mean age was 39 ( $\pm 5$ ). Also, 30 individuals participated in the phases of evaluating internal consistency and validity of the tool.

Validity assessment: With the agreement of all experts in the first phase of the study, the face and content validity of the tool was confirmed. The results of the CVR calculation showed that all items of the tool obtained values higher than 0.49 based on the Lawsche table. The items evaluated in CVI obtained values greater than 0.79 and were retained in the tool. Finally, the quantitative and qualitative validity of the 15-item performance measurement tool was confirmed. The reliability of the performance measurement tool was confirmed with internal consistency (Cronbach's Alpha coefficient) of 0.86, and the ICC of 0.81.

**Table 1.** The content validity and internal consistency of the WHOSSC tool.

Phase	Items	CVR	CVI	Clarity	Cronbach's Alpha coefficient
Sign in	The initiation of the patient safety checklist process is done appropriately.	0.73	1	1	0.88
	All team members participate carefully and committedly in the process of doing the items on the checklist.	1	1	1	
	All team members are engaging using guided interactions and comprehensiveness of work is shown to encourage people to participate in the process.	1	1	1	
	Important and vital patient information is reviewed and issues of concern are appropriately discussed.	1	1	1	
	Critical safety processes and procedures are reviewed and approved as a completed process, otherwise they are re-examined appropriately.	0.73	1	1	
Time out	The initiation of the patient safety checklist process is done appropriately.	0.73	1	1	0.83
	All team members participate carefully and committedly in the process of doing the items on the checklist.	1	1	1	
	All team members are engaged using guided interactions and comprehensiveness of work is shown to encourage people to participate in the process.	1	1	1	
	Important and vital patient information is reviewed and issues of concern are appropriately discussed.	1	1	1	
	Critical safety processes and procedures are reviewed and approved as a completed process, otherwise they are re-examined appropriately.	0.73	1	1	

Sign out	The initiation of the patient safety checklist process is done appropriately.	0.73	1	1	0.85
	All team members participate carefully and committedly in the process of doing the items on the checklist.	1	1	1	
	All team members are engaging using guided interactions and comprehensiveness of work is shown to encourage people to participate in the process.	1	1	1	
	Important and vital patient information is reviewed and issues of concern are appropriately discussed.	1	1	1	
	Critical safety processes and procedures are reviewed and approved as a completed process, otherwise they are re-examined appropriately.	0.73	1	1	

**Discussion**

Considering the importance of patient safety, it is very important to use a valid and reliable tool according to Iran's cultural conditions as well as common guidelines and protocols in surgical departments. In this study, the validation of the translated version of WHOBARS was done with some modifications, and the results showed that this observational tool was a valid, reliable, and practical tool that can be used in the process of evaluating the performance of different groups involved in the operating room in Iran.

Medvedev et al. (2019) investigated the validity of WHOBARS as a tool for measuring the quality of the implementation of WHOSSC in the surgical teams of three New Zealand hospitals. It showed that this tool in its current form had a good generalizability among teams and evaluators, and removing any of the WHOBARS items led to a decrease in the overall validity of the tool (32). Several studies highlighted the positive impact of the WHOSSC on patient safety outcomes in various surgical fields (33). However, the implementation of this checklist was affected by several factors including individual, team, and organizational barriers (34). Despite these challenges, this checklist significantly reduces complications in obstetrics and gynecology surgeries (35). Therefore, the checklist is a vital tool to protect patients from injury during surgery, but its effectiveness depends on the understanding and commitment of both the manager of the operating room and the members of the surgical team (36). In the current study, the validity of all items was verified and the tool was finalized

with 15 items.

In a series of studies that investigated the implementation and effectiveness of SSC, Moyle Smith (2022) emphasized the need for a comprehensive assessment of performance, including quality of care, safety culture, and adherence to the checklist (37). Panda (2021) confirmed this by emphasizing the importance of effective implementation strategies (38). However, Burgess (2015) identified obstacles to the implementation of the checklist, such as conflicting priorities and employees' routine work processes, which can disrupt the use of the checklist (39). These studies generally emphasized the necessity of continuous performance evaluation and the use of SSCs to promote patient safety, whose effectiveness depends on the continuous and sustainable use of the checklist. This requires a supportive hospital environment and a system for monitoring and managing adherence to the checklist items (40).

