

Safe surgery checklist: content validation proposal for liver transplantation

Lista de verificação de cirurgia segura: proposta de validação de conteúdo para o transplante hepático

Lista de verificación de cirugía segura: propuesta de validación de contenido para trasplante de hígado

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ABSTRACT

Objectives: to develop the safe surgery checklist for liver transplantation according to the original model of the World Health Organization and perform content validation. **Methods:** a methodological research developed in four stages: integrative review; expert participation; consensus among researchers; and content validation using the Delphi technique in two rounds, by five judges. For data analysis, the Content Validation Index was used. **Results:** the first version of the checklist consisted of four surgical moments with 64 items of verification, with an average Content Validation Index of 0.80. After adjustments, in the second round the checklist maintained four surgical moments with 76 items and a Content Validation Index of 0.87. **Conclusions:** the checklist was validated and adequate for the safety of liver transplantation in the surgical environment, given that each item established must be mapped and managed for the success and effectiveness of the procedure.

Descriptors: Perioperative Nursing; Intraoperative Period; Liver Transplantation; Patient Safety; Checklist.

RESUMO

Objetivos: elaborar a lista de verificação de cirurgia segura para transplante hepático segundo modelo original da Organização Mundial da Saúde e realizar a validação de conteúdo. **Métodos:** pesquisa metodológica desenvolvida em quatro etapas: revisão integrativa; participação de experts; consenso entre os pesquisadores; e validação de conteúdo utilizando a técnica Delphi em duas rodadas, por cinco juízes. Para análise dos dados, foi utilizado o Índice de Validação de Conteúdo. **Resultados:** a primeira versão do *checklist* foi formada por quatro momentos cirúrgicos com 64 itens de verificação, com média do Índice de Validação de Conteúdo de 0,80. Após ajustes, na segunda rodada o *checklist* manteve quatro momentos cirúrgicos com 76 itens e Índice de Validação de Conteúdo de 0,87. **Conclusões:** considerou-se o *checklist* validado e adequado para segurança do transplante hepático no ambiente cirúrgico, haja vista que cada item estabelecido deve ser mapeado e gerenciado para o sucesso e efetividade no procedimento.

Descritores: Enfermagem Perioperatória; Período Intraoperatório; Transplante de Fígado; Segurança do Paciente; Lista de Checagem.

RESUMEN

Objetivos: elaborar la lista de verificación de cirugía segura para trasplante hepático según modelo original de la Organización Mundial de la Salud y realizar la validación de contenido. **Métodos:** investigación metodológica desarrollada en cuatro etapas: revisión integrativa; participación de especialistas; consenso entre los investigadores; y validación de contenido utilizando la técnica Delphi en dos rodadas, por cinco jueces. Para análisis de los datos, ha sido utilizado el Índice de Validación de Contenido. **Resultados:** la primera versión del *checklist* ha sido formada por cuatro momentos quirúrgicos con 64 ítems de verificación, con media del Índice de Validación de Contenido de 0,80. Después de ajustes, en la segunda rodada el *checklist* mantuvo cuatro momentos quirúrgicos con 76 ítems e Índice de Validación de Contenido de 0,87. **Conclusiones:** se ha considerado el *checklist* validado y adecuado para seguridad del trasplante hepático en el ambiente quirúrgico, puesto que cada ítem establecido debe ser mapeado y administrado para el suceso y efectividad en el procedimiento.

Descriptorios: Enfermería Perioperatoria; Período Intraoperatorio; Trasplante Hepático; Seguridad del Paciente; Lista de Control.

INTRODUCTION

A checklist is an instrument used for quick and simple checks, and should be used by all professionals in the health team, as it enables safer care practices, minimizing risks in patient care, besides reducing hospitalization time, risk of failures, hospital expenses and improved communication between professionals⁽¹⁻⁴⁾.

