



Journal of Nursing

Revista de Enfermagem

UFPE On Line

ISSN: 1981-8963

ORIGINAL ARTICLE

NURSING IN VENTILATORY ASSISTANCE: ANALYSIS OF ENDOTRACHEAL ASPIRATION IN THE INTENSIVE CARE UNIT

ENFERMAGEM NA ASSISTÊNCIA VENTILATÓRIA: ANÁLISE DA ASPIRAÇÃO ENDOTRAQUEAL NA UNIDADE DE TERAPIA INTENSIVA

ENFERMERÍA EN ASISTENCIA VENTILATORIA: ANÁLISIS DE LA ASPIRACIÓN ENDOTRAQUEAL EN LA UNIDAD DE CUIDADOS INTENSIVOS

Amanda Figueirôa Silva Carmo¹, Juliana Pedrosa Korinfsky², Cecília Coelho Xavie³, Rodrigo Nonato Coelho Mendes⁴, Gittanha Fadja de Oliveira Nunes⁵, Ralessandra Moreira da Silva⁶

ABSTRACT

Objective: to analyze the behavior of the nursing staff facing the endotracheal suctioning patients in an intensive care unit. **Method:** a descriptive observational study, of a quantitative approach, developed at the Intensive Care Unit of an Emergency and Trauma Hospital in Petrolina/Pernambuco/Brazil. 100 aspiration procedures were observed, performed by 20 nurses. The data analysis was conducted from the suction tab techniques. The study was approved by the Research Ethics Committee, Opinion n. 12081029. **Results:** it was found that in 59% of aspirations there was no previous hand-washing, 32% of the beds were not elevated at 30° to 45°, in 73% the FiO₂ was not adjusted and in 72% occurred due to contamination of the glove and / or catheter. **Conclusion:** it was found deficiency in the nursing staff, with regard to patient care in the suction of the airways, leaving them vulnerable to the development of respiratory infections, making evident the need of establishing permanent educational actions. **Descriptors:** Nursing; Intensive Care Units; Artificial Respiration; Suction.

RESUMO

Objetivo: analisar as condutas da equipe de enfermagem frente à aspiração endotraqueal em pacientes de uma unidade de terapia intensiva. **Método:** estudo descritivo observacional, de abordagem quantitativa, desenvolvido na Unidade de Terapia Intensiva do Hospital de Urgências e Traumas, de Petrolina/PE/Brasil. Foram observados 100 procedimentos de aspiração, realizados por 20 profissionais de enfermagem. A análise de dados procedeu-se a partir da tabulação das técnicas de aspiração. O estudo foi aprovado pelo Comitê de Ética em Pesquisa, parecer n° 12081029. **Resultados:** verificou-se que em 59% das aspirações não houve higienização das mãos previamente, 32% dos leitos não foram elevados em 30° a 45°, em 73% a FiO₂ não foi ajustada e em 72% ocorreu contaminação da luva e/ou do cateter. **Conclusão:** constatou-se deficiência na equipe de enfermagem no que diz respeito aos cuidados aos pacientes na aspiração de vias aéreas, deixando-os vulneráveis ao desenvolvimento de infecções respiratórias, evidenciando a necessidade de se instituírem ações de educação permanentes. **Descritores:** Enfermagem; Unidades de Terapia Intensiva; Respiração Artificial; Sucção.

RESUMEN

Objetivo: analizar el comportamiento del personal de enfermería a los pacientes frentes a succión endotraqueal en una unidad de cuidados intensivos. **Método:** estudio observacional descriptivo, con enfoque cuantitativo, desarrollado en la Unidad de Cuidados Intensivos de un Hospital de Emergencias y Trauma, Petrolina/Pernambuco/Brasil. Se observaron 100 procedimientos de aspiración, realizados por 20 enfermeras. El análisis de datos se lleva a cabo a partir de las técnicas de la ficha de succión. El estudio fue aprobado por el Comité de Ética de Investigación, Opinión n° 12081029. **Resultados:** se encontró que en 59% de las aspiraciones las manos no fueron lavadas previamente, 32% de las camas no fueron elevados en 30° a 45°, en 73% el FiO₂ no fue ajustado y en 72% ocurrió contaminación de la guante y / o catéter. **Conclusión:** se encontró en el personal de enfermería deficiencia en cuanto a la atención al paciente en la succión de las vías respiratorias, lo que les dejaba vulnerable a la aparición de infecciones respiratorias, poniendo de relieve la necesidad de establecer acciones permanentes de educación. **Descriptor:** Enfermería; Unidades de Cuidados Intensivos; La Respiración Artificial; Succión.

