



ENDOTRACHEAL TUBE FIXING: DIFFERENTIATED TECHNOLOGY FIXAÇÃO DE TUBO OROTRAQUEAL: TECNOLOGIA DIFERENCIADA PARA SEGURANÇA DO PACIENTE

FIJACIÓN DEL TUBO ENDOTRAQUEAL: LA TECNOLOGÍA DIFERENCIADA

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ABSTRACT

Objective: to evaluate a differentiated technology to the endotracheal tube fixing (ET) and the criteria about the handling security and the artifact quality under the professional's perspective. **Methodology:** a descriptive and retrospective study, through the evaluation production form analysis filled by nine physiotherapists and twelve nurses in the adult Intensive Care Unit (ICU), between July and September 2012, from a cardiac public hospital institution in São Paulo/SP, Brazil. To the data analysis was used the technical norm NBR ISSO/IEC 14598-6. **Results:** regarding to the agreement percentage related to the evaluation criteria, the **results** were: 100% about the tube movement facility; 90% about the dispositive security, the oral hygiene facility and the knowledge about a similar product; 85% about the handling application facility; 71% about the attendance quality, the patients' appearance improvement and this product adoption; 67% about the product recommendation; the medium length to the fixing was about 6 days. **Conclusion:** the professionals evaluated positively the artifact as differentiated technology to the ET fixation. **Descriptors:** Endotracheal Tube; Ulcer; Nursing Care; In-Patients; Patient Security.

RESUMO

Objetivo: avaliar uma tecnologia diferenciada para fixação de tubo orotraqueal (TOT) e os critérios sobre segurança no manuseio e qualidade do artefato na perspectiva dos profissionais. **Método:** estudo retrospectivo descritivo, por meio da análise da ficha avaliação do produto preenchida por nove fisioterapeutas e doze enfermeiros em uma Unidade de Terapia Intensiva (UTI) adulta, no período de julho a setembro de 2012, de uma instituição hospitalar pública cardiológica de São Paulo/SP, Brasil. Para a análise dos dados foi utilizada a norma técnica NBR ISSO/IEC 14598-6. **Resultados:** com relação ao percentual de concordância dos profissionais a respeito dos critérios de avaliação, os resultados foram: 100% sobre a facilidade na movimentação do tubo; 90% sobre a segurança do dispositivo, a facilidade na higiene oral e o conhecimento sobre produto semelhante; 85% sobre a facilidade no manuseio na aplicação; 71% sobre a qualidade do atendimento, a melhoria na aparência do paciente e adoção deste produto; 67% sobre a recomendação do produto; a duração média da fixação foi de seis dias. **Conclusão:** os profissionais avaliaram positivamente o artefato como tecnologia diferenciada para a fixação de TOT. **Descritores:** Intubação Endotraqueal; Úlcera; Cuidados de Enfermagem; Pacientes Internados; Segurança do Paciente.

RESUMEN

Objetivo: evaluar una tecnología diferenciada para la fijación del tubo endotraqueal (TET) y los criterios relativos a la seguridad en el manejo y la calidad del artefacto desde la perspectiva de los profesionales. **Metodología:** estudio retrospectivo descriptivo, a través del análisis de la evaluación del registro de lo producto completado por nueve fisioterapeutas y doce enfermeras en una Unidad de Cuidados Intensivos (UCI) de adultos en el periodo de julio a septiembre de 2012, en un hospital público cardiológico de Sao Paulo/SP, Brasil. Para análisis de datos se utilizó la norma técnica NBR ISSO/IEC 14598-6. **Resultados:** en relación con el porcentaje de acuerdo de los profesionales con respecto a los criterios de evaluación, los resultados fueron: 100% de la instalación sobre el movimiento del tubo; 90% de la seguridad del dispositivo, la facilidad de la higiene oral y el conocimiento de un producto similar; 85% de la facilidad en el manejo de la aplicación; 71% de la calidad de la atención, mejorar la apariencia del paciente y la adopción de este producto; 67% de la recomendación del producto; la duración media de la fijación fue de seis días. **Conclusión:** profesionales evaluaron positivamente lo artefacto como tecnología diferenciada para fijación de ET. **Descritores:** Intubación endotraqueal; Úlcera; Cuidados de Enfermería; Pacientes Hospitalizados; Seguridad del Paciente.

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INTRODUCTION

The endotracheal intubation (ET) is a procedure performed in cases where there is need to maintain the efficient airway. There is no maximum time of permanence in the patient tube,¹ However, if the intubation becomes necessary for more than 21 days, it is suggested that an early tracheostomy,² however, two complications are often recognized in the hospital and generating means of assessment indicators in nursing assistance: accidental extubation and skin lesion arising from the tube fixation.

