59 - PRECAUTIONS THAT CONTRIBUTE TO THE LOWERING OF MECHANICAL VENTILATOR CONTAMINATION RISKS

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INTRODUCTION

The creation of the Intensive Care Unit (ICU) for life support treatment has been a great advancement for the health field, especially for critical condition patients, contributing to their lives' recovery and/or maintenance. Among these advancements, we underline the importance of the mechanical ventilator.

This equipment is a respiration device, with positive or negative pressure, which can keep ventilation and oxygen liberation for a prolonged period. Its use is indicated in the presence of severe respiratory insufficiency or temporary ventilation problems, which can lead a person to hypoxemia, hypercapnia and death (BONGARD; SUE, 2005).The use of mechanical ventilators is also indicated during the performance of large scale surgical procedures, in which patients need artificial ventilation in order to maintain adequate ventilation and oxygenation until normal functions are reestablished (MOREIRA; PADILHA, 2001).

In order to initiate invasive mechanical ventilation (MV), it's necessary to access the lower respiratory tract through oral or nasal-tracheal intubation, or tracheostomy. This technology allows medicine to treat and improve prognostics and evolve treatment, but several problems appeared, such as: trauma on upper airways, bronchial-source selective intubation, necrosis of tracheal mucosa, accidental extubation and respiratory infections (DREYER; ZUÑIGA, 2003).

The current mechanical ventilator is composed of ventilation circuits or a primary system which consists of a set of tubes that move humidified and warmed gas mixture from the ventilator to the patient, being basically composed of: expiration branch, draining cup or condenser and expiration valve. Some also contain accessories for determining time, flux, volume and proximity pressure, as well as bacteria filter and micro-nebulizer (SAMPAIO; FARIA, 1998).

In order for the mechanical ventilator to present no contamination risks, the ventilator system must go through high level chemical disinfection with glutaraldehyde 2% for 20 minutes or ethylene oxide sterilization or autoclave, prior to installation, and be packed with appropriate materials. The replacement must be performed after 48 hours, according to the time ruled by the hospital's Hospital Infection Control Commission (HICC). It must afterwards be assembled with aseptic technique, tested and regulated for the respiratory parameters (SILVA; NOGUEIRA; PEIXOTO, 2003).

Considering that precautions with these accessories is inarguably an essential attitude for infection control, we bring to mind the need for establishing quality control measures aiming at an improvement on offered assistance. Given that, we question: what are the precautions taken by the nursing team in regard to mechanical ventilators? Are they in accordance with the CDC (2004) directives? Setting out from these questions, we constructed the following objectives: to observe the precautions taken by the nursing team regarding mechanical ventilators; to identify whether the precautions taken by the nursing team regarding mechanical ventilators are in accordance with the CDC (2004) directives.

METHODOLOGY

The research is of the exploratory descriptive type, with prospective data and quantitative approach, performed in an Intensive Care Unit from a public hospital in the greater Natal/RN.

The studied population consisted of the entire nursing team working in the emergency unit and adult ICU, of which 12 were nurses and 38 nursing technicians.

In order to construct the data collection instrument, we based our work on the foundation slaid by several authors, with Guidelines for Prevention of Nosocomial Pneumonia the main one (CDC, 2004). For this process to happen, some procedures were carried: initially, we sent a letter to the hospital's general administration and nursing administration offices, asking for permission for the carrying out of the research and the formal use of the institution's name in the final investigation report, as well as asserting our compromise of honoring the ethical and legal principles that regulate research on human beings, laid out by the Brazilian national health council resolution #196/96 (BRASIL, 2000). After this committee's authorization, under report code CEP-UFRN 101-04, we initiated data collection, held throughout the months of January and February 2005, during all three shifts.

The method of data collection was systematized observation. For this to be possible, we had a previous meeting with all nursing professionals, communicated our objective and asked for their collaboration as research subjects. We then asked them to read and sign a term of free and clear consent (TCLE), since the procedure to be observed was to take place without previous scheduling. The data were categorized and analyzed by descriptive statistics with the Statistica 6.0 and Microsoft-Excel XP software.

RESULTS

In order to use mechanical ventilators, some principles inherent to handling in three different moments before use, during installation and during MV, must be observed.