To promote safe surgery, the World Health Organization (WHO) has prepared a checklist — validated for Brazil and called a checklist - which establishes three phases: the first, called Sign in, which occurs before induction of anesthesia; the second, Time out, performed immediately before the surgical incision; and the third, Sign out, developed before the patient left the operating room. This instrument aims to meet a central set of safety standards, increasing the quality of the service, preventing sentinel events, surgical site infections, enabling safe anesthesia, safe surgical teams⁽¹⁻⁴⁾.

It is a multi-professional tool, flexible, being possible to adapt it to each reality. It should be adjusted according to the need of the institution and focused on the complexity of the surgical procedure so that it can contribute to the excellence of patient care^(1,4-5).

Among the various complex procedures developed in the surgical environment, liver transplantation (Liver Transplant) is considered an extremely complex surgery, considering: the importance of the liver as a vital organ of the organism and its influence on the patient's hemodynamic stability; surgical time; the presence of the anepathic phase; and factors related to the graft. It is worth noting that this procedure consists of the total removal of the diseased liver and the replacement of a healthy liver, with the anatomical reconstruction of the liver and the biliary tract as close to the physiological pattern as possible⁽⁶⁻⁸⁾.

Still, from the perspective of this surgery, the need to manage donor-related data (age, blood type, time of aortic clamping, organ perfusion conditions, ischemia time) and the recipient (age, blood type, pre-Liver Transplant exams, among others)⁽⁹⁾. The National Health Surveillance Agency (ANVISA)⁽¹⁰⁾, through bio-vigilance, determines the management and monitoring of information from the selection of the donor to the extraction, preparation, conservation, control, distribution and implantation of the organ. Thus, it aims to develop a safe procedure in order to provide better quality of life for the patient and graft survival⁽¹⁰⁾.

As a result, it is understood as necessary and prudent to constantly manage and evaluate the conduct of the Liver Transplant surgical procedure through the checklist adjusted for such surgical reality. In order to provide greater safety during the operation, quality of care provided and less chance of errors and adverse events (AE) arising in the Liver Transplant procedure in adults, the guiding question of this study is: What are the items to be adjusted and included in the WHO safe surgery checklist for the liver transplant surgical procedure in adult patients?

OBJECTIVES

To develop the safe surgery checklist for liver transplantation according to the original model of the World Health Organization and perform content validation.

METHODS

Ethical aspects

This research complied with the terms of Resolution 466 NHC/MH, of December 12, 2012, which regulates and regulates research with human beings; and was approved by the Research Ethics Committee of the Federal University of Santa Catarina (UFSC), under Opinion No. 2.17.221.

Design and period

This is a methodological, quantitative study, whose purpose was to promote adjustments to the WHO safe surgery checklist for the liver transplantation surgical procedure in adult patients. The choice for adult patients is related to the fact that this procedure in children has other specific characteristics, which requires new adjustments in the tool. The study was developed in four stages, carried out from April to July 2017, being presented below. Content validation took place from August to November of the same year.

Study location

Teaching hospital in the southern region of Brazil, linked to a public university of reference in the Liver Transplant procedure since 2011. Until 2018, more than 120 procedures related to liver transplantation were performed there.

Population, inclusion and exclusion criteria

The population to assess the preliminary checklist for clarity (must be easy to understand or understand) and pertinence (must be congruent and relevant to the theme). Criteria for inclusion of professionals with expertise who participated in the second stage of the research: training time in the health field over eight years and time in the Liver Transplant transoperative area over five years. To define these criteria, the authors considered the complexity and specificities of the Liver Transplant transoperative, as already mentioned. Seven professionals participated, among them: anesthetists, nurses and surgeons of Liver Transplant.

After necessary adjustments to the checklist as suggested by professionals with expertise, the content was validated with the participation of five judges. To define them, the following criteria were used: having a degree in Nursing or Medicine; masters and / or doctorate; have published works in the area of interest of the study; have at least five years' experience in direct Liver Transplant patient care during the operation. The search for the judges took place in June and July 2017 through the curriculum at *Lattes Platform* - National Council for Scientific and Technological Development (CNPq). The sample of judges was intentional, considering those who met the largest number of criteria established. Contacts with them were made via e-mail, to send the FICT as well as documents and guidelines in order to proceed with content validation.

