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The Surgical Safety Checklist from the resident's perspective. Observational study

La lista de cirugía segura desde la perspectiva del residente. Estudio observacional

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What do we know about this topic?

- Patient safety education translates into less perioperative adverse events.
- There are multiple barriers to the administration of the surgical checklist.
- Conveying a culture of safety among trainees has a positive impact on the adoption of safe practices during their professional life.

What does this study contribute with?

- There is a limited exposure to education about the surgical safety checklist during the anesthesiology postgraduate programs in the country.
- Residents have a favorable perception about the value of the surgical safety checklist.

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Abstract

Introduction

The Surgical Safety Checklist implemented by the World Health Organization has proven to decrease perioperative morbidity and mortality; however, the barriers and limitations to its implementation are consistently reported in the literature.

Objective

To establish the level of appropriation of the surgical safety checklist in the training of human resources in anesthesiology, in addition to identifying the perception and the level of implementation of such checklist at the national scale.

Methods

Descriptive cross-sectional study conducted through a survey administered to the residents of anesthesiology in Colombia. Likert-type questions were included, distributed into three domains: appropriation, perception and implementation.

Results

215 answers corresponding to 54.5 % of the population were analyzed, comprising participants from all of the anesthesiology programs in the country. 20% of the residents have never been subject to formal academic reviews about checklists, and this trend did not change throughout the residency; 97.2 % considers that the implementation of the lists improves the safety of surgical procedures and 40 % have seen rejection or indifference by surgeons. 80.5 % of the residents have seen the frequent use of the checklist, while only 13.5% have seen the use of the checklist during the three surgical moments – before the induction of anesthesia, before the surgical incision, and before the patient leaves the operating room –; 88 % have observed that the form is completed without actually doing the verification.

Conclusions

There is limited exposure to education about the surgical safety checklist in anesthesiology postgraduate programs in the country. The residents have a favorable perception about the value of the list, however, there are some shortcomings in its administration.

Keywords

Perioperative period; Patient safety; Health; Culture; Checklist; Internship and residence; Anesthesiology.

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Resumen

Introducción: La lista de verificación de cirugía segura implementada por la Organización Mundial de la Salud ha demostrado disminuir la morbi-mortalidad perioperatoria; no obstante, en la literatura se reportan de manera sistemática las barreras y limitaciones en su aplicación.

Objetivo: Establecer el grado de apropiación de la lista de verificación de cirugía segura en la formación del talento humano en anestesiología en entrenamiento, así como determinar la percepción y el nivel de implementación de dicha lista a escala nacional.

Métodos: Estudio descriptivo de corte transversal realizado mediante una encuesta a los residentes de anestesiología en Colombia. Se incluyeron preguntas tipo Likert distribuidas en 3 dominios: apropiación, percepción e implementación.

Resultados: Se analizaron 215 respuestas correspondiente a un 54,5 % de la población y se contó con la participación de todos los programas de anestesiología del país. El 20 % de los residentes nunca ha tenido revisiones académicas formales sobre listas de verificación y esta tendencia no se modificó a lo largo de la residencia, el 97,2 % considera que la implementación de las listas incrementa la seguridad de los procedimientos quirúrgicos y el 40 % ha observado rechazo o indiferencia por parte de los cirujanos. El 80,5 % de los residentes ha observado su aplicación frecuente, solo el 13,5 % ha observado aplicar la lista en los tres momentos (antes de la inducción anestésica, antes de la incisión quirúrgica, antes de la salida del paciente del quirófano) y el 88 % ha observado diligenciar el formato sin realizar la verificación.

Conclusiones: Existe poca exposición a la enseñanza de la lista de verificación de cirugía segura en los posgrados de anestesiología del país. Los residentes tienen una percepción favorable sobre la utilidad de la lista; sin embargo, su implementación tiene falencias en cuanto a la forma de aplicación.

Palabras clave: Periodo perioperatorio; Seguridad del paciente; Salud; Cultura; Lista de verificación; Internado y residencia; Anestesiología.

