

DOI: <https://doi.org/10.36489/nursing.2020v23i265p4245-4256>

Variation of CUFF pressure in serious patients submitted to invasive mechanical ventilation under nursing care in an intensive unit

ABSTRACT | The aim of this research was to evaluate the variation in cuff pressure of patients in the intensive care unit, in the bed bath, aspiration of the lower airways and in the decubitus change, and to build an assistance protocol for checking the cuff pressure. This is a descriptive, cross-sectional, exploratory, and experimental study, with a quantitative approach, where data collection took place in March 2020, in a public hospital in the municipality of Cabo Frio. Data collection was performed using a collection instrument and to check the cuff pressure, a hand-held cuffometer was used, enabling the measurement in mmHg. After the inclusion and exclusion criteria, 10 patients were selected. When analyzing the P_{cuff} variation during the procedures performed by the Nursing team, the occurrence of changes was frequent, the most significant being after the bed bath. In view of the above, this study contributes to subsidize data for the implementation of care directed to intubated patients, based on actions that ensure patient safety, such as the routine of daily measurements and the training of the assistance team. Thus, protecting the patient from important complications that may be associated with the hyperinflation and hypoinflation of this device.

Keywords: Pressure; Nursing Care; Critical Care; Artificial Respiration.

RESUMEN | El objetivo de esta investigación fue evaluar la variación en la presión del manguito de los pacientes en la unidad de cuidados intensivos, en el baño de cama, la aspiración de las vías respiratorias inferiores y el cambio de decúbito, y construir un protocolo de asistencia para controlar la presión del manguito. Este es un estudio descriptivo, transversal, exploratorio y experimental, con un enfoque cuantitativo, donde la recolección de datos tuvo lugar en marzo de 2020, en un hospital público en el municipio de Cabo Frio. La recolección de datos se realizó utilizando un instrumento de recolección y para verificar la presión del manguito, se usó un cuffómetro de mano, lo que permitió la medición en mmHg. Después de los criterios de inclusión y exclusión, se seleccionaron 10 pacientes. Al analizar la variación de P_{cuff} durante los procedimientos realizados por el equipo de enfermería, la aparición de cambios fue frecuente, siendo la más importante después del baño en la cama. En vista de lo anterior, este estudio contribuye a subsidiar los datos para la implementación de la atención dirigida a pacientes intubados, en base a acciones que garantizan la seguridad del paciente, como la rutina de las mediciones diarias y la capacitación del equipo de asistencia. Protegiendo así al paciente de complicaciones importantes que pueden estar asociadas con la hiperinflación e hipoinflación de este dispositivo.

Palabras claves: Presión; Cuidado de Enfermera; Cuidado Crítico; Respiración Artificial.

RESUMO | O objetivo desta pesquisa foi avaliar a variação da pressão do cuff de pacientes em unidade intensiva, no banho no leito, aspiração de vias aéreas inferiores e na mudança de decúbito, e construir um protocolo assistencial de verificação da pressão do cuff. Trata-se de um estudo descritivo, transversal, exploratório e experimental, de abordagem quantitativa, onde a coleta de dados se deu em março de 2020, em um hospital público no município de Cabo Frio. A coleta de dados foi realizada por meio de um instrumento de coleta e para verificar a pressão do cuff, foi utilizado um cuffômetro artesanal, possibilitando a aferição em mmHg. Após os critérios de inclusão e exclusão, foram selecionados 10 pacientes. Ao analisarmos a variação da P_{cuff} durante os procedimentos realizados pela equipe de Enfermagem, a ocorrência de alterações foi frequente, sendo a mais significativa, após o banho no leito. Diante do exposto, este estudo contribui para subsidiar dados para implementação de cuidados direcionados aos pacientes intubados, a partir de ações que garantam a segurança do paciente, como a rotina de mensurações diárias e o treinamento da equipe assistencial. Protegendo assim o paciente de importantes complicações que possam estar associadas à hiperinsuflação e hipoinsuflação deste dispositivo.