¹Nurse, Master Teacher, Nursing Course, Federal University of Vale do São Francisco - Campus Petrolina. Petrolina (PE), Brazil. E-mail: amandafigueiroa@gmail.com; ²Nurse, Master Teacher, Nursing Course, Federal University of Vale do São Francisco - Campus Petrolina. Petrolina (PE), Brazil. E-mail: juliana.korinfsky@univasf.edu.br; ³Nurse, Federal University of Vale do São Francisco - Campus Petrolina. Petrolina (PE), Brazil. E-mail: ceciliacoelho18@hotmail.com; ⁴Nursing Graduating, Federal University of Vale do São Francisco - Campus Petrolina. Petrolina (PE), Brazil. E-mail: rodrigo.coelho.mendes@gmail.com; ⁵Nursing Graduating, Federal University of Vale do São Francisco - Campus Petrolina. Petrolina (PE), Brazil. E-mail: gittanha_fadja@hotmail.com; ⁶Nursing Graduating, Federal University of Vale do São Francisco - Campus Petrolina. Petrolina (PE), Brazil. E-mail: ralessandra.moreira@yahoo.com.br

INTRODUCTION

The Intensive Care Unit (ICU) is a hospital environment destined to caring for critically ill patients, which provides medical and skilled nursing and uninterrupted, with their own specific equipment, specialized human resources and access to technologies for the diagnosis and treatment.¹ They are, therefore, levels of health care of high complexity, acting decisively when there is instability of organs and functional systems with risk of death.²

According to the National Agency for Sanitary Surveillance (ANVISA) among the leading causes of hospital acquired infection is the respiratory tract, especially pneumonia morbidity as more expressive of ICU patients. The calculated risk for these patients is as high as 10 to 20 times higher.³

Infections in patients hospitalized in intensive care units account for 20 to 30% of all hospital cases, although the number of beds in this sector usually represents about 5 to 10% of a hospital.⁴

The tracheobronchial aspiration is therefore the introduction of a probe in the patient airway in order to extract the secretions. Therefore, the suction catheter should be connected to a vacuum or suction pressure so that there is negative pressure movement of fluids and gases, thereby promoting oxygenation and preventing airway obstruction.⁵

Nursing, characterized as care profession has important errand to rescue human welfare ruled the goal of a holistic and effective care in any situation, especially in critical frames that cause imbalances and losses biopsychosocial.¹

Therefore, in the assisted ventilation, nursing remains the domain of techniques concerning airway aspiration, fixing the exchange of ventilatory device (endotracheal tube or tracheostomy), preventive measures for infection associated with mechanical ventilation and management of the patient in bed.⁶

Due to the magnitude of respiratory infections acquired in hospitals, not only in relation to their frequency, morbidity and mortality but also for verifying the need for more knowledge about the impact of the actions of the nursing staff in patient care in serious condition the study found that the improper practice this procedure can cause various health complications aggravating the patient's general condition questioning if so,

how the nursing staff of the ICU performs the techniques of airway aspiration?

OBJECTIVE

- To analyze the behavior of the nursing staff before the endotracheal suction in patients in an intensive care unit.

METHOD

A study prepared from Work of a Course Completion (monography) << **Nursing on Ventilatory assistance: a study about the aspiration of the airways in ICU patients** >>. Federal University of Vale do São Francisco, Campus Petrolina/2010.

A study of a quantitative, observational and descriptive character⁷, developed in the Intensive Care Unit of an Emergency and Trauma Hospital in the city of Petrolina/PE/Brazil.

The ICU has 16 active beds for all specialties except neonatology, pediatrics and gynecology and obstetrics. The team consisted of six doctors, 11 nurses, 39 nursing technicians and three physiotherapists. Observed aspiration procedures were performed in the period 08th to 24th September 2010, during the hours of 08 to 12h 13 to 18h, or even 19 to 23h from Monday to Sunday.

