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REVIEW ARTICLE

Good practices in nursing in the use of chest tubes: an integrative review

Buenas prácticas de enfermería en el uso de sondas torácicas: una revisión integradora

Boas práticas de enfermagem na utilização de dreno de tórax: revisão integrativa

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Abstract

The aim was to identify in the scientific literature the best nursing practices related to the use of a chest tube in an adult Intensive Care Unit. This is an integrative review with consultation of the Latin American Caribbean Literature on Health Sciences, Nursing Database, Online Medical Literature Search and Analysis System, Scientific Electronic Library Online, PubMed, CINAHL and EBSCO. Studies published between January 2014 and December 2018 in English, Portuguese and Spanish and available in full of full texts are included. Those with pediatric patients and duplicities were excluded. 133 studies were identified that gave rise to five articles analyzed. Of the selected articles, 80% corresponded to international studies; 40% published in 2016 and 60% with quantitative analysis. The categories of good practices with chest tube, complications related to chest tube, and use of a care protocol related to chest tube emerged. Therefore, the use of care protocols in the use of chest tubes and evidence-based practices contribute to the improvement and quality of nursing care for these patients.

Descriptors: Nursing Care; Drainage; Thoracic Wall; Suction; Patient Safety.

Resumén

El objetivo fue identificar en la literatura científica las mejores prácticas de enfermería relacionadas con el uso de un tubo torácico en una Unidad de Cuidados Intensivos de adultos. Se trata de una revisión integradora con consulta de la Literatura del Caribe Latinoamericano en Ciencias de la Salud, Base de Datos de Enfermería, Sistema de Búsqueda y Análisis de Literatura Médica en Línea, Biblioteca Electrónica Científica en Línea, PubMed, CINAHL y EBSCO. Se incluyen estudios publicados entre enero de 2014 y diciembre de 2018 en inglés, portugués y español y disponibles íntegramente con textos completos. Se excluyeron aquellos con pacientes pediátricos y duplicidades. Se identificaron 133 estudios que dieron lugar a cinco artículos analizados. De los artículos seleccionados, el 80% correspondió a estudios internacionales; 40% publicado en 2016 y 60% con análisis cuantitativo. Surgieron las categorías de buenas prácticas con el tubo torácico, complicaciones relacionadas con el tubo torácico y uso de un protocolo de atención relacionado con el tubo torácico. Por lo tanto, el uso de protocolos de atención en el uso de sondas torácicas y prácticas basadas en la evidencia contribuyen a la mejora y calidad de la atención de enfermería para estos pacientes.

Descriptores: Cuidado de enfermería; Drenaje; Pared Torácica; Succión; Seguridad del Paciente.

Resumo

Objetivou-se identificar na literatura científica as melhores práticas de enfermagem relacionadas a utilização de dreno torácico em Unidade de Terapia Intensiva adulta. Trata-se de uma revisão integrativa com consulta à Literatura Latino-Americana do Caribe em Ciências da Saúde, Base de Dados de Enfermagem, Sistema *Online* de Busca e Análise de Literatura Médica, *Scientific Electronic Library Online,* PubMed, CINAHL e EBSCO. Incluídos estudos publicados entre janeiro de 2014 a dezembro de 2018 nos idiomas inglês, português e espanhol e disponíveis na íntegra com textos completos. Excluídos aqueles com pacientes pediátricos e duplicidades. Foram identificados 133 estudos que deram origem a cinco artigos analisados. Dos artigos selecionados 80% corresponderam a estudos internacionais; 40% publicados em 2016 e 60% com análise quantitativa. Emergiram as categorias de boas práticas com dreno torácico, complicações relacionadas ao dreno torácico e uso de protocolo de cuidados relacionados ao dreno torácico. Portanto, a utilização de protocolos de assistência na utilização de drenos torácicos e práticas baseadas em evidências contribuem para a melhoria e qualidade da assistência de enfermagem a esses pacientes.