TABLE 1- DISTRIBUTION ACCORDING OF PRECAUTIONS TAKEN WITH MECHANICAL VENTILATORS PRIOR TO INSTALLATION AND DURING USE, TO MOMENT OF EMERGENCY ROOM IN THE USE. CLÓVIS SARINHO (PSCS) NATAL/RN, 2005

Mechanical Ventilator Prior to Use	YES		NO		TOTAL	
	N	%	N	%	N	%
Performs cleaning and disinfection on the ventilation prior to mounting	10	28,5	25	71,4	35	100,0
Assembles the mechanical ventilator with asseptic technique	14	40,0	21	60,0	35	100,0
Tests the mechanical ventilator with a sterile lung	02	06,8	27	93,1	29	100,0
Protects the circuit's Y connection with sterile material	08	22,8	27	77,1	35	100,0
Labels with date and assembler's signature	17	48,5	18	51,4	35	100,0
Empties the humidifier	30	85,7	05	14,2	35	100,0
At the time of installation	YES		NO		TOTAL	
	N	%	N	%	N	%
Tests the mechanical ventilator with a sterile lung	03	13,0	26	87,0	29	100,0
Uses sterile water in the humidifiers	23	65,7	12	34,2	35	100,0
Only adds water to the humidifier when starting MV	30	85,7	05	14,2	35	100,0
During MV	YES		NO		TOTAL	
	N	%	N	%	N	%
Discards the condensed material in the circuit	70	80,4	17	19,5	87	100,0
Washes hands after the procedure	18	25,7	52	74,2	70	100,0
Uses sterile water in the humidifiers	58	84,0	11	15,9	69	100,0
Discards the remaining humidifier liquid prior to adding water	00	00,0	69	100,0	69	100,0
Performs replacement of the ventilation system	00	00,0	35	100,0	35	100,0

*** 06 mechanical ventilators were not tested prior to and after assembly**
**** 26 did not show condensed material**
***** 17 occasions the condensed material was not discarded**
****** 44 remained with water without being completed**

Table 1 shows data on ventilator cleaning and disinfection before assembly, in which we observe the procedure was not performed on 25 moments (71.43%). It's important to stress that on 10 times in which this procedure was executed, 09 (90%) a general service assistant did it and only 01 (10%) the nursing technician cleaned and disinfected the device.The data found contradict orientations from Passos et al. (2000) stating ventilators must undergo daily cleaning with soap and water or friction with alcohol at 70% for 30 seconds or according to the device maker's orientations.

Regarding use of aseptic technique during assembly, from 35 times the procedure was performed, on 21 (60%) the material was contaminated, that is the hand sanitizing, use of sterile gloves and precautions to avoid ventilator component contamination were not observed.

Regarding the test lung being disinfected or sterile, we recorded that from 35 times they were used, only 29 times (82.86%) they were tested and among these, 27 (93.11%) the lung used was stored (prior to use) in a non-sterile or unprotected bag, with no consideration for sterilizing or disinfecting after each use. The total of times when ventilators were assembled (35), on 27 (77.15%) professionals used non-sterile procedure glovers or collector bags in order to protect the respiratory circuit's Y connection (part that is connected to the TOT or tracheotomy). We know, however, that after testing this connector must be protected by a sterile field in order to avoid contamination (SAMPAIO; FARIA, 1998).

In order to observe the date of assembly and expiration date after the use of each sterile material, it's an institutional rule to label it with the date and responsible person's signature. We detected, however, that on 18 (51.43%) of these procedures the rule was not respected. Failure to follow these directives promotes the use of materials past their expiration date and consequently increases the risk of infection. When we observe who assembled the mechanical ventilator, we see 26 (74.29%) were assembled by nurses and 09 (25.71%) by nursing technicians.

It's worth underlining the fact that when observed whether the humidifiers were empty until MV installation, we detected that from 35 assembled ventilators, on 30 (85.71%) this directive was observed. On this aspect, water used on humidifiers may become a culture environment for several resistant organisms, which leads to the orientation which calls to them being kept empty until the moment of MV installation (CDC, 2004); PASSOS et al., 2000)

From 29 tested ventilators, on 26 occasions (87.00%) disinfected or sterile lung were not used; on 23 occasions (65.72%) sterile water was used to fill the humidifiers and on 30 occasions (85.71%) water was only added in the time of ventilator installation. On the other 12 occasions, (34.28%), faucet water or saline solution was used and one of the professionals used a single ringer, leading to contamination and/or circuit damage.

