ALN201412073

Supplemental Digital Content 1
Table 1
Original respiratory Distress Observation Scale (RDOS) as described by Campbell et al. [adapted from Campbell ML, J Palliat Med 2010]

Variable	**0 Point**	**1 Point**	**2 Points**	**Total**
Heart rate (beats per minute)	< 90	90 - 109	≥ 110	
Respiratory rate (breaths per minute)	≤ 18	19 - 30	> 30	
Restlessness: non purposeful movements	None	Occasional slight movements	Frequent movements	
Paradoxical breathing pattern: abdomen moves in on inspiration	None	-	Present	
Accessory muscle use: rise in clavicle during inspiration	None	Slight rise	Pronounced rise	
Grunting at end expiration: guttural sound	None	-	Present	
Nasal flaring: involuntary movement of nares	None	-	Present	
Look of fear			Eyes wide open Facial muscles tense Brow furrowed Mouth open Teeth together	
Total				

Detailed description of the intensive care-respiratory distress observation scale (IC-RDOS) construction proccess

To begin with, a correlation matrix was established between D-VAS as the quantitative variable to explain and 21 observable variables with possible clinical relevance (11 quantitative variables : heart rate -HR-, respiratory rate -RR-, systolic arterial pressure -SAP-, diastolic arterial pressure -DAP-, mean arterial pressure -MAP-, pulsed oxygen saturation -SpO2-, body temperature -Temp-, weight, height, body mass index -BMI-, age ; 10 binomial qualitative variables : admission for a respiratory motive -RespAdm-, agitation, abdominal paradox during inspiration -paradox-, use of neck muscle during inspiration -accessory-, end-expiratory grunting -grunting-, nasal flaring, mechanical ventilation -MV-, supplemental oxygen, facial expression of fear, gender). Factorial principal component analysis was then performed to select those of the variables mostly contributing to the principal axes (first factorial plan). This led to retain 11 explanatory variables (5 quantitative: HR, RR, SpO2, Temp, and height; 6 qualitative: RespAdm, paradox, accessory, nasal flaring, supplemental oxygen, facial expression of fear). These variables were entered into an iterative partial least square regression process (PLS) that characterizes each variable in terms of its VIP index (variable importance in the projection). An initial model provided a r^2 of 0.389, with an mean square errors of prediction (MSEP) of 4.872 and a root mean square errors (RMSE) of 2.207. Imposing a lower limit of 0.8 for the VIP index limited the variables set to HR (RR was excluded because of statistical redundancy with HR), RespAdm, paradox, accessory, supplemental oxygen, facial expression of fear, and Temp. With this model, r^2 was 0.415 with an MSE of 4.666 and a RMSE of 2.160. From this, the 0.8 VIP criterion led to retain 5 variables, namely HR, paradox, accessory, supplemental oxygen, and facial expression of fear. Iterations were performed to determine weighting factors that optimized the model. This led to a maximal r^2 value of 0.61, withIC-RDOS = 3.3 + (HR/65) + IF(Paradox breathing=0,-1,1) + IF(Accessory muscles=0,-1,1) + IF(Oxygen=0,-0.7,0.7) + IF(Fear=0,-1,1). This model was simplified into IC-RDOS = 3.3 + (HR/65) +/- (1 X Paradox breathing) +/- (1 X Accessory muscles) +/- (0.7 X Oxygen) +/- (1 X Fear) for the sake of applicability, and without loss of performance.

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Geladi P, Kowalski B. Partial least-squares regression: a tutorial. Analytical Chimical Acta,1986 185:1-17.

Tenenhaus M,Gauchi J-P,Ménardo C.Régression PLS et applications. Revue de statistique appliqué,e 1995, 43: 7-63.

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Figure 1. Sensitivity (Se) and specificity (Sp) of the modified intensive care respiratory distress observation scale (IC-RDOS) to predict moderate to severe dyspnea (dyspnea visual analog scale ≥ 4) in the initial derivation cohort (panel A, 120 patients) and in the subsequent validation cohort (panel B, 100 patients).