Descritores: Cuidados de Enfermagem; Drenagem; Parede Torácica; Sucção; Segurança do Paciente.

Introduction

Chest drains correspond to invasive devices used to restore and maintain negative pressure in the pleural space, restoring cardiopulmonary function and hemodynamic stability. They are used for the purpose of removing any bloody, purulent, serous fluid or for the removal of air[1].

In the Intensive Care Unit (ICU), the use of chest drains refers to the therapy used in postoperative cases of major surgery, chest trauma of various origins, such as pleural effusion, empyema, hemothorax, pneumothorax, bleeding, mechanical failure, edema. The placement of this type of device is intended to remove fluids, air, blood, and secretions, so the care with chest drains is extremely important[2].

The use of chest tubes can lead to complications, such as infection, drain disposition, accidental removal, obstruction, bleeding, exteriorization, among others, which can lead to an increase in hospital stay, morbidity, mortality. One study shows that the main complications related to the use of chest tubes are system obstruction (58%), followed by emphysema (6%), peri-drain infection, accidental drain displacement and pneumothorax (1%)[3].

Another study pointed out that critically ill patients using a chest tube may present other complications such as poor tube placement and the need for new drainage; residual hemothorax; residual pneumothorax; pneumonia; infection and permanence of the orifice outside the chest cavity[4].

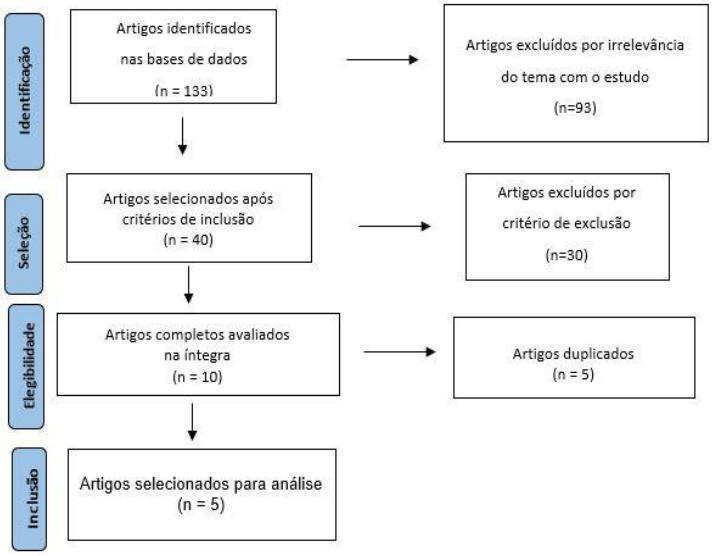
Because they are hemodynamically unstable, with prolonged hospital stay and are exposed to invasive procedures, ICU patients are more likely to develop complications and of greater severity associated with the use of chest tube[5].

Given the problems arising from the use of chest tubes and the need to update nursing care in view of the manipulation of this device, this study aimed at good practices in nursing care for critically ill adult patients who use a chest tube. Therefore, the objective was to identify in the scientific literature the best nursing practices related to the use of chest tubes in adult ICUs.

Methodology

Study of the integrative review type, which is based on the search, critical evaluation, and synthesis of evidence on the topic of interest, using research as a method. This method provides extensive information on the subject/problem, leading to the formation of a comprehensive body of knowledge6. In the search, 133 articles were identified, which after reading in full and inclusion criteria, gave rise to five articles, as shown in Figure 1.

Figure 1. Flowchart of the search, selection, and analysis of review articles, adapted from PRISMA. Rio de Janeiro, RJ, Brazil, 2021



The integrative review consists of six phases, which are the identification of the theme and selection of the hypothesis or research question, establishment of criteria for inclusion and exclusion of studies and sampling or research in the literature, definition of the information to be extracted from the selected studies and categorization of studies; evaluation of included studies; interpretation of results; and presentation of the review/synthesis of knowledge[6].