INTRODUCTION

Major complications have been recorded in 3–17% of patients undergoing surgery that require hospital admission in high income countries, with mortality or permanent disability rates ranging from 0.4 % to 0.8 %. This has led to the worldwide implementation of the campaign “safe surgery saves lives”. (1) The World Health Organization (WHO) summarized the basic safety standards that should be followed in the operating room when conducting a procedure, in order to ensure patient safety. (2) This initiative was adopted in Colombia within the framework of the 28th Colombian Congress of Anesthesiology in 2009. (3)

The correct use of the surgical safety checklist (SSC) promotes a culture of safety among the entire surgical team. It is extremely important to involve the anesthesiology trainees since they will be the future leaders in patient safety. It has been shown that exposure to a perioperative safety culture from early stages in academic training is effective and persists for up to 15

years after the completion of the residency.

(4) Consequently, it is indispensable to learn about the appropriation, perception and implementation from the perspective of the anesthesiology residents.

During the implementation of the checklist, the literature shows the significant benefits in terms of decreased mortality. (5,6) Haynes et al. (7) found that after administering the SSC in hospitals in different cities around the world, the mortality rate dropped from 1.5 % to 0.8 %. A study in Colombia reports an adherence above 90 % with most of the items in the SSC, in addition to a reduction in the number of adverse events since the list has been implemented (from 7.26 % to 3.29 %) (8). A second study found that the SSC was completed in 75.5 % of the surgical cases assessed. (9)

Consequently, the purpose of this study was to establish the level of appropriation of the SSC in the training of anesthesiologists in Colombia, and to identify the perception and the level of implementation of such list at the national scale.

METHODS

A survey-type observational, descriptive study was designed with approval of the ethics committee of the Universidad de Caldas. Each participant signed the informed consent.

Anesthesia residents of all the medical schools endorsed by the National Ministry of Education were included. Residents from other medical-surgical specialties, undergraduate medical students, and other healthcare-related professions, as well as anesthesiology residents studying abroad were all excluded.

The researchers designed a digital survey based on the key findings described in the literature with regards to the limitations for the implementation of the SSC. The survey was reviewed and a pilot test was used to assess its performance. The questions were classified into three major domains: appropriation, perception and implementation. The survey was distributed via email and via the personal mobile phone of each of the national residents. The survey was available online

through the platform from March 4 through March 18, 2021. The data were collected in a platform-generated database.

STATISTICAL ANALYSIS

The summary of the continuous data was based on medians and interquartile ranges. The answers to the Likert-type questions were analyzed using frequency distribution tables. The information was analyzed using the Stata software version 16.1 in an exploratory approach.

RESULTS

From a total number of 394 residents of anesthesiology in the country, 231 answers were collected. After screening the database, 215 valid answers were included for analysis, which corresponded to 54.6% of the total population. The mean age was 28 years with an interquartile range of 27 to 31 years. The other socio-demographic characteristics of the population are shown in Table 1; all the anesthesiology programs in the country participated in variable proportions (Figure 1).

Appropriation of the SSC

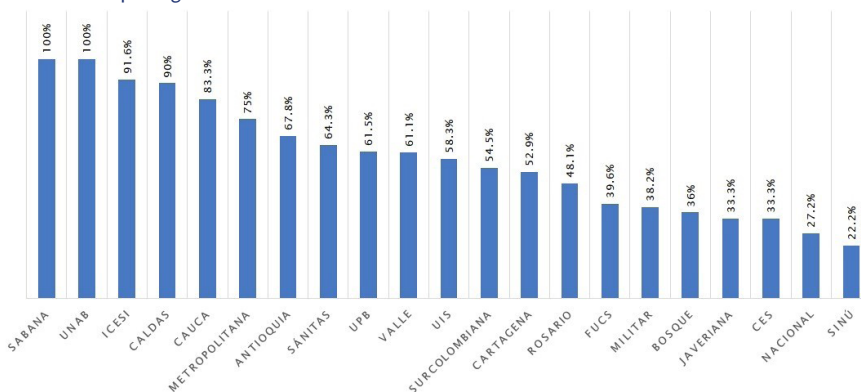
39.1 % of the residents said that they had never or almost never been exposed to

TABLE 1. Socio-demographic variables of the participating residents.