Study protocol

The construction of the checklist consisted of four distinct stages: 1) an integrative literature review, 2) consultation with

professionals with expertise in the field, 3) preparation of the first version of the safe surgery checklist adapted for Liver Transplant and 4) content validation performed using the Delphi technique.

1st step - Literature review through six stages: elaboration of the research question; definition of criteria for searching the literature; data collection; critical analysis of the material obtained; careful evaluation and interpretation of information; and presentation of the results obtained. The search was carried out in six databases, namely, Latin American and Caribbean Literature in Health Sciences (LILACS), Biomedical Literature Citations and Abstracts (PubMed), SCOPUS, Web of Science and Cumulative Index to Nursing and Allied Health Literature (CINAHL) and the Scientific Electronic Library Online library (SciELO); without time filter, in order to find as much information as possible. The literature search aimed to identify evidence regarding safety in the Liver Transplant transoperative that supported adjustments and inclusion of items in the WHO checklist (original version). It was carried out by two independent professionals between April and May 2017. The search strategy was subsidized by a librarian, who used the descriptors "intraoperative period", "surgical centers", "liver transplantation", "safety management", "safety", "patient safety" and "checklist", in Portuguese, English and Spanish, without restriction of years. In this review, 16 articles related to the theme were identified. However, only four referred to safe care during Liver Transplant transoperative. The information obtained in the integrative review was organized in an electronic spreadsheet with the aid of Excel software version 2013, in which they were recorded: title, year of publication, authors, journal, database, objectives, type of study, level of evidence, results and recommendations.

2nd step - Considering the little material obtained in the literature review to compose the adjustments in the checklist, professionals with expertise in the area and who could contribute with other information related to the Liver Transplant transoperative were sought. An anesthetist, a nurse and a Liver Transplant surgeon participated in this step. To obtain their contributions, there were two meetings, in which the WHO checklist (original version) and the data obtained from the literature review were presented. Contributions were guided through the three phases of the WHO checklist (Sign in, Time out, Sign out). Following, they were asked to point out important issues and facts about Liver Transplant that needed management and care by the surgical team.

3rd step - After meeting with the experts, the researchers met to define the items to be adjusted and included in the WHO checklist (original version), thus composing the first version of the checklist adapted for Liver Transplant, formed by four surgical moments with 64 items. To minimize the risk of bias, three researchers were present, with two 30-minute meetings. It is noted that one of the researchers has 16 years of experience in Liver Transplant.

4th step - Validation of the content of the checklist, performed using the Delphi technique, with the participation of five judges, in two cycles. The Delphi technique was chosen because it is a method intended to deduce and refine the opinions of a group of people, experts/judges, researchers with experience in validation. In this method, a systematic search is made to carefully evaluate each item of the instrument through two rounds. In view of the need to promote systematic and refined adjustments to the Liver Transplant safe surgery checklist, the researchers consider this method promising to support the development of validation. This

reference does not define the number of specialists / experts, but determines that they must be chosen according to their competence in the area, experience in the subject, language and culture⁽¹¹⁾. Thus, this method was chosen due to the importance of the judges' experience in the Liver Transplant scenario.

In this study, consensus was defined as a Content Validity Index (CVI) greater than 0.8 in each item; if one of the items obtained a lower value, it would be excluded. The initial contact with the judges took place via e-mail, and later contact was made by telephone. The following documents were sent to them: WHO checklist (original version); first version of the checklist for the Liver Transplant and a table with all the items in it, in which there was space for them to score each item considering: clarity of language, content of the text, consistency of the item, relation of the item to its disposition in the checklist according to the WHO original. To score the items, the judges used the Likert scale with the following scores: 1 - strongly disagree; 2 - partially disagree; and 3 - strongly agree. When scoring scores 1 and 2, they should point out their suggestions. The first round was carried out containing all the items on the checklist, so that they could be evaluated. After returning material from the first round, the adjustments requested by the judges were all made, obtaining the second version, which was sent for the second round of evaluations. At the end of the second round, the last adjustments were made, reaching the final version of the checklist for Liver Transplant.

