Compliance level with prevention measures for ventilator-associated pneumonia among nurses in a Mexican hospital

Nivel de cumplimiento de las medidas de prevención de neumonías asociadas a la ventilación mecánica en enfermeras de un hospital mexicano

Nível de conformidade com as medidas de prevenção de pneumonia associada à ventilação mecânica entre enfermeiros de um hospital mexicano

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ABSTRACT

Objective: To evaluate the compliance level of nursing staff with general and specific measures for preventing ventilator-associated pneumonia in an intensive care unit. **Methodology:** This quantitative, descriptive, cross-sectional study included all nursing staff (n = 19) working in the ICU of a General Hospital, responsible for patients on mechanical ventilation. The compliance level with VAP prevention measures and safety barriers was assessed during June and July 2024. **Results:** The participants had a mean age of 39 years (SD = 5.1); the majority were women (68.3%), held a bachelor's degree in nursing with intensive care unit postgraduate training (52.6%), and worked morning shifts (31.6%). Regarding the compliance level with specific recommendations, 100% performed the semi-Fowler position and closed-system suctioning, 89.5% performed oral cavity hygiene, 84.2% implemented sedation interruption, and 0% conducted active or passive

humidification. For general measures, 68.4% complied with the "five moments of hand hygiene," and 78.9% used personal protective equipment when caring for patients on mechanical ventilation. **Conclusions:** High compliance levels were observed for most ventilator-associated pneumonia prevention recommendations, except for active or passive humidification. However, compliance with safety barrier measures was low.

Keywords: Ventilator-Associated Pneumonia; Artificial Respiration; Infection Control; Critical Care Nursing; Intensive Care Units.

RESUMEN

Objetivo: Evaluar el nivel de cumplimiento las medidas generales y específicas sobre la prevención de las neumonías asociadas a la ventilación mecánica del personal de enfermería en una unidad de cuidados intensivos. **Metodología**: Estudio cuantitativo, descriptivo y transversal. Participaron el total del personal de enfermería (n = 19) que trabaja en una Unidad de Cuidados Intensivos de un Hospital General de Zona, cargo de pacientes con ventilación mecánica, a quienes se les evaluó el cumplimiento de las acciones para la prevención de neumonía asociada a la ventilación mecánica y las barreras de seguridad durante los meses de junio y julio del 2024. **Resultados:** Predominaron la media de edad de 39 años (DE = 5,1), las mujeres (68,3 %), la Licenciatura en Enfermería con Postécnico en UCI (52,6 %) y turno matutino (31,6 %). De acuerdo con el cumplimiento de las recomendaciones: el 100 % realizó la posición semifowler y aspiración con técnica cerrada respectivamente, el 89,5 % aseo de cavidad oral, el 84,2 % interrupción de sedación y el 0% efectuó la humidificación activa o pasiva. Sobre acciones generales: el 68,4 % llevó a cabo los cinco momentos de la higiene de manos y el 78,9 % utilizó equipo de protección al momento de atender al paciente con ventilación. **Conclusiones:** Lograron un alto nivel de cumplimiento la mayoría de las recomendaciones para prevenir las neumonías a excepción de la humidificación activa o pasiva. Las medidas de barrera de seguridad tuvieron un bajo nivel de cumplimiento.

Palabras clave: Neumonía Asociada al Ventilador; Respiración Artificial; Control de Infecciones; Enfermería de Cuidados Críticos; Unidades de Cuidados Intensivos.