Palavras-chaves: Pressão; Cuidados de Enfermagem; Cuidados Críticos; Respiração Artificial.

Sara de Sena Bucoski

Nurse. Resident in Intensive Care at UERJ / Pedro Ernesto University Hospital. RJ, Brazil.

Thayná Magalhães Coutinho de Oliveira

Nurse. Graduated from Veiga de Almeida University - Campus Cabo Frio. RJ, Brazil.

Giselle Barcellos Oliveira Koeppel

Nurse. Master and PhD in Nursing. Professor of the Nursing Graduation Course at Veiga de Almeida University - Campus Cabo Frio. RJ, Brazil.

Priscila Pradonoff Oliveira

Nurse. Master in Psychoanalysis Health and Society. Coordinator and Professor of the Nursing Course at Universidade Veiga de Almeida Campus Cabo Frio. Specialist in Higher Education Teaching, Public Health and Hospital Infection Control. RJ, Brazil.

Murillo Ribeiro de Mattos

Nurse. Resident in Intensive Care at UERJ / Pedro Ernesto University Hospital. RJ, Brazil.

Luciana da Costa Nogueira Cerqueira

Nurse. Master in Bioscience. PhD student in Bioscience at the Federal University of the State of Rio de Janeiro. Professor of the Undergraduate Nursing Course at Veiga de Almeida University - Campus Cabo Frio. RJ, Brazil.

Received on: 04/25/2020

Approved on: 04/26/2020

INTRODUCTION

Invasive mechanical ventilation (IMV) has an important role in intensive care units, with the purpose of promoting adequate ventilation and oxygenation when the patient has compromised his ventilatory function and the available therapeutic possibilities are not successful. Invasive ventilatory support is performed through tracheal intubation, where a tube is inserted into the trachea orally or naso, the latter being less common⁽¹⁾. The duration of the tube may be short-lived, in cases of general anesthesia for surgical purposes, or prolonged, as is routinely used in patients admitted to the intensive care unit⁽²⁾.

The endotracheal tube has a device called a cuff at its end, whose function is to check the air pressure exerted inside the cuff⁽²⁾. The cuff is located in the distal part of the tube, its pressure is transmitted directly to the mucosa of the trachea, with the function of sealing the airway, preventing the escape of air, aiding ventilation and preventing bronchoaspiration of the subglottic content^(3,4). The cuff pressure (Pcuff), must be evaluated with a cuffometer, this equipment is connected to the cuff, where it is possible to view the values of pressure exerted inside the cuff in cmH₂O or mmHg and make it possible to increase or decrease the pressure, when necessary adjustments⁽⁵⁾.

In some studies, the practice of using the Pcuff monitoring technique by manual palpation of the cuff is reported, which is not effective because it does not correspond to the reality of the ideal pressure^(1,6).

The ideal Pcuff is described in the literature as 25-30 cmH₂O or 18-22 mmHg and should not exceed tracheal perfusion pressure. When these values are exceeded, there is a possibility of generating ischemic lesions of the tracheal wall⁽⁵⁾. Below-ideal values can impair ventilation due to gas leakage

and secretions from the upper airways, kept on top of the cuff, predisposing to bronchoaspiration. This last complication is cited in studies as being a factor of great impact for the emergence of pneumonia associated with mechanical ventilation - PAV^(5,7-9).

There is no consensus for the frequency of Pcuff measurement, however, the Brazilian Mechanical Ventilation Directive suggests that it be checked at least four times a day⁽⁷⁾. This moment to be established according to institutional protocol. However, changes can occur at different times, especially during nursing care, the most significant changes being: bathing in the bed, changing beds and aspiration of the airways⁽¹⁰⁻¹²⁾.

Some studies refer to the distancing of the nursing team from the clinical evaluation process and actions aimed at patients with an invasive airway device, which can exponentially increase the risk of damage to these patients^(1,8). This reality further emphasizes the importance and relevance of nursing professionals as a scientific body of care.

In view of this scenario, a research question emerged: What behavior of cuff pressure in routine nursing care?