Analysis of results and statistics

For the organization and analysis of literature evidence and data obtained from experts in the practice, the researchers read and reread the findings, carefully interpreting each fact and giving meaning to the material acquired according to each phase of the WHO checklist (original version): Sign in, Time out, Sign out. After analysis, adjustments were made to the original WHO version according to the most important recommendations that could support the first version of the checklist for Liver Transplant, considering the particularities of this procedure.

As for the organization and analysis of content validation, the data for each cycle were digitized in an Excel spreadsheet and analyzed using the calculation of the CVI, mean and standard deviation. The results are presented in descriptive form, graphs and tables, using the relative frequencies (%) and the absolute frequency (N) of the classes of each variable.

To better represent the CVI, the items were grouped according to the surgical moments proposed by the WHO checklist (original version): Moment 1, items related to the activities "Before anesthetic induction"; Moment 2, the items related to "Before starting the surgery"; Moment 3, which was added to the checklist for Liver Transplant, considering that there are important data to be checked during the operation itself, and called "During the surgical procedure"; and Moment 4, formed by the items referring to "Before the patient leaves the operating room".

RESULTS

The results are presented using tables, tables and figures. Chart 1 presents examples of information obtained from evidence in the literature and from experts in practice, with the adjustments

and inclusion of items pointed out by the judges. Tables 1 and 2, on the other hand, present the results of content validation by calculating the CVI; and Figure 1 shows the final version of the checklist for Liver Transplant.

In the first version of the checklist adjusted for Liver Transplant, consisting of four surgical moments, seven items were added at the time "Before anesthetic induction"; at the moment "Before starting the surgery", 26 items were added and/or adjusted; for the moment "During the surgical procedure", seven items were created; and at the time "Before the patient leaves the operating room", three items were added to the checklist.

Regarding the results of the content validation, it is noted that all the judges have expertise in the Liver Transplant area; everyone participates directly in Liver Transplant, three of them directly in care during the operation and two of them in research in the Liver Transplant scenario. Table 1 shows the results of the CVI of the first version of the Liver Transplant checklist.

Table 1 – Mean Content Validity Index, mean and standard deviation per surgical moment of the first round of validation of the Liver Transplant checklist, Florianópolis, Santa Catarina, Brazil, 2019

Surgical moment	CVI	Average	Standard deviation
Before anesthetic induction	0.66	2.56	0.52
Before starting surgery	0.89	2.88	0.18
During the surgical procedure	0.78	2.72	0.37
Before the patient leaves the operating room	0.87	2.85	0.33
Overall average of categories	0.80	2.75	0.35

Note: CVI - Content Validity Index.

It is noteworthy that all the suggestions proposed by the judges in the first round were made. For further clarification of these adjustments, Chart 1 shows, as an example, the changes made at the surgical moment "Before starting the surgery" in the checklist for Liver Transplant. We chose to present this category because it was the one that suffered the greatest adjustments and inclusion.

Chart 1 – Modifications, changes and / or adjustments (A) and inclusion (I) of items by the judges at the surgical moment "Before starting the surgery", second version in the Liver Transplant checklist, Florianópolis, Santa Catarina, Brazil, 2019

Second version after adjustments and inclusion of items by the judges
<p>Adjustment (A): Check heating system installation; Check puncture of two peripheral accesses; Maintain body temperature above 36 °C.</p> <p>Inclusion (I) Installation of transesophageal echo; Check transplant modality; Check installation of nasogastric tube; Check installation of thrombus prevention device; Check volume expanders (crystalloid / colloid); Check auto-transfusion system; Check installation of rapid infusion device; Check installation of coagulation control device.</p>

After adjustments made to the four phases of the Liver Transplant checklist, the second version was sent to the judges for the second round of evaluation. However, it was pointed out to them that they should evaluate only the changed items, according to

suggestions and inclusions. Considering the CVI of the second round, Table 2 shows that the highest CVI value is at the moment "During the surgical procedure", 0.92, with the general average of the surgical moments being 0.87; standard deviation of 0.22.