RESUMO

Objetivo: avaliar o nível de conformidade com medidas gerais e específicas sobre a prevenção de pneumonias associadas à ventilação mecânica entre a equipe de enfermagem em uma unidade de terapia intensiva. **Metodologia:** estudo quantitativo, descritivo e transversal. Toda a equipe de enfermagem (n = 19) que trabalha em uma Unidade de Terapia Intensiva de um Hospital de Área Geral, responsável por pacientes ventilados mecanicamente, que foram avaliados quanto à conformidade com ações para a prevenção de pneumonia associada à ventilação mecânica e barreiras de segurança durante os meses de junho e julho de 2024. **Resultados:** Idade média de 39 anos (DP = 5,1), sexo feminino (68,3 %), bacharelado em enfermagem com formação pós-técnica em UTI (52,6 %) e predomínio do turno da manhã (31,6 %). Em termos de cumprimento das recomendações: 100% realizaram a posição semi-fowler e a aspiração com técnica fechada, respectivamente, 89,5% realizaram a limpeza da cavidade oral, 84,2% interromperam a sedação e 0% realizaram a umidificação ativa ou passiva. Em relação às ações gerais: 68,4% realizaram todos os cinco momentos de higiene das mãos e 78,9% usaram equipamentos de proteção ao cuidar do paciente ventilado. **Conclusões:** Foi alcançado um alto nível de conformidade para a maioria das recomendações de prevenção de pneumonias, com exceção da umidificação ativa ou passiva. As medidas de barreira de segurança tiveram um baixo nível de conformidade.

Palavras-chave: Pneumonia Associada à Ventilação Mecânica; Respiração Artificial; Controle de Infecções; Enfermagem de Cuidados Críticos; Unidades de Terapia Intensiva.

INTRODUCTION

Ventilator-associated pneumonia (VAP) is a common type of healthcare-associated infection (HAI).[1] It occurs in patients with an artificial airway after 48 hours or more of orotracheal intubation,[2] with an incidence ranging from 5% to 50%. As the most common nosocomial infection among critically ill patients in an intensive care unit (ICU), VAP increases morbidity and mortality, prolongs hospital stays (by 4 to 13 days), and increases healthcare costs.[3] In Mexico, the epidemiological surveillance of HAIs is managed by *Red Hospitalaria de Vigilancia Epidemiológica* (RHOVE), which reported that in 2022, there were 56,859 HAIs, of which 8,675 (15.3%) were due to VAP, and 2,883 occurred in adult ICUs.[4]

One of the most important factors in preventing the development of VAP is the implementation of preventive measures, which include functional strategies such as strict hand hygiene, the use of gloves and protective gowns, the semi-Fowler's position, daily weaning assessment, tubing changes, humidification, physiotherapy, and nutritional support. Additionally, mechanical measures include monitoring endotracheal cuff pressure, using tubes with subglottic secretion drainage, fine-bore feeding tubes, closed/open suction systems, respiratory filters, tooth brushing, negative pressure suction techniques, and pharmacological strategies (digestive decontamination, short-course antibiotic therapy, oral hygiene with chlorhexidine, antibiotic rotation, and probiotics).[3,5]

Regarding VAP prevention strategies implemented in Mexico, the Clinical Practice Guideline (GPC for its acronym in Spanish, *Guía de Práctica Clínica*) for nursing interventions for the prevention of VAP in hospitalized adults in Critical Care Units at secondary and tertiary care levels was developed in 2015 by the Ministry of Health. This guideline includes the previously mentioned recommendations.[6]

Later, in 2019, the Ministry of Health published the Manual for the Implementation of Action Bundles to Prevent and Monitor HAIs (*Manual para la implementación de los paquetes de acciones para prevenir y vigilar las IAAS*), which includes the VAP prevention bundle. The bundle includes measures such as maintaining the bed at an angle of 30° to 45°, assessing the possibility of sedation interruption, performing endotracheal secretion suctioning with the correct use of a closed system, daily evaluation of potential weaning, oral hygiene, and the use of a humidifier. This bundle requires 100% compliance to be effective. These recommended actions are implemented in healthcare institutions, including the Mexican Institute of Social Security (IMSS).[7]

Several quarterly analyses of epidemiological evidence were conducted in Mexico in 2023, where VAP was the most frequent infection in adult ICUs. Baja California had the highest number of reported cases during the first two quarters, with 22.6 cases per 1,000 ventilator days.[8]

In Tabasco, a study was conducted in the ICUs of two high-specialty hospitals to assess the level of knowledge and practices of ICU nursing staff regarding VAP prevention. The results showed that 56.3% of participants had a moderate level of knowledge, while 87.5% had less knowledge about the implications of using closed and open suction systems. Additionally, 58.2% performed oral hygiene with chlorhexidine less frequently.[9] Another study aimed to determine the impact of an educational intervention on weaning patients from mechanical ventilation among nursing professionals in a hospital setting. After the intervention, the number of nurses with increased knowledge of mechanical ventilation weaning rose from 6 to 13.[10]

Despite the ongoing development and update of VAP prevention strategies, as well as the training provided to healthcare staff—including nurses, who play a crucial preventive role—the issue persists.[8,11]

Therefore, the objective of this study was to assess compliance with the VAP prevention bundle in hospitalized adults in the ICU of the General Zone Hospital (HGZ) No. 30 of the Mexican Institute of Social Security (IMSS).