Socio-demographic variables		n	%
Gender	Male	93	43.2
	Female	122	56.8
Level of residence	First year	55	25.6
	Second year	76	35.3
	Third year	72	33.5
	Fourth year	12	5.6
Age	Average	29.2 years (SD 0.24)	
	Median	28 years	
	Interquartile range	27-31 years	

SD: Standard deviation. **SOURCE:** Authors.

FIGURE 1. Participating universities.



CES: Corporación de Estudios para la Salud; FUCS: Fundación Universitaria de Ciencias de la Salud; UIS: Universidad Industrial de Santander; UNAB: Universidad Autónoma de Bucaramanga; UPB: Universidad Pontificia Bolivariana.

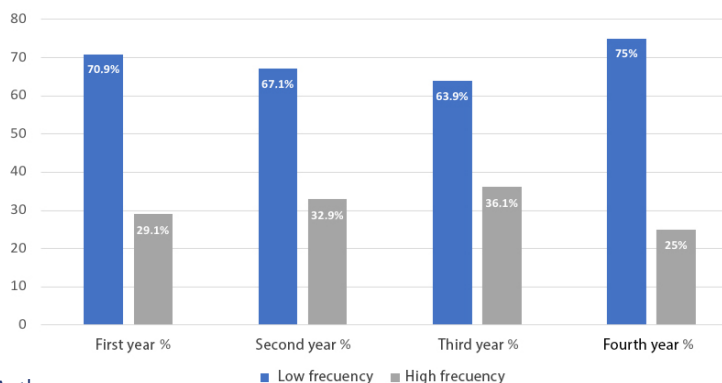
SOURCE: Authors.

TABLE 2. Appropriation.

Appropriation	Frequency	n	%
Formal academic reviews	Never	43	20
	Almost never	41	19.1
	Occasionally	61	28.4
	Frequently	37	17.2
	Very frequently	33	15.3
	Total	215	100
The most important moment of the SSC based on the academic reviews	Has not had any reviews	50	23.2
	Before the induction of anesthesia	90	41.9
	Before the surgical incision	12	5.6
	Before leaving the operating room	0	0
	At the three moments	63	29.3
Total	215	100	
Knowledge about the impact on mortality gained from academic reviews	Has not had any reviews	51	23.7
	Does not remember	39	18.1
	Has no impact on mortality	3	1.4
	Low mortality impact	4	1.9
	Average mortality impact	23	10.7
	High mortality impact	95	44.2
	Total	215	100

SOURCE: Authors.

FIGURE 2. Frequency of formal reviews on SSC based on level of residency.



SOURCE: Authors.

TABLE 3. Perception.

Perception	n	%	
Improved safety of surgical procedures	Disagrees	2	0.9
	Partially agrees	4	1.9
	Totally agrees	209	97.2
	Total	215	100
Improved surgical team communication	Deteriorates communication	0	0
	Has no impact on communication	3	1.4
	Partially agrees	13	6.1
	Totally agrees	199	92.5
	Total	215	100
Improved safety culture	Deteriorates the safety culture	0	0
	Has no impact on safety culture	1	0.5
	Partially agrees	5	2.3
	Totally agrees	209	97.2
	Total	215	100
Delays the start of the procedure	Disagrees	179	83.3
	Partially agrees	30	13.9
	Totally agrees	6	2.8
	Total	215	100
Easy to administer	Yes	210	97.7
	No	5	2.3
	Total	215	100
If you ever undergo surgery, would like the SSC to be used?	Yes	215	100
	No	0	0
	Total	215	100
Has any significant oversight been prevented with the use of the SSC?	Yes	183	45.1
	No	32	14.9
	Total	215	100
Length of the SSC	Too short	0	0
	Short	4	1.9
	Adequate	173	80.5
	Long	36	16.7
	Too long	2	0.9
	Total	215	100
Dispense with any moment	None	156	72.5
	Before the induction of anesthesia	3	1.4
	Before the surgical incision	24	11.2
	Before leaving the operating room	24	11.2
	Total	215	100
Acceptance by anesthesiologists	Rejection	1	0.5
	Indifferent	10	4.7
	Low acceptance	14	6.5
	Moderate acceptance	71	33.0
	High acceptance	119	55.3
	Total	215	100
Acceptance by surgeons	Rejection	5	2.3
	Indiferente	22	10.2
	Baja aceptación	59	27.5
	Moderada aceptación	71	33.0
	Alta aceptación	58	27.0
	Total	215	100

