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Observation scales to suspect dyspnea

in non-communicative intensive care unit patients

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Dyspnea, like pain, is a major cause of physical suffering and emotional distress. In the intensive care unit, mechanically ventilated patients are at high risk of dyspnea [1] and increasing attention is given to this symptom [1, 2]. Because its evaluation relies on self-report and self-assessment [3], dyspnea carries the risk of being underestimated or even unrecognized and therefore unattended in many intensive care unit patients. This is particularly so in patients unable to communicate with their caregivers (sedation, delirium ...). We recently developed and validated a specific intensive care unit version of the respiratory distress observation scale (IC-RDOS, http://www.ic-rdos.com) [4]. IC-RDOS, based on respiratory and behavioural signs, correlates strongly with ratings of dyspnea on a visual analogic scale in "communicative" patients, but this is by definition not the most pertinent target population. The present secondary analysis describes IC-RDOS in "non-communicative" intensive care unit patients, as the first step of its clinical and prognostic evaluation in this setting.

The 120 communicative patients of the yet reported cohort were compared to 73 non-communicative patients (sedation, n = 49; delirium, n = 9; not understanding the questions/instructions, n = 6; or another cause, n = 9) admitted during the same 4.5 months period. Clinical data were gathered during the first 24 hours of the intensive care unit stay, between 8 and 10 a.m. Based on the 21 observable variables with possible clinical relevance (namely, to detect dyspnea) among the 120 communicative patients, the selection started with a principal component analysis which identified 11 explanatory variables that mostly contributing to the principal axes. These variables were entered into an iterative partial least square regression process that ultimately identified 5 variables, of which the combination and weighting allowed optimal correlation with dyspnea on a visual analogic scale including: heart rate , use of neck muscles during inspiration, abdominal paradox during inspiration, facial expression of fear and supplemental oxygen which constitute the IC-RDOS.

In the present principal component analysis, quantitative variables were centered and reduced, binomial variables were treated as "0" or "1" in a quantitative manner, and the "communicative/non-communicative" variable was treated as an illustrative variable not participating in the building of the factorial analysis.

Expectedly, the non-communicative patients were, compared to the communicative ones, more often mechanically ventilated, more often on supplemental oxygen, more acidotic and had higher severity scores (Table SDC 1). Otherwise, their general characteristics were roughly similar to those of the communicative patients. IC-RDOS values were not different in both groups (2.3 [1.1-3.1] in the communicative patients, versus 2.4 [2.2-2.7] in the non-communicative ones, p=0.115) although this result should be interpreted with caution since this ancillary study was underpowered to address such comparison. These two sub-populations as well as their corresponding centers of gravity were further plotted and compared on the main factorial plan (F1 X F2) expressing 57.23% of the total inertia. Beyond the similarity in IC-RDOS values, the projections of the two sub-populations (communicative and non-communicative patients) first had very nearly centers of gravity, second were geometrically congruent (Figure 1), attesting the homogeneity of the communicative and non-communicative populations in terms of physical and behavioral manifestations based on the five IC-RDOS variables.

These results suggest that IC-RDOS could be of value to identify non-communicative intensive care unit patients experiencing dyspnea. This hypothesis will have to be verified, for example by studies testing the responsiveness of IC-RDOS to interventions known to alleviate dyspnea in the intensive care unit context [1], like this has been done for RDOS in palliative care [5].

References

1. Schmidt M, Banzett RB, Raux M, Morelot-Panzini C, Dangers L, Similowski T, Demoule A (2014) Unrecognized suffering in the ICU: addressing dyspnea in mechanically ventilated patients. Intensive Care Med 40: 1-10
2. Chanques G, Nelson J, Puntillo K (2015) Five patient symptoms that you should evaluate every day. Intensive Care Med 41: 1347-1350
3. Binks AP, Desjardin S, Riker R (2017) ICU Clinicians Underestimate Breathing Discomfort in Ventilated Subjects. Respir Care 62: 150-155
4. Persichini R, Gay F, Schmidt M, Mayaux J, Demoule A, Morelot-Panzini C, Similowski T (2015) Diagnostic Accuracy of Respiratory Distress Observation Scales as Surrogates of Dyspnea Self-report in Intensive Care Unit Patients. Anesthesiology 123: 830-837
5. Campbell ML, Templin T, Walch J (2010) A Respiratory Distress Observation Scale for patients unable to self-report dyspnea. J Palliat Med 13: 285-290