It's part of the various emergency sectors and ICU to keep mechanical ventilators previously assembled, due to the grave state of patients admitted in these units. In order for them to be installed after intubation or tracheostomy, however, these measures must be taken in order to lower the risk of MV complications.

Based on the above call, in a third moment we also observed how precautions with the mechanical ventilator were carried out during the period when the patient was undergoing MV. In this sense, the ventilator circuit was observed on all three shifts (morning, afternoon and night), on whether condensed material was present. From 113 occasions when the check was made, on 26 there was no condenser material, and among the other 87 remaining occasions, we underline that on 70 (80.45%) the condensed material was discarded. We also detected that on 17 (19.55%) occasions the corrugated tubes had a great amount of condensed liquid, with no concern by the professional in removing it. In regard to the washing of hands after removing condensed liquid, we saw that among 70 times when it was discarded, this procedure was not observed on 52 procedures (74.28%).

Regarding condensation, Passos et al. (2000) stress that condensed water in the circuits must be removed whenever needed because it not only adds resistance, but also increases positive pressure in the end of respiration (PEEP) and contamination risk. In the nosocomial infection prevention directives constructed by the CDC (2004) and Anvisa (2000), the necessity for periodical removal of condensed material is emphasized, as is the need for the washing of hands after this procedure, aiming to minimize cross infections.

During MV, we observed whether sterile water was being injected in the ventilator humidifier in use and whether this liquid was replaced or completed. From 69 occasions when water was injected, on 58 (84.5%) it was sterile. Water replacement was not executed in the studied sectors, that is, contents were maintained inside the humidifier through the patient's permanence under mechanical ventilation. We observed, however, that when the humidifier was empty or low on liquid, on 100% of occasions, complementation alone was performed.

Contradicting the gathered data, Passos et al. (2000), Anvisa (2000) and CDC (2004) state that on humidifiers that use water, it should be sterile and must be replaced daily and whenever it's required in order to keep an adequate level. It's important to stress that the water level should not be completed, but rather completely replaced.

There was no pre-programmed interval for replacement of mechanical ventilator circuits in the studied sectors. This procedure was never performed during the study. Anvisa (2000) states respiratory circuits should not be replaced on intervals shorter than 48 hours. There is no definition for a replacement period. It does recommend, however, that the replacement is carried out every seven days.

CONCLUSIONS

We observed the assembly of 35 mechanical ventilators. On 25 moments, cleaning and ventilator disinfection were not performed before assembly; on 10 occasions this precaution was taken, 09 were done by general service assistants and 01 by nursing technicians. On 21 occasions the ventilators were not assembled with aseptic technique.

From 29 occasions when the ventilators were tested, on 27 the test lung was not sterile. On 27 non-sterile materials were used in order to protect the ventilator circuit's Y connection after assembly. On 18 moments, the ventilator assembler's label was not applied. On 26 occasions ventilators were assembled by nurses and 09 by nursing technicians.

On 30 occasions, the humidifiers were kept empty until MV installation. From 29 tested ventilators, on 26 times, the lung used was not sterile or disinfected; on 12 occasions, water used to fill the humidifiers was not adequate. From 113 occasions when we checked the circuits for condensed material, on 17 times, the corrugated tubes had a great amount of condensed liquid. From 70 occasions when the condensed liquid was discarded, on 52 procedures the washing of hands was not executed after the procedure. During MV, water was never replaced but rather only completed.

On 69 occasions when water was injected into the humidifiers, on 58 it was sterile. Regarding ventilation circuit replacement, there was no pre-programmed interval. This procedure was never performed during our research.

We then conclude that precautions kept by the nursing team regarding mechanical ventilators are not in accordance with the CDC (2004) directives, contributing to an increase in VAP risk.