METHODOLOGY

Type of Study

This was a quantitative, descriptive, and cross-sectional study.

Location

The study was carried out at General Zone Hospital (HGZ) No. 30 in Mexicali, Baja California, Mexico. This secondary-level care hospital, which serves an adult population, has a total of 252 beds and an adult ICU with a capacity of eight beds. The primary epidemiological characteristics of the patients receiving care at this hospital include chronic degenerative, oncological, cardiovascular, metabolic, and neurological diseases. The ICU operates with four nurses per shift, distributed across four shifts: morning, afternoon, and two night shifts (A and B).

Universe and Sample

The universe consisted of the nursing staff working in the ICU at the hospital's main site. A purposive convenience sampling method was employed to achieve a sample size as close as possible to the universe. The sample included all nursing staff assigned to the ICU service responsible for patients on mechanical ventilation between June and July 2024, with 19 participants in total.

Selection Criteria

The inclusion criterion required participants to be nursing staff working in the ICU, responsible for patients on mechanical ventilation during the study period. No exclusion criteria were established, but the elimination criterion considered that incomplete information would not be used. Additionally, any participant who chose to revoke their consent and withdraw from the study after it had begun would be excluded.

Instruments and Collection Techniques

A form in a Word document was used to collect the data, which included the following information: age, gender, shift, academic level, work experience, and ICU experience. Participants were also asked if they were familiar with the VAP prevention bundle and the safety barriers (proper hand hygiene technique and the use of personal protective equipment when caring for a patient on mechanical ventilation). Nursing records were reviewed to identify any pneumonia diagnosis and antibiotic therapy orders.

The adherence of nursing staff to proper hand hygiene techniques and protective equipment when caring for patients with mechanical ventilation was observed. Compliance with *Cédula única de Gestión de los Paquetes de Acciones Preventivas de las Infecciones Asociadas a la Atención de la Salud-NAVM* was verified. This tool is the national standard and includes evidence on VAP prevention measures. It evaluates nursing staff attending to patients with mechanical ventilation, ensuring they perform the following actions: head-of-bed positioning, assessment for possible sedation interruption, closed suction system, weaning evaluation, brushing and rinsing with 0.12% chlorhexidine or saline solution, and active humidification. The form consists of six items with the responses being 'Yes', 'No', and 'NA' (Yes = 1, No = 0, and Not Applicable = NA), with full compliance on all six items equating to 100%, and so on.[7] This form is based on the 2015 Clinical Practice Guideline for nursing interventions for the prevention of VAP in critically ill adults at in

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second- and third-level hospitals, developed by the Ministry of Health, which includes the previously mentioned points and general prevention strategies for VAP.[3,5,6]

Data Collection Procedure

Participants had been previously informed of the study's objectives and procedures, ensuring their understanding and addressing any questions.

After collecting the data, compliance with VAP prevention measures (included in the Cédula única de Gestión-NAVM) was assessed in person, while the nurses cared for patients with mechanical ventilation. Compliance with safety barriers (hand hygiene technique and protective equipment use) was also evaluated.

All collected data were coded to maintain participant confidentiality. The information was entered into a secure database, accessible only to the authorized research team.

Data Analysis

Descriptive statistics were used, specifically mean and standard deviation, for the variables age and work experience. For the remaining variables (gender, shift, category, academic level, and knowledge of the HAI action bundle for VAP prevention and safety barriers), proportions and frequencies were employed, using the statistical software SPSS 24.

Ethical Aspects

This study strictly adhered to the Declaration of Helsinki, which outlines the ethical principles for medical research involving human subjects. It was reviewed and approved by the General Zone Hospital's Ethics Committee at IMSS in Mexicali, Mexico (R-2024-205-054).

