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STANDARD OPERATING PROCEDURE IN CARDIOPULMONARY BYPASS

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ABSTRACT

Objective: to report the experience during the process of elaborating a standard operating procedure in the cardiopulmonary bypass. **Methods:** descriptive study of the type of experience report experience between December 2018 and January 2019 in a university hospital in southern Brazil. **Results:** the need of standardization of procedures, lack of rules and routines may indicate disorganization of the service due to different forms of professional conduct. The use of Standard Operating Procedures are considered as an indispensable tool in process standardization to ensure the quality and efficiency in its activities in the strategies of the patient safety in cardiopulmonary bypass. **Conclusion:** the implementation of standardization of operating procedures is already a reality in Brazil and should be seen as a way to organize institutional activities in order to ensure patient safety through incident prevention and if appropriate corrective actions can be applied to avoid damage during cardiopulmonary bypass.

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INTRODUCTION

The development of cardiovascular surgery is based on the progress of cardiopulmonary bypass (CPB). If a CPB incident occurs, the patient may suffer serious or irreversible damage. Therefore, safety should be considered as a primordial factor for conducting CPB (NICOLETTI, 2018). It is noteworthy that small errors in CPB can be considered as causing serious problems, making it essential to implement measures that enable patient safety during the intraoperative period of cardiovascular surgery (MURAD, 2007). In this sense, the perfusionist plays a fundamental role not only in his direct action with specific cardiac perfusion materials and equipment, but in the prevention of incidents in CPB (ADACHI, 2009).

The practice of safe surgery has gained space and credibility in recent years, providing remarkable safety to the processes, which can be considered a breakthrough in health, in an attempt to reduce mortality rates in the intraoperative period. Safety in surgery can also be considered to be closely linked to the early recognition of potential problems as well as their preventive resolution. Thus, it is essential that the perfusionistadopts measures that contribute to the consolidation of patient safety during cardiovascular surgeries with CPB (NICOLETTI, 2018). The use of Standard Operating Procedures (POPs) are considered as an indispensable tool in process standardization. With it, the hospital institution can ensure greater quality and efficiency in its activities in the strategies of the National Patient Safety Program, cites the elaboration and support to the implementation of protocols, guides and patient safety manuals (BRASIL, 2013). In this context, it is believed that the elaboration of a POP in CPB may contribute to the safety culture of perfusionists during the intraoperative period of cardiovascular surgeries.

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MATERIALS AND METHODS

The study is based on an experience report during the process of elaborating a standard operating procedure in CPB between december 2018 and january 2019 in a university hospital in southern Brazil. From the definition of the key points of the elaboration, a literature survey about the good care practices was conducted and the elaboration of the described procedures started.

RESULTS AND DISCUSSION

The Standard Operating Procedure (POPs) is a systematized process that describes each step to be followed by all

professionals to ensure a satisfactory result in a given intervention / care. The POPs are instruments widely used in nursing and aim to standardize, according to scientific principles, practices that should be followed by the entire team (HONORIO; CAETANO; ALMEIDA, 2009). Standardization is an important managerial tool, aiming at standardizing the conduct in the accomplishment of the tasks inherent to the service sectors. It is an instrument that ensures quality maintenance (SOUZA *et al*., 2017).

The need of standardization of procedures, lack of rules and routines may indicate disorganization of the service due to different forms of professional conduct. The standards are defined to establish guidelines for quality control and continuous improvement, and standardized care is detailed guidelines that represent predictable care, indicated for specific situations, which will drive organizations to develop their improvement processes and results. Standards define their field of practice and provide guidance for their performance, project

Table 1. Materials and equipment. Standard operating procedure in cardiopulmonary bypass. Brazil, 2019.

Special materials	Equipment
Venous reservoir/membrane oxygenator	CPB machine
Tube set	Blender - gas mixer
Arterial filter	Vacuum system
Cardioplegia system	Bioconsole with safety crank for the centrifugal pump
Cardioplegic Solution	Autotransfusionmachine

Table 2. Special cares. Standard Operating Procedure in Cardiopulmonary Bypass. Brazil, 2019

Special Care at CPB
1. Keep equipment safely protected and packed, preferably in the room for cardiac surgery materials;
2. Equipment with battery must be kept connected to the power grid;
3. Record and monitor the preventive maintenance performed on payroll equipment;
4. Perform equipment surface cleaning after all procedures;
5. Clean and change the heat exchanger tank water every 15 days and / or as recommended by the payroll manufacturer / supplier company;
6. The material of choice will be according to the surgical proposal;
7. Ensure the presence of a cardiopulmonary bypass kit of the same brand to be used near the operating room;
8. Ensure a safety crank for the centrifugal pump;
9. Fill out the materials order with all the labels of the materials used, sending one way to the materials pharmacy for immediate replacement and another way to provide the circulating responsible for the operating room;
10.Perform safety checklist before and after CPB circuit preparation;
11. Immediately report to the surgical and anesthesiology team if there are any problems detected during the checklist;
12.If red blood cell concentrate is used during cardiopulmonary bypass, the bag number, patient name, blood typing should preferably be checked with a member of the anesthetic team prior to installation and afterwards complete the form with the requested data and record in the electronic medical record;

Table 3. Technical procedures. Standard Operating Procedure in Cardiopulmonary Bypass. Brazil, 2019