The PICo strategy was followed, which aims to answer a problem based on largely quantitative studies and that seek the sensitivity of qualitative studies focusing on the problem indicated by this study. From four items: the population, the patient or the problem addressed; the intervention and exposure that will be considered; comparing the intervention or exposure when it is necessary and relevant; and the clinical outcomes or outcomes of interest[7].

In the case of this study, P/I/Co were used, that is, P= patients in the adult ICU; I= best nursing practices and Co= chest tube, it applies because it is an integrative review and has the role of the review context7. Thus, the question that guided the research was what are the best nursing practices for patients with chest tubes in the adult ICU present in the literature?

For this purpose, a survey was carried out from April to May 2019 in the following databases: Latin American and Caribbean Literature on Health Sciences (LILACS), Database on Nursing (BDENF), Medical Literature Analysis and Retrievel System Online (MedLine), Scientific Electronic Library Online (SciELO), PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Business Source Complete (EBSCO). Descriptors in Health Sciences (DECs) and Medical Subject Heading (MeSH) were used: "Nursing Care", "Drainage", "Chest" and "Chest Tubes". The Boolean "AND" operator was applied between all descriptors to obtain the most accurate crossing in the search.

Studies published from January 2014 to December 2018, in English, Portuguese and Spanish, available in full and full texts, were included. Excluding those related to neonatal and pediatric patients, and with duplicates in the databases.

From the identified articles, a thorough reading of each study was carried out, highlighting those that responded to the objective proposed by this research to organize and tabulate the data. For this purpose, a data collection instrument was created containing a database, year of publication, journal, country and language, type of study and level of evidence, authors, title and nursing care for patients with chest tubes in the ICU.

Then, the characterization of the selected studies was carried out, and the concepts covered in each article were extracted, according to interest. The contents were compared and grouped by similarity into categories.

Results

It was observed that of the five studies, one is national (20%) and four are international (80%). Regarding the year of publication, it was shown that two studies were published in 2016 (40%); and one (20%) in 2015, 2017 and 2018, respectively. About the type of study, a quantitative and qualitative study, three quantitative and one qualitative study were found, as shown in Chart 1. After carefully reading the content of the articles, three categories emerged: a) Good practices with chest tube, b) Complications related to chest drain and c) Use of a chest tube-related care protocol.

Chart 1. Categorization of selected articles according to title, author, journal, type of study and nursing care for patients with chest tubes in the ICU. Rio de Janeiro, RJ, Brazil, 2021

No.	Title/ Author/Year	Journal	Study type	Good practices in nursing for patients with drains and chests
1	Intervenção de Enfermagem: cuidados com dreno torácico em adultos no pós-operatório (ALMEIDA et al, 2018)	Revista Rene	Quanti and qualitative	- Guide the patient on drain care. - Change the dressing every 24 hours. - Keep the drainage bottle below the chest level. - Perform correct hygiene during drain manipulation. - Carry out milking from the drain when necessary.
2	Place Atrium to Water Seal (PAWS): Assessing Wall Suction Versus No Suction for Chest Tubes After Open Heart Surgery (KRUSE et al, 2017)	Critical Care Nurse	Quantitative	- Assess air leakage and signs of pneumothorax.
3	Institutional protocol to standardize the chest drainage system management, from surgery to nursing care, at a regional hospital in northern Paraná. (MORAIS et al, 2016)	Acta Scientiarum. Health Sciences	Quantitative	- Evaluate water seal oscillation. - Keep the collector bottle in the correct position. - Perform the milking.
4	Nurses' knowledge of care of chest drain: A survey in a Nigerian semiurban university hospital (KESIEME et al, 2016)	Annals of African Medicine	Quantitative	- Keep the drainage system below the chest level. - Assess the drainage system coloration daily. - Change the dressing whenever necessary. - Assessing drainage system fluctuation. - Carry out the milking of the drain.
5	Evidence-based management of patients with chest tube drainage system to reduce complications in cardiothoracic vascular surgery wards. (GAN e TAN, 2015)	International Journal of Evidence-Based Healthcare	Qualitative	- Assess the drain insertion site, paying attention to phlogiston signs. -Monitor drain bottle oscillation. - Evaluate drainage system color. - Assess air infiltration. - Keep dressing clean and dry.