The most common factor associated with not accidental extubation in the ICU is the ET fixation technique.^{3,4} A different look for safety, ease of handling and durability of fixing it is necessary. The product type used in fixing the endotracheal tube (ET) and the residence time are indispensable for improving the quality of care, since the accidental extubation and skin lesions are complications arising from these factors.

The use of a differential device that provides security to the patient intubated, to facilitate handling, drive tube and oral hygiene can prevent such complications.

The ET-setting which will be presented in this paper aims to break traditional concepts about setting strategies in the labor market, aiming at safety, ease and comfort-seeking, increasingly, improve of the patient care

OBJECTIVE

Subsequently, some information on the characterization and use of the product were presented: a) due hydrocolloid, the manufacturer indicates the use of attachment for up to 7 days but may vary in accordance with the patient condition (Sweating and hypothermia, for example, reduces device life); b) single adult use; c) does not contain latex and is not sterile; d) exchange fixing in the presence of two professionals (as recommended by the literature). For application of the device, the first care before letting it is with skin. A cleaning with soap and water in the zygomatic area is required.

- Evaluate a differentiated technology to ET setting and the criteria on safety in handling and quality of the device, from the perspective of professionals.

MÉTHODOLOGY

Descriptive retrospective study to evaluate the artifact to ET fixation through the analysis of product evaluation form completed by the research subjects when using the product in the Intensive Care Unit (ICU) adult in the period July-September 2012, a cardiologic public hospital in Sao Paulo City.

The sample consisted of two categories of professionals: nurses and physical therapists, who work in the ICU and performing within their routine work ET fixing and manipulation.

The sample included 21 assessments in different patients, 9 conducted by physical therapists and 12 nurses, respecting the standards of norm NBR ISSO/IEC 14598-6.⁵

three phases have been defined for product evaluation: training, product usage and evaluation.

Stage 1 - Training

All professionals involved were trained by nurse technical advisor to the company responsible for the device by following the same methodology.

No training was conducted to demonstrate the artifact application. First it was submitted product design, comprises hydrocolloid plates on the sides, a rear padded strip and, at the front, the rail and the locking/grip tube, as illustrated in Figure 1.0.

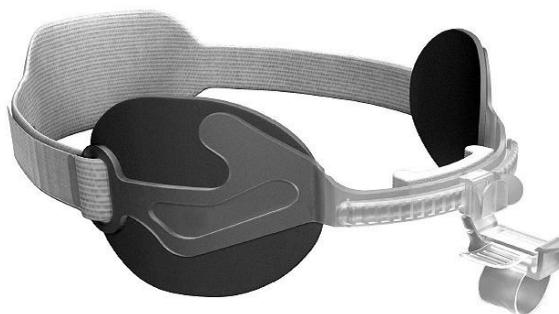


Figure 1. Design Artifact

After drying it as well, can be applied with cotton or gauze, an alcoholic solution of chlorhexidine 0,5% in the location following the protocols of the institution regarding the use of antiseptic. It is noteworthy that epilation is carried out in the zygomatic area when needed.

As additional care to those with crispy skin and delicate, it is recommended to apply a skin protector, never with creamy base, in the same region. Then cut up the paper protecting the hydrocolloid, sleeps up the previous foam in the labial region above and

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place the fastener holding the hydrocolloid for about 40 seconds to turn it on. After fixation, holds up the handle behind the head leaving about an inch away.

Made these procedures, for fixing the ET, takes the role of the lock/handle that involve the tube and, with necessary adjustments, should secure the cannula (5-10mm). This handle this adhesive/closure surrounding the tube is not responsible for fixing, for what will ensure the success of this device is the correct fit this handle to the tube, preventing accidental extubation. The closure contains "claws" which prevent friction and sliding the cannula without causing perforations in the tube.

At any time the professional can handle the tube without necessarily having to change the setting, simply moves down and up: with the left index finger rests on the tube and the left thumb moves the latch down. At the same time and with the same force, the right thumb will hold the strap that holds the tube and make a move up.

With stuck pipe, it is possible to make the rotation of the cannula position, allowing for greater ease of oral cleanliness and avoiding labial injury. Therefore, you should tighten the "tabs" and change the positioning on track.

To remove the device, just use a damp gauze and gently pull the hydrocolloid. One can use an oil to facilitate removal, however, it is important to pay attention to cleaning of the skin so that no residue thereof in a next fixation.

The professionals had the opportunity to manipulate the fixing during the demonstration to remedy the concerns.

Stage 2 - Product application

the inclusion and exclusion criteria were defined for device use in patients, following the recommendations mentioned above.

Inclusion Criteria

✓ Chronic patient, more time spent in the ET.

This criterion aims to assess benefits to the patient and professional, plus the cost to the institution.

