v. 4, n. 97, 2024

International Journal of Health Science

Acceptance date: 07/11/2024

EVALUATION OF PROCESSES TO PREVENT HOSPITAL-ACQUIRED BLOODSTREAM INFECTIONS ASSOCIATED WITH CENTRAL VENOUS CATHETERS

Lília Maria Nobre Mendonça

Raissa Mayara Pereira Machado

Bruno Eduardo Cordeiro Dantas

Domingas Machado da Silva

Andreia Alves Hayashi

Jociléia da Silva Bezerra

Mariellen Oliveira Sarmento Santos

Ediana Viana da Silva

Antenor Matos de Carvalho Junior

Rodrigo Ruan Costa de Matos

Maria Elizete Diniz dos Santos

Giselle Diniz dos Santos

Abstract: Bloodstream infections related to central venous catheters (CVCs) are a public health problem that still persists today at a global level. In this sense, the purpose of this research is to show the unstable and stable dynamics of the variables during the period studied, after a statistical analysis of the practices for the prevention and control of bloodstream infection (HI) related to CVC, based on procedural indicators between 2017 and 2018, using the Statistical Process Control (SPC) chart. In this context: What mechanisms are used to monitor and validate adherence during the maintenance of this invasive device and how do they look after statistical analysis? This is a descriptive study, with a quantitative approach and exploratory nature, from 2017 to 2018, using statistical and statistical control methods. Variables from the intra-hospital database will be used, based on the compliance and non-compliance *checklist* "Indicators of prevention processes for the prevention of bloodstream infection/CVC" made available by the Hospital Infection Control Service - SCIH, supported by ANVISA/2017 standards. The following indicators were identified for the compliance parameters for 2017 and 2018, respectively: "Daily recording of the insertion site and indication of stay" (92.02%; 93.83%); "Clean, dry and well-adhered dressing" (94.56%; 94.88%); "Disinfection of connectors before administering medication" (96.99%); 91.25%); "Equipment lumen with blood" (96.84%; 98.43%); "Hand hygiene before and after handling the catheter (HMAEAMC)" (97.15%; 87.50%); in the monthly analysis of HMAEAMC compliance in 2018, the upper central limit (UCL) was slightly outside statistical control, and for the non-compliance of this parameter in the same year, points of the plotted sample were outside statistical control in May. Daily and periodic monitoring with the insertion of SPC reaffirms the need to check samples for anomalous profiles during the analytical process, making it possible to detect deviations and helping to make decisions about preventive practices during CVC maintenance.

In the mid-1990s, a new terminology for infections in the healthcare environment began to be discussed, with the term "Hospital Infection - HI" being replaced by "Healthcare-Related Infection (HAI)", which is a broader term, encompassing all infections acquired and related to the healthcare environment (SILVA, 2016).

Among hospital procedures, the use of intravascular catheters is indispensable in current medical practice, especially in the case of critically ill patients. Many risks arise from the use of this device, mainly infection, which is called central venous catheter-associated bloodstream infection (CVBI) when there are local signs of infection, with purulent secretion or hyperemia, in patients without a concomitant diagnosis of primary bloodstream infection (SILVA, 2016).

CVCs, on the other hand, provide therapeutic benefits, as they are used for specialized diagnoses and treatments, hemodynamic monitoring, administration of parenteral nutrition, liquids with extreme pH and osmolarity, chemotherapy, infusion of blood and blood components, hemodialysis and prolonged antibiotic therapy. They are flexible, radiopaque tubes made of silicone, polyurethane or Teflon, and can have one to three lumens, arranged in parallel at the proximal end, independent of each other, of varying lengths and gauges (MIRANDA, 2016).

The patient safety approach had an initial diagnostic phase based on studies on the occurrence of adverse events in health services, which identify their frequency, nature, main causes and severity in order to guide the definition of priorities and the formatting of policies and interventions aimed at increasing the safety of health care (STUDART et al., 2017).

The pursuit of quality is a complex issue and should be a priority for health institutions and the professionals who are part of them. Among these are nursing professionals, who play a fundamental role in healthcare organizations, focusing on individualized care in line with the best quality and safety practices (CALDANA et al., 2013).

Studies that point out and use performance indicators aimed at evaluating the outcome of care are necessary and fundamental for subsidizing new practices and research. With regard to Brazil, the approach to quality management in health is still lacking in competitiveness between health institutions and timid social participation with regard to the rights of the population in relation to health services (CALDANA et al., 2013).

Although the measures to prevent and control Catheter-Related Bloodstream Infection (CRBI) - to the central venous catheter (CVC) - are well established, the reality points to a need for investigation, because in practice, the evidence shows unsatisfactory levels of performance in their realization by health professionals (OLIVEIRA et al. 2015).

Although procedural evaluations do not, in themselves, determine direct results in terms of quality of care - and, in this specific case, a reduction in rates of central venous catheter-associated bloodstream infection (CVCA-BBI) - they are, at the same time, fundamental tools, as they allow us to make initial diagnoses, identify the necessary qualification actions and correlate them with results, through their successive applications (JARDIM et al. 2013).

Increased research into the development of indicators that include specialized, low and medium complexity services would also be relevant to obtaining more reliable data to portray the reality of these situations (MENEGUETI et al., 2015). Therefore, CVC-related bloodstream infection is considered, in most cases, a preventable complication for patient safety, which is why good practices should be used during the insertion and maintenance of these catheters (SALAMA et al, 2015).

In terms of good methodological practices, the use of *bundles* to improve care theoretically proposes the adoption of measures with the best levels of evidence. Although most of the interventions included in the *bundles* were recommendations based on scientific evidence, recommendations were also found that were not based on any evidence, as well as recommendations that diverged from scientifically established evidence (CURAN and ROSSETO, 2017). Among the interventions most frequently used to make the *bundles* are: hand hygiene, use of the maximum precautionary barrier for catheter insertion, chlorhexidine gluconate for skin antisepsis, daily review of the need for the catheter to remain in place and selection of the catheter insertion site: avoid accessing veins, etc. femoral (MIRANDA, 2016).

The application of each recommendation is successful when implemented together, and may also include constant epidemiological surveillance, education of the health team, training of the insertion team and catheter care, however, the existence of protocols in institutions does not guarantee their proper use (MANZO et al., 2018).