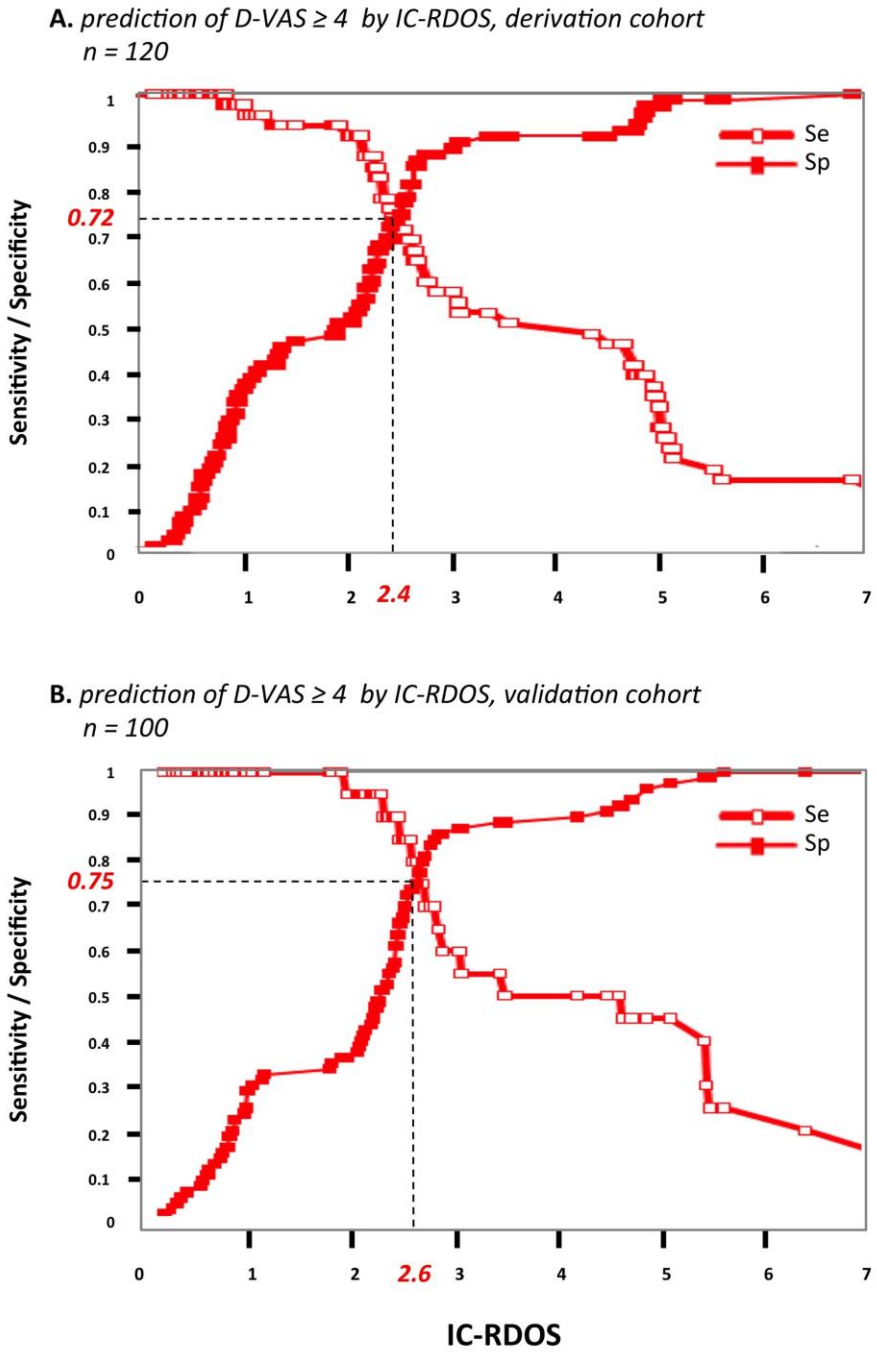

Table 2

Physicians-Nurses agreement for orginal observational respiratory distress observation scale (RDOS) and adapted intensive care RDOS (IC-RDOS), and their constituting variables.