Figure 1. Panel A shows the calculation of the Intensive Care Respiratory Distress Observation Scale (IC-RDOS). An IC-RDOS $\geq$ 2.4 predicted a visual analogic scale for dyspnea (D-VAS) of 4 or greater with equal sensitivity and specificity (72%) in communicative patients. Panel B shows the comparison of the communicative and non-communicative populations. Patients are plotted on the main factorial plan (F1XF2=57.23% of the total inertia) from a principal component analysis build with the five variables of the IC-RDOS together with their respective ellipses and barycenters.

Figure 1

Panel A

Variables	Score
0 –	**3,3**
1 – Heart Rate (beats/min)	**+ (Heart rate)/65**
2 – Use of neck muscles during inspiration	
if present	**+ 1**
if absent	**- 1**
3 – Abdominal paradox during inspiration	
if present	**+ 1**
if absent	**- 1**
4 – Facial expression of fear	
if present	**+ 1**
if absent	**- 1**
5 – Supplemental oxygen	
if present	**+ 0.7**
if absent	**- 0.7**

Panel B

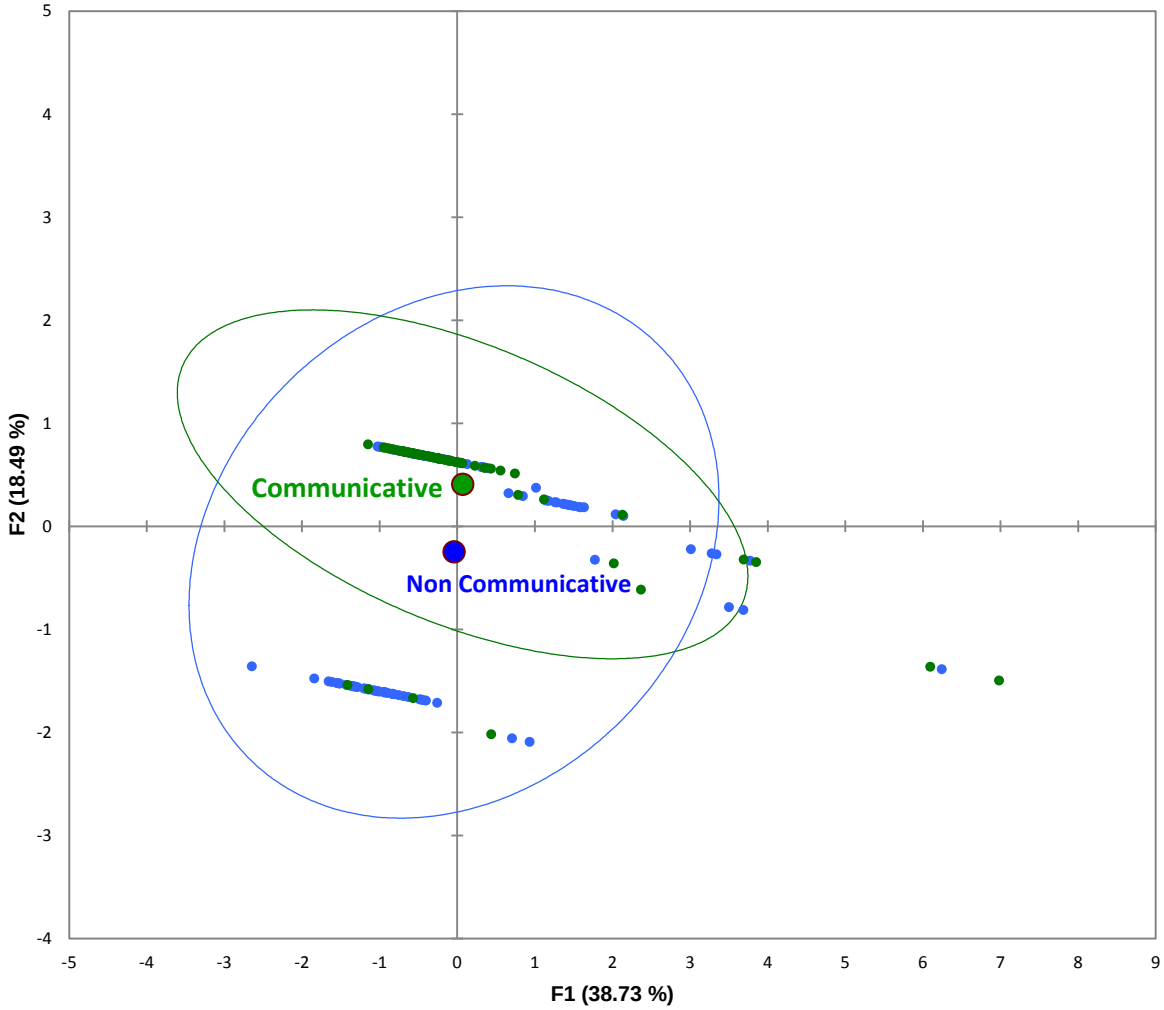

Table SDC 1. Comparison of the communicative (n=120) and non-communicative (n=93) patients in the derivation cohort

	communicative (n = 120)	**non-communicative (n = 73)**	*p*
age (y)	61 [46 - 71]	60 [45 - 73]	0.575
male gender	60%	60%	1.000
height (cm)	1.68 [1.60 - 1.73]	1.70 [1.65 - 1.77]	0.431
weight (kg)	71 [60 - 83]	73 [60 - 90]	0.365
BMI (kg/m^2)	25 [21 - 28]	25 [22 - 27]	0.768
respiratory admission	63% (76/120)	44% (32/73)	0.011*
oxygenotherapy	66% (79/120)	93% (68/73)	<0.0001*
mechanical ventilation	12% (14/120)	75% (55/73)	<0.0001*