Exclusion Criteria

✓ Patients who use dentures: as in ICU patients do not remain with the prosthesis, the device might not be adequate, since there would be no support point; Pacientes com

queimadura em região zigomática ou fratura em face;

✓ ICU pediatric;

✓ Patients or guardians thereof not authorized trichotomy of zygomatic region.

Stage 3 - Product Evaluation

After the professional decide to use the device in the patient, following the recommendations mentioned above and the criteria, it was explained that it should complete a product evaluation sheet drawn up by the manufacturer.

The evaluation form was composed of data of the institution (name and sector), the valuation date, name of the professional responsible for the evaluation. Then there is a brief description about the device, with technical and commercial information, followed by closed questions dichotomous (yes or no) and an open question about the average time the device stay.

Dichotomous issues relate to security, facilities as the placing, oral hygiene and tube drive, considering the tube slip; also make mention of improvements in care and aesthetics of the patient. Finally, questioned about the knowledge regarding similar products, adoption and recommendation of the artifact.

Data collection

Data were collected from the evaluation form completed by professionals while using the product in the ICU.

Data analysis

This study evaluated the criteria on safety in handling and quality of the device, from the perspective of professionals, in order to assess the artifact as a differentiated technology to ET fixation. For data analysis we used, as shown in Figure 2.0, the technical standard NBR ISSO/IEC 14598-6⁽⁵⁾ derived from BTSA (Brazilian Technical Standards Association), which uses a scale (0-10) which shows expected values for the evaluation of a product correlated with the degree of satisfaction of each requirement. The target range is the measured value equal to or greater than 7⁶.

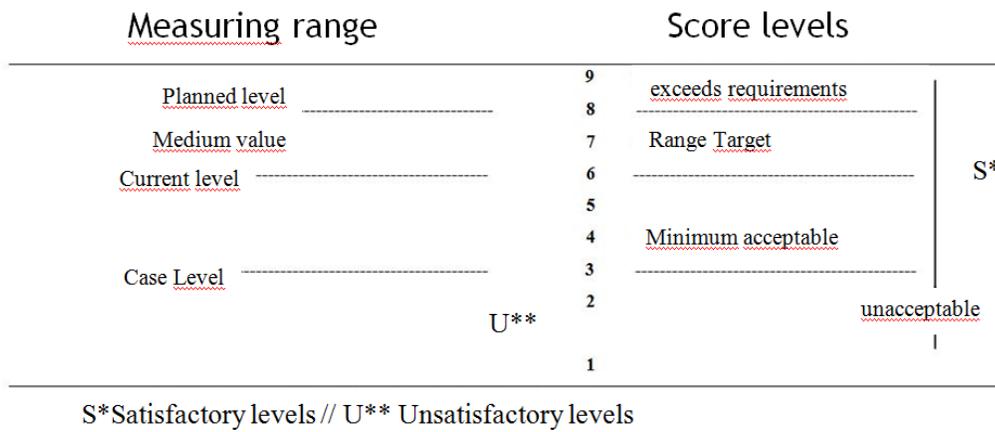


Figure 2. Score levels for the evaluation of a product, according to ABNT NBR ISO/ IEC 14598-1.

Data analysis was performed from the classification and quantification in number and percentage of content.

Ethical aspects of the research

O study had approved the research project by the Ethics Committee of the institution, field of study, as the Protocol 4430/2014.

from the perspective of professionals. The objective questions mentions relevant evaluation of this new product, the criteria guided the professionals in this analysis.

Figure 3 shows the results of this assessment in percentage, according to ABNT NBR ISO/IEC 14598-1.⁶

RESULTS

This study was carried out a differentiated technology to ET setting and the criteria on safety in handling and quality of the device,