Discussion

Good practices in chest drain

The importance of correct drain handling is characterized by nursing interventions such as keeping the drainage bottle below the chest level, clamping the drains when they are above the chest level and keeping them that way in the shortest time possible, maintaining the system drainage at the vertical level, sanitize hands before and after insertion of the drain, change the dressing every 24 hours or when necessary, monitor signs and symptoms of pneumothorax, clean around the drain with 0.9% saline solution , use gauze with saline, dry and clean with 70%

alcohol around it, use non-traumatic clamps, monitor the position of the drain through radiography, time for changing the thoracic drainage bottles and always change the drainage system bottles what needed; perform milking when indicated to guide the patient and family about the need for drain care; prevent occlusion of the bottle. Regarding milking and the use of clamps, there is still a lack of research, demonstrating whether it can be carried out[2].

Also, milking the chest tube tubing should always be carried out in the direction of the incision to the collection bottle, in the presence of clot and with a frequency of 2/2h - 4h/4h or according to the institution's protocol[8].

One study shows a low adherence related to some practices with the drain, such as milking, use of non-traumatic clamps, time to change chest drainage bottles, guidance to the family and the patient. Regarding milking and the use of clamps, there is still a lack of research demonstrating whether it can be performed. And there are still questions about changing the drainage system[2].

Regarding drainage system changes, the professional must inform the patient and family about the procedure, in addition to antisepsis of the hands, separate all the material to be used, open the saline solution or distilled water bottles, perform antisepsis again hands and put on gloves, fill the collector bottle with solution until it covers 2 cm of the rigid tube, mark the liquid level with adhesive and note the date and time of the water seal change, using hemostatic forceps to clamp the drain before the circuit change[8,9].

During patient transport, special care must be given to the collection bottle, always below the level of the patient's chest to prevent collections from returning to the patient's pleural cavity. Another important factor concerns the seal of the extension tube, which must not be closed during transport[9].

In this regard, patients with pneumothorax with large air leak can quickly progress to hypertensive pneumothorax if the system seal is closed. Thus, the drain should only be closed for fractions of a second in situations where the collection bottle is above the level of the chest, and then opened. Furthermore, according to the authors, there is no scientific evidence that milking the system can contribute to preventing system obstruction[8].

A study analyzed the knowledge that nurses have about chest tube care in a hospital in Nigeria. For this purpose, variables such as gender, age, sector, academic qualification, time in the profession, and whether professionals received training or participated in an event with this theme were used. Most professionals (99%) correctly knew the insertion site and the purpose of using the device, demonstrating basic knowledge of the anatomy and function of the chest tube. The authors verified the need for training in relation to this practice, especially in the postoperative management, where less skill was evidenced[10].

Although nursing professionals believe in the importance of training on chest tubes, most (66.7%) did not receive training to update themselves on the subject, which is a worrying factor, as the maintenance of the chest tube is a nurse's responsibility. In addition, about 45% of nurses did not know or were not sure that fluctuating fluid level in the drainage tubing was indicative of good device functioning. The vast majority recognized that the drainage system must be below the level of the drain insertion. Another care addressed was in relation to milking, to avoid obstruction of the drainage system. It was observed that 41.1% of the subjects believed that milking should be performed by the nurse[10].

One can see the importance of studies in the development of strategies to improve assistance in the care of chest tubes. Two studies showed failures in the correct handling and handling with this device, demonstrating the importance of research related to this practice, since the nursing team has great responsibility in handling chest drains[2,11].

