Journal of Nursing
Revista de Enfermagem
UFPE On Line
ISSN: 1981-8963

CASE REPORT ARTICLE

PERFORMANCE OF THE NURSING TEAM IN EXTRACORPOREAL CARDIOPULMONARY RESUSCITATION

ATUAÇÃO DO TIME DE ENFERMEIROS NA RESSUSCITAÇÃO CARDIOPULMONAR EXTRACORPÓREA

ACTUACIÓN DEL EQUIPO DE ENFERMEROS EN LA RESUSCITACIÓN CARDIOPULMONAR EXTRACORPÓREA

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ABSTRACT

Objective: to present the work of a team of specialist nurses in the care of patients submitted to ECMO-VA after cardiac arrest. ***Method:*** this is a qualitative, descriptive, retrospective study, in the modality of the case study, carried out in a philanthropic hospital. The sample was composed by an 18-year-old girl, who analyzed the medical record and the result was presented in the form of a report. ***Results:*** it is emphasized that the establishment of a well-structured team with a nurse's role in the integral care contributed to the evolution of the clinical picture of the patient after cardiorespiratory arrest results in their recovery and hospital discharge. It is reported that the team worked continuously from cannulation until its withdrawal, to the care of the patient in ECMO. ***Conclusion:*** it should be noted that the team's performance was indispensable for specialized care and a favorable outcome in patient care throughout their period of circulatory support. ***Descriptors***: Extracorporeal Membrane Oxygenation; Nursing Care; Heart Arrest; Cardiopulmonary Resuscitation; Patient Outcome Assessment; Case Reports.

RESUMO

Objetivo*:** apresentar a atuação de um time de enfermeiros especialistas na assistência ao paciente submetido à ECMO-VA pós-parada cardíaca. ***Método*:** trata-se de estudo qualitativo, descritivo, retrospectivo, na modalidade do estudo de caso, realizado em um hospital filantrópico. Compôs-se a amostra por uma jovem de 18 anos, em que se analisou o prontuário médico e o resultado se apresentou em forma de relato. ***Resultados*:** ressalta-se que o estabelecimento de um time bem estruturado, com atuação do enfermeiro na assistência integral contribuíram para evolução do quadro clínico do paciente pós parada cardiorrespiratória resulta em sua recuperação e alta hospitalar. Informa-se que time atuou de forma contínua desde a canulação até a sua retirada, para o cuidado da paciente em ECMO. ***Conclusão: salienta-se que a atuação do time foi indispensável para um cuidado especializado e um desfecho favorável na assistência à paciente durante todo o seu período em suporte circulatório. ***Descritores*:** Oxigenação por Membrana Extracorpórea; Cuidados de Enfermagem; Parada Cardíaca; Reanimação Cardiopulmonar; Avaliação de Resultados da Assistência ao Paciente; Relatos de Casos.

RESUMEN

Objetivo: presentar la actuación de un equipo de enfermeros especialistas en la asistencia al paciente sometido a la ECMO-VA post-parada cardiaca. ***Método:*** se trata de un estudio cualitativo, descriptivo, retrospectivo, en la modalidad del estudio de caso, realizado en un hospital filantrópico. Se compuso la muestra por una joven de 18 años, en la que se analizó el prontuario médico y el resultado se presentó en forma de relato. ***Resultados:*** se resalta que el establecimiento de un equipo bien estructurado, con actuación del enfermero en la asistencia integral, contribuyó para la evolución del cuadro clínico del paciente pos paro cardiorrespiratorio resulta en su recuperación y alta hospitalaria. Se informa que el equipo actuó de forma continua desde la canulación hasta su retirada, para el cuidado de la paciente en ECMO. ***Conclusión:*** se destaca que la actuación del equipo fue indispensable para un cuidado especializado y un desenlace favorable en la asistencia al paciente durante todo su período en soporte circulatorio. ***Descriptores***: Oxigenación por Membrana Extracorporea; Atención de Enfermería; Paro Cardíaco; Reanimación Cardiopulmonar; Evaluación del Resultado de la Atención al Paciente; Informes de Casos.