The possibility of further studies is envisioned, with the aim of mapping the Brazilian reality and subsidizing public policies to improve hospital infection control practices. It is recommended that the application of indicators for evaluating Hospital Infection Control Programs (PCIH) be incorporated into the evaluation routine in health services, including internal audits and health inspections (MENEGUETI et al., 2015).

The challenge to prevent harm to users of health services and damage associated with care resulting from processes or structures of care is increasing and, therefore, it is necessary to update specific protocols for diagnostic criteria and preventive measures to reduce HAIs (BRASIL, 2017).

With this in mind, what processes were used to monitor adherence to measures to prevent and control hospital-acquired bloodstream infections related to central venous catheters between 2017 and 2018?

In view of the above, the following guiding questions were chosen for this study (QN):

QN0: IH is still a frequent compilation among patients
hospitalized or discharged;

QN1: Technical training linked to the knowledge of the multi-professional health team deserves to be constant when it comes to bloodstream infection related to HI prevention measures;

QN2: The operational technical structure must have adequate support, both in terms of hospital structure and logistics, to carry out the prevention processes, in compliance with the microbiological principles of care;

QN3: The operational guidelines for the control and prevention of HI, although active, must have daily routines, through a daily *checklist*, as a preventive method in their work demands;

QN4: The question about the lack of awareness among health professionals is a gap that needs to be reviewed at an individual level;

QN5: Healthcare professionals must ensure patient safety, as patients are susceptible to the risk of HCI due to the daily handling of central venous accesses;

QN6: In order for workers to adhere to infection prevention and control actions, the process of worker training/continuing education must be part of the organization of health work.

The use of clinical indicators, according to Giunta and Lacerda (2006), is defined as continuous and/or periodic quantitative measures of variables, characteristics of a given process or system, becoming, in our routine, a useful tool for evaluating health services.

According to Menegueti et al. (2015), increased research into the development of indicators that include specialized, low and medium complexity services would also be relevant to obtaining reliable data to portray the reality of these situations. Therefore, according to Salama et al. (2015), ICS/CVC is considered, in most cases, a preventable complication for patient safety, which is why good practices should be used during the insertion and maintenance of these catheters.

The current evaluation system, according to Silva and Lacerda (2011), does not favor measurement, interpretation and qualification of its evaluation, which must be considered insufficient to determine the quality of care practices. Given this context it is considered appropriate to verify the practices of hospital bloodstream infection control related to central venous catheters in a reference hospital in the west of Pará in the municipality of Santarém during the years 2017 and 2018.

Above all, the development of this study is considered relevant in view of the need to monitor procedural clinical indicators, by means of a daily *checklist*, for the prevention of bloodstream infections associated with central venous catheters, through the collection and evaluation of data, which will serve as a contribution to future preventive interventions and epidemiological control, since this is a hospital infection in the context of preventive public health.

MATERIALS AND METHODS

To develop the results, we used tables condensed using *Epi info™* 7 (a public domain tool formulated by the CDC, 2017), graphs and the CEP (also known as the *Shewhart* chart established by the ISO 8258 standard), developed in electronic spreadsheets with "Excel" software.

Shewhart control charts are intended to show evidence that a process is working under statistical control; to identify the presence of special causes of variation; to monitor and improve the performance of the measurement process. De Oliveira et al. (2013) mention that SPC evaluates the performance of methods statistically through control. The text below explains well what the author wants to show:

It is known that in the field of statistics, the control chart statistically determines upper control limits (UCL) and lower control limits (LCL), as well as a central limit, when monitoring processes as a way of evaluating their performance over time, with a view to improving services. When this tool is outside the control limit, there is evidence of an investigation and corrective action to eliminate the cause of the unexpected effect in the process.

The data was analyzed using Excel software, *Epi info™ 7*. A 95% confidence interval and a significance level of ($p<0.05$) were adopted for the sample acquired. In addition to inspection in graphs and tables, the EPC was produced using the average standard deviation (σ) and the average of the samples.

The research was **submitted to and approved** by the Research Ethics Committee (CEP) of the State University of Pará (UEPA), located at Campus XII/Santarém, Avenida Plácido de Castro, 1399, Aparecida neighborhood, in the municipality of Santarém, State of Pará. The research will then be carried out in accordance with International Documents and Resolution No. 466/12 and Resolution No. 510/16 of the National Health Council (CNS), which advocate data confidentiality and privacy.

Only after obtaining the **INSTITUTIONAL ACCEPTANCE** (APPENDIX 1) from the Waldemar Penna Regional Hospital of the Lower Amazon, through the Teaching and Research Department (DEP), and subsequent approval from the CEP/UEPA, will the research itself begin, through a visit to the sector responsible for the data.

In addition to the above-mentioned stage, the research will continue, alongside this Institutional Acceptance, and also in view of the authorization that was signed by the person responsible for the data protection intended through the **TFD - TERMO DE FIEL DEPOSITÁRIO** (ANNEX 3), which contains the necessary clarifications on the part of the express compliance of the same, regarding the research with regard to the general objective, as well as its appropriate guarantees regarding the rights guaranteed by Resolution 466/2012 of the National Health Council.

With regard to how the data will be collected, **there will be no use of patient records or any other information that could lead to the identification of patients,** and the research does not aim to make reference to them. All that will be used are numbers, from digital media, which have been identified, on a data platform, which is carried out using a manual form called a *check list* (ANNEX 6), used by SCIH itself as "Process indicators for the prevention of bloodstream infection" and its subsequent storage on the basis of this hospital data platform.

Regarding the data granted, the reliability and security of the information granted and acquired will be guaranteed, without causing damage to the professional responsible for granting the elements, to the hospital institution, to research or to anyone who has access to the information, through the recent entry of the European Data Use Law and Privacy

Policy for their protection, applicable in Brazilian territory, under penalty of establishing fines, if the guidelines of Law 13.709/18 of 16/08/2018 are not complied with.

RESULTS AND DISCUSSION

8,616 procedures were assessed for compliance and 471 for non-compliance in 2017 and 2018, subdivided according to the parameters/year set out in Table 4.1 below:

In the daily record of the insertion site and the indication of permanence, compliance was 92.02% (N= 438) in 2017, slightly lower than the 93.83% (N= 1080) recorded in 2018, showing an improvement in this parameter. Similarly, there was a decrease in the non-compliance indicator over the current years, 7.98% and 6.17% (N= 71), a favorable difference of 1.81%, certainly due to the work of hospital epidemiological surveillance, due to the existence of the SCIH, which trains and empowers health professionals to advance the service.

