Title

Specific Training Improves the Detection and Management of Patient-Ventilator Asynchrony

Abstract

BACKGROUND: Patient-ventilator asynchrony is common in patients undergoing mechanical ventilation. The proportion of health-care professionals capable of identifying and effectively managing different types of patient-ventilator asynchronies is limited. A few studies have developed specific training programs, but they mainly focused on improving patient-ventilator asynchrony detection without assessing the ability of health-care professionals to determine the possible causes. METHODS: We conducted a 36-h training program focused on patient-ventilator asynchrony detection and management for health-care professionals from 20 hospitals in Latin America and Spain. The training program included 6 h of a live online lesson during which 120 patient-ventilator asynchrony cases were presented. After the 6-h training lesson, health-care professionals were required to complete a 1-h training session per day for the subsequent 30 d. A 30-question assessment tool was developed and used to assess health-care professionals before training, immediately after the 6-h training lecture, and after the 30 d of training (1-month follow-up). RESULTS: One hundred sixteen health-care professionals participated in the study. The median (interquartile range) of the total number of correct answers in the pre-training, post-training, and 1-month follow-up were significantly different (12 [8.75–15], 18 [13.75–22], and 18.5 [14–23], respectively). The percentages of correct answers also differed significantly between the time assessments. Study participants significantly improved their performance between pre-training and post-training (P < .001). This performance was maintained after a 1-month follow-up (P 5.95) for the questions related to the detection, determination of cause, and management of patient-ventilator

asynchrony. CONCLUSIONS: A specific 36-h training program significantly improved the ability of health-care professionals to detect patient-ventilator asynchrony, determine the possible causes of patient-ventilator asynchrony, and properly manage different types of patient-ventilator asynchrony. © 2024 Daedalus Enterprises.

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References

Thille AW, Rodriguez P, Cabello B, Lellouche F, Brochard L., Patientventilator asynchrony during assisted mechanical ventilation, Intensive Care Med, 32, 10, pp. 1515-1522, (2006); Mirabella L, Cinnella G, Costa R, Cortegiani A, Tullo L, Rauseo M, Et al., Patient-ventilator asynchronies: clinical implications and practical solutions, Respir Care, 65, 11, pp. 1751-1766, (2020); Chao DC, Scheinhorn DJ, Stearn-Hassenpflug M., Patient-ventilator trigger asynchrony in prolonged mechanical ventilation, Chest, 112, 6, pp. 1592-1599, (1997); Blanch L, Villagra A, Sales B, Montanya J, Lucangelo U, Lujan M, Et al., Asynchronies during mechanical ventilation are associated with mortality, Intensive Care Med, 41, 4, pp. 633-641, (2015); Vaporidi K, Babalis D, Chytas A, Lilitsis E, Kondili E, Amargianitakis V, Et al., Clusters of ineffective efforts during mechanical ventilation: impact on outcome, Intensive Care Med, 43, 2, pp. 184-191, (2017); Ramirez II, Arellano DH, Adasme RS, Landeros JM, Salinas FA, Vargas AG, Et al., Ability of ICU health-care professionals to identify patient-ventilator asynchrony using waveform analysis, Respir Care, 62, 2, pp. 144-149, (2017); Ramirez II, Adasme RS, Arellano DH, Rocha ARM, Andrade FMD, Nuunez-Silveira J, Et al., Identifying and managing patient-ventilator