The result of this study in the social context is justified, which is relevant for contributing to the adoption of good care practices and, consequently, the improvement of care, aiming at reducing complications due to inadequate cuff pressure and the well-being of the assisted patient. It becomes a contributor to subsidize and guide the Nursing team regarding the monitoring of cuff pressure routinely. Since, studies refer that the measurement of this device is not part of the usual practice on the part of professionals and there is a high incidence of inadequate Pcuff in patients under IMV⁽²⁾. In the scientific scope, it becomes relevant to generate updated data, contributing to the learning process and the elaboration of new research about the presented theme.

METHODOLOGY

This is a descriptive, cross-sectional, and experimental study with a quantitative approach. This study aims to record, describe, and analyze a phenomenon observed in a population, without intervening in the results that will be presented now or for a short period. The experimental study, on the other hand, analyzes the relationship between events to determine whether one is the cause of the other. And the quantitative approach is characterized by expressing the causes of a phenomenon through mathematical language and the relationship between variables⁽¹³⁾.

This study was conducted in March 2020 in two units, in a public hospital, a reference in the care of critically ill patients, located in the city of Cabo Frio-RJ. The units had a multidisciplinary team within 24 hours, with 01 consisting of 06 active beds and 01 by 04 beds, totaling 10 beds. The research subjects were 10 individuals.

The study complies with Resolution No. 466/2012 of the National Health Council - CNS⁽¹⁴⁾, considering the ethical and legal aspects in research involving human beings, being carried out with the approval of the Research Ethics Committee of the Veiga de Almeida University (CEP/UVA). Having the consubstantiated opinion of no. 3,961,621/2020.

The research was carried out after the family member, or person responsible for the patient, received information about the research and signed the Free and Informed Consent Form, since the patients did not have the clinical conditions to answer for themselves.

Inclusion criteria were patients who underwent artificial ventilation by tracheal intubation and who were under invasive mechanical ventilation. Exclusion criteria were patients under 18 years of age, with a contraindicated decubitus change, previous history of tracheal stenosis, head, and neck surgery and tracheomalase.

Data were collected from patients' medical records and recorded in an

instrument prepared by the research authors, which contained information about the patient's identification, age, gender, length of stay, duration of invasive mechanical ventilation, medical diagnosis and cuff pressure before and after the nursing procedures.

During the research, variations in cuff pressure were analyzed, after some routine nursing procedures, namely, bed bath, decubitus change and aspiration of lower airways. The cuff pressure was checked with a hand-made device, using a two-way aneroid and polyfix manometer, allowing measurement in mmHg when connected to the external cuff of the endotracheal tube. This verification method was performed because it deals with a unit that does not have its own device for checking P_{cuff}, the cuffometer. The values were obtained before and after each procedure.

The data were analyzed using a table built in Microsoft Excel®, and later included in tables to perform a descriptive analysis by percentage.

RESULTS AND DISCUSSION

During data collection, 11 patients were found. However, one was excluded due to the family member's withdrawal. Thus, 10 participants were selected. After the beginning of the research, one was contraindicated for changing the position, making it impossible to check the P_{cuff} in the change of position of this patient. However, the other procedures remained in the research.

In the sociodemographic analysis, it is possible to identify a predominance of the age group of 60 years or more (60%). Most representative male gender (90%) and white ethnicity (60%), as shown in Table 1.

The data found corroborate with available evidence, where the prevalence of the elderly population in intensive care units is related to the increase in life expectancy, contributing to population aging and, as a consequence,

an increase in chronic diseases and the need for highly complex care. in times of worsening^(15,16). Regarding the pre-

valence of hospitalization in male patients, studies show that this public is more vulnerable due to less adherence

Table 1. Distribution of clinical and sociodemographic data of intubated patients under invasive mechanical ventilation in a critically ill patient unit. Cabo Frio, RJ, Brazil, 2020. (N = 10)