When it came to checking for clean, dry and well-adhered dressings, the results were close, which did not compromise the target set for this variable in 2017 (56%, N= 452) and 2018 (94.88%, N= 1520). Similarly results of proximity to non-adherence of the system, 2017 (5.44%, N= 26), and 2018 (5.12%, N= 82), within a context on the values presented give good results not implicative for the standards determined

Compliance in disinfecting the connectors before administering medicines in 2017 was 96.99% (N= 2090) and in 2018, 91.25% (N= 709), a positive differential of 5.74% for the first year. Non-compliance was 3.01% (N= 9) in the first year and 8.75% (N= 68) in the second year.

The change/identification of the system every 96 hours in 2018 showed almost 98% (N= 1122) and 2017, 96.85 (N= 461) for compliance, although the absolute numbers during the second year are more representative, the first year reached the expected compliance. Non-compliance was highest in 2017 (3.15%, N= 15), then in 2018 (2.01%, N= 23).

When it came to observing the lumen of the equipment containing blood, the 98.43% compliance (N= 1128) in 2018 was a convenient increase on the 96.84% (N= 459) in 2017, although the percentage for this last result is within the established standards. On the other hand, and inversely proportionally, 2018 (1.57%) had lower non-compliance than 2017 (3.16%).

The analysis of the daily recording of hand hygiene before and after catheter manipulation in accordance with the ANVISA/MH protocol during 2017 was 97.15% (N= 273), higher than that observed in 2018, which complied with the protocol measures in 87.50% of cases (N=686), consequently, there was an increase in the percentage of non-conformities in 2018 (12.50%, N=98) when compared to the previous year (2.85%, N=8).

Research into central catheter infection is still poor today, but scientific evidence, clinical guidelines and government regulations that underpin SIR prevention and control actions have made a positive contribution to arguing why and how it happens, although they are still not enough to ensure that the problem is eradicated.

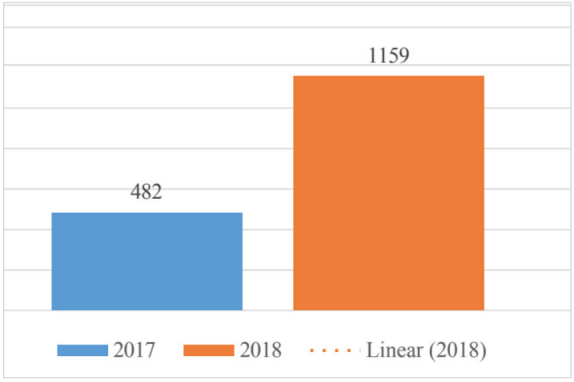

Figure 4.1: Distribution of process indicators for the prevention of HF/CVC Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2017 to 2018.

Parameters/Year	Compliance		Non-conformity		TOTAL	
	N	%	N	%	N	%
Daily record of insertion site and the indication of permanence						
2017	438	92,02	38	7,98	476	100,00
2018	1080	93,83	71	6,17	1151	100,00
TOTAL	1518		109		1627	
Clean, dry and well-adhered dressing						
2017	452	94,56	26	5,44	478	100,00
2018	1520	94,88	82	5,12	1602	100,00
TOTAL	1972		108		2080	
Disinfecting the connectors before the administration medicines						
2017	290	96,99	9	3,01	299	100,00
2018	709	91,25	68	8,75	777	100,00
TOTAL	999		77		1076	
System change/identification every 96 hours						
2017	461	96,85	15	3,15	476	100,00
2018	1122	97,99	23	2,01	1145	100,00
TOTAL	1583		38		1621	
Equipment lumen with blood						
2017	459	96,84	15	3,16	474	100,00
2018	1127	98,43	18	1,57	1145	100,00
TOTAL	1586		33		1619	
Hand hygiene before and after manipulation of the catheter						
2017	273	97,15	8	2,85	281	100,00
2018	686	87,50	98	12,50	784	100,00
TOTAL	959		106		1065	

Table 4.1: Processes for preventing CVC-associated bloodstream infections - HRBA, 2017-2018

Source: Data from the Bloodstream Infection/CVC Process Indicators.

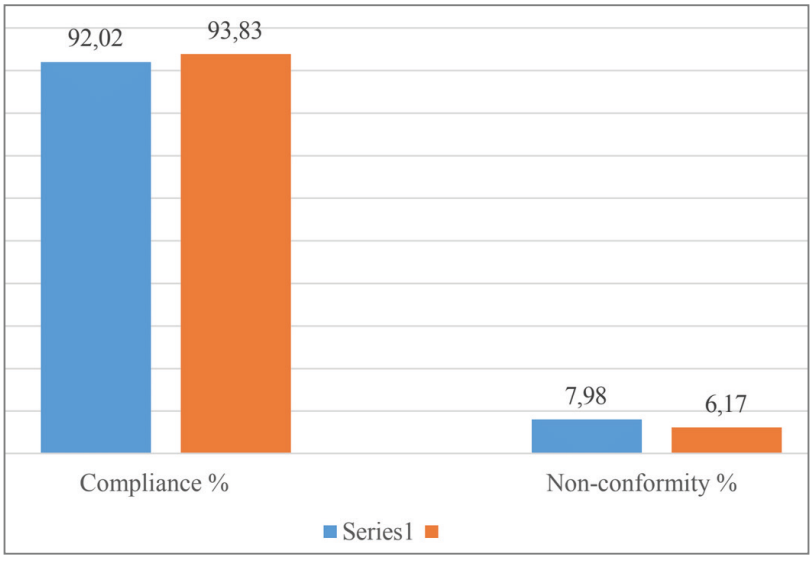

Figure 4.2: Daily record of insertion site and indication of stay. Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2017 to 2018.

Figure 4.1 shows an increase in the number of records of indicators for the processes of preventing hospital-acquired bloodstream infections associated with CVC, due to some obvious factor, in 2018 (N=1159), which resulted in a linear characteristic that was higher than in 2017 (N=482), demonstrating SCIH's performance due to the increase in this invasive procedure, the insertion of the central venous catheter, in other hospital sectors, given that previously this system was more common in intensive care units.

In the United States (USA), SIQUEIRA *et al*. (2011), five million of these central venous devices are installed and the rate of ICS by CVC is 14% per year, making it the third most common type of infection. Undoubtedly, through continuous training and adherence to procedures, there has been an improvement in the daily practice of identifying these indicators as a preventive aspect for infectious events, respectively, certification for recording infection, possibly belonging to the variables mentioned in the previous paragraph.