Table 2 – Mean Content Validity Index, mean and standard deviation per surgical moment of the second round of validation of the Liver Transplant checklist, Florianópolis, Santa Catarina, Brazil, 2019

Surgical moment	CVI	Average	Standard deviation
Before anesthetic induction	0.89	2.82	0.13
Before starting surgery	0.84	2.82	0.28
During the surgical procedure	0.92	2.92	0.14
Before the patient leaves the operating room	0.83	2.83	0.33
Overall average	0.87	2.84	0.22

Note: CVI - Content Validity Index.

The following is the final version of the Liver Transplant safe surgery checklist.

DISCUSSION

In this study, the development of the adjustments in the safe surgery checklist sought to meet the specific needs of the Liver Transplant transoperative. During the progress of each stage, we sought to include evidence from the literature, suggestions from experts, as well as changes presented by the judges in order to ensure a tool that supports the multidisciplinary team in the safety of this procedure. Above all, this tool addresses the requirements of ANVISA through bio-surveillance⁽¹⁰⁾, providing, in the postoperative period, better graft functionality and restoration of the functional activity of the liver and the patient^(7-8, 12-15).

As for the evidence in the literature, there were few suggestions for changes in the tool: the data practically points to body temperature, surgical position and use of blood products⁽¹²⁻¹⁵⁾. The information of professionals with expertise in the area, on the other hand, gave rise to important facts to be checked by the team at all stages of the checklist. The combination of such identified facts, after the researchers' analysis, enabled the first version of the checklist for Liver Transplant, with 64 verification items. The surgical moment in which there were more adjustments and inclusion of items was, "Before starting the surgery"; both for the evidence, for the professionals with expertise, as well as for the judges in the content validation.

All the surgical moments presented in the checklist are extremely important; however, the phases "Before anesthetic induction" and "Before starting surgery" are unique moments in this procedure, considering that many patients, when undergoing Liver Transplant, will have their first contact with the surgical team on arrival at the surgical environment. When judging that Liver Transplant surgery, in many situations, due to the severity of the patient and factors related to logistics, occurs at an unscheduled and/or scheduled time in advance, there is a possibility that the team responsible for conducting the stages of the operation has not had previous contact with the patient.

From this perspective, the Liver Transplant checklist tends to promote safety when investigating the patient's name, the modality of TH, factors related to blood products, biochemistry exams