CARACTERÍSTICAS DEMOGRÁFICAS	% N
Gênero	
Masculino	90 (09)
Feminino	10 (01)
TOTAL	100 (10)
Etnia	
Branco	60 (06)
Pardo	20 (02)
Negro	20 (02)
TOTAL	100 (10)
Faixa Etária	
18 F- 40 anos	20 (02)
41 F- 59 anos	20 (02)
60 anos ou mais	60 (06)
TOTAL	100 (10)
Diagnóstico Médico	
Cerebrovascular	30 (03)
Pulmonar	30 (03)
Cardiovascular	20 (02)
Outros	20 (02)
TOTAL	100 (10)
Comorbidade Associada	
Hipertensão Arterial	80 (08)
Diabetes Mellitus	70 (07)
Sem comorbidades	20 (02)
TOTAL	100 (10)
Tempo de Internação	
1 a 10 dias	70 (07)
11 a 20 dias	20 (02)
Acima de 20 dias	10 (01)
TOTAL	100 (10)
Tempo de Ventilação Mecânica	
1 a 10 dias	90 (09)
11 a 20 dias	0 (0)
Acima de 20 dias	10 (01)
TOTAL	100 (10)

to treatment and greater exposure to external risks - car accidents and violence^(17,18). As for ethnicity, a greater number of white people can be identified, which is described in some studies of the same nature^(2,19). However, it is worth mentioning that the black population is described in the literature as a population of great expression with regard to chronic degenerative diseases and exposure to risks, related to genetic and environmental causes, which may also favor that this group may need intensive support, at some point in life⁽²⁰⁾.

When analyzing the clinical data, it was shown that the most frequent reasons for hospitalizations were related to cerebrovascular (30%) and pulmonary (30%) pathologies, followed by cardiovascular (20%). The main comorbidity is Systemic Arterial Hypertension (80%). With hospital stay from 01 to 10 days and mechanical ventilation from 01 to 10 days, as shown in Table 1.

The data found are similar to other Brazilian studies, where cerebrovascular diseases are responsible for 79.6% of hospitalizations⁽²¹⁾, além de serem a segunda maior causa de morte do mundo⁽²²⁾. This finding may also be associated with the average age of patients, as these diseases affect more frequently individuals over 60 years of age^(23,24), and have the main risk factor for SAH⁽²³⁻²⁵⁾. Regarding pulmonary causes as a reason for hospitalization, they are frequently seen in intensive care units, with some of them being pneumonia and Chronic Obstructive Pulmonary Disease (COPD). Both are conditions that affect the patient's respiratory tract, which can lead to acute respiratory failure, being the frequent cause of admission to the ICU and the need for invasive mechanical ventilation^(2,26). Even in a smaller quantity presented in this research, when compared to other pathologies, cardiovascular diseases have a high frequency of ICU admissions^(27,28), besides being the main causes of death in the world⁽²²⁾. The emergence of these diseases is directly

related to the change in the population's lifestyle associated with the growth of risk behaviors, such as: inadequate diets, physical inactivity, smoking and alcohol consumption⁽²⁹⁾.

The length of stay most frequently found was around a maximum of 10 days. It is worth mentioning that the patient's stay in the highly complex environment is a stressful factor, contributing to the emergence of other complications, such as: anguish, fear and neurological changes⁽³⁰⁾, in addition to contributing to worsening prognosis and increasing hospitalization costs⁽³¹⁾. It is worth mentioning that the clinical and sociodemographic profile found has already been described by another study developed at the same health unit. This study identified that, of 168 patients, the highest prevalence of hospitalizations was of elderly men, of white ethnicity and were related to cerebrovascular pathologies with a hospital stay of less than 10 days⁽¹⁹⁾. Which shows a specific profile of the unit. For this reason, it is noted the importance of knowing the profile of patients undergoing invasive ventilatory support, contributing to the improvement of nursing care and targeted care. And, consequently, a better clinical evolution of these patients.