Considering that the management and maintenance of the drain is a practice carried out by the nursing team, it is extremely important to discuss this issue. However, there is a lack of research related to care in chest tube maintenance and prevention of complications.

Regarding nursing care, patients undergoing pleural drainage are preferably hospitalized in the wards where they undergo dressing change, drain flow measurement, water seal change and monitoring of their evolution. However, in other sectors, such as polytrauma and surgical observation, there are large numbers of people circulating, which can lead to an increase in contamination and possible infections in these patients[12].

Changing dressings by nurses is important, as they must assess the insertion site and phlogistic signs to avoid possible complications, such as infection[2,11]. A high level of validation of nurses in relation to this practice was evidenced. However, there is a high rate of use of only 70% alcohol for dressings[2]. However, 0.9% saline solution can be used[13].

Nurses should encourage the mobilization of the patient whenever possible to facilitate drainage, milk the drain in the direction of the drainage bottle, of accumulated fluids and expansion pulmonary, preventing atelectasis[14].

Thus, as a result, a checklist with the intention of helping to improve the practice related to the chest tube can be used. This list was applied by nurses and there was an improvement in care, as they were alerted about possible complications, through a checklist carried out daily. It is noteworthy the difficulties of adherence by nurses regarding the checklist, as they claimed to be overworked with difficulty in accepting the change[11].

Complications related to chest tube

Chest drain management varies and affects how long the drains remain, pain management, length of stay, early patient mobilization, and the type of nursing care that is needed[15].

The authors bring up adult patients undergoing cardiac surgery who use chest tubes to drain excess fluid, air, and blood, or create additional negative pressure suction for lung reexpansion. In these surgeries, placement of at least

one mediastinal tube is traditional, but patients may also have a second pleural chest tube[15].

The fulfillment of criteria for evaluating chest tubes with water seal is important until the chest tube is removed. Nursing care should be directed towards possible air leaks through chest drains, acute dyspnea, increased drainage around the chest tube insertion site, rhythm changes - atrial fibrillation and tachycardia[15].

As for location, it can be said that the thoracic tubes in the mediastinum are placed on the surface of the diaphragm in the pericardium, while the pleural chest tubes are placed in the pleural space, with negative pressure in the pleural space and the closed system with intrapleural pressures of approximately 4 mmHg between breaths. Therefore, this negative pressure allows for expansion and sustains the lung during inspiration, however the entry of air, fluid, or blood into the space interrupts the negative pressure, and the lung recoils and collapses. However, patients undergoing other types of chest surgery such as pulmonary resection may also have pleural chest tubes placed postoperatively to prevent pneumothorax, to monitor air leakage and hemothorax[15].

Historically, the thoracic drainage technique started to be used through the insertion of a metallic tube in the pleural space coupled to a collection bottle. However, currently it corresponds to the insertion of a polyvinyl chloride or silicone tube in which one of its ends is inserted in the pleural cavity, the other in the flask or collecting equipment, giving rise to the unidirectional valve mechanism. This mechanism prevents the contents drained from the pleural cavity from returning to the pleural cavity, thus restoring the recovery of expansion and lung function in the physiological conditions of the pleural cavity as it restores the negative pressure within the chest[14].

Thus, the nursing team has great importance in the maintenance of chest drains, ensuring that the aspiration is working, and the tubes are permeable, monitoring the system so that air does not leak from the system through possible bubbling and ensuring that there is fluctuation in the liquid level in the drain tube[14].

Therefore, checking the drained output is crucial, as it assesses how much blood or fluid the patient is losing after trauma. It can be done every hour or every 2 hours to assess critically ill patients, noting that 1500 ml of blood in the initial drainage is an indication for emergency thoracotomy, as well as flow rates of 200 ml/hour for 2 to 4 hours[16].