BEFORE ANESTHETIC INDUCTION	BEFORE STARTING THE SURGERY	DURING SURGICAL PROCEDURE
<p>1. Confirmation about the patient:</p> <p><input type="checkbox"/> Identification: <input type="checkbox"/> Surgery location: <input type="checkbox"/> Transplant modality: <input type="checkbox"/> Informed consent provided:</p> <p>2. Does the patient have any allergies? () No () Yes Which? _____</p> <p>3. Anesthesia</p> <p><input type="checkbox"/> Confirmation of pre-anesthetic evaluation: <input type="checkbox"/> Confirmation of the patient's ASA: <input type="checkbox"/> Confirmation of collection of laboratory tests upon arrival at the hospital: <input type="checkbox"/> Confirm the reserve of blood components / blood products: <input type="checkbox"/> Confirmation of drugs used in anesthesia: <input type="checkbox"/> Is there a risk of difficult airway / bronchoaspiration? () No () Yes and there is material available to act in this situation.</p> <p>4. Nursing</p> <p><input type="checkbox"/> The logistics of the arrival of the reserve of blood components / blood products was carried out? () No () Yes</p>	<p><input type="checkbox"/> 1. All team professionals confirm their names and professions.</p> <p>2. The surgical, anesthetic, nursing and instrumentation staff verbally confirm:</p> <p><input type="checkbox"/> Patient identification <input type="checkbox"/> Transplant modality <input type="checkbox"/> Oximeter installed <input type="checkbox"/> Cardiac monitoring installed <input type="checkbox"/> Heating system installed <input type="checkbox"/> Esophageal thermometer installed <input type="checkbox"/> Transesophageal echo installed <input type="checkbox"/> Capnograph installed <input type="checkbox"/> Peripheral access punctured <input type="checkbox"/> Installed ABP <input type="checkbox"/> Installed CVP <input type="checkbox"/> Installed Swan Ganz / Introducer <input type="checkbox"/> Bladder delay probe installed <input type="checkbox"/> Nasogastric tube installed <input type="checkbox"/> Thrombus prevention device installed <input type="checkbox"/> Checking volume expanders (crystalloid / colloid) <input type="checkbox"/> Checking the auto-transfusion system <input type="checkbox"/> Checking the rapid infusion device <input type="checkbox"/> Checking the coagulation evaluation device <input type="checkbox"/> Argon scalpel check</p> <p style="text-align: center;">Anticipation of critical events</p> <p>3. Surgeon review</p> <p><input type="checkbox"/> Are there critical steps in surgery? <input type="checkbox"/> What is its estimated duration? <input type="checkbox"/> Are there possible blood losses? <input type="checkbox"/> Checking the organ conditioning <input type="checkbox"/> Donor ABO typing check <input type="checkbox"/> Checking the time of aortic clamping and time of cold ischemia of the organ <input type="checkbox"/> Checking the description of any changes with the agency</p> <p>4. Anesthetist review</p> <p><input type="checkbox"/> Is there some other concern about the patient? <input type="checkbox"/> Control of collection of laboratory tests as routine <input type="checkbox"/> Is there a risk of blood loss > 500 ml: () No () Yes, the reserve of blood components and blood products (CHAD, PFC, platelets, fibrinogen)</p> <p>5. Nursing review</p> <p><input type="checkbox"/> Was there correct sterilization of the surgical instruments? <input type="checkbox"/> Is there some concern about the equipment? <input type="checkbox"/> Was all the care to maintain body temperature above 36° C taken? <input type="checkbox"/> Was adequate surgical positioning maintained?</p> <p>6. General</p> <p><input type="checkbox"/> Was the prophylactic antibiotic administered in the last 60 min and re-administered? () Not applicable () Yes <input type="checkbox"/> Are imaging exams available? () Not applicable () Yes <input type="checkbox"/> Was Hepatitis B immunoglobulin administered? () Not applicable () Yes</p>	<p>1. Anesthetist</p> <p><input type="checkbox"/> Check the start time of anesthesia and surgery <input type="checkbox"/> Check the hemodynamic stability of the pre-anepathic, anepathic and neo-hepatic phase <input type="checkbox"/> Make sure the result of the last collection of laboratory tests before each phase</p> <p>2. Surgeon</p> <p><input type="checkbox"/> Confirm the patient's stability with the anesthetist before each phase: pre-anepathic; anepathic; and neohepatic <input type="checkbox"/> Check the warm ischemia time <input type="checkbox"/> Check vessel anastomosis time</p> <p>3. Nurse</p> <p><input type="checkbox"/> Before the surgeon explores the recipient, check the time and make sure there is hemodynamic stability <input type="checkbox"/> Make sure the patient is at 36 ° C <input type="checkbox"/> Make sure there is use of blood products / blood components: () No () Sim: quantity _____ <input type="checkbox"/> Check the volume of fluid inlet and outlet <input type="checkbox"/> Count compresses, weigh compresses and make sure instruments and needle are correct</p> <p style="text-align: center;">BEFORE THE PATIENT LEAVES THE SURGERY ROOM</p> <p>1. Anesthetist and surgeon</p> <p><input type="checkbox"/> Make sure the patient's hemodynamic stability before transport to the ICU <input type="checkbox"/> Check for any bleeding</p> <p>2. Nurse</p> <p><input type="checkbox"/> Transplant modality: <input type="checkbox"/> Biopsy or parts are identified and named after the patient: <input type="checkbox"/> There was a problem with equipment during the surgery that must be resolved: <input type="checkbox"/> Check portable monitors and fans for transportation <input type="checkbox"/> Check if the ICU is prepared to receive the patient <input type="checkbox"/> Check if the material was collected for culture</p>
<p>Continuously keep an eye on:</p> <p>1. Temperature: heated serum, thermal blanket, forced heated air system, lower limb wrapping. 2. Surgical positioning: use mattresses, dry viscoslastic device, hydrocolloid plate in regions prone to pressure injuries. 3. Thrombus prevention: pneumatic boot.</p>		