The study sample consisted of 100 procedures airway aspiration performed by professional nursing staff to participate in the study. The number of observations was determined as a result of experience in the practice of supervised training of the Undergraduate Nursing, which were observed at least six procedures per shift. Participants were 20 professional nursing staff, 18 nursing technicians, which held 96% of aspirations, and two nurses who performed four aspirations. To undertake the observation we used two checklists containing identification data and professional practices recommended for the procedure of endotracheal suctioning. This study defined four basic criteria to be observed in order to assess how professional nursing staff checked the need to aspirate the patient's airway, namely: follow predetermined time for aspiration; verify decrease in oxygen saturation; perform auscultation pulmonary secretions or observe visible or audible endotracheal tube/tracheostome.

In this study we considered basic behaviors to be adopted by the nursing staff prior to the aspiration: Wash hands before the procedure; clarify the patient about the procedure to be

performed; raise, wherever possible, the patient's bedside 30-45°; adjust the FiO₂ (regular double or 100%).

Regarding the conduct undertaken by staff during the procedure were observed: contaminate the glove and/or catheter during the procedure; properly use sterile gloves, use appropriate gauge catheter; using sterile suction catheter, using sterile gauze to clean the secretions of the catheter, tube or tracheostome; uses Solution 0,9% saline to thin secretions; uses ambu[®] barren sequence follows the tube/ tracheostome, nose, mouth, connecting the patient to the ventilator in the intervals of aspiration; clamp probe before introducing the tube or it tracheostome; The time of maximum suction 15".

After the execution of the procedure of removal of secretions from the airways was observed: washing and protection of the extent of the probe or latex, the return of the initial FiO₂, performing oral hygiene of the patient when necessary, dispose of the material in the purge expired, washing hands after the procedure and the record of the procedure handbook

All steps in this study were based on 196/96 of the Ministry of Health and were approved by the ethics committee on research protocol number 12081029. Nurse practitioners who agreed to participate signed the Instrument of Consent (IC).

RESULTS AND DISCUSSION

Regarding the category of professional performers procedures observed, it was identified that there was a greater number of nursing staff in relation to nurses, this demonstrates that the mid-level professionals

are the executors of most actions related to direct care to patients who require intensive care. Already the nurse fits more acting in the management unit for bureaucratic and managerial activities that they are also required.⁸

It is noteworthy, moreover, that the demand for ICU aspirations is extremely large, becoming unfeasible that this activity is carried out solely by top-level professionals. Thus, activities that should be performed by nurses, such as checking the indicators of need for tracheal suctioning, check the setting of the orotracheal tube - TOT, keep the patient hydrated, check the ventilation parameters, and define nursing diagnoses to propose interventions that ensure care maintenance, end up being delegated to unqualified to perform such assignment.

Regarding gender, females predominated with 15 professionals, ie, 75% of participants, corroborating studies⁹ we define as socio-historical process of feminization of nursing. This is because the practice of caring conceived as natural and intrinsic "being" a woman was broadcast from birth and establishment of nursing as a profession. Fact reaffirmed by another study¹⁰, which identified the predominance of women among professional nursing units and emergency intensive care of a hospital in Natal-RN.

With regard to the time of operation in service, it was found that 55% of the nursing staff observed activities played in the intensive care unit for less than a year, 20% a year ago and 25% two years ago.

Table 1 shows the detailed profile of the survey participants, with variables distributed between absolute and relative frequencies.

Table 1. Professionals of ICU who performed the aspiration procedure, according to Professional category, sex, age, time of vocational training, time in service and prior experience in intensive therapy. Petrolina-PE, 2010.

Professional Category	n	%
Nurse	2	10
Nursing Technician	18	90
Total	20	100
Gender		
Male	5	25
Female	15	75
Total	20	100
Age (in years)		
20 - 30	09	45
30 - 40	11	55
Total	20	100
Training time (in years)		
01 - 04	13	65
05 - 09	04	20
10 - 14	02	10
15 - 20	01	05
Total	20	100
Time of performance in Service (in years)		
< 1	11	55
01	04	20
02	05	25
Total	20	100
Prior experience in ICU		
Yes	02	10
No	18	90
Total	20	100

As regards the criteria for setting the need for aspiration, the observed data are set out in Table 2.

Table 2. Criteria used by nursing staff to perform endotracheal aspiration. Petrolina-PE, 2010

Criteria	n	%
Predetermined time for aspiration	00	00
Decrease in oxygen saturation	00	00
Visible or audible secretion in endotracheal/tracheostome tube	92	92
Uses pulmonary auscultation	08	08
Total	100	100

It was found that no professional observed used as a criterion for the fulfillment of aspiration prearranged times or check the deterioration of oxygenation evidenced by the drop in oxygen saturation.