asynchrony: an international survey, Med Intensiva (Engl Ed), 45, 3, pp. 138-146, (2021); Colombo D, Cammarota G, Alemani M, Carenzo L, Barra FL, Vaschetto R, Et al., Efficacy of ventilator waveforms observation in detecting patient-ventilator asynchrony, Crit Care Med, 39, 11, pp. 2452-2457, (2011); Bulleri E, Fusi C, Bambi S, Pisani L., Patient-ventilator asynchronies: types, outcomes and nursing detection skills, Acta Biomed, 89, 7S, pp. 6-18, (2018); Longhini F, Colombo D, Pisani L, Idone F, Chun P, Doorduin J, Et al., Efficacy of ventilator waveform observation for detection of patientventilator asynchrony during NIV: a multicentre study, ERJ Open Res, 3, 4, pp. 00075-2017, (2017); Ramirez II, Gutierrez-Arias R, Adasme RS, Arellano DH, Felipe Damiani L, Gordo-Vidal F, Effect of a specific training program on patient-ventilator asynchrony detection and management, Med Intensiva (Engl Ed), 47, 6, pp. 353-355, (2023); Chacon E, Estruga A, Murias G, Sales B, Montanya J, Lucangelo U, Et al., Nurses' detection of ineffective inspiratory efforts during mechanical ventilation, Am J Crit Care, 21, 4, pp. e89-e93, (2012); Gravante F, Crisci F, Palmieri L, Cecere L, Fusi C, Bulleri E, Et al., The impact of a training intervention on detection of patient-ventilator asynchronies in nursing students, Acta Biomed, 93, S2, (2022); de Haro C, Ochagavia A, Lopez-Aguilar J, Fernandez-Gonzalo S, Navarra-Ventura G, Magrans R, Et al., Patient-ventilator asynchronies during mechanical ventilation: current knowledge and research priorities, Intensive Care Med Exp, 7, (2019); Pham T, Telias I, Piraino T, Yoshida T, Brochard LJ., Asynchrony consequences and management, Crit Care Clin, 34, 3, pp. 325-341, (2018); Imanaka H, Nishimura M, Takeuchi M, Kimball WR, Yahagi N, Kumon K., Autotriggering caused by cardiogenic oscillation during flow-triggered mechanical ventilation, Crit Care Med, 28, 2, pp. 402-407, (2000); Rodriguez PO, Tiribelli N, Fredes S, Gogniat E, Plotnikow G, Fernandez Ceballos I, Et al., Prevalence of reverse triggering in early ARDS: results from a multicenter observational study, Chest, 159, 1, pp. 186-195, (2021); Magrans R, Ferreira F, Sarlabous L, Lopez-Aguilar J, Goma G, Fernandez-Gonzalo S, Et al., The effect of clusters of double triggering and

ineffective efforts in critically ill patients, Crit Care Med, 50, 7, pp. e619-e629, (2022); Kyo M, Shimatani T, Hosokawa K, Taito S, Kataoka Y, Ohshimo S, Shime N., Patient-ventilator asynchrony, impact on clinical outcomes and effectiveness of interventions: a systematic review and meta-analysis, J Intensive Care, 9, 1, (2021); Blanch L, Sales B, Montanya J, Lucangelo U, Garcia-Esquirol O, Villagra A, Et al., Validation of the Better Care[VR] system to detect ineffective efforts during expiration in mechanically ventilated patients: a pilot study, Intensive Care Med, 38, 5, pp. 772-780, (2012); Marchuk Y, Magrans R, Sales B, Montanya J, Lopez-Aguilar J, de Haro C, Et al., Predicting patient-ventilator asynchronies with Hidden Markov Models, Sci Rep, 8, 1, (2018); Chen C-W, Lin W-C, Hsu C-H, Cheng K-S, Lo C-S., Detecting ineffective triggering in the expiratory phase in mechanically ventilated patients based on airway flow and pressure deflection: feasibility of using a computer algorithm, Crit Care Med, 36, 2, pp. 455-461, (2008); Casagrande A, Quintavalle F, Lena E, Fabris F, Lucangelo U., Pressure-flow breath representation eases asynchrony identification in mechanically ventilated patients, J Clin Monit Comput, 36, 5, pp. 1499-1508, (2022); Mulqueeny Q, Ceriana P, Carlucci A, Fanfulla F, Delmastro M, Nava S., Automatic detection of ineffective triggering and double triggering during mechanical ventilation, Intensive Care Med, 33, 11, (2007); Sousa MLA, Magrans R, Hayashi FK, Blanch L, Kacmarek RM, Ferreira JC., Predictors of asynchronies during assisted ventilation and its impact on clinical outcomes: the EPISYNC cohort study, J Crit Care, 57, pp. 30-35, (2020); Gutierrez G, Ballarino GJ, Turkan H, Abril J, De La Cruz L, Edsall C, Et al., Automatic detection of patient-ventilator asynchrony by spectral analysis of airway flow, Crit Care, 15, 4, (2011)

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