Figure 1 – Safe surgery checklist for liver transplantation, Florianópolis, Santa Catarina, Brazil, 2019

and pre-anesthetic consultation. Studies indicate the verification of laboratory tests as a safety criterion in anesthetic induction, making it possible to take actions as soon as possible to reverse certain problems⁽¹⁶⁻¹⁷⁾. In liver transplantation, anesthetic induction ensures a stable transoperative, a more peaceful anepathic and neohepatic phase, in addition to an effective reperfusion considering the control performed by the anesthesiologist⁽¹⁸⁻²⁰⁾.

With regard to checking, the moment "Before starting the surgery", which underwent the greatest number of adjustments and inclusion of items, the evidence brought data related to body temperature and use of devices⁽¹²⁻¹⁵⁾. The professionals with expertise highlighted factors related to the donor and recipient, items related to rapid infusion and care for the prevention of complications such as pressure injury and thrombosis. Such care is fundamental to the Liver Transplant procedure, providing safety and preventing major health complications in this postoperative period⁽²¹⁻²²⁾.

Still, with regard to such surgical moment, it is noteworthy that the greatest number of items inclusion is directed to the use of devices, whose relationship with safety in the Liver Transplant procedure involves hemodynamic monitoring, quality in the procedure, less risk of damage and injuries in the postoperative period, in addition to strict control of cardiac, pulmonary and renal functions, among others⁽²³⁾.

Bearing in mind that the Liver Transplant surgery time is prolonged, between six and ten hours, considering the effects of anesthesia on respiratory mechanics, lung volumes and gas exchange, in addition to the effects of the anepathic and neohepatic phase in the body, the devices allow monitoring of hemodynamics and help to assess and assume appropriate and immediate procedures preventing risk and damage to the patient⁽²⁴⁻²⁶⁾. The use of devices and equipment in Liver Transplant are extremely important to promote agility and safety during the operation^(16-17,20). There are recommendations that, in major surgeries, devices should be installed, as well as maintaining a temperature above 36 °C to promote hemodynamic stability⁽²⁷⁾.

The inclusion of a third check category, called "During the surgical procedure", brings to the Liver Transplant checklist greater clarity and organization of the operative moments of this procedure, considering that transplants present a unique moment, referring to the removal of the diseased organ for implantation of the donor's organ. In Liver Transplant, this moment includes the so-called anepathic and neohepatic phases. In the anepathic phase, for a few minutes, the patient is left without the liver; and in the neo-hepatic phase, the donor liver starts to function - reperfusion occurs. These are crucial moments for the success of Liver Transplant, which requires the team to check important factors such as: hemodynamic stability for clinical maintenance, evaluation of the latest biochemical exams, in addition to stability for reperfusion of the new organ⁽¹⁸⁻¹⁹⁾.

The safety of the category "During the surgical procedure" is associated with heart rate control; reduction of central venous pressure; hemodynamic response to clamping of the inferior vena cava; substantial increase in the systemic vascular resistance index after clamping, showing weaker cardiovascular reflexes for reperfusion⁽¹⁸⁻¹⁹⁾. Thus, the inclusion of this category in the checklist for Liver Transplant implies the team's opportunity to

manage, map and control factors related to important moments of this surgery as proposed by ANVISA through biovigilance⁽¹⁰⁾.