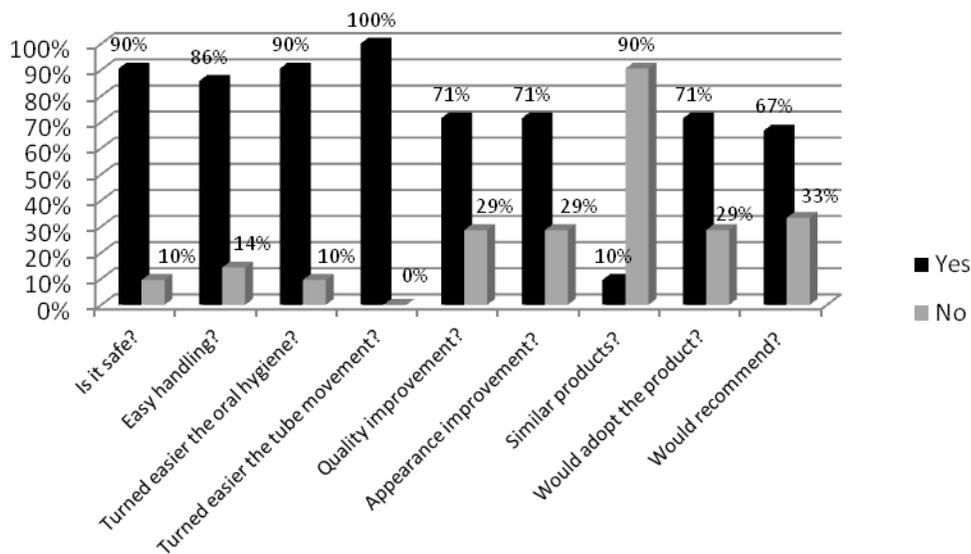


Figura 3. Concordance of professionals as the criteria on safety in handling and quality of the artifact.

Regarding the safety of the device for the proper setting of the ET, there was agreement of 90% among professionals, 57,89% nurses and 42,1% physiotherapists.

About ease in handling the application, professionals showed concordance of 85%, with 61,11% nurses and 38,88% physiotherapists.

Regarding the ease of oral hygiene, a concordance of 90%, a proportion of 63.15% nurses and 36,84% physiotherapists.

The residence time was also evaluated by professionals, as shown in Figure 4.0. However, eight raters did not report on this criterion.

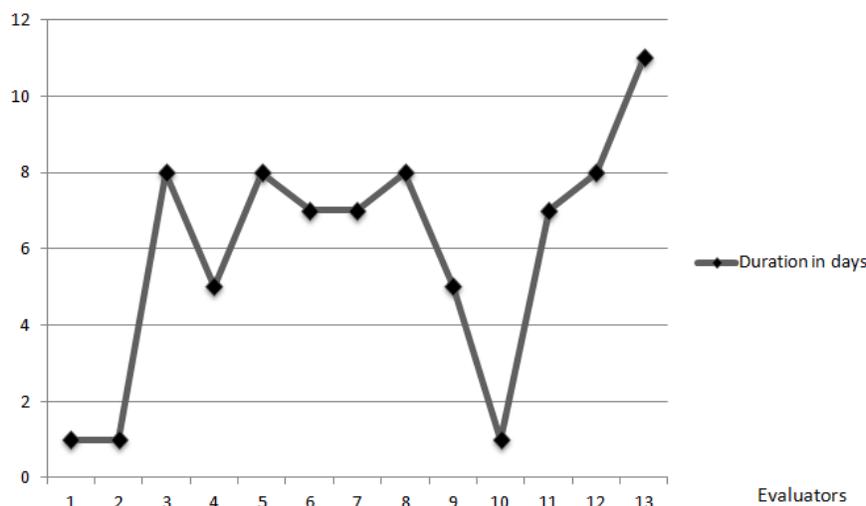


Figure 4. Concordance of professionals regarding the patient's length of stay with the artifact.

The device had an average duration of 6 days fixation, which shows that the product meets the specification related to the last seven days of permanence defined by the manufacturer. Thirteen professionals described this criterion, two associated the reduced dwell time to tracheostomy, two to the planned extubation and the adverse event the product during handling.

In respect of easiness in handling tube 100% of the professionals analyzed positively. The slide rail of the tube in addition to promoting oral hygiene and handling of the pipe is a measure for the prevention of skin damage, in this case, the labial.

The quality of patient care through the use of the device was evaluated with 71% agreement among professionals, being 73,33% nurses and 26,66% physiotherapists. The improvement in the patient's appearance was also evaluated with 71% agreement, but the evaluation of professional diverged by 66,66% nurses and 33,33% of physiotherapists.

In relation to knowledge of similar product on the market, 90% of professionals are unaware of another device with the same characteristics. We point out that 10% of professionals who report knowledge of this same device are physiotherapists.

As for the adoption of this product, 71% of professionals are in favor of the use, being 73,33% nurses and 26,66% physiotherapists.

On the recommendation of the product, 67% of the professionals would indicate the artifact. We emphasize that the agreement is lower than expected given the evaluation of a professional physiotherapist who presented contradictory analysis with regard to adopt and would not recommend the product. Professionals who would recommend the product, 78,57% are nurses and 21,42% physiotherapists.

DISCUSSION

In the analysis of this study we identify research that strengthened the evaluation findings of professionals regarding the ET fixation method.

