Characteristics of patients

Variable	Nonsurvivors	Survivors	p value
Age, years	66 (62-73)	61 (46-67)	**0.021**
APACHE II	21 (15-33)	19 (11-21)	0.06
SAPS	53 (38-79)	47 (40-56)	0.26
PaO2/FiO2	140 (96-190)	136 (92-229)	0.84
Vt/kg, ml	8 (7-8)	7 (6-9)	1
Pplateau, cmH2O	31 (28-33)	28 (24-30)	**0.01**
PEEP, cmH2O	11 (8-14)	10 (9-12)	0.73
Pdriving. cmH2O	20 (14-23)	15 (12-18)	**0.008**
Cst, ml/cmH2O	29 (21-36)	37 (30-50)	**0.008**

Conclusion: COVID 19 related ARDS seems to have similar characteristics as other forms of ARDS. Lung protective ventilation with low plateau and driving pressures may be related with lower mortality.

001617

Prediction model of endotracheal obstruction, in patients with severe pneumonia due to COVID 19, analyzing ventilatory parameters using intelligent computation

G. Pérez-Acosta[1]; J. Navarro-Mesa[2]; L. Santana-Cabrera[1]; J. Blanco-Lopez[1]; C. Suárez-Araujo[3]; J. Martín-González[1]
[1]ICU, C.H.U. Insular-Materno Infantil, Las Palmas de Gran Canaria, Spain; [2]Idetic, Universidad de las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain; [3]Iuctc, Universidad de las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain
Correspondence: G. Pérez-Acosta
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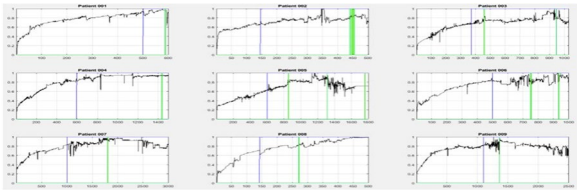
Introduction: Patients admitted to the ICU with severe COVID-19 pneumonia present clinical complications during their admission, such as endotracheal obstruction due to accumulation of secretions. This problem often requires urgent endotracheal tube change and manual ventilation, both of which are health risk procedures for the generation of aerosols and constitute a potential life-threatening risk for the patient.
The model based on Machine Learning (ML) techniques and intelligent computing, using the signals produced by the respirators, constitute fundamental tools for the extraction of common patterns related to obstruction, and for the creation of prognostic and therapeutic prediction systems.
Objectives: To study the possibility of predicting the appearance of endotracheal obstruction in patients with COVID-19 pneumonia, using neuronal computing techniques, integrating the different respiratory variables during hospital admission into a model.
Generate a predictive model that follows the time course of patients with COVID-19 pneumonia undergoing mechanical ventilation and predict the appearance of endotracheal obstruction well in advance.
Methods: Descriptive, observational study using data mining in 22 patients with Pneumonia due to COVID-19, where 16 of them presented an episode of endotracheal obstruction during their admission to the IMU. Compilation of the respiratory variables Peak Pressure, Plateau Pressure, Medium Pressure, Resistance and Compliance, collected at least every 15 minutes during the entire intensive care admission. The recording of signals during the hours prior to the development of the obstruction is studied, representing the signals collected synchronously and in parallel. To develop a neural computing model, using data mining techniques, to analyze the existence of specific temporal patterns that help early detection of endotracheal obstruction, hours before it occurs.
Results: Based on the designed predictive model, changes in the respiratory mechanical signals collected by the system during admission to the ICU that precede the development of endotracheal obstruction are detected, with an average anticipation of 47 hours.



The model's output (black line) provides information about lung mechanics, from patient admission to endotracheal obstruction (green line). Image 1 shows common patterns of changes in lung mechanics prior to obstruction. The blue line indicates the start of abnormal changes in the registry, thus indicating the start time of the alert against possible obstruction. In the studied patients, changes in the pulmonary mechanics are observed with an average 47 hours before the episode of endotracheal obstruction.
Conclusion: We demonstrate that the application of computational intelligence techniques and data mining on lung mechanical signals studied, show promising results in the early detection of endotracheal obstruction.
This is of great value for the prevention of this complication during ICU admission, being useful in reducing the mortality of COVID-19 patients and reducing biosanitary risk.