Regarding the safety of this procedure, the category "Before the patient leaves the operating room" on the Liver Transplant checklist proposed: adjustments directed to the verification and confirmation of equipment that can propose safety in transporting the patient from the surgical environment to the Intensive Care Unit (ICU); as well as the adjustments related to the checking of hemodynamic stability and complications that may compromise their arrival at the ICU. The checking of these items at the end of the surgery provides early extubation, which can also occur in the operating room, and minimizes the risk of cardiac arrhythmias, postoperative infections and cardiopulmonary arrest during the journey to the ICU^(12-15,28).

Regarding the CVI values in content validation by judges, both in the first and second rounds, it is considered that there were satisfactory indexes, considering that 76 items were adjusted and included in the second version of the checklist for Liver Transplant, given that the lowest CVI index in the first round was 0.66. In the second round, the lowest CVI was 0.83. In two studies with checklist validation, in the first round, an agreement index between 60% and 100% was obtained⁽²⁹⁻³⁰⁾. This study does not differ from the others in relation to the CVI values found in the content validation stages, with the general CVI average in the first round being 0.8, while in the second round, the average was 0.87.

From this perspective, it is considered that content validation was extremely relevant for the creation of a safe surgery checklist for liver transplantation, since the judges, forming a multidisciplinary team, collaborated with adjustments and inclusion of important items, which will ensure a safer and more effective Liver Transplant procedure during the operation. In addition, this tool will assist in the communication between professionals involved in such surgery.

As this is a complex procedure and involves odd moments, causing tension in the team and can lead to failures and errors in the process, this tool appears as a support in the management of activities to be developed in the surgical environment. The secure exchange of essential information by the team while conducting the surgical procedure reinforces safety and supports the management of health actions^(28,31-32).

The results of this study, presented by adjusting the checklist, reveal the impact that this tool may have on the health services that perform Liver Transplant, in view of the complexity of this procedure and the demand for items to be verified. Such information corroborates a study in which the authors point out that, although this tool is a relatively simple strategy, the results are surprising in preventing adverse events, risk detection, reduction of surgical complications and effectiveness in the communication of the operational team⁽³³⁾.

Study limitations

A limiting factor of this study is the failure to perform the clinical validation of the Liver Transplant checklist in the clinical practice of the intraoperative period. Another limitation was the difficulty in identifying professionals with expertise in the area according to inclusion criteria for participation in the study.

Contributions to the area of Nursing, Health or Public Policy

It is understood that the process of preparing and validating the safe surgery checklist for liver transplantation brings important contributions to the safety of the Liver Transplant procedure during the operation, especially for nurses working in this area, since, in most cases, they have already participated in the donor's explant and are under strong impact from many hours of work, with several items to be checked. This checklist appears as support for these professionals in order to guide and guide in this procedure, considering that it has several stages during the operation and, when considering that the nurse manages all of them, this tool proposes speed, greater team skill, logical sequence and, above all, error prevention.

CONCLUSIONS

The purpose of this study was to present the checklist of safe surgery for liver transplantation adjusted based on the original

version created by the WHO. It is noteworthy that this activity was successfully developed by exposing the checklist for Liver Transplant, composed of four surgical moments with 76 items to be checked. The four surgical moments (Before anesthetic induction, Before starting the surgery, During the surgical procedure and Before the patient leaves the operating room) present important factors for the safety of the Liver Transplant procedure in the surgical environment. Each item contains unique and necessary data to be mapped and managed in order to achieve success and effectiveness in Liver Transplant.

Regarding the content validation by the judges, it is considered that the Liver Transplant checklist was validated with excellence, since it obtained a CVI of 0.8 in the first round; and 0.87 in the second. It is concluded that the Liver Transplant safe surgery checklist proved to be valid, and its applicability may contribute to patient safety, since the tool aims to improve the quality of care, reduce adverse events and develop a culture of safety in the surgical environment.

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