According to Figure 4.2, in 2017 and 2018, the daily records of the insertion site and the indication of permanence (RDSIIP/CVC) were 92.0% and 93.83% compliant, respectively, above the 80% expected according to ANVISA guidelines. Non-conformities for this variable corresponded to 7.98% and 6.17%, respectively. There was an increase in the proportion of average compliance M= 92.96 % between the current years.

When it comes to the insertion site, considerations should be made regarding short- and long-stay catheters in their insertion sites. In the study by Albuquerque et al. (2014), comparing ICS/CVC rates in hemodialysis, they identified different results in terms of the type of CVC, as short-stay catheters represent a greater risk factor for infection than long-stay ones.

The femoral vein, according to the CDC (2019), should be considered as the last choice due to scientific evidence confirming a greater risk of contamination due to its proximity to the anus and perineal region, but when other insertions along the patient's body are exhausted, specific training and patient awareness should be included in the care team's routine.

Figure 4.3 shows a minimum difference of 0.32% between 2017 and 2018 in terms of compliance (94.56% and 94.88%) and non-compliance (5.44% and 5.12%). The results for this parameter show the effectiveness of maintaining a clean, dry and well-adhered dressing.

The CVC dressing is a local protection mechanism for catheter implantation. Sousa et al (2018), this strategy aims to fix the insertion site, reducing the chances of infection and maintaining the integrity of the blood vessel, preventing it from possible movement that would cause its loss. Barros et al (2009), the unprotection of the central device generates repercussions for microorganisms that cause bacteremia such as *Staphylococcus aureus* and coagulase negative *Staphylococcus*, increasing patient morbidity and mortality.

In line with Figure 4.4, regarding the disinfection of connectors before administering medication, there was an average difference of 5.74% in favorable compliance for 2017 (96.99%) compared to 2018 (91.25%), which should characterize a significant result of the years in their increasing orders, in the same sense for the criterion of non-compliance 2017 (3.01%) and 2018 (8.75%), even though epidemiological surveillance obtained a lower number for this parameter in 2017. This variable studied involves the promotion of safe practices established in the hospital unit based on protocols.

Azambuja, Pires and Vaz (2004), the increase in the preventive understanding of professionals through stability procedures followed by training, qualification and motivation of the team involved determines an improvement in the standards of knowledge regarding their techniques.

International Journal of Health Science ISSN 2764-0159 DOI https://doi.org/10.22533/at.ed.1594972405115

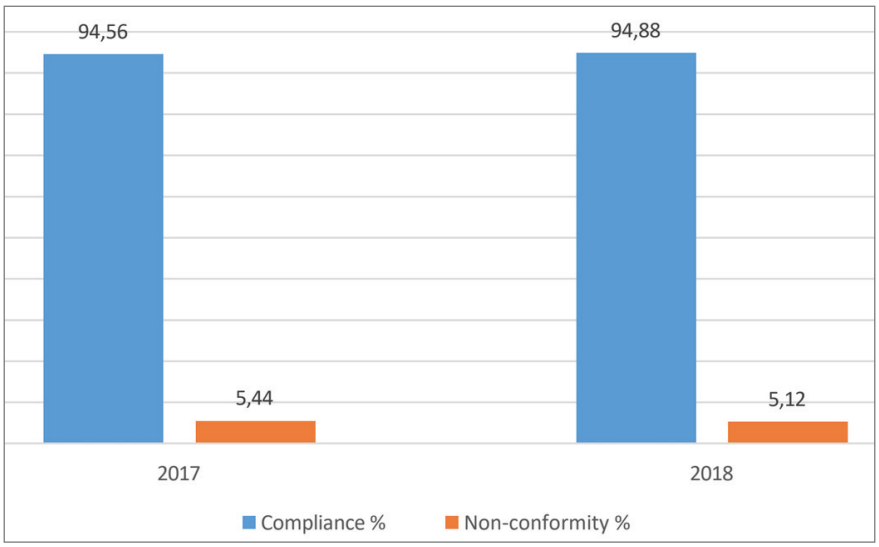

Figure 4.3: Clean, dry and well-adhered dressing.
Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2017 to 2018.

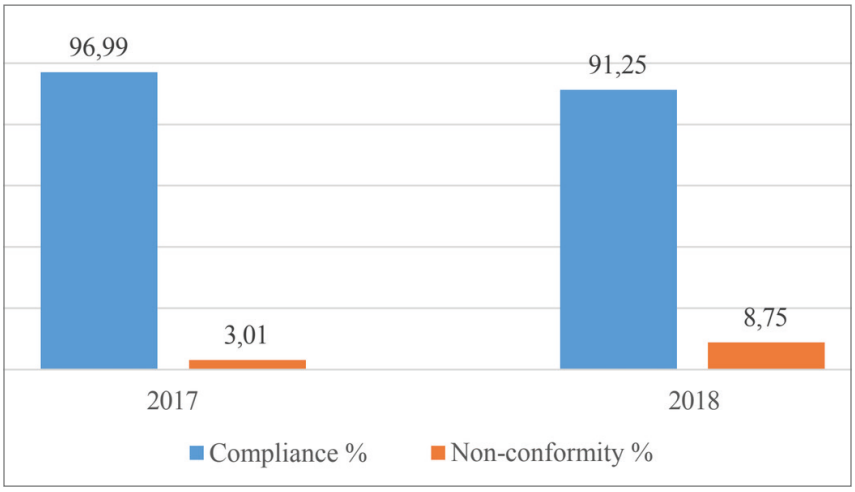

Figure 4.4: Disinfection of connectors before administering medication. Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2017 to 2018.

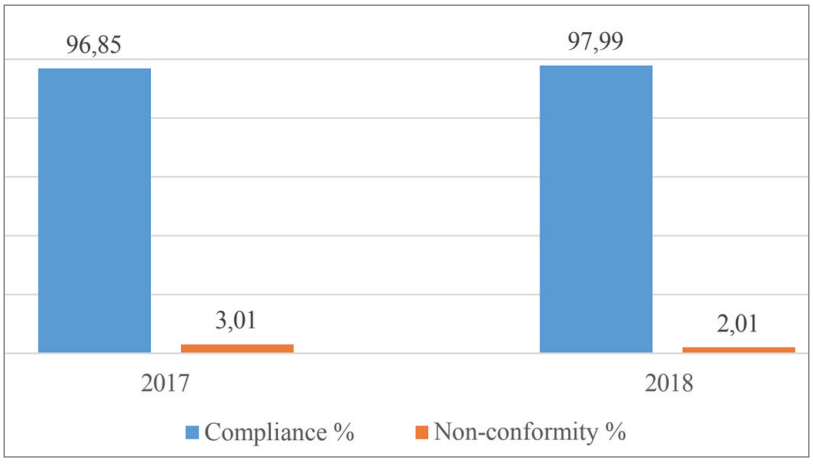

Figure 4.5: System change/identification every 96 hours.
Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2017 to 2018.