The most prevalent IMV time was 01 to 10 days. There is already evidence that the IMV time is related to the length of hospital stay, as patients in this scenario usually evolve with the need for invasive ventilatory support in the first 24 hours of their admission. And the longer the time submitted to IMV, the more susceptible the patient becomes to the appearance of other complications. Among them, we can highlight the pneumonia associated with mechanical ventilation^(32,33). This complication is mitigated through preventive measures. One of these measures is to check the cuff pressure, which needs to be within the ideal parameters (18 to 22 mmHg or 25 to 30 cmH₂O), in order to avoid bronchoaspiration, if hypoinflated, and damage to the tracheal

mucosa, if hyperinflated⁽⁵⁾. The nurse having an important role about adherence to these practices because he is directly involved in the care, where these pressures can change.

Among the nursing care that may show changes in cuff pressure, we can mention the bed bath that may vary as a result of the necessary mobilization for the bath⁽¹⁰⁾. This procedure is prescribed by the nurse due to the high complexity that this action can represent in critically ill patients. Therefore, technical-scientific knowledge is necessary in order to identify and intervene in hemodynamic and ventilatory changes that this care may present⁽³⁴⁾.

When analyzing the P_{cuff} variation in the different nursing procedures, it can be identified in this study that, during the bed bath, the average elevation was 11.25 mmHg in 40% of patients and a decrease of 3.33 mmHg in 60% of patients. In the aspiration of the lower airways, there was an average increase of 5.5 mmHg in 20% of patients and an average reduction of 6.8 mmHg in 80% of patients. The change in left lateral decubitus increased by an average of 9 mmHg in 11.1% and decreased by 4 mmHg in 66.6% of patients, whereas in the change in right lateral decubitus, there was an average increase of 10 mmHg in 22.2% and a decrease in 5 mmHg in 66.6% of patients. 22.2% and 11.1% of patients remained with the same pressure values as before the procedure, respectively. According to data in Table 2.

Becarria⁽⁹⁾ points out the importance of checking P_{cuff} after nursing care, especially after bathing in bed. Since this procedure showed a reduction in intra-cuff pressure in most intubated patients. As a consequence, it can generate pneumonia associated with mechanical ventilation, air leak hindering ventilation, among others^(3-5,9). In relation to the increase in pressure after bathing in the bed, this factor may be associated due to the compression of the tube on the cuff caused by movement⁽¹¹⁾. The

Table 2. Variation of cuff pressure in patients undergoing invasive mechanical ventilation under nursing care in the critically ill patient unit. Cabo Frio, RJ, Brazil, 2020.

Procedimentos de Enfermagem	Após procedimento % N	Média da variação da pcuff mmHg
Banho no leito		
Aumentou	40 (4)	11.25
Diminuiu	60 (6)	3.33
Permaneceu	0 (0)	
TOTAL	100 (10)	
Aspiração de via aérea inferior		
Aumentou	20 (2)	5.5
Diminuiu	80 (8)	6.8
Permaneceu	0 (0)	
TOTAL	100 (10)	
Decúbito lateral esquerdo		
Aumentou	11,1 (1)	9
Diminuiu	66,6 (6)	4
Permaneceu	22,2 (2)	
TOTAL	100 (9)	
Decúbito lateral direito		
Aumentou	22,2 (2)	10
Diminuiu	66,6 (6)	5
Permaneceu	11,1 (1)	
TOTAL	100 (9)	

elevation of this pressure under the tracheal mucosa, above the reference values, can generate complications, such as: stenosis, laryngitis, mucosal ulceration, ischemia, hemorrhage, among others^(1,2,5,9). Such complications can hinder the patient's extubation, favoring an increase in hospitalization time and, consequently, an increase in hospitalization costs⁽³¹⁾.