SOURCE: Authors.

any formal training on the SSC and the frequency of reviews does not change as they move forward in their residence year (Table 2 and Figure 2).

Perception

97.2 % of the residents considered that the use of the SSC improves the safety of surgical procedures and helps to develop a culture of safety among the team. With regards to the attitude of the anesthesiologists when administering the checklist, 88.3 % perceived a moderate to high acceptance and when asked about the attitude of surgeons, 60 % of the residents felt they had a similar attitude (Table 3).

Implementation

80.5 % of the residents noticed that the SSC is completed always or almost always.

When inquiring about the presence of the full team at the time of administering the SSC, 40 % said the team was always complete and 88 % of the residents have observed that the form is completed without a proper verification. 40 % has evidenced this behavior always or almost always (Table 4).

Discussion

Patient safety associated with the perioperative environment is an ongoing concern and ideally should be mandatory. Enhancing patient safety has been shown to decrease the number of adverse events, improve patient safety and raise the level of satisfaction and confidence of the surgical team to conduct the procedures, particularly when these procedures are not frequently conducted. (10)

Patient safety education at the academic institutions responsible for training healthcare human resources is not given the importance it deserves. (11) In this study, 20 % of the residents said

TABLE 4. Implementation.

Implementation	n	%	
Who administers the SSC?	Anesthesiologist	129	60
	Licensed practical nurse	127	59.1
	Anesthesiology resident	80	37.2
	Scrub nurse	69	31.2
	Surgeon	57	26.5
	Head nurse	46	21.4
	Surgical resident	27	12.6
Have you seen the SSC being implemented? How frequently?	Never	0	0
	Almost never	9	4.2
	Some times	33	15.3
	Almost always	80	37.2
	Always	93	43.3
	Total	215	100
At which moment is the SSC more often administered?	None	0	0
	Preinduction of anesthesia	159	74
	Pre-surgical incision	25	11.6
	Before leaving the operating room	1	0.5
	All	30	13.9
	Total	215	100
How rigorous is the administration of the SSC?	Very low	2	1
	Low	6	2.8
	Medium	65	30.2
	High	114	53.0
	Very high	28	13.0
	Total	215	100
The surgical team in full is present	Never	1	0.5
	Some times	12	5.5
	Fifty percent of the times	26	12.1
	Most of the time	90	41.9
	Always	86	40.0
	Total	215	100
Have you seen that the SSC form is completed without a rigorous verification?	Never	26	12
	Very rarely	53	24.7
	Some times	50	23.3
	Almost always	46	21.4
	Always	40	18.8
	Total	215	100
Have you seen the use of technology tools?	Never	90	41.9
	Very rarely	68	31.6
	Some times	30	13.9
	Almost always	15	7.0
	Always	12	5.6
	Total	215	100

SOURCE: Authors.

they have never been exposed to a formal review on surgical safety checklists, while 80 % said they did, though with varying levels of frequency. This is in contrast with the results of the Accreditation Council for Medical Graduate Education in the United States, in a study conducted between September 2012 and March 2015, which interviewed 297 institutions comprising 8,755 residents and fellows of all the clinical and surgical specialties. This study showed that 96.8 % of the residents had received formal education on patient safety via group discussions and virtual sessions with questions. (4) Additionally, the study found that the primary center where learning takes place has a lasting impact on the professional behavior and conduct of the graduated residents for up to 15 years; therefore, it is important that the institutions that admit residents be even more diligent in the implementation of surgical safety checklists and in their patient safety policy. (4)