Critically ill patients must undergo blood flow measurement every hour and have their vital signs continuously evaluated. Stable patients on the ward or in the ICU can have their debt measured every 24 hours[9].

Among the complications related to the use of chest tubes are poor positioning of the tube and need for new drainage; residual hemothorax; residual pneumothorax; pneumonia; infection and permanence of the orifice outside the chest cavity[4].

In one study, drainage system obstruction occurred in 6% (6/100) of cases, caused by clamping (one case), siphoning (two cases) and clots and fibrin (three cases). There was no statistically significant association between a longer drainage period and a higher occurrence of related obstruction mechanisms. Regarding chest drainage, it was 5% (5/100) of subcutaneous emphysema - due to the drain located in the subcutaneous cell tissue; one case (1%) of infection around the drain; five cases (5%) of accidental displacement of the tube, requiring rehydration, and 5% (5/100) of the patients reported having the drain removed, with pneumothorax due to the presence of air in the pleural cavity at the time of removal; however, re-drainage was not necessary[17].

In another study, it was also possible to observe complications such as: system obstruction (58%), emphysema (6%), peri-drain infection, accidental drain displacement and pneumothorax (1%)[3].

ICU patients are more likely to develop complications and of greater severity associated with the use of chest tubes, as they are hemodynamically unstable, with prolonged hospital stay and are exposed to invasive procedures[5].

Use of a chest tube care protocol

Regarding the management of drainage systems, the standardization and implementation of a protocol for nursing care with this procedure is essential for improving care, increasing patient safety, and mitigating incidents or adverse events for critical patients[15,17].

A study evaluated the manipulation of the closed thoracic drainage system by professionals and established a protocol for the care of this procedure, describing how the collector is exchanged and proper measurement with appropriate marking on the bottle, dressing, checking the drainage system, checking if there is debt and possible complications, refer to the responsible physician. Thus, of the chest drainages (n = 100) monitored, 83 patients required more than one chest drainage. The mean drainage time was 6.7 days, among the indications for chest drainage, the traumatic cause was prevalent, totaling 72% (72/100) of the cases. Regarding the etiology of trauma, 27% (27/100) resulted from injury caused by firearms; another 17% (17/100) due to injuries caused by cold weapons, representing 44% of the causes[17].

Thus, it is suggested to standardize the exposed protocol and through technical training and the importance of clarification, thus trying to reduce morbidity, as therapeutic success is directly related to the qualification and training of those who provide care to patients submitted to the use of chest tubes[17].

In other studies, strategies were also developed to improve assistance in the care of chest tubes. Such studies showed failures in the correct handling and handling with this device, demonstrating the importance of research related to this practice, since the nursing team has great responsibility in handling chest drains[2,11].

In the studies, it can be observed that the role of the nursing professional is highly necessary in the care of the chest tube. Its importance ranges from before the procedure with the proper preparation of materials, preparation of the water seal, measurement of drained output, attention

during transport and after the procedure in longer-term care in the ward and ICU beds[9].

Aiming to implement best practices to provide safe and effective care to patients with a chest drainage system in cardiothoracic wards at a university hospital in Singapore, a study showed that there were ten incidents of drain disposition and five related to drain fixation[11].

Therefore, a checklist was created, with the aim of helping to improve the practice related to the chest drain. This list was applied to nurses to assist them in manipulating the drain, from its insertion to the end of drainage. At first, 36 failures related to suction, bubbling and color change were evidenced. After the checklist, there was an improvement in care, as nurses were alerted to possible complications, through a checklist performed daily[11]. Chest drain check may follow the criteria of drain insertion, tube connection, bubbling, watercolor change, suction pressure.

It is noteworthy the difficulties of adherence by nurses regarding the checklist, as they claimed to be overworked with difficulty in accepting the change. In short, it was observed that the use of a guide for nurses generates more safety when handling chest drains[11].