Physicians *vs.* Nurses	**Kendall's W** [continuous variables]	**Cohen's kappa** [dichotomous variables]
RDOS	Tau = **0.453**	not applicable
IC-RDOS	Tau = **0.656**	not applicable
Heart rate (bpm)	Tau = **0.719**	not applicable
Respiratory rate	Tau = **0.405**	not applicable
Restlessness	not applicable	Kappa = **-0.018** 95%CI = [-0.166 – 0.0130]
Abdominal paradox during inspiration	not applicable	Kappa = **-0.045** 95%CI = [-0.247 – 0.157]
Use of neck muscle during inspiration	Tau = **0.473**	not applicable
End-expiratory grunting	not applicable	Kappa = **0.477** 95%CI = [0.274 – 0.680]
Nasal flaring	not applicable	Kappa = **-0.028** 95%CI = [-0.234 – 0.177]
Facial expression of fear	not applicable	Kappa = **0.087** 95%CI = [-0.092 – 0.267]
Supplemental oxygen	not applicable	Kappa = **0.973** 95%CI = [0.763 – 1.183]

Table 3
Characteristics of the patients in the derivation and validation cohorts used to develop the modified intensive care respiratory distress observation scale (IC-RDOS)

	derivation cohort (communicant patients) *(n=120)*	**validation cohort** *(n = 100)*	p
age (y)	61 [46 - 71]	64 [51 - 75]	0.138
male gender	60% (72)	56% (100)	0.584
height (cm)	1.68 [1.60 - 1.73]	1.70 [1.63 - 1.77]	0.260
weight (kg)	71 [60 - 83]	72 [63 - 84]	0.438
BMI (kg/m2)	25 [21 - 28]	25 [22 - 29]	0.677
respiratory admission	62% (74)	74% (74)	0.061
oxygenotherapy	67% (80)	69% (69)	0.773
mechanical ventilation	12% (14)	17% (17)	0.331
HR (beat/min)	95 [80 - 105]	95 [84 - 107]	0.489
RR (cycle/min)	22 [18 - 26]	23 [18 - 26]	0.700
systolic arterial pressure (mmHg)	123 [110 - 135]	123 [112 - 144]	0.310
diastolic arterial pressure (mmHg)	65 [56 - 75]	68 [58 - 79]	0.189
mean arterial pressure (mmHg)	84 [76 - 92]	85 [76 - 98]	0.178
SpO_2 (%)	97 [95 - 99]	97 [95 - 99]	0.735
PaO_2 (mmHg)	81 [70 - 93]	81 [68 - 93]	0.925
$PaCO_2$ (mmHg)	37.7 [32.5 - 45.9]	40 [35 - 52]	0.103
HCO_3^- (mmol/l)	25.2 [21.0 - 29.1]	25.0 [21.0 - 29.0]	0.962
pH	7.41 [7.36 - 7.47]	7.40 [7.34 - 7.44]	0.027
Hb (g/dl)	11.6 [9.7 - 13.5]	11.1 [9.4 - 13.2]	0.194
lactate (mmol/l)	1.4 [1.0 - 2.0]	1.4 [1.0 - 1.9]	0.806
temperature (°C)	37.0 [36.4 - 37.5]	37.0 [36.4 - 37.5]	0.841
SAPSII	33 [21 - 43]	35 [24 - 49]	0.079
anxiety			
percentage of patients	51% (61)	52% (52)	0.893
VAS when anxiety present	5.4 [4.0 - 8.0]	4.0 [2.5 - 5.5]	0.003
pain			
percentage of patients	44% (41/94)	38% (38)	0.466
VAS when pain present	4.5 [2.0 - 6.0]	3.8 [2.0 - 5.5]	0.289
dyspnea			
percentage of patients	57% (69)	47% (47)	0.137
VAS when dyspnea present	4.5 [3.2 - 6.0]	3.8 [2.6 - 4.8]	0.009
IC-RDOS	2.3 [1.2 - 3.1]	2.4 [1.3 - 2.8]	0.664

Data are expressed as median [interquartile range] for quantitative data end frequency (%) for qualitative data. Mann & Whitney test or Fisher's exact test as appropriate.

Although come p values were below 0.05, none of the comparisons remained significant after correction for multiple comparisons according to Benjamini-Hochberg procedure (see methods).

BMI: body mass index; HR: heart rate; RR: respiratory rate; Hb: hemoglobin; SpO_2: pulse oximetry; SAPSII: simplified acute physiology score II.