The second Brazilian Consensus on Mechanical Ventilation discusses the complications related to the tube (endotracheal and tracheal). The first complication raised concerns the accidental extubation, tracheal intubation and saw more prone to accidental extubation. The second complication is underlined the existence of skin lesions and/or lip, due to the tube fixing mode, type of material used (plasters) and the lack of mobilization cannula at regular time intervals.⁷

This consensus also addresses questions about the care of the tube, which are: oral hygiene every four hours with antiseptic; presence of two professionals during the changing of the setting and change the tube position as prevention of accidental extubation or inadvertent mobilization ET; exchange fixing daily and whenever necessary, considering the cleanliness and the prevention of injury to the lips and ear lobes; preferably the fixing position in the center of the labial, in order to reduce the risk of erosion labial commissure; ET repositioning should take place at least every 12 hours, in order to prevent lesions in tongue and lips; avoid tensioning of the tube to prevent tracheal injury. The third Brazilian mechanical ventilation Consensus mentioned fixing the tube with a care of artificial airways, highlighting the appropriate setting and evaluation tube position as important aspects.⁸

The greatest difficulty in the use of adhesive tapes for ET fixation is related to oral hygiene. Another traditional method of

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fixing the pipes is through the laces; in this case the risk for bedsores in ear lobes increases, so it is necessary to protect it or prevent its contact with the lace. The repositioning of the tube as routine can prevent pressure sores on the lips.⁸

Proper fixation and constant evaluation of ET's position are important in the care and should be systematically carried out by the team. The ideal method should allow for fixing the smallest possible movement of the tube, to be comfortable to the patient, allowing oral hygiene, preserving the integrity of the skin and easy to apply.⁹

The use of adhesive tapes in the mounting ET is a traditional method; It should be done by two workers, where one holds the attachment and the other holding the tube, ensuring that it remains in the correct position, however, one problem that can be found with the use of tape is the difficulty in performing oral hygiene.¹⁰

The device in question demand the same procedure, however facilitates handling during patient care due to the rotation of the ET, the possibility of oral hygiene, oral intake and possible longer stay.

The oral cavity contains microorganisms that are conducive to microbial proliferation, especially in patients requiring mechanical ventilation and who are prevented from closing the mouth, keeping the oral cavity in contact with ambient air, added to the fact that mechanisms of disability be local cleaning.^{11,12}

The literature shows that hygiene measures reduce the colonization of pathogens in the oral cavity, as one of the most strongly recommended measures by companies and national and international organizations¹³⁻¹⁷ for preventing pneumonia associated with mechanical ventilation and reduce the mortality rate.¹⁸⁻²³

This care is also justified by interfering in the health and disease from a holistic approach to prevent changes in the oral cavity and prevent them becoming complicating agents with opportunistic infections, damaging the patient's general condition.¹²

Dentistry has directed studies in the search for a greater understanding of periodontal disease in order to scale the influence and interaction of oral bacteria in the systemic health diseases. Studies have shown a strong association between pathogens and infectious conditions remotely. Oral diseases may play an important role in the presence of various systemic diseases such as coronary heart disease, stroke, bacterial endocarditis,

diabetes mellitus and respiratory infection. Among the oral diseases, there is periodontal disease, where there is the presence of gram-negative microorganisms, similar to chronic and respiratory infections.²⁴

The greater is the length of stay of patients in the ICU, the greater the complications occurrences. In the first 48 to 72 hours, occurs oropharyngeal colonization by gram-negative bacteria intubated. Later microorganisms migrate to the lungs through the mouth secretions that drain the sides of the tracheal tube cuff.²⁵

However, it has been observed that cardiovascular and periodontal diseases, both chronic and multifactorial, have in common components of genetic background and susceptibility, such as diet-related habits, hygiene and practice of smoking. These components are also important in periodontal disease, as well as in cardiovascular diseases.²⁶

Respiratory diseases are the diseases that present scientific evidence of their relationship to periodontal, in which nosocomial pneumonia is the second cause of nosocomial infection and comprises a framework of high morbidity and mortality rates especially those who are on mechanical ventilation, where 20 % to 50% progress to death.^{22,25}

The residence time of fixing work positively to skin integrity, since there were no reports of such an event.

The result over time fixing stay for a long time corroborates with the literature,^{26,27} whose rapporteur is that this criterion affects the risk for unplanned extubation, ie the greater time spent with setting may help to decrease the incidence of this event.

The ideal method of mounting tube must permit the smallest possible movement of the tube, to be comfortable to the patient, allowing oral hygiene, preserving intact skin and easy to apply.²⁸

The exchange of fixing is necessary with a view to cleaning the ET and prevention of ulceration of the oral rhyme and auricular region.⁹ We also add that the zygomatic region is another pressure area affected by inadequate fixation.