In what concerns the prior verification of the decrease in oxygen saturation, it is not feasible, since there is a shortage of suitable material input, ie, the sixteen active beds had only two pulse oximeter, which contradicts the requirements required by RDC n. 7.¹¹ Thus, in none of 100 aspirations observed the patient was monitored for oxygen saturation, thus preventing this criterion was adopted by the professional performer of the procedure.

Of the 100 aspirations witnessed, only on eight the criterion of auscultation was applied, two auscultation performed by nurses and physiotherapists for six, which identified and informed the nurse technician need aspiration.

Finally, with regard to the criterion of observing secretion visible or audible in the endotracheal or tracheostome tube, there was a prevalence of 92% of the cases.

The conduct of nursing at the time of preparation or organization to perform the aspiration procedure can be seen in Table 3.

Table 3. Conduct adopted by nursing staff of the ICU before the accomplishment of the airway aspiration procedure. Petrolina-PE, 2010

Conduct before the suction procedure	Yes		No		Does not apply		Total	
	n	%	n	%	n	%	n	%
Wash their hands prior to the procedure	41	41	59	59	00	00	100	100
Clarifies the patient regarding the procedures to be performed	23	23	77	77	00	00	100	100
Raises, whenever possible, the head of the patient to 30-45°	57	57	32	32	11	11	100	100
Adjusts the FiO ₂ * (doubles or regulates to 100%)	04	04	73	73	23	23	100	100

*Inspired Fraction of Oxygen

It was found that hand-washing was neglected by professionals in 59% of procedures performed. It is noteworthy that

in cases where despite having done it, the professional before performing aspiration, played another activity for which at the time

was not intended, it was discarded and considered to have failed (some device handling the same patient or another handle and contact with doors, for example).

On the issue of clarifying the patient about the procedure to be performed, there was non-compliance in 77% of cases, highlighting that was done when the patient is treated with preserved level of consciousness.

Another essential item to be evaluated prior to the aspiration procedure was the elevation of the headboard. As can be seen in Table 3, in 57% of procedures performed patients were under proper positioning, while in 32% patients remained in the supine position or angle of less than 30 and 11 % of procedures was not possible change the position for a patient's clinical constraints.

Table 4. Conduct of the ICU nursing staff while conducting the procedure of aspiration of airway. Petrolina-PE, 2010

Conduct during the realization of the aspiration procedure	Yes		No		Does not apply		Total	
	n	%	n	%	n	%	n	%
Contaminating the glove and/or catheter during the procedure	72	72	28	28	00	00	100	100
Proper use of sterile glove	74	74	26	26	00	00	100	100
Uses appropriate gauge catheter	92	92	08	08	00	00	100	100
Uses sterile suction catheter	100	100	00	00	00	00	100	100
Use sterile gauze to clean the secretions of the catheter, tube or tracheostome	100	100	00	00	00	00	100	100
Uses SF * 0.9% to thin secretions	31	31	53	53	16	16	100	100
Ambu® uses sterile	07	07	56	56	37	37	100	100
Follow the tube/ tracheostome, nose, mouth	83	83	00	00	17	17	100	100
Connects the patient to the fan in the intervals of aspiration	76	76	01	01	23	23	100	100
Clamp the probe before inserting it into the tube or tracheostome	05	05	95	95	00	00	100	100
The time of maximum suction 15 "	34	34	66	66	00	00	100	100

*Saline solution 0.9%

The item contaminate the sleeve or catheter during aspiration was observed in 72% of the procedure, showing a major deviation from what is suggested by the literature as to prevent infectious complications arising from the endotracheal suction, it must be done aseptically.¹²⁻¹⁴

Regarding the use of sterile gloves, it was found that 26% of this aspiration was not performed properly, since the professional sterile gloves donned on contaminated gloves procedure. This corroborates the high rates of non-adherence to the practice of washing hands before the procedure.

Regarding the fluidizing tracheal secretions in 53% of the observations was the use of sterile 0,9% saline, to the extent that 31% of the aspirations were used physiological solutions already opened and placed improperly.