According to the study by Santana (2016), the implementation of WHOSSC in operating rooms showed different levels of compliance with its items; so, there has been a significant improvement in some areas such as patient identification (41). However, according to the findings of Dakivich (2012), challenges in its implementation, including the need for the participation of the surgical team in the planning and development of the project, have also been mentioned (42). According to the study by Selma-Vicent (2012), this checklist increased the employees' workload, but it highlighted certain activities that requires culture change and interdisciplinary cooperation. Also, the role of

nurses in the implementation process was emphasized; so, participation reveals both their commitment to patient safety and their educational needs (43). These findings emphasize the importance of a comprehensive approach to the implementation of checklist, including team participation, culture change, and continuous evaluation.

### Limitation

In this study, the validity and reliability of the tool were confirmed; the construct validity of the tool is suggested in the next section. Also, the use of this tool was restricted to clinical environments with rules and principles based on the investigated environment.

### Conclusion

According to the findings, the Iranian version of WHOBARS can be used as a reliable and valid tool to evaluate the safe performance of students and graduates of operating room technology in order to maintain patient safety which can be used for research, education, and quality improvement purposes of patient care.

### Ethical consideration

This study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran. (ID: IR.SSU.SPH.REC.1402.034). The work was conducted following the Declaration of Helsinki. All participants were provided with information on the study and gave their consent. The written consent forms were obtained from all participants.

### Acknowledgment

The researchers expressed their gratitude to the students of the operating room technology of Shahid Sadoughi University of Medical Sciences and the staff of the operating room of Shahid Sadoughi Hospital for participating in this research.

### Conflict of interests

The authors declared no conflict of interests.

### Authors' contributions

M.M and F.K conceptualized the study and its design. M.M. participated in data collection. H.S, F.K and S.J participated in data analysis and data interpretation. The authors fulfilled the requirements for authorship and contributed to the preparation of the manuscript. Additionally, the authors endorsed the final manuscript.

### Conflict of interests

The authors declared no conflict of interests.

### Funding

This project resulted from an MSc thesis in surgical technology at Shahid Sadoughi University of Medical Sciences, Yazd, Iran. (ID: 15257). The grant supported the data collection process. The funders had no role in the design of the study and collection, analysis, interpretation of data, or preparation of the manuscript.

### References

- Rodziewicz, T. L., Houseman, B., Vaqar, S., & Hipskind, J. E. (2024). Medical Error Reduction and Prevention. In StatPearls. StatPearls Publishing.
- Ingvarsdottir E, Halldorsdottir S. Enhancing patient safety in the operating theatre: from the perspective of experienced operating theatre nurses. *Scandinavian journal of caring sciences*. 2018;32(2):951-60.
- Gens-Barberà M, Rey-Reñones C, Hernández-Vidal N, Vidal-Esteve E, Mengíbar-García Y, Hospital-Guardiola I, et al. Effectiveness of new tools to define an up-to-date patient safety risk map: a primary care study protocol. *International Journal of Environmental Research and Public Health*. 2021;18(16):8612.
- Murphy J. World Patient Safety Day. *Irish Medical Journal*. 2019;112(9):997.
- Zegers M, de Bruijne MC, Wagner C, Hoonhout LH, Waaijman R, Smits M, et al. Adverse events and potentially preventable deaths in Dutch hospitals: results of a retrospective patient record review study. *BMJ Quality & Safety*. 2009;18(4):297-302.
- Baker GR, Norton PG, Flintoft V, Blais R, Brown A, Cox J, et al. The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. *Cmaj*. 2004;170(11):1678-86.
- Brennan TA, Leape LL, Laird NM, Hebert L, Localio AR,