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INTRODUCTION

It is known that the indications and the use of Extracorporeal Membrane Oxygenation (ECMO) have advanced considerably in the last 20 years.[1] Extracorporeal life support has been obtained, according to data from the annual reports of the International Registry of the Extracorporeal Life Support Organization (ELSO), by January 2017, for more than 85 thousand patients, [2] evidencing it as the most reliable therapy, improving equipment and increasing professional experience, which is reflected in improved results. It is considered, therefore, the essential tool in the care of adults and children with severe cardiac and pulmonary dysfunction refractory to conventional management.[1]

It is explained that ECMO is a form of cardiopulmonary life support in which blood is drained from the venous system, circulated out of the body by a mechanical pump, and then reinfused into circulation. The hemoglobin becomes completely saturated with oxygen outside the body and carbon dioxide is removed.[1,3] The indications for ECMO are divided into three categories according to organ support: cardiac, respiratory and a combination of the two.[2]

It should be emphasized that cardiogenic shock continues to be a condition with high mortality, and the early identification and resuscitation of these patients has a marked impact on the improvement of results. The oxygenation of the extracorporeal membrane of the venoarterial (ECMO-VA) is established as a strategy for cardiopulmonary support. However, this modality requires a higher level of care and has traditionally remained underutilized.[1,4]

This scenario emerges in which ECMO-VA therapy may provide acute support in cardiogenic shock or cardiac arrest in adults with ECMO maintained until the patient recovers or receives a long-term ventricular assist device such as a bridge for heart transplantation. The survival rate in the literature is reported between 20 and 30% among patients who received ECMO-VA.[4-5]

The prestige of this subject in the literature was recently taken up with the use of ECMO-VA during cardiopulmonary arrest (CPA) called extracorporeal cardiopulmonary resuscitation (ECPR). With the resumption of this application, through a number of prospective and retrospective studies, a superiority of ECPR compared to conventional cardiopulmonary resuscitation (CPR) was shown. Therefore, ECPR in the ELSO and American Heart Association (AHA) guidelines was recognized as a technique to be considered in selected patients in CPA. The number of ECPR patients has increased by more than tenfold since 2004 and there are now more than 7,000 ECPR patients in the ELSO registry.[5]

In this same ELSO register, 40% of total ECPR survival in neonates and infants and 28% of ECPR in adult patients are reported.[2] The success of this technique is corroborated, although it is increasingly clear that ECPR is associated to better survival, through some modifiable and non-modifiable factors such as adequate pre-EPCR resuscitation, efficient implementation of extracorporeal support, and adequate patient selection.[5]

The adverse events of this therapy are related to the use of the circuit itself, and the most frequently cited in the literature are: clot, gas embolism, crack and oxygenator failure. Clinical complications are also related to blood interactions with the artificial surfaces of the circuit and changes in blood flow pattern, as well as a greater number of complications to the use of ECMO for a prolonged period[7]. These events are associated with a significant increase in morbidity and mortality. However, ECMO, inserted for pulmonary support, presents fewer complications than the therapy intended for cardiogenic support, which provides, for the care team, a greater rigor in care when using ECMO-VA.[3-4,6]

It is revealed that a factor reducing the incidence, severity and consequences of mechanical complications is the presence of an ECMO team, as well as the experience and training of this group, that is, directly related to the care given to these patients. For example, in reference centers in ECMO, these complications are minor and generally do not have repercussion on the final result.[8]

It is pointed out that treatment with ECMO is highly complex and costly, since it requires material, laboratory, technological and professional infrastructure, and nurses are an essential professional in this process.[8] It is strongly recommended that there be continuous presence in bed, of ECMO specialist nurse for patient care during therapy. Thus, the nurse's action is monitored in the parameters of ECMO including: anticoagulation; gas exchange goals; pay attention to the flow rates, pressures and temperature of the circuit; maintenance of intact cannulas and other critical care for this patient.[7-8]

The creation of a group of specialist nurses for the integral care of patients submitted to ECMO in the intensive care units (ICU) was

recently adopted in the institution under study, as well as the creation of a protocol of care adopted to the patient in ECMO.