Concerning the use of Ambu®, must be sterile prior to use, but can be reused by the same patient when maintained without apparent dirt and protected with clean plastic.¹⁵

Thus it was observed that in 83 of the 100

Finally, as a last conduct that should be adopted by the nursing staff before performing endotracheal suctioning would be adjusting the inspired oxygen fraction. Thus, it was observed that in only four aspirations this approach was adopted, pointing out that three was conducted by physiotherapist, although the procedure has been performed by nursing technician, since, according to the rules and routines of the sector the mid-level professionals are not able to adjust parameters of the mechanical ventilator, which justifies the significant number, 73% of procedures performed without the patient's prior hyperoxygenation.

The pipelines considered suitable to be adopted by the nursing staff during the execution of aspiration are shown in Table 4.

procedures performed, there was the aspiration of the nasal and oral cavities or just oral, and all followed the proper sequence. Only 17 professionals aspirated procedures tube or only tracheostome.

Regarding the use of suction catheter of appropriate caliber, it was noted that only 8% of cases the device was not in agreement, having inadequate size for the consistency of secretions or by having a diameter unnecessarily large (n. 18) for tracheostome.

Regarding the conduct of pinching the probe before inserting it into the tube or traqueóstomo, we found only five cases, which were performed by the same professionals (one nursing technician and a nurse), demonstrating the lack of staff about this practice.

In 66% of the aspiration suction time was more than 15 seconds. Since the minimum time found for aspirating secretions was 7 seconds and 58 seconds maximum.

As regards the determination of the maximum stay tube in the trachea in order to avoid hypoxemia frames, Dreyeret et al. (2004) suggested time up to 10 seconds,

whereas other authors enter into the agreement indicates a period suction between 10 and 15 seconds (recommendation adopted in this study).^{13, 16-17}

Finally, as a last item related to the approaches used during the execution of the procedure is to connect the patient to the ventilator during breaks aspirations for it to ventilate and rest in order to correct hypoxemia and ease the discomfort.¹² there

In terms washing the latex with distilled water or saline solution after aspiration, it was found that 99% of the procedures pertinently approach was adopted, thereby preventing the establishment of culture media for bacterial growth. Regarding the protection of this latex the result was also satisfactory, considering that in 98% of cases this was wrapped in packaging clean and dry, conduct that prevents contamination of the environment.¹²

Regarding the return FiO₂, it was found that the four procedures in which it had been altered professionals readjusted to the initial value. Conduct deemed essential for maintenance of respiratory parameters and patient safety, in view of the potential risk of forgetting to take back control of the respirator prior to aspiration levels, thus increasing the possibility of barotrauma and emergence of absorptive atelectasis related to the fraction inspired oxygen to 100 %.¹⁸⁻¹⁹

In 83 of the 100 observed aspirations nursing staff found it necessary to aspirate the mouth of patients, performing oral hygiene later on, only, 49 of them. It is worth mentioning, that oral decontamination of patients admitted to the ICU of the institution studied is performed by applying mouthwash for domestic use, and not with the solutions recommended by the literature.

As for the washing of hands after the procedure, also characterized as additional item to the procedure implementing the VAS aspiration technique, it has a frequency of 57% observed cases.

Regarding the medical record notes about the aspirations held, regarded it as last

was, then, that in only one of the 77 procedures performed on patients under VM this conduct was not adopted correctly, since the trader has not reconnected to the ventilator patient among all intervals aspirations.

In relation to pipelines used by nursing staff after the realization of the aspirations, could observe the data presented in Table 5.

Table 5. Conduct of the ICU nursing staff after the airway aspiration procedure. Petrolina-PE, 2010

Varnish the latex with AD * or SF ** 0.9% after the aspiration	99	99	01	01	00	00	100	100
Protects the latex after aspiration with clean and dry packing	98	98	02	02	00	00	100	100
Returns the initial FiO ₂ ***	04	04	00	00	96	96	100	100
Performs oral hygiene of the patient after the aspiration	49	49	34	34	17	17	100	100
Handwashing after the procedure	57	57	43	43	00	00	100	100
Registers the procedure on the proptuary	81	81	19	19	00	00	100	100

*Distilled water ** saline solution 0.9% *** Inspired Fraction of Oxygen

complementary practice, we found a frequency of 81% in the executions. However, in 97,5% of records the nursing technician only checked the procedure in a proper institution , while in 2,5 % the nurse noted the characteristics of secretions in the appearance . It is noteworthy that in none of the notes in the medical records was observed record of respiratory conditions of the patient, the frequency with which the aspirations were being made, the estimated amount and odor of secretions.