KEYWORDS: Respiration, Artificial; Nursing Care ; Cross Infection

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PRECAUTIONS THAT CONTRIBUTE TO THE LOWERING OF MECHANICAL VENTILATOR CONTAMINATION RISKS

ABSTRACT

INTRODUCTION: the mechanical ventilator is a respiration mechanism that can maintain ventilation and oxygen liberation for a prolonged period of time on patients with respiratory insufficiency. **OBJECTIVES:** to observe the precautions employed by the nursing team related to mechanical ventilator and to identify whether these precautions follow the CDC's (2004) guidelines. **METHODOLOGY:** exploratory descriptive and quantitative study, performed on an ICU and emergency sector in an institution in the city of Natal-RN. The population consisted of 12 nurses and 38 nursing technicians. **RESULTS:** in the studied period 35 ventilators were assembled; 25 were not cleaned and disinfected prior to assembly; 21 were not assembled with aseptic technique; 29 were tested and among these, on 27 the test lung was not sterile. On 27 ventilators, the professionals used non-sterile materials to protect the Y connection; 18 were not labeled with name and date after assembly. 26 were assembled by nurses and 09 by nursing technicians; on 30 ventilators, the humidifiers were empty until installation; 29 were tested in the time of use; among these, on 26 the lung was not sterile; on 23, sterile water was used to fill the humidifiers. From 113 times when a check was made to see whether it had condensed in the circuit, on 87 condensation was present; among these, on 70 it was discarded. On 52 occasions hands were sanitized after extracting condensation. On 69 occasions in which humidifier water was refilled, on 58 it was already sterile. Regarding water change, this practice was not performed. **CONCLUSION:** the data point to a need of intensifying educational activities that promote behavior change on these professionals, thus improving the quality of assistance and prevention of nosocomial infection.

KEYWORDS**:** Respiration, Artificial; Nursing Care ; Cross Infection

SOINS AIDANT À MINIMISER LES RISQUES DE CONTAMINATION DES RESPIRATEURS

RÉSUMÉ

INTRODUCTION: le respirateur est un dispositif respiratoire qui permet de maintenir de façon prolongée la ventilation et la libération d'oxygène chez les patients affligés d'insuffisance respiratoire. **OBJECTIFS:** observer les soins fournis par l'équipe infirmière par rapport aux respirateurs et identifier si ces soins sont en accord avec les recommandations des CDC (2004). **MÉTHODOLOGIE:** étude exploratoire descriptive, prospective et quantitative, menée en réanimation et aux urgences d'un établissement de Natal-RN. La population compta 12 infirmiers et 38 techniciens infirmiers. **RÉSULTATS:** pendant la período de l'étude, 35 respirateurs furent montés; 25 d'entre eux ne furent pas nettoyés ni désinfectés avant le montage; 21 ne furent pas montés de façon aseptique; 29 furent testés, sauf que dans 27 cas la vessie de test n'était pas stérilisée. Sur 27 respirateurs, les professionnels employèrent du matériel non stérile pour protéger le raccord en fourche; 18 ne furent pas rotulés par le professionnel après le montage, avec le nom et la date; 26 furent montés par des infirmiers et 09 par des techniciens infirmiers; sur 30 respirateurs, les humidificateurs demeurèrent vides jusqu'à l'installation; 29 furent testés au moment de s'en servir; sur 26 de ces 29 cas, la vessie n'était pas stérile; dans 23 cas, les humidificateurs furent remplis d'eau stérile. Sur 113 vérifications des circuits, on détecta une condensation dans 87 cas; cette condensation fut éliminée dans 70 cas. Parmi ceux-ci, le personnel nettoya ses mains au terme de l'élimination de la condensation dans 52 cas. Sur 69 cas de réposition de l'eau de l'humidificateur, 58 fois celle-ci était stérile. Quant au remplacement de l'eau, cette pratique n'a pas lieu. **CONCLUSION:** les données révèlent le besoin d'intensifier les activités éducatives ayant pour objet de modifier l'attitude de ces professionnels, pour améliorer ainsi la qualité de l'assistance et la prévention des infections nosocomiales.

MOTS-CLÉS: Ventilation Mécanique; Soins Infirmiers; Infection Hospitalière.