- Lawthers AG, et al. Incidence of adverse events and negligence in hospitalized patients: results of the Harvard Medical Practice Study I. *New England journal of medicine*. 1991;324(6):370-6.
8. Classen DC, Pestotnik SL, Evans RS, Lloyd JF, Burke JP. Adverse drug events in hospitalized patients: excess length of stay, extra costs, and attributable mortality. *Jama*. 1997;277(4):301-6.
  9. Zegers M, de Bruijne MC, de Keizer B, Merten H, Groenewegen PP, van der Wal G, et al. The incidence, root-causes, and outcomes of adverse events in surgical units: implication for potential prevention strategies. *Patient safety in surgery*. 2011;5:1-11.
  10. Gawande AA, Thomas EJ, Zinner MJ, Brennan TA. The incidence and nature of surgical adverse events in Colorado and Utah in 1992. *Surgery*. 1999; 126(1):66-75.
  11. Leape LL, Brennan TA, Laird N, Lawthers AG, Localio AR, Barnes BA, et al. The nature of adverse events in hospitalized patients: results of the Harvard Medical Practice Study II. *New England journal of medicine*. 1991;324(6):377-84.
  12. Thomas EJ, Studdert DM, Burstin HR, Orav EJ, Zeena T, Williams EJ, et al. Incidence and types of adverse events and negligent care in Utah and Colorado. *Medical care*. 2000;38(3):261-71.
  13. De Rosis S, Ferrè F, Pennucci F. Including patient-reported measures in performance evaluation systems: Patient contribution in assessing and improving the healthcare systems. *The International Journal of Health Planning and Management*. 2022;37:144-65.
  14. de Vries EN, Prins HA, Crolla RM, den Outer AJ, van Andel G, van Helden SH, et al. Effect of a comprehensive surgical safety system on patient outcomes. *New England Journal of Medicine*. 2010;363(20):1928-37.
  15. Manser T. Teamwork and patient safety in dynamic domains of healthcare: a review of the literature. *Acta Anaesthesiologica Scandinavica*. 2009;53(2):143-51.
  16. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat A-HS, Dellinger EP, et al. Changes in safety attitude and relationship to decreased postoperative morbidity and mortality following implementation of a checklist-based surgical safety intervention. *BMJ quality & safety*. 2011;20(1):102-7.
  17. Makary MA, Mukherjee A, Sexton JB, Syin D, Goodrich E, Hartmann E, et al. Operating room briefings and wrong-site surgery. *Journal of the American College of Surgeons*. 2007;204(2):236-43.
  18. Lives SSS. WHO guidelines for safe surgery 2009. Geneva: World Health Organization. 2009.
  19. Weiser TG, Haynes AB, Dziekan G, Berry WR, Lipsitz SR, Gawande AA. Effect of a 19-item surgical safety checklist during urgent operations in a global patient population. *Annals of surgery*. 2010;25. 80-976:(5)1
  20. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat A-HS, Dellinger EP, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *New England journal of medicine*. 2009;360(5):491-9.
  21. Russ S, Rout S, Caris J, Mansell J, Davies R, Mayer E, et al. Measuring variation in use of the WHO surgical safety checklist in the operating room: a multicenter prospective cross-sectional study. *Journal of the American College of Surgeons*. 2015;220(1):1-11. e4.
  22. Vogts, N., Hannam, J. A., Merry, A. F., & Mitchell, S. J. (2011). Compliance and quality in administration of a Surgical Safety Checklist in a tertiary New Zealand hospital. *The New Zealand medical journal*, 124(1342), 48–58.
  23. Hannam JA, Glass L, Kwon J, Windsor J, Stapelberg F, Callaghan K, et al. A prospective, observational study of the effects of implementation strategy on compliance with a surgical safety checklist. *BMJ quality & safety*. 2013;22(11):940-7.
  24. Cheraqpur M, Aarabi A, Bahrami M, Akbari L. Competency assessment of the operating room staff and some related factors: A multi-center cross-sectional study. *Iranian Journal of Nursing and Midwifery Research*. 2022;27(4):287-93.
  25. Devcich DA, Weller J, Mitchell SJ, McLaughlin S, Barker L, Rudolph JW, et al. A behaviourally anchored rating scale for evaluating the use of the WHO surgical safety checklist: development and initial evaluation of the WHOBARS. *BMJ Quality & Safety*. 2016;25(10): 778-86.
  26. Lawsche C. A quantitative approach to content validity. *Pers Psychol*. 1975;28(4):563-75.
  27. Waltz CF, Bausell BR. *Nursing research: design statistics and computer analysis*: Davis Fa; 1981.
  28. Likert R. A technique for the measurement of attitudes. *Archives of psychology*. 1932.
  29. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in nursing & health*. 2007;30(4):459-67.
  30. Hyrkäs K, Appelqvist-Schmidlechner K, Oksa L. Validating an instrument for clinical supervision using