Throughout the research stages, the following ethical principles were upheld:

Regarding respect for persons, the rights, dignity, and well-being of the participants were protected throughout the study. The nursing staff were informed about the study's objectives, procedures, potential risks, and benefits, as well as their right to withdraw at any time without any repercussions.

All participants gave informed consent before being included in the study. Relevant information was clearly explained, and participants were allowed to ask questions and receive appropriate answers.

Confidentiality was ensured by coding personal data and securely storing it to prevent any unauthorized disclosure.

RESULTS

Participant Characteristics

The average age was 39 years (SD = 5.1), with 68.3% of participants being women and 31.6% men. Concerning academic level, 57.9% held a bachelor's degree in nursing with postgraduate ICU training, followed by a bachelor's degree in nursing at 21.0%. The morning shift accounted for 31.6%, followed by the evening and night shifts B at 26.3% each. The average work experience of the nursing staff at IMSS was 13.6 years (SD = 4.5 years), and the average ICU experience was 3.7 years (SD = 3.3) (Table 1).

Compliance with VAP Prevention Bundle Measures

Head-of-bed positioning and suctioning were performed in 100% of cases, sedation interruption in 84.2%, and weaning and oral hygiene in 89.5%. In contrast, humidification was not performed in any case (Table 2).

Table 1. Demographic and Work Characteristics of the ICU Nurses (n=19)

Variable	Category	n	%
Gender	Man	6	31,6
	Woman	13	68,4
Shift	Morning	6	31,6
	Afternoon	5	26,3
	Night A	3	15,8
	Night B	5	26,3
Academic Level	Master's Degree	3	15,8
	Bachelor of Nursing	4	21,0
	Bachelor of Nursing with Specialty	1	5,3
	Bachelor of Nursing with Postgraduate ICU Training	11	52,9

Source: Author's own elaboration.

Table 2. Compliance with VAP Prevention Bundle. (n=19)

Variable	Category	n	%
Semi-Fowler Position	Yes	19	100
	No	0	0
Sedation Interruption	Yes	16	84.2
	No	3	15.8
Closed Suctioning Technique	Yes	19	100
	No	0	0
Ventilation Weaning	Yes	17	89.5
	No	2	10.5
Oral Hygiene	Yes	17	89.5
	No	2	10.5
Active or Passive Humidification	Yes	0	0
	No	19	100

Source: Author's own elaboration.

Compliance with Safety Barriers

Regarding the general actions of the nursing staff, 100% reported being familiar with the VAP Prevention Bundle.

Although there were enough supplies in the ICU to perform the hand hygiene technique properly, only 68.4% complied with the five moments of hand hygiene, and 78.9% used protective equipment when attending to patients on mechanical ventilation. Additionally, 78.9% recorded pneumonia data in the nursing sheets, and 94.7% of the patients had orders for antibiotic therapy (Table 3).

Table 3. General Actions of ICU Nursing Staff. (n=19)

Variable	Category	n	%
Knowledge of the HAI Package	Yes	19	100
	No	0	0
Supplies for Hand Hygiene	Yes	19	100
	No	0	0
Performing Hand Hygiene Technique	Yes	13	68.4
	No	6	31.6
Using Protective Equipment	Yes	15	78.9
	No	4	21.1
Record of Pneumonia	Yes	15	78.9
	No	4	21.1
Antibiotic is Indicated	Yes	18	94.7
	No	1	5.3

Source: Author's own elaboration.