Regarding the standard precautionary measures and personal protective equipment, according to Norm - NR 6 are all used devices individual, for the protection of risks likely to threaten the safety and health at work. Include gloves, hearing protection, eye and face, respiratory protectors, aprons, as well as devices for protecting the head, trunk and limbs.²⁰

Therefore, we sought to observe, as well as professionals of the nursing staff used their personal protective equipment while performing procedures airway aspiration. The absolute and relative frequencies to the use or non-use can be seen in Table 6.

Table 6. The proper use of PPE by ICU nursing staff to perform the procedure of aspiration of airway. HUT, Petrolina-PE, 2010

Proper use of personal protective equipment	Yes		No		Total	
	n	%	n	%	n	%
Use of glove	100	100	00	00	100	100
Use of mask	100	100	00	00	100	100
Use of glasses	00	00	100	100	100	100
Use of Cap	88	88	12	12	100	100
Use of disposable apron	00	00	100	100	100	100

During the period of data collection, it was observed that 100% of the procedures to nursing staff made use of gloves and mask. However in the item cap, it was found that in 12% of the aspirations it has not been used, and all procedures performed by male professionals.

The glasses, though available in sufficient quantity in the sector, one by the bed, were not used in any procedure because of the nursing staff claim that the equipment provided discomfort.

With regard to the apron, it is justified to use by non-availability of the material in the institution, although it was noted that it was requested by the nurses in the sector. Thus, the nurses performed all procedures, making use of a unique suite laundry, thereby increasing the risk of cross contamination.

CONCLUSION

There were able to analyze the actions of nursing staff towards the procedure of airway aspiration of ICU patients. It is concluded therefore that the approaches used by professionals in caring for patients spent severe, especially with regard to aspiration of the airways, are inadequate, making them more vulnerable to diseases, and the development of respiratory infections, for example; and how much are insufficient nursing records in relation to the procedure for removal of secretions from the airways.

It was noted the need to establish themselves permanent education actions directed to the ICU nurses in order to promote the adequacy of procedures for airway aspiration.

The study therefore allowed reflection on the need for more information on the impacts of the actions of the nursing staff in patient care in serious condition, especially regarding the recognition of the rich that patients undergoing aspiration of airways are exposed, and the adoption of measures to prevent them or minimize them, bearing in mind that these factors directly affect the quality of care.

REFERÊNCIAS

1. Dias GT, Souza JS, Franco LMC, Barçante TA. Humanização do cuidado na unidade de terapia intensiva: uma possibilidade real. J Nurs UFPE online [Internet]. 2010 May/June [cited 2012 Jan 09];4:941-47. Available from: http://www.ufpe.br/revistaenfermagem/index.php/revista/article/view/600/pdf_159.

2. Brasil. Portaria nº 3432, de 12 de agosto de 1998. Estabelece critérios de classificação entre as diferentes unidades de tratamento intensivo - UTI. Brasília: Ministério da Saúde; 1998;

3. Puccini, PT. Perspectivas do controle da infecção hospitalar e as novas forças sociais em defesa da saúde. Cien Saude Colet [Internet]. 2011 [cited 2012 Oct 17];16(7):3043-9. Available from: <http://www.scielo.org/pdf/csc/v16n7/04.pdf>.

4. Oliveira TFL, Filho ISG, Passos JS, Cruz SS da, Oliveira MT, Trindade SC et al. Fatores associados à pneumonia nosocomial em indivíduos hospitalizados. Rev Assoc Med Bras [Internet]. 2011 [cited 2012 Oct 17]; 57(6):630-6. Available from: <http://www.scielo.br/pdf/ramb/v57n6/v57n6a08.pdf>.

5. Batista MA, Alcantara EC, Paula LKG de. Central de ventiladores mecânicos: organização, segurança e qualidade. Rev Bras Ter Intensiva [Internet]. 2007 [cited 2012 Oct 17];19(4):450-5. Available from: <http://www.scielo.br/pdf/rbti/v19n4/a08v19n4.pdf>.

6. Filho FL, Silva AAM da, Lopes JMA, Lam ZC, Simões VNF, Santos AM dos. Carga de trabalho de profissionais da saúde e eventos adversos durante ventilação mecânica em unidades de terapia intensiva neonatal. J Pediatr (Rio J) [Internet]. 2011 [cited 2012 Oct 17]; 87(6):487-92. Available from: <http://www.scielo.br/pdf/jped/v87n6/v87n06a05.pdf>.