OBJECTIVE

• To present the performance of a team of specialist nurses in the care of patients submitted to ECMO-VA after cardiac arrest.

METHOD

It is a descriptive, retrospective study, in the case report modality, which occurred in the period from October 11 to 18, 2017 in a large philanthropic hospital in the State of São Paulo. The sample was composed by an 18-year-old girl with a diagnosis of cardiogenic shock, assisted by a team of specialists in extracorporeal cardiopulmonary resuscitation.

The study was carried out with the authorization of the institution, respecting all the ethical precepts in accordance with Resolution CNS No. 466, of December 12, 2012, for conducting research involving human beings, preserving the identity of the subject.

RESULTS

It is reported that a 18-year-old female, from Rio Branco (Acre), coming from a large public hospital in the city of São Paulo, with dilated cardiomyopathy with no etiology since age 14, worsens after pregnancy, in April 2016, with a Left Ventricular Ejection Fraction (LVEF) in 20% and multiple hospitalizations with inotropic need. The patient was admitted to the Heart Failure Advanced Unit (HFAU) of the Sírio-Libanês Hospital, with diagnosis of cardiogenic shock, where measures for clinical stabilization were initiated until the heart transplantation.

It is described that after 48 hours of intravenous inotropes without adequate response, the patient has supraventricular tachycardia and acute pulmonary edema requiring orotracheal intubation and intra-aortic balloon (IAB). The patient presented a short period of hemodynamic stability, evolving after two days for an episode of non-pulse ventricular tachycardia and then performing CPR for 55 minutes. A team followed the ACLS (Advanced Cardiac Life Support) protocols for CPA care, while another team worked on ECMO-VA.

The ECMO team nurse proceeded to pull the trigger to assemble the kits for assembly and priming of the circuit, in addition to the preparation of the peripheral puncture site. It is detailed that the doctor also assisted the team in the cannulation by performing it through the femoral artery and vein. Cannulation was performed by guidewire passage in the IAB arterial line and the left femoral vein was punctured maintaining the recommended techniques, since the patient already had IAB in the left femoral artery. The degree of difficulty of the punctures was increased, since the patient still presented in CPA. Therefore, it was decided by the medical team, not to perform a new puncture in the femoral artery for reperfusion of the limb.

With the initiation of therapy, the nurses developed care focused on integral patient care. The measures developed by the team, ranging from the complexity of the care to the severe patient, as well as the care with the cannulas, their fixation and insertion dressing, were instituted during the period in which the patient remained in ECMO; the monitoring of peripheral perfusion and bleeding signals and the installation of circuit pressure monitoring. All these precautions were guided in the application of two daily checklists with special controls of creation of the team.

The patient evolved with gradual improvement, possible decrease of vasoactive drugs, ventilatory weaning and responding to commands. On the fourth day, there was improvement of the ventilatory part, being possible the orotracheal extubation, without neurological sequelae, with preserved level of consciousness. On the same day, despite the established measures for anticoagulation, clots and fibrins in the oxygenator membrane, it was observed that the evolution along with the medical team was followed. On the fifth day, there was a decrease in perfusion and the filiform pulses of the lower limbs, with cyanosis of the extremities and pain at palpation. Both changes were evidenced by the specialist nurse sharing them with the medical staff. It is revealed that on the next two days the patient evolved with new organic dysfunctions, opting for the programming of the exchange of peripheral ECMO by left ventricular paracorporeal circulatory support with Centrimag® centrifugal pump by sternotomy as a bridge for heart transplantation.