In the study of nursing care in the postoperative period of CABG surgery was indicated the nursing intervention about the alternation of rhymes as injury prevention, referring to one of the measures for the integrity of the oral cavity.⁷

Lesions of the skin and/or lips are changes that occur due to the tube fixing mode, the

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type of material used (plasters) and the lack of mobilization cannula at regular time intervals.⁷

Improving the assessment and quality of care are directly related to the adoption of measures to reduce the causes of accidental extubation and skin lesions resulting from inadequate fixation.^{29,30} continuous improvement program quality in reducing the incidence of NTBs, such as standardization of procedures including the setting of the endotracheal tube, tube aspiration, hygiene and patient transport, literature review about these practices and identification of younger patients (<2 years old) as a high risk factor for NTBs are important and effective measures to reduce this incidence.³¹

Although not identified any study that addresses the appearance of the patient in the context of setting the ET, we note that this feature is a concern both in the product concept and for the professionals who evaluated positively this criterion.

The methods for determining the ET that meet the needs of the patient during mechanical ventilation remain scarce in the market, which makes us think about the need to develop other devices, as well as the improvement of existing ones, to improve the assistance quality.

In health services, professional resistance to changes in the work process represent the weaknesses of service.³² The organizational changes are linked to innovation. Change patterns, modify, enter a new procedure which is capable of generating improvement.^{33,34}

Being in a convenience environment is safer and more comfortable for individuals. In a way all that escapes the convenience, the known, brings a natural tendency to resistance.³⁵

The evaluation of professionals about the ET fixture corroborates the findings in the literature on criteria for proper pipe attachment, as it provides security to the intubated patient, contributes to oral hygiene care and rotation of the tube position on the labial to prevention of injury and improves the aesthetics of the patient, being a humanized factor in the hospital environment.

The ET fixing residence time the patient is an important factor for the reduction of risks to the periodic exchange of the same, featuring the safe handling and maintenance of skin integrity.

It is limited to study the lack of professionals on new technologies related to the fixing, restricting them to the use of

conventional methods and limiting the possibility of joining alternatives that meet quality needs of patients during the period of intubation. We therefore consider that the dissemination and use of new methods, such as the device in question must be inserted in hospital practice.

We emphasize that the lack of research on devices for fixation and skin ulceration related to these artifacts is another limiting factor for the purpose of comparison with the present study, whereas no shortage of innovative methods that motivate the research and that many of these injuries can not It is valued by professionals in daily life as complications associated with inadequate fixation.

CONCLUSION

Professionals evaluated the artifact as differentiated technology for ET fixation and presented positive agreement on safety standards in handling and quality of the artifact.

The study contributes to the dissemination of an innovative method for professionals on a fixation ET suitable for critical patients in intensive care unit. It allows stratify the device indication leading to management of the assistance and, therefore, the improvement of care.

REFERENCES

1. Smeltzer SC, Bare BG. Tratado de enfermagem médico-cirúrgica. 11th ed. Rio de Janeiro: Guanabara Koogan; 2002.
2. Andrade MTS. Guias práticos de enfermagem: cuidados intensivos. Rio de Janeiro: Mc Graw Hill; 2002.
3. Richmond AL, Jarog DL, Hanson VM. Unplanned extubation in adult critical care. Quality improvement and education payoff. Crit care nurse [Internet]. 2004 [cited 2016 Apr 22];24(1):32-7. Available from: <http://ccn.aacnjournals.org/content/24/1/32.full.pdf+html>
4. Bouza C, Garcia E, Diaz M, Segovia E, Rodriguez I. Unplanned extubation in orally intubated medical patients in the intensive care unit: a prospective cohort study. Heart lung [Internet]. 2007 [cited 2016 Apr 22];36(4):270-76. Available from: [http://www.heartandlung.org/article/S0147-9563\(06\)00237-8/pdf](http://www.heartandlung.org/article/S0147-9563(06)00237-8/pdf)
5. Associação Brasileira de Normas Técnicas. NBR ISSO/IEC 14598-6. Engenharia de software: avaliação de produto parte 6: Documentação de módulos de avaliação. Rio de Janeiro; 2004.