7. Polit DF, Beck CT, Hungler BP. Fundamentos de pesquisa em Enfermagem: Métodos, avaliação e utilização. 5 ed. Porto Alegre: Artmed; 2004.

8. Peres HHC, Rodrigues RCV. Panorama brasileiro do ensino de Enfermagem. Rev Esc Enferm USP. 2008 [cited 2012 Oct 17];42(2):298-304. Available from: <http://www.scielo.br/pdf/reeusp/v42n2/a12.pdf>.

9. Chavaglia SRR, Borges CM, Amaral EMS, Iwamoto HH, Ohl RIB. Ambiente do centro de terapia intensiva e o trabalho da equipe de enfermagem. Rev Gaúcha Enferm [Internet]. 2011

[cited 2012 Oct 17];32(4):654-61. Available from: <http://www.scielo.br/pdf/rngen/v32n4/v32n4a03.pdf>;

10. Esperatti M, Ferrer M, Theessen A, Liapikou A, Valencia M, Saucedo L M et al. Nosocomial Pneumonia in the Intensive Care Unit Acquired by Mechanically Ventilated versus Nonventilated Patients. *Am J Respir Crit Care Med* [Internet]; 2010 Aug [cited 2012 Oct 17]182:1533-9. Available from:

<http://ajrccm.atsjournals.org/content/182/12/1533.full.pdf+html>

11. Brasil, ANVISA. Resolução RDC nº 7, de 24 de Fevereiro de 2010. Dispõe sobre os requisitos mínimos para o funcionamento de unidades de terapia intensiva e dá outras providências. Brasília; 2010;

12. Mendes NTT, Sabia F, Guimarães HP. Guia de Ventilação Mecânica para Enfermagem - Série Guias de Ventilação Mecânica para Profissionais da Saúde. Atheneu: Rio de Janeiro; 2012.

13. Brunner LS, Suddarth DS. Tratado de enfermagem médico-cirúrgica. 10th ed. Rio de Janeiro: Guanabara Koogan; 2008.

14. Knobel, E. Terapia intensiva: enfermagem. São Paulo: Atheneu; 2006;

15. Wunderink RG, Niederman MS, Kollef MH, Shorr AF, Kunkel MJ, Baruch A, et al. Linezolid in Methicillin-Resistant *Staphylococcus aureus* Nosocomial Pneumonia: A Randomized, Controlled Study. *Clin Infect Dis* [Internet]. 2012 [cited 2012 Oct 17];54(5):621-9. Available from: <http://cid.oxfordjournals.org/content/54/5/621.full.pdf+html>;

16. Machado MGR. Bases da fisioterapia respiratória. Terapia Intensiva e Reabilitação. 1ª Ed. São Paulo: Guanabara Koogan; 2008.

17. Aehlert B. ACLS: Advanced Cardiac Life Support: emergências em cardiologia. 3rd ed. Rio de Janeiro: Elsevier; 2007.

18. Santos MLM, Souza LA, Batiston AP, Palhares DB. Efeitos de técnicas de desobstrução brônquica na mecânica respiratória de neonatos prematuros em ventilação pulmonar mecânica. *Rev Bras Ter Intensiva* [Internet]. 2009 Apr-June [cited 2012 Oct 17];21(2):183-9. Available from: <http://www.scielo.br/pdf/rbti/v21n2/11.pdf>;

19. Brasil, CNS. Resolução no 196/96, de 10 de outubro de 1996. Dispõe sobre as diretrizes e normas regulamentadoras de pesquisa envolvendo seres humanos. Brasília; 1996;

20. Gonçalves LB, Cruz VMC da. Segurança e medicina do trabalho. São Paulo: Cenofisco; 2009;

21. Petrolina. Secretaria Municipal de Saúde. Hospital de Urgências e Traumas. Procedimento operacional padrão do hospital de urgências e traumas. Comissão de controle de infecção hospitalar. Petrolina; 2010.

Submission: 2012/02/09

Accepted: 2013/10/07

Publishing: 2013/01/01

Corresponding Address

Rodrigo Nonato Coelho Mendes
Avenida Robert Koch, 60
Bairro Vila Operária
CEP: 86039-440 – Londrina (PR), Brazil