شبكة المعلومات الجامعية

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بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

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Validation of the Modified Integrative Weaning Index as a Predictor of Weaning from Mechanical Ventilation in Comparison to Conventional Weaning Indices in Adult Critically Ill Patients.

Thesis submitted for the partial fulfillment of PhD degree in Intensive Care Medicine

By

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Hythem Barakat

Contents

List of Abbreviations

A-a DO_2	:	Alveolar-arterial gradient of oxygen tension
ABG	:	Arterial blood gases
A/C	:	Assist control
ALI	:	Acute lung injury
APACHE	:	Acute physiology and chronic health evaluation
ARDS	:	Acute respiratory distress syndrome
ARF	:	Acute respiratory failure
BP	:	Blood pressure
BMI	:	Body mass index
°C	:	Degrees Celsius
CI	:	Confidence interval
cm	:	Centimeter
CO_2	:	Carbon dioxide
COPD	:	Chronic obstructive pulmonary disease
CPAP	:	Continuous positive airway pressure
Cst,rs	:	Static compliance of respiratory system
dL	:	Deciliter
ECG	:	Electrocardiogram
ETT	:	Endotracheal tube
f	:	Frequency (respiratory rate)
FiO_2	:	Fraction of inspired oxygen
g	:	Grams
GCS	:	Glasgow coma scale
H_2O	:	Water
Hg	:	Mercury
HR	:	Heart rate
Ht	:	Height
ICU	:	Intensive Care Unit
IWI	:	Integrative weaning index
kg	:	Kilogram
L	:	Liter
min	:	Minute
mIWI	:	Modified integrative weaning index

List of Abbreviations (cont.)

mL	:	Milliliter
mm	:	millimeter
MV	:	Mechanical Ventilation
No.	:	Number
NPV	:	Negative predictive value
O_2	:	Oxygen
OR	:	Odds ratio
P0.1	:	Tracheal occlusion pressure
$PaCO_2$	:	Partial arterial carbon dioxide pressure
PaO_2	:	Partial arterial oxygen pressure
PEEP	:	Positive end expiratory pressure
PEEPi	:	Intrinsic positive end expiratory pressure (auto-peep)
Pinsp	:	Peak inspiratory pressure
PIP	:	Peak inspiratory pressure
PL	:	Transthoracic pressure
Pmus	:	Muscle generated pressure
Ppl	:	Transpleural pressure
Pplat	:	Plateau pressure
PPV	:	Positive predictive value
PS	:	Pressure support
Pz	:	Pressure at zero flow
Pvent	:	Proximal airway pressure on mechanical ventilation
Raw	:	Airway resistance
ROC	:	Receiver operator curve
RR	:	Respiratory rate
RSBI	:	Rapid shallow breathing index
SBT	:	Spontaneous breathing trial
SD	:	Standard deviation
SIMV	:	Synchronized intermittent mechanical ventilation
SpO_2	:	Peripheral capillary oxygen saturation
Temp	:	Temperature
Vi	:	Inspiratory flow
Vt	:	Tidal Volume
Wt	:	Weight

List of Tables

List of Figures

Introduction

Mechanical ventilation is an essential therapy used in Intensive care units for a variety of reasons with a variety of conditions, for the most, it is an invasive therapy and could result in several complications. On average, approximately 40% of critically ill patients will require mechanical ventilation at some point of their intensive care unit (ICU) stay. These patients will require a weaning protocol to remove them successfully from ventilator support, especially invasive mechanical ventilation. This weaning process, as it differs, could occupy an average 40% of the patient's total ventilation time. The extubation and weaning periods continue to be one of the most challenging aspects for intensive care teams (Wunsch et al. 2013).

Timely recognition of the return to spontaneous ventilation is essential for reducing costs, morbidity, and mortality. Delays in both removing invasive ventilatory support and excessively early removal are correlated with complications that vary according to the severity of the underlying disease. Several weaning indices and predictors were studied in an attempt to evaluate the outcome of removing ventilatory support. However, none of them have yet presented good results in discriminating the outcome of extubation, even those most used in clinical practices (Kollef et al. 1997).

There is no shortage of observational investigations examining the accuracy of weaning predictors. Whether accurate or not, there is no high-level evidence demonstrating that routine application of weaning predictors improves outcome. One possible application would be for the clinician who, despite published evidence to the contrary, remains hesitant to wean in the face of favorable clinical screening criteria (adequate oxygenation, hemodynamic stability, presence of spontaneous inspiratory efforts). Only under these circumstances will weaning predictors have the potential to reduce the duration of mechanical ventilation (Epstein 2009).

Recently, a new index was created, the modified integrative weaning index (IWI) = static compliance of respiratory system x arterial oxygen saturation/frequency/tidal volume (Cst,rs × arterial oxygen saturation/f/Vt ratio). This index evaluates respiratory mechanics, oxygenation, and respiratory pattern in an integrated manner. It demonstrated improved accuracy for weaning failure, and it was superior to all other predictors. The authors suggest that this index could also be used to predict extubation outcome (Nemer et al. 2009).

The threshold used to best discriminate the success or failure of weaning was >25 ml/cm H_2O/breath/min/L. However, all studies conducted on this index were carried out on a narrow patient population variant, and small patient population number, with no correlation to other less considered predictors, thus decreasing reliability of its use on various patient populations and their follow-up (Nemer et al. 2009). Other studies state that the modified IWI is as nonspecific as other indices in predicting weaning success, however is a good predictor for extubation failure (Epstein 2009).