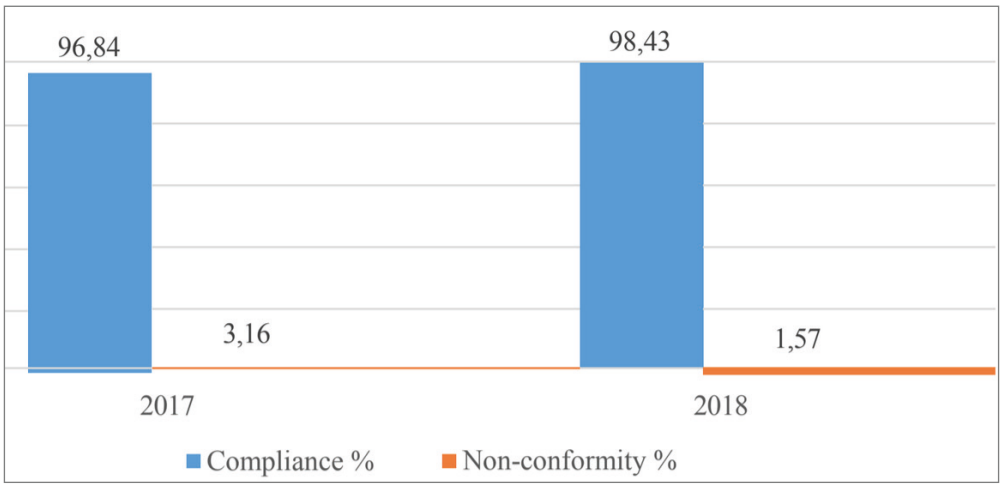

Figure 4.6: Lumen of the equipment with blood.
Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2017 to 2018.

Sales et al. (2013) in their analysis of the literature extracted from the questionnaires answered by nursing professionals on patient safety associated with good prevention practices, observed that the health team involved recognizes the importance of infection prevention and control, however, they consider it to be a "parasite", characterizing their lack of knowledge.

In harmony with Figure 4.5, changing/identifying the CVC system every 96 hours showed 96.85% in 2017 and 97.99% in 2018 for established compliance thanks to its positive execution by professionals who are operational and aware of the variable. Approximately 1% difference between the two years was an evolution for the second year, although minimal, considerable for non-compliance actions.

The question of changing/identifying the system every 96 hours involves relative issues to be considered. Cook et al. (1997) state that changing or replacing central catheters requires pre-programming due to the length of time they will be in place. According to the CDC (2019), catheters should be removed if they are unnecessary. According to Brazil (2017), the CVC should be removed after 24 hours of inactivity. A study by Borges and Bedendo (2015) shows exposure to the risk of HF among patients catheterized for more than 9 days. These data reveal the need for further studies to answer this question.

As well as the number of days corroborating the progression of infections, other elements contribute to this demand. Elward and Fraser (2006), identified that the association of the central catheter, days of permanence and the association with other invasive devices provides the proliferation of harmful microorganisms. These statements at the level of discontinuity of the skin or mucosa is biologically a great potential for an infectious source, so any device in disuse should be removed as soon as possible.

Looking at figure 4.6, the lumen of the equipment with blood, 2018 saw an improvement in specific adherence (98.43%) compared to 2017 (96.84%). Despite the existence of 1.57% of non-adherence to the system, there was a greater degree of commitment by the care team to this event in 2018, compared to 3.16% in 2017, a difference of more than 1% due to non-compliance with the regulations as a result of some factor, lack of knowledge, logistics or reduced involvement in relation to the person being cared for.

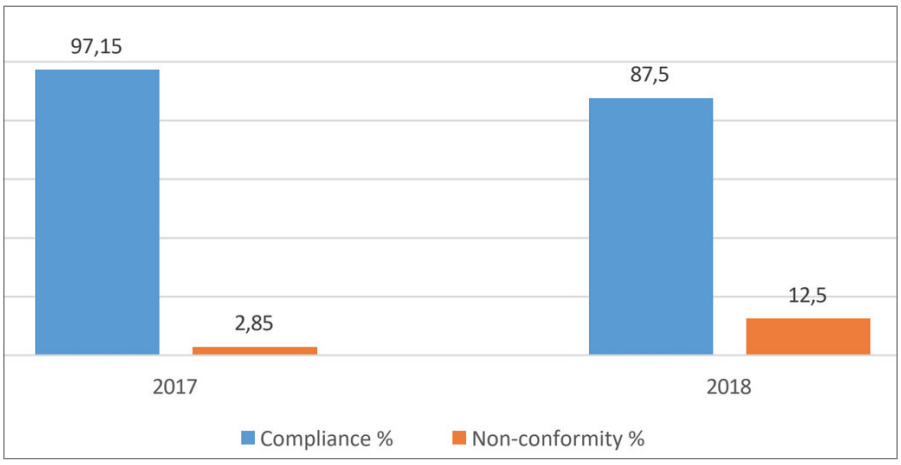

Figure 4.7: Hand hygiene (HH) before and after handling the catheter. Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2017 to 2018.

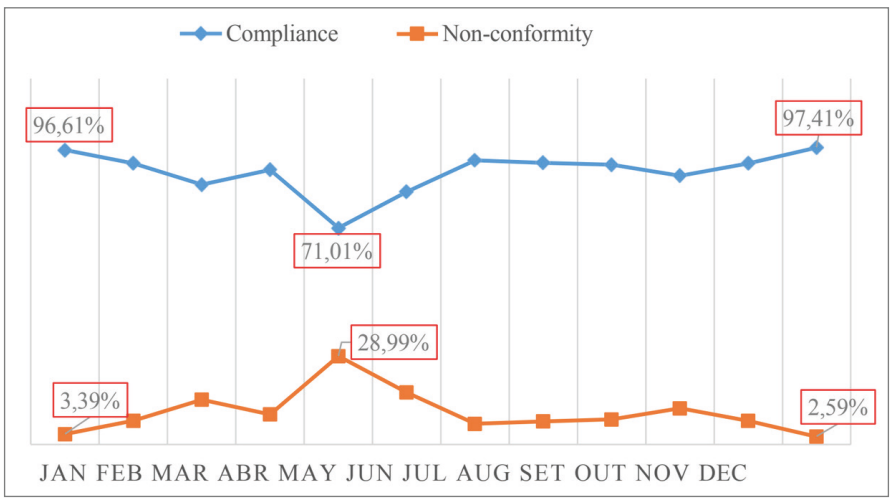

Figure 4.8: Hand hygiene before and after handling the catheter by month of occurrence.

Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna, 2018.

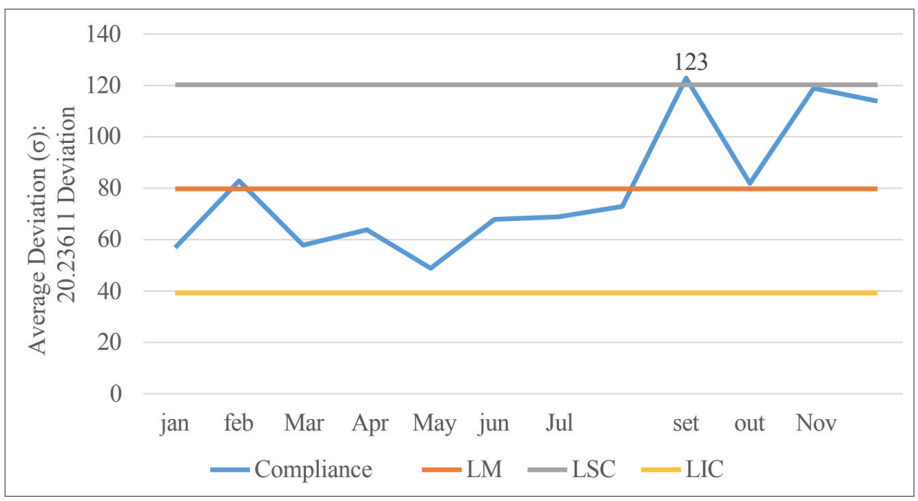

Figure 4.9: HMAEAMC Statistical Control of Compliance chart. Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna 2018.

Murray et al. (2014), Silva et al. (2013); Yon, and Low (2013), Huddam et al. (2012) and Moran et al. (2012), the use of therapeutic antibiotics throughout the use of the catheter has advantages in anticoagulation and in the prevention of HCI, so this recommendation should be considered in preventive control protocols for catheter infections in hemodialysis. Currently, guidelines from The Society for Healthcare Epidemiology of America - SHEA, (2019), already consider the standard mentioned above by the authors.

In the analysis of this parameter, few studies were found, and it is considered important to intensify new research and new discoveries about this variable, although in this one there was no compliance or non-compliance outside the limits standardized by ANVISA.

In the inspection of figure 4.7, with regard to hand hygiene - HH, before and after handling the catheter in relation to the compliance criteria, the year 2017 reached 97.15%, an intersection of 9.65% compared to 87.5% in 2018, a value approximately almost 10% higher than that achieved in 2018. As for the proportion of non-compliance, 2018 (12.5%) was the year in which the rate was much lower compared to 2017 (2.85%). Studies show that professional adherence to the practice of hand hygiene on a constant basis and in the daily routine is still low, and often needs to be encouraged and raised awareness among health professionals

In a study by Jardim et al. (2013), this individual measure also had reduced compliance (10.7%), suggesting an impact on the occurrence of HAIs. According to Sales (2013), the correct conduct of hand hygiene could be avoided by healthcare professionals, resulting in a reduction in the prevalence of hospital--acquired infections. The lack of applicability of this conduct in the hospital setting means that other situations contribute to evidence of possible installation of microorganisms.

From this perspective, MH before and after CVC maintenance has become an urgent measure worldwide, due to factors such as poor working conditions, overload, professional demotivation, a reduced number of professionals, and the use of technological resources without qualified personnel. From this point of view, health professionals have weaknesses in their behavior when it comes to inserting and handling CVCs.

Figure 4.8 shows hand hygiene before and after handling the catheter by month in the years analyzed in 2018. It can be seen that in May there was 71.01% compliance, below the value recommended by ANVISA, which is 80%. In the other months, the values exceeded the recommended value, with January and December standing out as having the highest percentages of compliance, totaling 96.61% and 97.41% respectively.

It can also be seen in this figure that the non-compliance values represented 28.99% in May, 3.39% in January and 2.59% in December. Thus, in May, the quality of services and patient safety were compromised by exceeding the maximum limit of 20% recommended for the minimum parameter. On the other hand, the rates seen in January and December reflect a positive outlook and show significant compliance with hand hygiene standards.

Dalé et al. (2012), in a study carried out in the adult ICU of the Hospital de Clínicas in Porto Alegre, after nominal notification to health professionals working in CVC maintenance, and when they were supervised during the procedure, observed an improvement in the handling of the device by acting in a special way using correct techniques. It is essential that the work-learning dynamics are inserted at the beginning of a situation of low adherence to the *bundle*, due to the fact that coherent planning turns into non-committal attitudes.

According to figure 4.9, HMAEAMC's statistical control chart for compliance, which is represented in the SPC, HMAEAMC's com-

International Journal of Health Science ISSN 2764-0159 DOI https://doi.org/10.22533/at.ed.1594972405115

pliance is only evident in 2018, since it was not possible to develop this same performance in 2017 due to incomplete data. Therefore, during the month of September, there was a slight trend outside (123) the established LSC (120), requiring corrective action for this process. Plotting the quality control chart also revealed instability in the process between September and December this year, compared to the months preceding them.

In the months between January and August, figure 4.9 also shows the results of the behavior of the preventive methods under stability, with no trend around the average deviation (σ= 20.23611), and no significant change, obeying a normal distribution and dispersion of stable points until the month of August, establishing probability within the normality standards between the points of the plotted sample.

When it comes to hand hygiene, this should be done during any type of catheter handling. The use of water and liquid soap when they are visibly dirty or contaminated with blood and other body fluids, or the use of a hand sanitizer should be avoided alcohol preparation (60 to 80%) for when they are not visibly dirty (SOUSA et al., 2018). According to Brasil (2017), the use of gloves does not replace this aseptic mechanism.