6. Associação Brasileira de Normas Técnicas. NBR ISSO/IEC 14598-1. Tecnologia da Informação - Avaliação de produto de software - Parte 1: Visão geral. Rio de Janeiro; 2001.
7. Passos E, Castilho VG. II Consenso brasileiro de ventilação mecânica. Papel da enfermagem na assistência ao paciente em ventilação mecânica. J Pneumol [Internet]. 2000 [cited 2016 Apr 22];26:S27-S34. Available from: <http://www.scielo.br/pdf/jbpneu/v33s2/a08v33s2.pdf>
8. Jerre G, Silva TJ, Beraldo MA, Gastaldi A, Kondo C, Leme F, et al. III Consenso Brasileiro de Ventilação Mecânica. Fisioterapia no paciente sob ventilação mecânica. J bras pneumol [Internet]. 2007 [cited 2016 Apr 22];33(Supl2):142-50. Available from: <http://www.scielo.br/pdf/jbpneu/v33s2/a10v33s2.pdf>
9. Hess DR. The Evidence for Noninvasive Positive-Pressure Ventilation in the Care of Patients in Acute Respiratory Failure: A Systematic Review of the Literature. Respir care [Internet]. 2004 [cited 2016 Apr 22];49(10):810-29. Available from: <http://rc.rcjournal.com/content/49/7/810.full.pdf+html>
10. Patel N, Smith CE, Pinchak AC, Hancock DE. Taping methods and tape types for securing oral endotracheal tubes. Can J Anaesth [Internet]. 1997 [cited 2016 Apr 22];44(3):330-6. Available from: http://download.springer.com/static/pdf/94/art%253A10.1007%252FBF03015375.pdf?originUrl=http%3A%2F%2Flink.springer.com%2Farticle%2F10.1007%2FBF03015375&token2=exp=1461354329-acl=%2Fstatic%2Fpdf%2F94%2Fart%25253A10.1007%25252FBF03015375.pdf%3ForiginUrl%3Dhttp%253A%252F%252Flink.springer.com%252Farticle%252F10.1007%252FBF03015375*-hmac=2f56ac153173b471e8c343da20741ce07c8eed90ffc534d828b36324f9a3ba03
11. Koeman M, van der Ven AJ, Ramsay G, Hoepelman IM, Bonten MJM. Ventilator-associated pneumonia: recent issues on pathogenesis, prevention and diagnosis. J hosp infect [Internet]. 2001 [cited 2016 Apr 22];49:155-62. Available from: [http://www.journalofhospitalinfection.com/article/S0195-6701\(01\)91073-4/pdf](http://www.journalofhospitalinfection.com/article/S0195-6701(01)91073-4/pdf)
12. Caldeira PM, Cobucci RAS. Higiene oral de pacientes em intubação orotraqueal internados em uma unidade de terapia intensiva. Rev enf integrada [Internet]. 2011 [cited 2016 Apr 22];4(1):713-41. Available from: <http://www.unilestemg.br/enfermagemintegr>
13. Agência Nacional de Vigilância Sanitária (ANVISA). Diretrizes sobre prevenção da pneumonia associada à ventilação mecânica (PAV). Brasília; 2009.
14. Tablan OC, Anderson LJ, Besser R, Bridges C, Hajjeh R. Guidelines for preventing healthcare-associated pneumonia - 2003. MMWR recommendations and reports [Internet]. 2004 [cited 2016 Apr 22];53(RR-3):1-36. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm>
15. Fagon JY. Prevention of ventilator-associated pneumonia. Int care med [Internet]. 2002 [cited 2016 Apr 22];28(7):822-23. Available from: http://icmjournal.esicm.org/permission_denied.html?ReturnUrl=http://icmjournal.esicm.org/journal/134/28/7/1341_10.1007_s00134-002-1341-3/2002/Prevention_of Ventilator-associated_pneumonia.pdf.html
16. Scott J, Vollman K. Procedure 4. Endotracheal Tube and Oral Care. In: Wiegand D, Carlson K, editors. AACN Procedure Manual for Critical Care. 5th ed. St. Louis: Elsevier Saunders; 2005.
17. Vieira DFVB. Implantação de protocolo de prevenção da pneumonia associada à ventilação mecânica: impacto do cuidado não farmacológico [tese]. Porto Alegre: Faculdade de Medicina da Universidade Federal do Rio Grande do Sul; 2009.
18. Tantipong H, Morkchareonpong C, Jaiyindee S, Thamlikitkul V. Randomized controlled trial and meta-analysis of oral decontamination with 2% chlorhexidine solution for the prevention of ventilator-associated pneumonia. Infect control hosp epidemiol [Internet]. 2008 [cited 2016 Apr 22];29(2):13-6. Available from: <http://www.cocemi.com.uy/docs/Clorhexidina%20al%20%20ICHE.pdf>
19. Houston S, Hougland P, Anderson JJ, Larocco M, Kennedy V, Gentry LO. Effectiveness of 0.12% chlorhexidine gluconate oral rinse in reducing prevalence of nosocomial pneumonia in patients undergoing heart surgery. Am j crit care [Internet]. 2002 [cited 2016 Apr 22];11(6):567-70. Available from: <http://ajcc.aacnjournals.org/content/11/6/567.full.pdf+html>
20. Koeman M, van der Ven AJ, Hak E, Joore HC, Kaasjager K, de Smet AG, et al. Oral decontamination with chlorhexidine reduces the incidence of ventilator-associated

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pneumonia. *Am J respir crit med* [Internet]. 2006 [cited 2016 Apr 22];173(12):1348-55. Available from: <http://www.atsjournals.org/doi/pdf/10.1164/rccm.200505-8200C>