Another nursing care that causes changes in P_{cuff} is the aspiration of the lower airways⁽¹⁰⁾. Aspiration is performed to remove accumulated secretions, favoring airway permeability and, consequently, improving ventilation and oxygenation. Since patients on IMV tend to accumulate respiratory secretions due to ineffective coughing and the presence of the tube, impairing the glottis closure; the accumulation of

secretions increases the chances of developing VAP as a result of bronchoaspiration⁽³⁵⁾. Emphasizing the important role of the nurse in face of this action, to prevent VAP by the accumulation of secretions or by the decrease that the cuff pressure can present after aspiration. The data found in the present study corroborate with other research, which demonstrated a decrease in cuff pressure after aspiration of endotracheal secretions⁽¹⁰⁾. About the increase in P_{cuff} in some patients, after aspiration of the lower airways, this finding may be related to the brand of the tube used or to the routine of procedures performed by other health professionals. This was not a variable investigated by the present study.

Regarding the change in decubitus, it is known that this activity aims to pre-

vent Pressure Injuries (PI) and cardio-pulmonary complications. This being a complex procedure, which requires technical and scientific knowledge from nurses to identify hemodynamic and ventilatory changes that this action can cause^(36,37). Among the changes motivated by the change in position, we can mention the variation of P_{cuff}^(2,10,11). A similar study identified an average elevation of the P_{cuff} from 25 to 32.59 cmH₂O, which is equivalent to a variation from 18 to 24 mmHg in 47.3% of the studied patients, after changing the decubitus⁽¹¹⁾, which corroborates with the results found in this research, since part of the patients had increased cuff pressure after changing the position. Another study found that 58.7% of intubated patients had a reduction in P_{cuff} after changing the position⁽¹²⁾, corroborating with the data found in the present study, where the majority of patients also had P_{cuff} decreased after changing the position.

CONCLUSION

It was concluded that most of the research subjects were white and elderly men, with a prevalence of cerebrovascular and pulmonary diagnoses. Having systemic arterial hypertension as the major associated comorbidity. And length of hospital stays and mechanical ventilation between 1 to 10 days.

The present study aimed to analyze the variation in cuff pressure of intubated patients under invasive mechanical ventilation in the bed bath, change of position, lower airway aspiration and to build a P_{cuff} follow-up form

In all nursing procedures, there was a prevalence of decreased cuff pressure, but there was also a significant number of elevations, especially after bathing in the bed. This corroborates with some studies, as already mentioned in this work. Demonstrating that there is no agreement between the increase and decrease of P_{cuff} in the bibliography.

For this reason, the importance of understanding, in each health unit, the variation profile of this device in the patient is highlighted, so that qualified and targeted nursing care is provided, through the implementation of mea-

asures to prevent tracheal injuries and bronchoaspiration.

The study limitation was restricted to the time of completion and complexity of analysis and the inclusion of patients, which made some associated discussions

difficult. It should be noted that there was a relatively small number of patients analyzed, associated with the complexity of carrying out experimental studies. However, similar studies showed a similar number of patients studied^(2,11). 🐦