According to figure 4.10, HMAEAMC's non-compliance control chart, which is represented in the graph, HMAEAMC's non-compliance was identified specifically during the month of May 2018, remaining above the average limit (LC) until June, precisely. It appears that special causes of variation may have been present during this period, and these should be identified and corrected through strengthening and monitoring mechanisms for process improvement.

Still referring to figure 4.10, in the months of February to April, and July to November, the graph operates under statistical control and within the limit (20%) determined by ANVISA, since the data is close to the LC.

Figure 4.10 also shows a specific need for investigation in January and December, as they are close to the LIC. Based on this last interpretation, there was a downward trend in relation to the LC, indicating a lack of control of the sample points plotted on the graph, in which case an investigation and corrective action is required.

Rubbing with alcohol gel is satisfactory, as long as the technique is correct and the amount of the product is sufficient. A study shows that the ideal amount of alcohol gel for sanitizing is 2 ml with a duration of 30 seconds and for rubbing with soap and water the duration will be 40 to 60 seconds, consequently, this practice is neglected most of the time due to the priority of carrying out care activities (JI and JEONG, 2013).

CONCLUSIONS

One of the major challenges for hospital managers is the customer safety culture that is embedded in the workplace. Job satisfaction, the way in which the institution's professionals deal with errors and adverse events that may occur and the perception of professionals in relation to management are indicators that make it possible to assess attitudes that favor a culture of safety in hospital sectors.

Empirically, there is a consensus that the work process for controlling and preventing HAIs, through epidemiological surveillance, is not sufficient to estimate adherence and the quality of HCI retrospectively with outcome indicators, i.e. after the events have already occurred. In addition, reports on infection rates need to be compared with reference data in order to sharpen the projection of infection control and the palpability of the intervention.

Failures in the aseptic technique of catheter manipulation, as well as a lack of proper structuring, can be considered determining factors in the occurrence of bloodstream infections related to the use of CVCs. Nevertheless, the

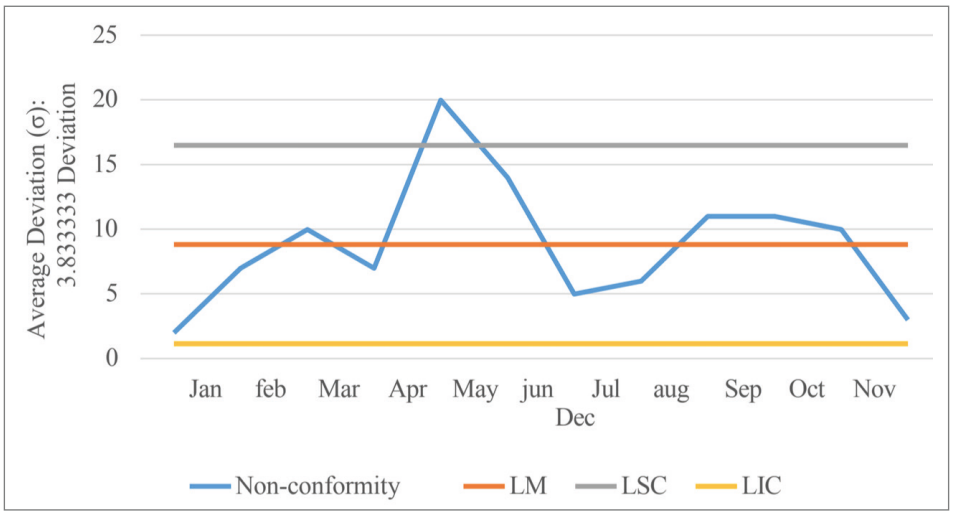

Figure 4.10: HMAEAMC non-compliance statistical control chart. Source: Hospital Regional do Baixo Amazonas Dr. Waldemar Penna 2018.

correct and rigorous application of the preventive routine by responsible professionals has a significant impact on the occurrence of cases, generating a reduction in the morbidity and mortality coefficients of the syndrome.

In line with the logic mentioned above, the existence of CVCs in patients who need this procedure has enabled them to survive in relation to their clinical condition through their dependence on this supply in the central veins, without which their lives would be at risk due to the lack of adequate venous support. Despite this, possible sources of infection, which involve multiple factors, evolve catastrophically.

The constant supervision of the SCIH through epidemiological surveillance makes it easier to analyze the conditions of the immediate reality which favor or disfavor the pattern of compliance and non-compliance of the procedural indicators, recognizing the needs of each individual to the detriment of the level of their knowledge professional category and stimulating sensitivity to the data that occurs, carrying out specific training of a scientific nature to improve adherence.

The risk of the health professional's experience must also be considered when they face a more complex hospital reality, such as CVC maintenance, which requires, in addition to care practice, technical training with an emphasis on microbiological principles so that every procedure carried out does not directly or indirectly harm the integrity and safety of the person being assisted, knowing that ICS also involves internal patient factors.

The technical and routine practice of hand hygiene, for example, shows that the lack of adherence is not directly associated with theoretical knowledge of the act of hygiene or the situation in which it should be carried out, but rather the incorporation of this knowledge into the daily practice of professionals in which there is a lack of motivation, a lack of conception of the risk of spreading microorganisms, an excess of activities/tasks and a lack of materials and/or a deficiency in the physical structure of the institution.

It is believed that this research could contribute as a source for other studies in a direct way regarding the care practices of safe prevention of CVC maintenance by hospital staff and collaborate in the creation of educational strategies aimed at the quality of care and indirectly due to the presentation of these rates which involve CVC maintenance.

The statistical results of this study show that there is a need for new strategic approaches to ensure both adherence to preventive measures

and lasting compliance with these practices as a means of reducing blood contamination rates involving CVCs. Furthermore, while the literature makes it possible to generalize the results of low compliance with these practices, their causes may not be the same because the territorial realities in terms of level of development are different.

After evaluating the research in question, it was found that in addition to awareness, training and effort on the part of the technical team involved, because in order to eliminate special causes, reduce the variability of the process and stabilize its performance, the team must be able to collect the data correctly, interpret the results, identify the root cause of any problems, implement corrective action and use the control chart as an instrument to verify and/or monitor process improvement, as well as strengthening the process by means of a control chart through the chart as a basic tool for unexpected events.

REFERENCES

ALBUQUERQUE, S. E. K. et al. Epidemiology of healthcare-associated infections among patients from a hemodialysis unit in southeastern Brazil. **Braz J Infect Dis**., v. 8. n. 3. p. 327-330, 2014.