21. Segers P, Speekenbrink RG, Ubbink DT, Van Ogtrop ML, de Mol BA. Prevention of nosocomial infection in cardiac surgery by decontamination of the nasopharynx and oropharynx with chlorhexidine gluconate: a randomized controlled trial. *JAMA* [Internet]. 2006 [cited 2016 Apr 22];296(20):2460-66. Available from: http://www.hopkinsmedicine.org/gim/_pdf/consult/chlorhexidine_2006.pdf

22. Penitenti RM, Vilches JIG, Oliveira JC, Mizohata MGG, Correa DI, Alonso TRMB, Mathiazzi IC, Testa RS. Cuff pressure control in intensive care unit: training effects. *Rev bras ter intensiva* [Internet]. 2010 [cited 2016 Apr 22];22(2):192-95. Available from: http://www.scielo.br/pdf/rbti/v22n2/en_a14v22n2.pdf

23. Souza AF, Guimarães AC, Ferreira EF. Evaluation of the implementation of new protocol of oral hygiene in an intensive care center for prevention of pneumonia associated with mechanical ventilation. *Rev min enferm* [Internet]. 2013 [cited 2016 Apr 22];17(1):177-84. Available from: http://www.reme.org.br/exportar-pdf/588/en_v17n1a15.pdf

24. Kahn S, Mangialardo ES, Garcia CH, Namen FM, Júnior JG, Machado WAS. Controle de infecção oral em pacientes internados: uma abordagem direcionada aos médicos intensivistas e cardiologistas. *Cien saude colet* [Internet]. 2010 [cited 2016 Apr 22];15(Suppl 1):1819-26. Available from: <http://www.scielo.br/pdf/csc/v15s1/094.pdf>

25. Morais TM, Silva A, Avia LR, Souza PH, Knobel E, Camargo LF. A importância da atuação odontológica em pacientes internados em unidade de terapia intensiva: revisão. *Rev bras ter intensiva* [Internet]. 2006 [cited 2016 Apr 22];18(4):412-17. Available: <http://www.scielo.br/pdf/rbti/v18n4/16.pdf>

26. Almeida RF, Pinho MM, Lima C, Faria I, Santos P, Bordalo C. Associação entre doença periodontal e patologias sistêmicas. *Rev port clin geral* [Internet]. 2006 [cited 2016 Apr 22];22:379-90. Available from: <http://docplayer.com.br/3440823-Associacao-entre-doenca-periodontal-e-patologias-sistemicas.html>

27. Carvalho FL, Mezzacappa MA, Calil R, Machado HC. Incidence and risk factors of accidental extubation in a neonatal intensive care unit. *J pediatr* [Internet]. 2010 [cited

2016 Apr 22];86(3):189-95. Available from: http://www.scielo.br/pdf/jped/v86n3/en_a05v86n3.pdf

28. Veldman A, Trautschold T, Weib K, Fischer D, Bauer K. Characteristics and outcome of unplanned extubation in ventilated preterm and term newborns on a neonatal intensive care unit. *Paediatr anaesth* [Internet]. 2006 [cited 2016 Apr 22];16:968-73. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1460-9592.2006.01902.x/pdf>

29. Manzano APF. Assistência de enfermagem no pós operatório de cirurgia de revascularização do miocárdio. [dissertação]. Curso de Graduação em Enfermagem da Universidade do Vale do Itajaí; 2008.

30. Ream RS, Mackey K, Leet T, Green MC, Andreone TL, Loftis LL, et al. Association of nursing workload and unplanned extubations in a pediatric intensive care unit. *Pediatr crit care med* [Internet]. 2007 [cited 2016 Apr 22];8(4):366-71. Available from: http://journals.lww.com/pccmjournal/Abstract/2007/07000/Association_of_nursing_workload_and_unplanned.10.aspx

31. Nicolau CM, Lahóz AL. Fisioterapia respiratória em terapia intensiva pediátrica e neonatal: uma revisão baseada em evidências. *Pediatria (São Paulo)*. 2007;29(3):216-21.

32. da Silva PS, de Aguiar VE, Neto HM, de Carvalho WB. Unplanned extubation in a pediatric intensive care unit: impact of a quality improvement programme. *Anaesthesia* [Internet]. 2008 [cited 2016 Apr 22];63(11):1209-16. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2044.2008.05628.x/epdf>

33. Oliveira MS. O papel dos profissionais de saúde na formação acadêmica. *Rev Olho mágico*. 2003;10(2):37-9.

34. Maravieski E, Reis D. Avaliação de resistência à mudança em processos de inovação: a construção de um instrumento de pesquisa. In: Encontro Nacional de Engenharia De Produção, 28. Rio de Janeiro, 2008. Anais. Rio de Janeiro: ABEPRO; 2008.

35. Bernardo CG. A resistência a mudanças em uma organização: uma análise à luz do processo controle integrado de mudanças do PMBOK3. Unibero; 2005.

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