References

- Pinto DM, Schons ES, Busanello J, Costa VZ. Segurança do paciente e a prevenção de lesões cutâneo-mucosas associadas aos dispositivos invasivos nas vias aéreas. *Rev Esc Enfermagem USP*. 2015 out; 49(5): 775-782.
- Barroso AKS, Soares JS. Análise da pressão do cuff/balonete em pacientes sob ventilação mecânica invasiva na unidade de terapia intensiva (UTI). *Brazilian Journal of Surgery and Clinical Research*. 2017 nov; 20(1): 07-20.
- Hinkle JL, Cheever KH. Kerry H. Brunner & Suddarth tratado de enfermagem médico-cirúrgica. 13. ed. Rio de Janeiro-RJ: Guanabara Koogan; 2016.
- Mogal SS, Baliarsing L, Dias R, Gujjar P. Comparação de alterações na pressão do balonete do tubo endotraqueal usando ar versus óxido nitroso nos gases anestésicos durante cirurgias abdominais laparoscópicas. *Rev Bras Anesthesiol*. 2018 jan; 68(4): 369-374.
- Agência Nacional de Vigilância Sanitária em Saúde (BR). Medidas de prevenção de infecção relacionada à assistência à saúde. Brasília (DF): ANVISA, 2017.
- Giusi GD, Rogari C, Gili A, Nisi F. Cuff pressure monitoring by manual palpation in intubated patients: How accurate is it? A manikin simulation study. *Australia Critical Care*. 2017 jul; 30(4): 234-8.
- Medicina Intensiva Brasileira. Diretrizes Brasileiras de Ventilação Mecânica. 2013:1-136.
- Maran E, Spigolon DN, Melo WA, Barreto MS, Tostes MFP, Teston EF. Prevenção da pneumonia associada à ventilação mecânica sob a ótica de acadêmicos de enfermagem. *Cuidado é fundamental*. 2019 mar; 11(1): 118-123.
- Cruz JRM, Martins MDS. Pneumonia associada à ventilação mecânica invasiva: cuidados de enfermagem. *Rev Enf Ref*. 2019 mar; IV (20): 87-96.
- Becarria LM, Doimo TMA, Polletti NAA, Barbosa TP, Silva DC, Werneck AL. Mudança de pressão do balonete traqueal antes e depois da realização dos cuidados de enfermagem. *Rev. Bras. Enferm*. 2017 dez; 70(6): 1145-1150.
- Alcan AO, Giersbergen MYV, Dincarslan G, Hepcivici Z, Kaya E, Uyar M. Effect of patient position on endotracheal cuff pressure in mechanically ventilated critically ill patients. *Australian Critical Care*. 2017 set; 30(5): 267-272.
- Ferreira EG, Rickli P, Molina Filho ET, Fischer J, Antunes MD, Nascimento Junior JRA, Oliveira DV. Pressão do cuff em pacientes em ventilação mecânica-relação com a mudança de decúbito. *Ciência e Saúde*. 2017; 10(2): 114-119.
- Hulley BS, Cummings RS, Browner SW, Grady GD Newman BT. *Delineando a pesquisa Clínica*. 4. Ed. Porto Alegre (RS): Artmed; 2015.
- Conselho Nacional de Saúde (BR). Resolução n.º 466, de 12 de dezembro de 2012. Diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos. *Diário Oficial da União* 13 Jun 2013; Seção 1.
- Organização Mundial da Saúde, Organização Pan-Americana da Saúde. *Folha informativa - Envelhecimento e saúde*. Brasília (DF): OMS/OPAS, 2018.
- Rodriguez AH, Bub MBC, Perao OF, Zandonadi G, Rodriguez MJH. Características epidemiológicas e causas de óbitos em pacientes internados em terapia intensiva. *Rev Bras Enferm*. 2016 set; 69(2): 210-4.
- Castro RR, Barbosa NB, Alves T, Najberg E. Perfil das internações em unidade de terapia intensiva adulto na cidade de Anápolis – Goiás em 2012. *Revista de Gestão em Sistemas de Saúde*. 2016 mar; 5(2).
- Perão OF, Bub MBC, Zandonadi GC, Martins MA. Características sociodemográficas e epidemiológicas de pacientes internados em uma unidade de terapia intensiva de adultos. *Rev Enferm UERJ*. 2017 mar; 25:7736.
- Pinto DS, Silva BAA, Koeppel GBO, Pereira SP, Teixeira PC, Cerqueira LCN. Descrição clínica e sociodemográfica de pacientes internados em uma Unidade de Pacientes Graves de Cabo Frio-RJ. *Revista Nursing*. 2019; 22 (259): 3431-35.