DISCUSSION

predominant demographic of female participants in their thirties, with a bachelor's degree in nursing with postgraduate ICU training, working the morning shift, and with an average ICU experience of nearly four years. These findings are similar to those of Jam et al.[12] regarding age, gender, and shift. Regardless of educational background, ICU staff need to be trained in VAP prevention.[6,9]

The results show that all participants are familiar with the VAP prevention bundle, which means they have a solid foundation for VAP prevention strategies. This contradicts the findings of Pastrana et al., where only 43% claimed to know the prevention protocol.[13]

Over 84% of participants complied with the VAP prevention strategies, except for passive humidification, which none of the participants performed. According to Villamón, humidifiers and heat-moisture exchangers reduce bacterial colonization and condensation and have a lower cost than potential complications.[14] Various national evaluation tools indicate that active or passive humidification should be used in patients with mechanical ventilation.[7,8,15]

Concerning the general actions of the nursing staff, such as the use of safety barriers, despite having the necessary supplies for hand hygiene and personal protective equipment, only 68.4% and 78.9% complied with these two barriers, respectively. Undoubtedly, the handling of invasive methods by healthcare teams is a determining factor in the development of complications such as HAIs.[16]

The study by Granizo et al.[11] showed similar compliance rates for safety barriers, but this remains an unacceptable value, as such omissions contribute to the development of HAIs.[17,18] Moreover, the nursing sheets indicated that most patients had pneumonia and were receiving antibiotics.

In Mexico, the incidence rate of VAP in 2023 was 14 per 1,000 days of mechanical ventilation;[19] however, there is still a lack of information published in Mexico regarding nursing staff's compliance with the evaluation form and preventive actions, as well as the impact these measures have on patient health.

A limitation of this study is that it only included nursing staff assigned to the ICU, which represents a small sample in a specific context. Future studies could incorporate nursing staff in other hospitals within the same context.

CONCLUSIONS

This study included predominantly female nursing staff with postgraduate ICU training. They showed high compliance with most of the recommendations for preventing pneumonia, except for active or passive humidification. On the other hand, compliance with safety barrier measures was low.

Based on the results, it is recommended that new strategies be incorporated to achieve high compliance with the full set of measures. This would significantly reduce the risk of pneumonia in patients requiring mechanical ventilation.

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AUTORSHIP:
AVO: Conceptualization, Investigation, Methodology, Validation, Writing – Original Draft Preparation, Writing – Review & Editing.
DVR: Conceptualization, Investigation, Methodology, Validation, Writing – Original Draft Preparation, Writing – Review & Editing.
MSA: Conceptualization, Investigation, Methodology, Validation, Writing – Original Draft Preparation, Writing – Review & Editing.
PVE: Análisis formal, Investigación, Metodología, Validación, Escritura - borrador original, Escritura - revisión y edición.
JRH: Formal Analysis, Investigation, Methodology, Validation, Writing – Original Draft Preparation, Writing – Review & Editing.
MHC: Formal Analysis, Supervision, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing.

REFERENCES

1. Alegranzzi B, Cassini A, editor. Global report on infection prevention and control. Primera ed. Geneva: World Health Organization; 2022. 182 p.
2. Pezo Galdea MA, Menoscal Tómala KL, García Barreto A. Neumonía asociada a ventilación mecánica en pacientes ingresados en UCI: Etiología y factores de riesgo. RECIMUNDO 2018;2(3):140-150. https://doi.org/10.26820/recimundo/2.(3).julio.2018.140-150
3. Maldonado E, Fuentes I, Riquelme M, Sáez M, Villarroel E. Documento de Consenso: Prevención de Neumonía Asociada a Ventilación Mecánica del adulto. Rev Chil Med Intensiva. 2018;33(1):15-28.
4. Secretaría de Salud México. Boletín Infecciones Asociadas a la Atención de la Salud Red Hospitalaria de Vigilancia Epidemiológica (RHOVE). Primera ed. México: Dirección General de Epidemiología; 2022. 25 p.
5. Arias-Rivera S, Jam-Gattell R, Casais N, Vázquez-Calatayul M y equipo Neumonía-Zero. Actualización de las recomendaciones del proyecto Neumonía Zero. Enferm Intensiva 2022; 33: S17-S30. https://doi.org/10.1016/j.enfi.2022.05.005
6. Bruno Carrasco G, Posos González M, editor. Intervenciones de Enfermería para la Prevención de Neumonía Asociada a Ventilación Mecánica en el adulto hospitalizado en áreas críticas de segundo y tercer nivel de atención: GPC de Enfermería. Primera ed. México: Centro Nacional de Excelencia Tecnológica en Salud; 2015. 43 p.
7. Sarabia González O, Moreno Sánchez P, Zenteno Martínez I, Sánchez Rodríguez M, Rodríguez Farfán F, Sernas Romero R, editor. Manual para la Implementación de los Paquetes de Acciones Para Prevenir y Vigilar las Infecciones Asociadas a la Atención de la Salud. Primera ed. México: 2019. 68 p.