Patient safety education is considered a “non-major” subject in the curriculum and skills development plan of the anesthesiology program in Colombia, published by the Colombian Society of Anesthesiology and Resuscitation (S.C.A.R.E.) in 2016 (12). In this program, the subjects or topics are classified into two domains: “inclusion recommended” and “discussion”; such classification is based on surveys administered to anesthesiologists and by comparisons against universities abroad. The closest subject description in this classification is “safety and anesthesia”, which belongs to the discussion domain and is not considered “mandatory” in the anesthesiology curriculum. This situation is most concerning since in the “inclusion recommended” domain there are subjects or situations to which anesthesiologists will be very seldom exposed to, while patient safety and the surgical safety checklist are part of the daily practice of any anesthesiologist. (12)

No information has been found on patient safety among postgraduate students at the national level; in contrast,

there are review articles and a systematic review of patient safety involving undergraduate students. A significant involvement of nursing programs in patient safety is to be noted. (13) These documents emphasize the importance of teaching patient safety to undergraduate students, since they are more likely to use the knowledge acquired and to practice a culture of safety during their professional lives. (11) It is quite surprising that 23.8 % of the anesthesiology residents feel that one of the three moments in the list could be disregarded; 3.75 % believe that all the three moments may be omitted; moreover, 20 % of them have never experienced any formal reviews on the topic, notwithstanding the evidence that these teachings – even in undergraduate programs – may prove to be effective. (14) This behavior is similar to the situation in Guatemala, where albeit the wide acceptance of the SSC, there is poor implementation and use. (15)

Studies such as the one by Haynes et al. (16) suggest that the introduction of the surgical safety checklist generates a change in perception about safety of the surgical team members and this change in perception is associated with improved mortality and morbidity outcomes. In this study, the anesthesiology residents in the country felt that the SSC improves the safety of surgical procedures, enhances communication and strengthens the culture of safety of the perioperative team, with no negative impact on the timely start of the procedure. Moreover, their perception is that it is not difficult to use and 85 % have found that the use of the checklist has prevented the occurrence of adverse events. 100 % of the residents expressed their wish to have the SSC implemented if they were to undergo a surgical procedure, although 2.8 % of them doubt that the use of the SSC improves safety.

Russ et al. (17), in their study on barriers and facilitators for the implementation of the SSC in the United Kingdom, unveil the existence of organizational barriers to the implementation of the checklist, in addition to hurdles associated with

the team involved and highlight active resistance or passive non-compliance by the surgeon or the anesthesiologist. In this regard, the study found that the attitude of the anesthesiologist tends to be empathetic vis a vis the administration of the checklist, but 40 % of the surgeons tend to reject or show poor acceptance of the checklist.

When asking the residents surveyed about any potential changes to the surgical safety checklist to which they have been exposed, most of them said they would not make any changes. However, when assessing the administration of the checklist, 74 % said that it is used during the first moment and only 13.9 % administer the checklist in full, which has proven to be most effective approach. (18) Therefore, it is yet unclear whether the institutional changes to the SSC improve its applicability or make it longer and more difficult to use and hence those who implement the checklist in their daily practice only use it for the first moment.

While 80 % of the residents expressed that the SSC are always or almost always administered, it is quite concerning that 88 % have seen that the SSC form is completed without conducting a proper timeout; hence, this highly effective tool becomes just one more document attached to the patient's medical record. Moreover, in most cases, it is mostly administered before the induction of anesthesia, and when asked about the presence of all the team members involved with the procedure, only 40 % of the residents said that the surgical team was complete at the time of the administration of the checklist. This proves that strictness is highly variable and this affects the effectiveness of the SSC. (18,19) According to our study, the principal actors responsible for the implementation of the SSC are the anesthesiologists - 60% of the cases – and the licensed practical nurse represents 59.1 %; these data are consistent with previous local studies. (9)

According to Stolsky et al. (20), this behavior may be the result of the fact that the institutional changes introduced to the SSC delete the items intended to foster communication or include additional items

to try to make the list more comprehensive; however, the result is a list designed to simply check boxes instead of providing an opportunity to identify potential errors. Therefore, further studies are needed to assess barriers and facilitators for the administration of the SSC.