The articles analyzed are in line with the objective of this research, such as good practices in nursing care for critically ill adult patients with chest tubes, demonstrating the importance of nurses' knowledge about device care and the suggestion of using a pre- established.

Thus, in view of the described content, a checklist was created, containing the following items to be observed by the nursing staff in the daily routine of the ICU when there are patients in this sector using chest tubes. They are dressing, drainage, general care and the patient's response to drain use.

As for the dressing, the instrument allows us to assess whether it was performed in the last 24 hours, whether it is clean and dry, whether the ostium presents or not without phlogistic signs, whether there is adequate fixation/suture. In relation to drainage, it is possible to record the permeability, appearance, volume, presence of clot, oscillation, and bubbling.

Other general precautions include confirming that the drain is free from traction or clamping, date and time of exchange of distilled water in the collection bottle, marking the height of distilled water (2cm) on the water seal, position of the collection bottle in relation to the floor/fixed to bed or stand, as well as chest level. Regarding the patient's response to the use of the drain, the instrument allows confirming guidance regarding use, presence of pain and breathing pattern. This instrument allows for the systematization of nursing care in the care of critically ill patients who use a chest tube. Furthermore, in addition to the proper use of the instrument, recording in the medical record can indicate whether nursing care was provided safely to the patient[18].

Conclusion

The study achieved the proposed objective, identifying the best evidence in the literature related to good nursing practices in the use of chest tubes in the adult ICU. Faced with the possible complications of the use of chest tubes in critically ill patients, which negatively interfere in their health-disease process, this study allows for more targeted nursing care for these patients, as it promotes grounded guidelines about the care with the drain of chest.

As limitations, there was a small number of articles found in the databases. Therefore, the production of more scientific studies on this topic by nursing professionals to ensure quality and safe care is necessary.

As seen in this literature review, two studies point to the use of care protocols in the use of chest drains and all the others confirm that evidence-based practices contribute to the improvement and quality of nursing care for these patients' undergoing chest drain drainage.

References

1. Carvalho EA, Oliveira MVB. Modelo de segurança para realização de drenagem torácica na pandemia pela COVID-19. Rev. Col. Bras. Cir. 2020;47:e20202568. DOI: 10.1590/0100-6991e-20202568
2. Almeida RC, Souza PA, Santana RF, Luan AA. Intervenção de enfermagem: cuidados com dreno torácico em adultos no pós-operatório. Rev Rene. 2018;19:e3332. DOI: 10.15253/2175-6783.2018193332
3. Nishida G, Sarrão BD, Colferai DR, Tenório GOS, Bandeira COP. Cuidados com o sistema de drenagem torácica em adultos internados no Hospital Universitário Regional de Maringá, Estado do Paraná, Brasil. Acta Sci. Health Sci. 2011;33(2):173-9. DOI: 10.4025/actascihealthsci.v33i2.8877
4. Mendes CA, Hirano ES. Fatores preditores de complicações da drenagem de tórax em pacientes vítimas de trauma. Rev. Col. Bras. Cir. 2018;45(2):e1543. DOI: 10.1590/0100-6991e-20181543
5. Roque KE, Tonini T, Melo ECP. Eventos adversos na unidade de terapia intensiva: impacto na mortalidade e no tempo de internação em um estudo prospectivo. Cad. Saúde Pública. 2016;32(10). DOI: 10.1590/0102-311X00081815
6. Sousa LMM, Vieira CMAM, Severino SSP, Antunes AVA. Metodologia de revisão integrativa da literatura em enfermagem. Revista investigativa em enfermagem [Internet]. 2017 [acesso em 05 set 2020];(2). Disponível em: http://hdl.handle.net/20.500.12253/1311
7. Oliveira AWC. Recuperação da informação em saúde: construção, modelos e estratégias. ConCI. [Internet] 2020[acesso em 05 set 2020];3(2). Disponível em: https://seer.ufs.br/index.php/conci/article/view/13447
8. Kusahara DM, Chanes DC, Harada MJCS. Boas Práticas - Drenos de Tórax. Conselho Regional de Enfermagem de São Paulo [Internet]. 2011[acesso em 05 set 2020]. Disponível em: https://portal.coren-sp.gov.br/sites/default/files/dreno-de-torax.pdf