It was necessary to plan the referral of the patient to the surgical center for the exchange of the device. The transportation in the protocol of the ECMO team is described, to guarantee safety during the entire journey, led by the specialist nurse and accompanied by the surgeon physician, anesthesiologist and two nursing technicians. Finally, the transport occurred without any adverse events.

It was observed after the Centrimag® implant that the patient remained for five more days with this circulatory assistance,

until the CT, which had a satisfactory evolution, remained in the HFAU for a further 24 days, totaling 41 ICU and hospital discharge with an additional eight days of hospitalization unit.

DISCUSSION

ECMO trained nurses were adopted to provide comprehensive care for these patients, after the creation of the ECMO team at the hospital under study, with the structuring of an institutional protocol. It is noteworthy that, despite the high level of experience of nurses in the institution's ECMO team, this was the first case in which the team acted continuously from cannulation to withdrawal and also the first time the team participated of an ECPR.

Only the ECPR support after first trying to maintain a spontaneous circulation return with conventional measures, those guided by the ACLS and PCR in the presence of a shockable rate were indicated, as recommended in the literature.[9-10]

After the arrival of the doctor responsible for the ECMO team, it was discussed. This decision should be based on defined inclusion and exclusion criteria. It is added that, despite a long CPR, lasting more than thirty minutes, there is still an indication of ECPR.[9] The existence of several factors relevant to this indication and the duration of CPR, before the onset of ECMO, is important and an independent factor for good neurological outcomes. Studies have shown that, in patients maintained in CPR for a time not exceeding forty minutes, the survival rate is acceptable and has a favorable neurological outcome when ECPR is used.[10] The quality of care during CPR was also considered, since studies already show that this factor is relevant at the moment of the decision to use this technique.[11]

The protocol adopted after the onset of ECMO therapy was maintained by the team. The routines of this protocol are individualized according to the need of the patient and the characteristics of the therapy adopted. It is noted that, because it is ECMO V-A, nurses use a package of measures more focused on cardiovascular evolution and also on the care of the critically ill patient because, in this modality, mortality is higher when compared to ECMO V-V.[4,12]

The use of the checklist, which is a useful instrument for the standardization of care to be followed, was used for ECMO patient care. It is recommended to use this tool in several scenarios, from multidisciplinary visit rounds to patient transfer communication, but in the patient care area, this tool is most recently used. On an ICU day, the patient will require, on average, 178 interactions in his or her care.[13] Thinking about the management of a patient in ECMO, of course, that number of interactions will double. With this, a checklist standardizes the process to ensure that all elements or actions are addressed. The structure and predictability of checklists facilitates delivery of assistance, which reduces variability and improves performance.[13]

Each institution should make its tool guided by international recommendations and tailored to its reality. In the team of this study, the tendency of large centers in ECMO to make use of a checklist for the care of these patients remains. It was adopted the use of two checklists by this team: the first consists in the nurse checking measures, once per shift, that ensure the proper functioning of the centrifugal pump as the safe connection in the electric network (220v); checking the console lights; adjustment of flow and speed alarms; keep the manual route, two tweezers, flashlight and gel available for the sensor; observe the circuit to make sure that the extensions of the cannula are not elbowed, moving or whipping; the presence of fibrin or clots in the circuit; the monitoring of the cannula fixation and the integrity of the sutures and dressing; the verification of the water level of the heat exchanger and, finally, the realization of the "Sweep Gas''.

The second cheklist is performed every two hours by the nurse, recording the data that accompanies the evolution of the therapy and the patient's responses by counting the rotations per minute, decided together with the medical team, and which flow generated ; the sweep gas flow and the inspired fraction of oxygen; the pre, post and transmembrane pressures. Further care is also given to the patient in order to prevent complications arising from the use of ECMO such as checking the perfusion, pulse and circumference of the peripheral extremities of the punctured limb, the appearance of the dressing for signs of bleeding, of phlogistic signs and infection.