This study may have been subject to selection biases (volunteer effect). To overcome this bias, a broad dissemination of the survey was conducted via email forwarded directly from the Office of Scientific Research of the S.C.A.R.E. Moreover, the anesthesia residents were reached by phone by the heads of the residency program and the postgraduate coordinators of each school.

In conclusion, there is little exposure to SSC education in the anesthesiology postgraduate programs in the country during the residency; a significant proportion of residents complete their career training without a clear understanding of the SSC. The anesthesiology residents in the country have a favorable perception about the value of the SSC and show a positive attitude versus its implementation, hence acknowledging and promoting its proper use.

ETHICAL RESPONSIBILITIES

Endorsed by the Ethics Committee

This study was approved by the Ethics Committee of Universidad de Caldas under code CBCS-090 dated November 23, 2020, in Manizales, Colombia.

Protection of persons and animals

The authors declare that no experiments in humans or animals were conducted for this research project. The authors declare that the procedures followed were consistent with the ethical standards of the responsible human experimentation committee and in accordance with the World Medical Association and the Declaration of Helsinki.

Confidentiality of the data

The authors declare that they have followed the protocols of their institutions on the publication of patient data.

Right to privacy and informed consent

The authors declare that this article does not include any patient data. The authors have obtained the informed consent of the patients and/or subjects mentioned in the article. This document is in possession of the corresponding author.

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Authors' contributions

CAGC and JVHR: Study planning, data collection, interpretation of the results, initial drafting and final approval of the manuscript.

JCGS: Conception of the original project, data collection, interpretation of the results and final approval of the manuscript.

Assistance for the study

Dr. Luz María Gómez, scientific deputy director of the Colombian Society of Anesthesiology and Resuscitation (S.C.A.R.E.) and Yenny Marcela Muñoz, Professional in Research and Scientific Publications of S.C.A.R.E. assisted in disseminating the survey.

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None declared.

Conflicts of interest

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Presentations

None declared.