HR (beat/min)	95 [80 - 105]	91 [77 - 108]	0.628
RR (cycle/min)	22 [18 - 26]	20 [18 - 25]	0.238
systolic APB (mmHg)	123 [110 - 135]	117 [102 - 135]	0.165
diastolic ABP (mmHg)	65 [56 - 75]	58 [53 - 70]	0.042
SpO_2 (%)	97 [95 - 99]	98 [96 - 100]	0.036
PaO_2 (mmHg)	81 [70 - 93]	98 [76 - 124]	0.001*
$PaCO_2$ (mmHg)	37.7 [32.5 - 45.9]	37.5 [32.3 - 48.7]	0.772
HCO_3^- (mmol/l)	25.2 [20.9 - 29.1]	22.5 [18.7 - 26.6]	0.017
pH	7.41 [7.36 - 7.47]	7.35 [7.27 - 7.42]	<0.0001*
Hb (g/dl)	11.6 [9.7 - 13.5]	11.2 [9.1 - 13.1]	0.207
lactate (mmol/l)	1.4 [1.0 - 2.0]	1.9 [1.2 - 2.6]	0.009
temperature (°C)	37.0 [36.4 - 37.5]	37.0 [36.0 - 37.7]	0.851
SAPSII	33 [21 - 43]	61 [45 - 75]	<0.0001*
RDOS	2 [1 - 3]	2 [1 - 3]	0.816
IC-RDOS	2.3 [1.1 - 3.1]	2.4 [2.2 - 2.7]	0.115

Data are expressed as median [interquartile range] for quantitative data and frequency (%) for qualitative data.

Univariate comparisons were conducted between the communicative and non-communicative patients using Fisher's exact test for binomial variables and the Mann-Whitney U-test for quantitative variables.

The "*" symbol denotes p values below 0.05 that remained significant after correction for multiple comparisons according to Benjamini-Hochberg procedure (see methods); corrected p-value for this table = 0.0117.

BMI: body mass index; ABP: arterial blood pressure; HR: heart rate; RR: respiratory rate; Hb: hemoglobin; SpO_2: pulse oximetry; SAPSII: simplified acute physiology score II, RDOS: respiratory distress observation scale, IC-RDOS: intensive care - respiratory distress observation scale, IC-RDOS.