Reference(s) and grant ackowledgment(s)

1. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Yang X, Yu Y, Xu J, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study SO. Lancet. 2020.
2. Pérez Acosta G, Santana L Traqueobronquitis necrotizante con obstrucción del tubo endotraqueal en pacientes COVID-19. Revista Clínica Española. DOI: 10.1016/j.rce.2020.05.002.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville. "Deep Learning". MIT Press. 2016. http://www.deeplearningbook.org.
4. Amisha, Paras Malik, Monika Pathania, and Vyas Kumar Rathau. Overview of artificial intelligence in medicine. J Family Med Prim Care. 2019 Jul; 8(7): 2328–2331. https://doi.org/10.4103/jfmpc.jfmpc_440_1.
5. None.

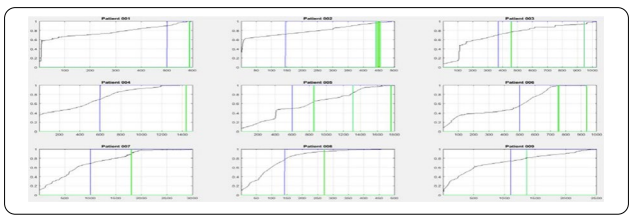
001633

Prediction model of endotracheal obstruction, in patients with severe pneumonia due to COVID 19, analyzing clinical parameters using intelligent computing

G. Pérez-Acosta[1]; J. Navarro-Mesa[2]; J. Blanco-Lopez[1]; C. Suárez-Araujo[3]; L. Santana-Cabrera[1]; J. Martín-González[1]
[1]ICU, C.H.U. Insular-Materno Infantil, Las Palmas de Gran Canaria, Spain; [2]Idetic, Universidad de las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain; [3]Iuctc, Universidad de las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain
Correspondence: G. Pérez-Acosta
Intensive Care Medicine Experimental 2020, **8(2)**: 001633

Introduction: The current COVID-19 pandemic has caused a high percentage of patients who require critical management due to acute hypoxemic respiratory failure with the need for mechanical ventilation. This situation implies a high vital risk in addition to possible respiratory complications such as obstruction of the endotracheal tube.
This complication occurs suddenly from the first week of admission, it is a medical emergency due to the impossibility of ventilation of the patient and implies a high risk of contagion for the health workers due to exposure to aerosols.
Data mining and Artificial Intelligence (AI) techniques are a fundamental tool to create patient profiles, study their common characteristics and help predict the evolutionary development of this disease.
Objectives: Design and develop a computational predictive model to study the evolution of patients with COVID-19 pneumonia with

mechanical ventilation. Analyzing the clinical variables that help predict the development of endotracheal obstruction over time.
Methods: We recorded the clinical variables (heart rate, systolic blood pressure, diastolic pressure, mean pressure, oxygen saturation, and temperature) of all patients at least every 15 minutes during the entire intensive care admission. The variables were The set of variables were studied, represented in graphs synchronously and in parallel.
Through data mining and the development of neural networks, a computational model was generated that helps early detection of endotracheal obstruction.
Results: In our unit, of the 22 patients with COVID-19 Pneumonia who required mechanical ventilation, 72.7% had at least one episode of endotracheal obstruction. 100% of these events took place after 7 days of admission.
The predictive model detects changes in the clinical variables studied that precede the endotracheal obstruction with an average advance of 42 hours.



In the Image 1, the changes observed in the clinical variables precede the development of endotracheal obstruction (green line). It shows common patterns of disturbances in the studied signals prior to obstruction. The blue line shows the start of abnormal registry changes indicating the time.
In the studied patients, clinical changes are observed with an average 42 hours before the endotracheal obstruction.
Conclusion: The use of signal recording of clinical variables, studied techniques using data mining and RNN techniques, show promising results in the early detection of endotracheal obstruction, being of great value for the prevention of this complication during ICU admission, reducing mortality of the Covid-19 patients as well as the risk for the health workers.

Reference(s) and grant ackowledgment(s)

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman. The Elements of Statistical Learning Data Mining, Inference, and Prediction. Springer Series in Statistics book series (SSS). 2009. DOI https://doi.org/10.1007/978-0-387-84858-7.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville. "Deep Learning". MIT Press. 2016. http://www.deeplearningbook.org.
3. Pérez Acosta G, Santana L Traqueobronquitis necrotizante con obstrucción del tubo endotraqueal en pacientes COVID-19. Revista Clínica Española. DOI: 10.1016/j.rce.2020.05.002.
4. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Yang X, Yu Y, Xu J, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study SO. Lancet. 2020.
5. None.