9. Medeiros BJC. Cuidados Padronizados com Dreno de Tórax: Aspectos e Manejo [Dissertação]. Profissional em Cirurgia Universidade Federal do Amazonas [Internet]. Amazonas; 2019 [acesso em 27 set 2020]. Disponível em: https://tede.ufam.edu.br/handle/tede/7165
10. Kesieme EB, Essu IS, Arekhandia BJ, Welcker K, Prisadov G. Nurses' knowledge of care of chest drain: A survey in a Nigerian semiurban university hospital. Ann Afr Med. 2016;15(2):95. DOI: 10.4103/1596-3519.172556
11. Gan KL, Tan M. Evidence-based management of patients with chest tube drainage system to reduce complications in cardiothoracic vascular surgery wards. Int J Evid Based Healthc. 2015;13(2):58-65. DOI: 10.1097/XEB.0000000000000041
12. Conselho Regional de Enfermagem de São Paulo (COREN – SP). Parecer nº. 035/2019. Retirada de drenos de diferentes tipos, troca de selo d'água, ordenha e aspiração contínua por profissional de enfermagem. [Internet]. São Paulo (SP): COREN; 2019 [acesso em 20 set 2020]. Disponível em: https://portal.coren-sp.gov.br/wp-content/uploads/2020/01/Parecer-035.2019-Manuseio-de-drenos-pela-enfermagem-retirada-troca-de-selo-d%C3%A1gua-ordenha-e-aspira%C3%A7%C3%A3o.pdf
13. Brasil. Agência Nacional de Vigilância Sanitária. Medidas de Prevenção de Infecção Relacionada à Assistência à Saúde [Internet]. Brasília (DF): Anvisa;2017 [acesso em 20 set 2020]. Disponível em: https://www20.anvisa.gov.br/segurancadopaciente/index.php/publicacoes/item/caderno-5
14. Lucio V, Araújo APS. Nursing care in thoracic drainage: a literature review. UNOPAR. Cient., Ciênc. biol. Saude [Internet]. 2011;[acesso em 20 set 2020]13. Disponível em: https://edisciplinas.usp.br/pluginfile.php/5585868/mod_resource/content/1/Lucio%20e%20Araujo%202011.pdf
15. Kruse T, Wahl S, Guthrie PF, Sendelbach S. KRUSE, T. et al. Place Atrium to Water Seal (PAWS): Assessing Wall Suction Versus No Suction for Chest Tubes After Open Heart Surgery. Critical Care Nurs. 2017;37(4):17-28. DOI: 10.4037/ccn2017269
16. American College of Surgeons (ACS). ATLS Advanced Trauma Life Support: Student course manual [Internet]. 2018 [acesso em 20 set 2020]. Disponível em: http://paginas.facmed.unam.mx/deptos/cirugia_/wp-content/uploads/2018/07/Advanced-Trauma-Life-Support.pdf
17. Morais ACC, Lemos MM, Marques VD, Bandeira COP. Protocolo institucional para padronizar o manejo do sistema de drenagem torácica, da cirurgia ao cuidado de enfermagem, em um hospital regional do norte do Paraná. Acta Scientiarum. Health Sciences. 2016;38(2): 173-77. DOI: https://doi.org/10.4025/actascihealthsci.v38i2.26972
18. Queiroz FSMA, Moraes SC, Nogueira VSAL, da Silva OT, Duarte de OL. Auditoria de enfermagem: aspectos da qualidade da assistência e do seu registro no prontuário. Glob Acad Nurs. 2020;1(2):e33. DOI: 10.5935/2675-5602.20200033