AZAMBUJA, E. P; PIRES, D. P.; VAZ, M. R. C. Prevenção e Controle da Infecção Hospitalar: As Interfaces Com o Processo de Formação do Trabalhador. **Texto Contexto Enfermagem**, v. 13, n. específico, pp. 79-86, 2004.

BARROS, L. F. et al. Avaliação do tipo de curativo utilizado em cateter venoso central para hemodiálise. In: Acta Paul Enferm, v. 22, n. espe1, pp. 481-486, 2009, Vila Clementino, São Paulo, 2009.

Agência Nacional de Vigilância Sanitária. **Medidas de Prevenção de Infecção Relacionada à Assistência à Saúde**. Brasília: ANVISA, 2017.

Agência Nacional de Vigilância Sanitária. **Critérios Diagnósticos de Infecções Relacionadas à Assistência à Saúde/Agência Nacional de Vigilância Sanitária**. Brasília: ANVISA, 2017.

CALDANA, G. et. al. Avaliação da qualidade de cuidados de enfermagem em hospital público**. Semina: Ciências Biológicas e da Saúde**, v. 34, n. 2, p. 187-194, Londrina, jul./dez. 2013.

CENTERS FOR DISEASE CONTROL. Epi Info™, 2017. Disponível em: http://www.cdc.gov/ epiinfo. Acesso em: agosto de 2019.

CENTERS FOR DISEASE CONTROL. **Bloodstream infection event**. U.S, Department of Health &Human Services, 355 p., 2019. Disponível em: <http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_ CLABScurrent.pdf>. Acesso em julho de 2019.

COOK, D. et al. Central venous catheter replacement strategies: a systematic review of the literature. **Crit Care Med**, v. 25, n. 8, pp. 1417-24, 1997.

CURAN, G. R. F. e ROSSETO, E. G. Medidas para redução de infecção associada a cateter central em recém-nascidos: revisão integrativa. **Texto Contexto Enferm.**, v. 26, n. 1, pp. 1-9, 2017.

DALLÉ, N. M. K. et al. Infecção relacionada a cateter venoso central após implementação de um conjunto de medidas preventivas (*bundle*) em centro de terapia intensiva. **Rev. HCPA**, v. 32, n. 1, pp. 10-17, 2012.

GIUNTA, A. P. N. e LACERDA, R. A. Inspeção dos Programas de Controle de Infecção Hospitalar de serviços de saúde pela Vigilância Sanitária: um diagnóstico da situação. **Revista da Escola de Enfermagem da USP**, v. 40, n. 1, pp. 64-77, 2006.

HUDDAM, B. et al. The efficacy of prophylactic antibiotics administration prior to insertion of tunneled catheter in hemodialysis patients. **Renal Failure**, v. 34. n. 8. p. 998- 1001, 2012.

JARDIM, J. M. et. al. Avaliação das práticas de prevenção e controle de infecção da corrente sanguínea em um hospital governamental. **Rev. Esc. Enferm**., v. 47, n. 1, pp. 38-45, São Paulo, 2013.

JI, Y.J. e JEONG, J.S. Comparison of antimicrobial effect of alcohol gel according to the amount and drying time in health personnel hand hygiene. **J. Korean Acad.** V. 43, n. 3, pp, 305-311, 2013.

MENEGUETI, G. et al. Avaliação dos Programas de Controle de Infecção Hospitalar em serviços de saúde. **Revista Latino-Americana de Enfermagem**, v. 23, n. 1, pp. 98-105, 2015.

MIRANDA, I. J. J. **Medidas de prevenção de infecção de corrente sanguínea associada ao cateter.** 2016. 28f. Dissertação (Mestrado Profissional em Cuidados Intensivos e Paliativos) – Universidade Federal de Santa Catarina. Florianópolis, 2016.

MORAN, J. et al. A randomized trial comparing gentamicin/citrate and heparin locks for central venous catheter in maintenance hemodialysis patients. **Am J Kidney Dis**., v. 59. n.1. pp. 102-107, 2012.

OLIVEIRA, F. J. G. et. al. O uso de indicadores clínicos na avaliação das práticas de prevenção e controle de infecção de corrente sanguínea. **Texto e Contexto Enfermagem**, v. 24, n. 4, pp. 1018-1026, 2015.

SALAMA, M. F. et al. Implantação de cateter venoso central em unidade de terapia intensiva no Kuwait: efeito sobre infecções de corrente sanguínea associada à linha central. **Jornal de Infecção e Saúde Pública**, v. 9, n. 1, pp. 34-41, 2015.

SALES, A. C. L. et al. Atuação da enfermagem na prevenção e controle de infecção hospitalar no setor de urgência. **Journal of Research Fundamental Care On Line**, v. 5, n.6, pp. 293-305, 2013.

SILVA, K. P. **Conhecimento dos enfermeiros sobre ações de prevenção da infecção hospitalar de corrente sanguínea associada ao cateter venoso central**. 2016. 54f. Dissertação (Mestrado Profissional) – Faculdade de Medicina, Universidade Estadual Paulista "Júlio de Mesquita Filho". Boltucatu, 2016.

SILVA, C. P. R. e LACERDA, R. A. Validação de proposta de avaliação de programas de controle de infecção hospitalar. **Rev. Saúde Pública**, v. 45, n. 1, pp.121-8, 2011.

SILVA, T. N. V. et al. Successful prevention of tunneled central catheter infection by antibiotic lock therapy using cefazolin and gentamicin. **Int Urol Nephrol**. v. 45. pp. 1405-1413, 2013.

SOUSA, F. C. et al. Avaliação dos cuidados de enfermagem com o cateter venoso central em uma unidade de terapia intensiva adulto e pediátrica. **Rev. Adm. Saúde**, v. 18, n. 40, pp. 1-15, 2018.

STUDART, R. M. B. et al. Avaliação sobre a segurança do paciente durante o procedimento anestésico-cirúrgico**. Revista de Enfermagem**, v. 11 n. 5, pp. 2191-2201, 2017.

The Society for Healthcare Epidemiology of America and Cambridge University Press Announce Publishing Partnership SHEA, 2014. Disponível em: www.shea-online.org**. Acesso em 08 de setembro de 2019.**

YON C. K. e LOW, C. L. Sodium citrate 4% versus heparin as a lock solution in hemodialysis patients with central venous catheters. **Am J Health Syst Pharm**. v. 70. n. 2. pp. 131-136, 2013.