- Ministério da Saúde (BR). Painel de indicadores do SUS n.º 10. Temático Saúde da População negra. v.VII. Brasília (DF): MS, 2016.
- Melo EM, Barbosa AA, Silva JLA, Sombra RLS, Studart RMB, Lima FET, et al. Evolução Clínica dos Pacientes em uso de ventilação mecânica em unidade de terapia intensiva. *Rev Enferm UFPE*. 2015 fev; 9(2): 610-1.
- Organização Mundial da Saúde, Organização Pan-Americana da Saúde. 10 principais causas mortais do mundo. Brasília (DF): OMS/OPAS, 2018.
- Lotufo PA, Goulart AC, Passos VMA, Satake FM, Souza MFM, França EB, et al. Doença cerebrovascular no Brasil de 1990 a 2015: Global Burden of Disease 2015. *Rev. bras. epidemiol*. 2017 mai; 20(1):129-141.
- Oliveira JG, Damasceno KG, Souza LP, Lima MG. Perfil clínico epidemiológico e os principais rótulos diagnósticos de enfermagem aos pacientes internados com acidente vascular cerebral em um hospital de grande porte na região sul da Amazônia legal. *Revista Amazônia Science & Health*. 2016 set; 4(3):3-11.
- Melo EM, Oliveira TMM, Marques AM, Ferreira AMM, Silveira FMM, Lima VF. Caracterização dos pacientes em uso de drogas vasoativas internados em unidade de terapia intensiva. *Cuidado é fundamental*. 2016 set; 8(3):129-141.
- França CDM, Albuquerque PR, Santos ACBC. Perfil epidemiológico da unidade de terapia intensiva de um Hospital Universitário. *Revista Inter-Scientia*. 2016 dez; 1(2):72-82.
- Perão OF, Bub MBC, Zandonadi GC, Martins MA. Características sociodemográficas e epidemiológicas de pacientes internados em uma unidade de terapia intensiva de adultos. *Rev enferm UERJ*. 2017 mar; 25:e7736.
- Organização Mundial da Saúde, Organização Pan-Americana da Saúde. *Doenças cardiovasculares*. Brasília (DF): OMS/OPAS, 2017.
- Organização Mundial da Saúde, Organização Pan-Americana da Saúde. *Doenças crônicas não transmissíveis causam 16 milhões de mortes prematuras todos os anos*. Brasília (DF): OMS/OPAS, 2015.
- Membrive AS, Souza LPS, Donoso MTV, Silqueira SMF, Corrêa AR, Matos SS. Caracterização dos estressores envolvidos na internação de pacientes em unidade coronariana. *Rev baiana de Enfermagem*. 2017; 31(1):e16552.
- Sinésio MCT, Magro MCS, Carneiro TA, Silva KGN. Fatores de risco às infecções relacionadas à assistência em unidades de terapia intensiva. *Cogitare Enferm*. 2018; 23(2):e53826.
- Freitas MA, Aragones BL, Fleck CS. Perfil clínico de pacientes submetidos à ventilação mecânica em uma unidade de pronto atendimento da região central do Rio Grande do Sul. *Fisioterapia Brasil*. 2019 jun; 20 (4): 476-484.
- Frota ML, Campanharo CRV, Lopes MCBT, Piacenzi LHV, Okuno MFP, Batista REA. Boas práticas para prevenção de pneumonia associada à ventilação mecânica no serviço de emergência. *Revista da Escola de Enfermagem da USP*. 2019 jun; 53:e0460.
- Bastos SRB, Gonçalves FAF, Bueno BRM, Silva GS, Ribeiro KRA, Brasil VV. Banho no Leito: Cuidados Omitidos pela Equipe de Enfermagem. *J res fundam care*. 2019 jun; 11(3): 627-63.
- Lopes VJ, Muller F, Souza MAR, Silva IA. Aspiaração endotraqueal em pacientes com via aérea artificial sob ventilação mecânica invasiva internados em UTI. *Revista de Enfermagem do Centro-Oeste Mineiro*. 2018; 8:e1973.
- Magnus LM, Backes MTS, Backes DS. Mudança de decúbito em pacientes com injúria cerebral grave: construção de um guia com enfermeiros intensivistas. *Enferm. Foco*. 2018; 9(2):28-34.
- Oliveira TMC, Bucoski SS, Koeppel GBO, Santos AG, Pereira LS, Cerqueira LCN. Repercussões hemodinâmicas e ventilatórias do paciente em ventilação mecânica invasiva na mudança de decúbito. *Revista Nursing*. 2020; 23(261):3600-06.