ATENCIÓN A QUE CONTRIBUYAN A MINIMIZAR EL RIESGO DE CONTAMINACIÓN DE LOS VENTILADORES MECÁNICOS

RESUMEN

INTRODUCCIÓN: la respiración artificial es un dispositivo que puede seguir respirando el aire fresco y la liberación de oxígeno durante un período prolongado en pacientes con insuficiencia respiratoria. **OBJETIVOS:** observar la atención prestada por el personal de enfermería relacionados con ventiladores mecánicos y determinar si esta atención está en conformidad con las directrices de los CDC (2004). **METODOLOGÍA:** estudio exploratorio descriptivo, prospectivo y cuantitativo, llevado a cabo una UCI y la sala de emergencia de una institución en Natal-RN. La población consistió de 12 enfermeras, 38 técnicos de enfermería. **RESULTADOS:** en el período objeto de estudio se han montado 35 ventiladores, 25 no fueron limpiados y desinfectados antes de la reunión, 21 no fueron equipados con una técnica aséptica, 29 fueron probados y de estos, 27 de pulmón de la prueba utilizada no fue

estéril. En 27 aficionados, no fue utilizado materiales estériles para proteger la conexión Y, 18 no fueron etiquetados con el nombre y fecha después de la reunión. 26 fueron ensamblados por personal de enfermería y 09 técnicos de enfermería; 30 ventiladores, humidificado era el vacío hasta la instalación, 29 fueron probados en el momento de uso; estos, en 26 de pulmón no es estéril, en 23, con agua estéril para llenar la humidificado. De las 113 veces que la conferencia se hizo para ver si se habían condensado en el circuito, tenía presencia en 87, de estas 70, fue descartado. En 52 veces las manos se lavan después de la retirada de condensado. En 69 veces que la agua de humidificado fue repuesta, en 58 estaba estéril. Ya en el intercambio de agua, esta práctica no se celebró. **CONCLUSIÓN:** detectamos la necesidad de intensificar las actividades educativas, mejorando así la calidad de la atención y la prevención de las infecciones nosocomiales.

PALABRAS CLAVE: Respiración Artificial; Atención de Enfermería; Infección Hospitalaria.

CUIDADOS QUE CONTRIBUEM PARA MINIMIZAR OS RISCOS DE CONTAMINAÇÃO DOS VENTILADORES MECÂNICOS

RESUMO

INTRODUÇÃO: o ventilador mecânico é um dispositivo de respiração que pode manter a ventilação e liberação de oxigênio por um período prolongado em pacientes com insuficiência respiratória. **OBJETIVOS:** observar os cuidados prestados pela equipe de enfermagem relacionados aos ventiladores mecânicos e identificar se os cuidados prestados pela equipe de enfermagem relacionados aos ventiladores mecânicos estão de acordo com as diretrizes do CDC (2004). **METODOLOGIA:** estudo exploratório descritivo prospectivo e quantitativo, realizado numa UTI e setor de emergência de uma instituição em Natal-RN. A população constou 12 de enfermeiros e 38 técnicos de enfermagem. **RESULTADOS:** no período em estudo foram montados 35 ventiladores; 25 não foram limpos e desinfetadas antes da montagem; 21 não foram montados com técnica asséptica; 29 foram testados e destes, 27 o pulmão de teste utilizado não estava estéril. Em 27 ventiladores, os profissionais utilizaram materiais não estéreis para proteger *a* conexão em Y; 18 não foram rotulados com o nome e data após a montagem. 26 foram montados por enfermeiros e 09 por técnico de enfermagem; em 30 ventiladores, os umidificadores ficavam vazios até a instalação; 29 foram testados no momento do uso; destes, em 26 o pulmão não estava estéril; em 23, utilizaram água estéril para encher os umidificadores. Das 113 vezes que foi feita conferência para ver se tinha condensado no circuito, em 87 havia presença de condensado; destas, em 70, foi descartado. Em 52 vezes as mãos foram lavadas após a retirada do condensado. Em 69 vezes que foi reposta a água do umidificador, em 58 ela estava estéril. Já em relação à troca da água, essa prática não é realizada. **CONCLUSÃO:** os dados apontam a necessidade de intensificar as atividades educativas que promovam a mudança de comportamento destes profissionais, melhorando, assim, a qualidade da assistência e a prevenção de infecções nosocomiais.

PALAVRAS-CHAVE**:** Ventilação Mecânica; Cuidados de Enfermagem; Infecção Hospitalar.