Another care was added in the checklist, with the anticoagulation of the patient, because in the case of an extracorporeal, the occurrence of clot formation is high. This care should be emphasized by the team, since there are publications reporting that thrombotic and hemorrhagic complications occur in up to 20% of patients with ECMO support, thus configuring the main

complications and the threat during therapy. The study team maintains the care recommended in the published evidence that indicates the maintenance of minimum levels of hemoglobin, fibrinogen and platelets. In the face of these recommendations, the group maintains strict clinical evaluations so that the indications of these corrections are made on the basis of the patient's need and not only in laboratory values.[15-6]

For this patient, anticoagulation with unfractionated heparin was started in continuous infusion in the ECMO circuit itself. It is also important to choose the drug in the routine monitoring of the hemostatic system during therapy and numerous tests are available to titrate the anticoagulant dosage. Standardization of these tests by the team should be standardized, as guidelines indicate that the use of a single test is not acceptable, but the need to perform multiple tests several times a day can easily confuse team members.[15]

In this patient, the use of activated clotting time (ACT) was maintained as a bedside method interspersed with partially activated thromboplastin time (PaTT). Their ranges are varied according to the clinical presentation of the patient and the moment of therapy. The ratio of PaTT between 2.0 and 3.0 and ACT is generally maintained between 200-220 seconds. Thromboelastography was also performed at specific times, in accordance with the recommendations of ELSO.[17]

In this case, the ECMO was preserved in peripheral cannulation and, due to vascular difficulty, no arterial return of the cannulation was performed. The care related to tissue perfusion of the arterial puncture limb was thus adopted immediately with limb warm-up using orthopedic cotton and tubular mesh. It is indicated that the evaluation of the limb should be performed every six hours, but in this case, due to the patient's severity and not having a recanalization puncture, the team opted to intensify the perfusion evaluation of the limb by half of the distal pulse check, temperature and capillary filling every two hours.[18-9]

This attention is further reduced due to the results of studies such as a meta-analysis with 1866 patients in VA ECMO who reported a 16.9% incidence of lower extremity ischemia.[18] It is assessed that, in this situation, the ECMO team intervene, as the specialist nurses identified early the reduction of the perfusion of the catheterized limb signaling it to the medical staff, making it necessary to change the device.

The procedure was scheduled in the surgical center when we opted for the implantation of a circulatory assistance with central cannulation. The whole sequence was then programmed by the ECMO team so that the transport could be carried out safely. At the time of the procedure, the patient was prepared, such as: the passage of the centrifugal pump and oxygenator membrane from the console to the bed to check if the battery was fully charged; keep the manual route near the centrifugal pump; turn off the heater to decrease battery consumption; check the levels of the gas cylinders so that they have enough for the whole transport and also adopt all the measures of the transport of an intensive care patient.

The importance of transport scheduling and the use of checklist as used by the team of this study is indicated by studies. A publication related to the transport of the patient in ECMO is maintained by the ELSO describing the importance of the presence of specialist nurse in ECMO throughout the transport. It is reported that it is up to the nurse during transportation: transportation scheduling; communication with the sector involved and organization of the return; medication administration and responsibility of the patient's nursing care during all phases of transportation.[20] Similar conclusions are drawn in the light of these publications that transport of these patients is safe if conducted by experienced staff.

CONCLUSION

In this scenario, a new challenge is presented to nurses who play a fundamental role in the application, maintenance of extracorporeal care and high complexity care. In Brazil, ECPR is still little used due to the lack of ECMO teams and there is a shortage, in the literature, of the Nursing performance.

It should be noted that, in the case presented, despite being the team's first performance in ECPR, knowledge restriction was not a hindrance to specialized care and a favorable outcome in patient care throughout its period in circulatory support.

This work contributes to the elucidation of the importance of a team of specialist nurses to provide care to patients using ECMO, focusing care on their patients and highlighting the need for new studies to improve Nursing care in this therapy.

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Submission: 2018/06/23
Accepted: 2018/09/23
Publishing: 2018/11/01

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