CPB: Technical Procedures
1- Obtain information in the medical record and with the medical team about the patient's clinical history; check for diseases or conditions that may interfere with performance, or require special care with the conduction of cardiopulmonary bypass, such as diabetes, high blood pressure, endocrine disorders, use of diuretics, digitalis and anticoagulants;
2- Obtain the biometric data of the patient, age, weight, height and body surface to calculate blood flows, gases, composition and volume of circuit liquids;
3- Provide the surgeon with the minimum caliber of the aortic and venous cannulas, appropriate to the blood flows to be used;
4- Obtain the hemodynamic parameters of the patient, from anesthetic induction, to their maintenance during perfusion;
5- Perform blood circulation and extracorporeal oxygenation, after the surgeon's indication, monitor arterial and venous pressures, diuresis, arterial and venous blood gases, hematocrit, anticoagulation level and promote the necessary corrections;
6. Induce the degree of systemic hypothermia indicated by the surgeon, by cooling the blood in the oxygenator circuit, for the metabolic preservation of the central nervous system and other organ systems; reheat the patient at the end of the procedure;
7- Prepare and administer cardioplegic solutions, designed to protect the myocardium, through special equipment and circuits for that purpose;
8- Administer the necessary medications to the patient in the cardiopulmonary bypass under the direction of the surgical and / or anesthesiology team;
9- Close the procedure, returning to ventilation to the anesthetist, after the heart has resumed its functions, maintaining the patient's volume and hemodynamic conditions necessary for the good cardiorespiratory functioning;
10- Record all data related to the procedure, as well as the water and blood balance, to guide the postoperative treatment.

Table 4. Corrective actions. Standard Operating Procedure in Cardiopulmonary Bypass. Brazil, 2019

CPB:Corrective Actions
1. Prejud Impaired gas exchange: check O2 and compressed air valves, gas line connection to oxygenator. If the problem is not solved, immediately inform the surgical and anesthesiology team about the occurrence. If the aorta is not clamped, restore ventilation and evaluate the possibility of perfusion output for oxygenator replacement. If not, request the help of the circulating room to reach a new oxygenator; induce hypothermia while awaiting the arrival of the new oxygenator and provide sufficient volume in the venous reservoir for exchange; clamp and disconnect the heat exchanger hoses; use sterile field below the oxygenator; after having all the material and support for the exchange, leave cardiopulmonary bypass; clamp the recirculation, arterial and venous line about 3-5 cm below the connection; Proceed to remove them and the arterial line being careful not to contaminate (for this, ask the help of a team member). After the exchange, restart the circulation of the system via recirculation for complete air removal and only after certifying the complete elimination of bubbles, restart the cardiopulmonary bypass.
2. Oxygenator leak: review the connections, if the leak persists, immediately inform the surgical and anesthesiology team about the occurrence; evaluate the amount of leakage and the remaining period of surgery, requiring replacement, proceed to change following the steps listed in the item above;
3. Centrifugal pump failure: evaluate the detected problem immediately inform the surgical and anesthesiology team about the occurrence; If problem is limited to flow reading, review sensor and connections. If the problem persists and other equipment is available, replace it. If you do not correct flow reading after these actions, maintain communication with anesthesiology, guided by rotations, venous reservoir level, blood pressure, and use of vasoactive drugs. In case of total electrical failure, without the availability of another bioconsole, it will be necessary to immediately clamp the arterial and venous line, proceeding to perfusion. Connect the centrifugal pump to the safety hand crank and assisted by another professional and under their supervision, return the infusion while maintaining the rotations compatible with the level of the venous reservoir and establishing an adequate blood pressure.
4. Water pump failure: assess the detected problem; Immediately communicate the surgical and anesthesiology team about the event; if it is in the warm-up period, request adjustment of the thermal mattress and use of heated solutions while providing another machine to use the heat exchanger.

the desired competencies and educational requirements of nurses ensuring better quality care provided with the use of POP (SOUZA *et al*., 2017). In this sense, the theme of the SOP was delimited and after the literature review was elaborated the topics that constitute the institutional routine of performing the CPB. The objective of POP is to standardize the routine of the activities of the Nurse Perfusionist and its application occurs in surgeries that require CPB. Table 1 lists the materials and equipment required. Personal protective equipment intended for use during the procedure are: gloves, mask and goggles. Special cautions are listed in Table 2 and technical procedures in Table 3. The expected results are patient stability and reduction of the likelihood of adverse events during the CPB. It is important to mention the corrective actions that may be required in case of serious adverse events (Table 4). The checklist is an indispensable instrument for safety and accident prevention in CPB. Basic items that should be reviewed before preparing the CPB circuit include the review of patient data, equipment and materials, verification of CPB circuit preparation, patient hemodynamic monitoring and clear communication between the surgical and anesthetic staff. Is a complement to safe cardiovascular surgery and requires the attention of the perfusionist for prevent the occurrence of incidents with irreversible damage to the patient during thesurgical procedure (NICOLETTI, 2018).

Conclusion

The implementation of standardization of operating procedures is already a reality in Brazil and should be seen as a way to organize institutional activities in order to ensure patient safety through incident prevention and if appropriate corrective actions can be applied to avoid damage during CPB.

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