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Compliance level with prevention measures for ventilator-associated pneumonia among nurses in a Mexican hospital.
Rev. chil. enferm. 2024;6:75995.

8. Secretaría de Salud México. Boletín Infecciones Asociadas a la Atención de la Salud Red Hospitalaria de Vigilancia Epidemiológica (RHOVE), Primer trimestre 2023. Primera ed. México: Dirección General de Epidemiología; 2023. 22 p.

9. Torres López J, Gerónimo Carrillo R, Magaña Castillo M. Conocimiento y práctica de enfermería para prevenir la Neumonía Asociada al Ventilador. Rev. CONAMED. 2017;22(2):76-81

10. Peláez I, Morales A. Impacto de una intervención educativa en destete de ventilación mecánica en el profesional de enfermería del servicio de medicina interna del hospital general regional SSA Zihuatanejo. [Tesis de Especialistas en Enfermería en Cuidados Intensivos]. Guerrero: Universidad Autónoma de Guerrero; 2018.

11. Granizo-Taboada WT, Jiménez-Jiménez MM, Rodríguez-Díaz JL, Parcon-Bitanga M. Conocimiento y prácticas del profesional de enfermería sobre prevención de neumonía asociada a ventilación mecánica. AMC 2020;24(1):a6531.

12. Jam R, Hernández O, Mesquida J, Turégano C, Carrillo E, Pedragosa R, et al. Carga de trabajo y cumplimiento por parte de las enfermeras de las medidas no farmacológicas para la prevención de la neumonía asociada a la ventilación mecánica. Estudio piloto. Enferm Intensiva 2017;28(4):178–186. http://dx.doi.org/10.1016/j.enfi.2017.03.001

13. Pastrana Domínguez C, Velázquez Moreno E, Zarate Grajales RA. Factores asociados al incumplimiento del protocolo de prevención de neumonías asociadas a la ventilación mecánica. Rev Iberoam Educ Investig Enferm. 2022;12(3):31-41. https://doi.org/10.56104/Aladafe.2022.12.1021000388

14. Villamón Nevot M. Evaluación del cumplimiento de un protocolo de prevención de Neumonía asociada a Ventilación mecánica en una UCI polivalente. Enferm Glob. 2015;14(2):102–117.

15. Sanabria-Cordero D, Trejo-Rosas S, Méndez- Jesús IA, Silva-Escamilla MC. Impacto de la humidificación activa vs pasiva en la incidencia de neumonía asociada a la ventilación mecánica en la unidad de cuidados intensivos del Hospital de Infectología, Centro Médico Nacional "La Raza", IMSS. Arch Med Urgen Mex. 2024;16(2):72-80. https://dx.doi.org/10.35366/117752

16. Villacres-García E, Vivar-Morá CS, Gadvay Bonilla NM, Espinoza-Balseca LK. Prevención y manejo clínico de la neumonía asociada a ventilación mecánica en unidad de cuidados intensivos. Dom Cien. 2022; 8(2): 500-519. http://dx.doi.org/10.23857/dc.v8i2.2768

17. Cadillo Morales PG, Costa R, Arcaya Moncada MJ. Estrategias para garantizar la seguridad del paciente crítico. Enferm Global 2024; 73:514-27. https://doi.org/10.6018/eglobal.579091

18. Holguín Macías M, Carvajal Cabrera I. Prácticas de bioseguridad de enfermería asociada a neumonía a ventilación mecánica en terapia intensiva. Rev Científica Higía de la Salud. 2022;7(2). https://doi.org/10.37117/higia.v7i2.725

19. Secretaría de Salud México. Boletín Infecciones Asociadas a la Atención de la Salud Cierre de información 2023. Red Hospitalaria de Vigilancia Epidemiológica (RHOVE), Julio 2024. Primera ed. México: Dirección General de Epidemiología; 2024. 14 p.