- an expert panel. *International Journal of nursing studies*. 2003;40(6):61.9-25
31. Lohr KN, Aaronson NK, Alonso J, Burnam MA, Patrick DL, Perrin EB, et al. Evaluating quality-of-life and health status instruments: development of scientific review criteria. *Clinical therapeutics*. 1996;18(5):979-92.
  32. Medvedev ON, Merry AF, Skilton C, Gargiulo DA, Mitchell SJ, Weller JM. Examining reliability of WHOBARS: a tool to measure the quality of administration of WHO surgical safety checklist using generalisability theory with surgical teams from three New Zealand hospitals. *BMJ open*. 2019;9(1): e022625.
  33. Patel J, Ahmed K, Guru KA, Khan F, Marsh H, Khan MS, et al. An overview of the use and implementation of checklists in surgical specialties—a systematic review. *International journal of surgery*. 2014;12(12): 1317-23.
  34. Herman AL, Dhamanti I. Factors inhibiting the use of surgical safety checklist in hospitals: Literature review. *World Journal of Advanced Research and Reviews*. 2024;22(1):609-20.
  35. Singh SS, Mehra N, Hopkins L. No. 286-surgical safety checklist in obstetrics and Gynaecology. *Journal of Obstetrics and Gynaecology Canada*. 2018;40(3): e237-e42.
  36. Maslov M. Surgical safety checklist for surgical interventions. *Khirurgiia*. 2023(10):117-23.
  37. Moyal-Smith R, Etheridge JC, Lim SR, Sonnay Y, Tan HK, Yong TT, et al. Creating a high-performance surgical safety checklist: A multimodal evaluation plan to reinvigorate the checklist. *Journal of Evaluation in Clinical Practice*. 2023;29(2):341-50.
  38. Panda N, Haynes AB. Effective Implementation and Utilization of Checklists in Surgical Patient Safety. *Surg Clin North Am*. 2021 Feb;101(1):37-48.
  39. Bergs J, Lambrechts F, Simons P, Vlayen A, Marneffe W, Hellings J, et al. Barriers and facilitators related to the implementation of surgical safety checklists: a systematic review of the qualitative evidence. *BMJ quality & safety*. 2015;24(12):776-86.
  40. Robbins J. Hospital Checklists. *Critical care nursing quarterly*. 2011;34(2):142-9.
  41. Santana HT, de Freitas MR, Ferraz EM, Evangelista MS. WHO Safety surgical checklist implementation evaluation in public hospitals in the Brazilian Federal District. *Journal of infection and public health*. 2016;9(5):586-99.
  42. Dackiewicz N, Viteritti L, Marciano B, Bailez M, Merino P, Bortolato D, et al. Lista de verificación de seguridad de la cirugía: logros y dificultades de su implementación en un hospital pediátrico. *Archivos argentinos de pediatría*. 2012;110(6):503-8.
  43. MT CF. Patient safety in the operating room. Checklist implementation of general surgery. *Revista de Enfermería (Barcelona, Spain)*. 2012;35(5):22-4, 6.