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REFERENCES

- World Health Organization. The second global patient safety challenge: safe surgery saves lives [Internet]. 2008 [cited: 2018 Sep 30]. Available at: https://www.who.int/patientsafety/safesurgery/knowledge_base/SSSL_Brochure_finalJun08.pdf
- Weiser TG, Haynes AB, Lashoher A, Dziekan G, Boorman DJ, Berry WR, et al. Perspectives in quality: Designing the WHO surgical safety checklist. *Int J Qual Heal Care.* 2010;22(5):365-70. doi: <http://www.doi.org/10.1093/intqhc/mzq039>
- Collazos C. El compromiso de la SCARE con la calidad de atención: apoyo a la campaña cirugía segura salva vidas en Colombia. *Revista Médico Legal* [Internet]. 2009 [cited: 2018 Jun 16]. Available at: https://www.academia.edu/3848721/ARTICULO_EL_COMPROMISO_DE_LA_SCARE_CON_LA_CALIDAD_DE_LA_ATENCION.
- Koh NJ, Wagner R, Newton RC, Casey BR, Sun H, Weiss KB. Detailed findings from the CLER National Report of Findings 2018. *J Grad Med Educ.* 2018;10(4):49-68. doi: <http://www.doi.org/10.4300/1949-8349.10.45.49>
- Bergs J, Hellings J, Cleemput I, Zurel Ö, De Troyer V, Van Hiel M, et al. Systematic review and meta-analysis of the effect of the World Health Organization surgical safety checklist on postoperative complications. *British Journal of Surgery.* 2014. doi: <http://www.doi.org/10.1002/bjs.9381>
- Treadwell JR, Lucas S, Tsou AY. Surgical checklists: A systematic review of impacts and implementation. *BMJ Qual Saf.* 2014;23(4):299-318. doi: <http://www.doi.org/10.1136/bmjqs-2012-001797>
- 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. *N Engl J Med.* 2009;360(5):491-9. doi: <http://www.doi.org/10.1056/NEJMsa0810119>
- Collazos C, Bermúdez L, Quintero A, Quintero LE, Díaz MM. Checklist verification for surgery safety from the patient's perspective. *Colombian Journal of Anesthesiology.* 2013. <https://doi.org/10.1016/j.rca.2013.01.001>
- Ramírez CM, Prada WA, Guayán IC, Patiño M. Utilización de listas de chequeo en cirugías programadas. Bogotá. *Rev Colomb Cir.* 2017;32:109-23. doi: <https://doi.org/10.30944/20117582.14>.
- Thomassen Ø, Brattebø G, Heltne J-K, Sjøfteland E, Espeland A. Checklists in the operating room: Help or hurdle? A qualitative study on health workers' experiences. *BMC Health Serv Res.* 2010;10(1):342. doi: <http://www.doi.org/10.1186/1472-6963-10-342>.
- Nie Y, Li L, Duan Y, Chen P, Barraclough BH, Zhang M, et al. Patient safety education for undergraduate medical students: A systematic review. *BMC Med Educ.* 2011;11(1). doi: <https://doi.org/10.1186/1472-6920-11-33>
- Gómez LM, Gómez JC, Sánchez NF, González LM, Naranjo LF, Ríos F, et al. Plan de estudios y competencias para un programa de anestesiología en Colombia [Internet]. 2017 [cited: 2021 Mar 21]. Available: <https://scare.org.co/wp-content/uploads/Documento-Marco-del-Plan-de-Estudios-y-Competencias-para-un-programa-de-Anestesiologia-en-Colombia-1.pdf>
- Kilduff CLS, Leith TO, Drake TM, Fitzgerald JEF. Surgical safety checklist training: A national study of undergraduate medical and nursing student teaching, understanding and influencing factors. *Postgrad Med J.* 2018;94(1109):143-50. doi: <https://doi.org/10.1136/postgradmedj-2016-134559>
- Suleiman ARM, Amarasinghe D, Kathuria P, Vandel J, Holloway J, Elkin K, et al. Incorporating patient safety into early undergraduate medical education: Teaching medical students to perform surgical time outs during anatomy. *BMJ Open Qual.* 2021;10(1):1-5. doi: <https://doi.org/10.1136/bmjopen-2020-001229>
- Hurtado JDD, Jiménez X, Pëalonzo MA, Villatoro C, De Izquierdo S, Cifuentes M. Acceptance of the WHO Surgical Safety Checklist among surgical personnel in hospitals in Guatemala city. *BMC Health Serv Res.* 2012;12(1):0-4. doi: <https://doi.org/10.1186/1472-6963-12-169>.

16. Haynes AB, Weiser TC, Berry WR, Lipsitz SR, Breizat AHS, 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 Qual Saf.* 2011;20(1):102-7. doi: <https://doi.org/10.1136/bmjqs.2009.040022>.
17. Russ SJ, Sevdalis N, Moorthy K, Mayer EK, Rout S, Caris J, et al. A qualitative evaluation of the barriers and facilitators toward implementation of the who surgical safety checklist across hospitals in England. *Ann Surg.* 2015;261(1):81-91. doi: <https://doi.org/10.1097/SLA.0000000000000793>.
18. Haugen AS, Wæhle HV, Almeland SK, Harthug S, Sevdalis N, Eide GE, et al. Causal analysis of World Health Organization's surgical safety checklist implementation quality and impact on care processes and patient outcomes: Secondary analysis from a large stepped wedge cluster randomized controlled trial in Norway. *Ann Surg.* 2019;269(2):283-90. doi: <https://doi.org/10.1097/SLA.0000000000002584>.
19. 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. *J Am Coll Surg.* 2015;220(1):1-11.e4. doi: <https://doi.org/10.1016/j.jamcollsurg.2014.09.021>.
20. Solsky I, Berry W, Edmondson L, Lagoo J, Baugh J, Blair A, et al. World Health Organization Surgical Safety Checklist Modification: Do changes emphasize communication and teamwork? *J Surg Res.* 2020;246:614-22. doi: <https://doi.org/10.1016/j.jss.2018.09.035>.