001214

CPAP in prehospital patients with dyspnoea: implications during COVID-19 pandemic in Portugal. Analysis of an ambulance staffed nurse

P. Vasconcelos[1]; J. Lourenço[1]; LM. Ladeira[1]; F. Barros[1]; S. Rodeia[1]; A. Correia[1]; S. Nelson[2]; F. Rato[1]
[1]Departamento de emergência médica, Instituto Nacional de Emergência Médica, Lisboa, Portugal; [2]Serviço de anestesiologia, Hospital Professor Doutor Fernando da Fonseca, E.P.E, Amadora, Portugal
Correspondence: J. Lourenço
Intensive Care Medicine Experimental 2020, **8(2)**: 001214

Introduction: Continuous Positive Air Pressure (CPAP) treatment is used when approaching patients with dyspnoea in the prehospital (PH) setting1. Despite being one of the best treatment strategies for this clinical condition, CPAP is an aerosol generating procedure. Therefore brought insecurity to the emergency PH teams and challenges to maintain its application. In order to promote its safe use the Department of Emergency Medicine (DEM) of the National Institute for Medical Emergency (INEM), modified the procedure promoting security.
Objectives: To analyse prehospital CPAP use in two homologous periods, before and during the COVID-19 pandemic.
Methods: A case series of CPAP used by Lisbon Immediate Life Support ambulance (SIV- ambulance staffed nurse), before and during COVID-19 pandemic will be compared. For this purpose, patients records between 1st of March and 30th July 2019 and the same period in 2020 were extracted from the ITEAMS clinical record (INEM Tool for Emergency Alert System), concerning the application of dyspnoea protocol3,4 where CPAP is recommended.
Results: Between 1st of March and 30th July 2019, dyspnoea protocol was applied in 121 patients, resulting in 11 uses of CPAP (9%). For the same period in 2020 (COVID-19 pandemic period), dyspnoea protocol was applied in 80 patients, resulting in 4 CPAP applications (5%). However, it should be considered that at the beginning of the pandemic in Portugal the use of CPAP was discouraged. Only after 28th of April 2020, when a safer method of CPAP was suggested, nurses felt comfortable and secure to use this treatment.
Between 1st of May and 30th July 2020, dyspnoea protocol was applied to 39 patients, resulting in 3 CPAP uses (7.7%), compared to the same period in 2019 when dyspnoea protocol was applied in 66 patients, resulting in 4 CPAP uses (6%).
Conclusion: The use of CPAP in PH is essential to maintain quality of care for patients with dyspnoea. Its use was decreased at the beginning of the pandemic in Portugal but measures were implemented promoting the safe use of CPAP. The results demonstrate the maintenance and even an increase in the use of CPAP compared to the same period in 2019 (7.7% in 2020 *vs* 6% in 2019). Until now, no staff member of the SIV Lisboa ambulance had COVID-19. This analysis refers to one out of the 40 SIV ambulances with nurses in Portugal, which is not sufficient to national extrapolation of data.

Reference(s) and grant ackowledgment(s)

1. 1. Schwerin DL, Goldstein S. EMS, Prehospital CPAP Devices. StatPearls Publ. 2019. https://www.ncbi.nlm.nih.gov/books/NBK470429/. Accessed July 23, 2020.
2. 2. Departamento de Emergência Médica/Instituto Nacional de Emergência Médica. Orientação Técnica 11/2020 DEM: Oxigenoterapia, Suporte Respiratório e SAV, Em Pandemia COVID-19.
3. 3. Departamento de Emergência Médica/Instituto Nacional de Emergência Médica. Protocolo Ambulância SIV: Dispneia.; 2018.
4. 4. Departamento de Emergência Médica/Instituto Nacional de Emergência Médica. Protocolo Ambulância SIV: Dispneia Em Pandemia COVID-19.; 2020.
5. 5: Departamento de Emergência Médica/Instituto Nacional de Emergência Médica. Orientação Técnica 03/2020 DEM: Atuação Perante Suspeita de Doença COVID-19.

001261

Predicting the response to high flow nasal cannula as first-line respiratory support in the patients with pneumonia covid-19 and acute respiratory failure

M. De Alba Aparicio[1]; S. Carcel Fernandez[1]; C. López Martin[1]; M. Porras Pantojo[1]; C. De La Fuente Martos[1]; JM. Serrano Simón[1]
[1]Intensive Care Unit, Hospital Universitario Reina Sofia, Córdoba, Spain
Correspondence: M. De Alba Aparicio
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Introduction: Experience from the use of high-flow nasal oxygen (HFO) in acute hypoxemic respiratory failure (AHRF) (1), indicates that this method of respiratory support may reduce the invasive mechanical ventilation requirement of patients with COVID-19, depending on the degree of V/Q matching, and may be an appropriate therapy when conventional oxygen therapy does not provide sufficient respiratory