

Comparison of usual and alternative methods to measure patient's height in mechanically ventilated patients: potential impact on protective ventilation

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Online supplement

Additional Methods:

The following equations and table were used in the study:

Predicted body weight equations:

$$\text{PBW (kg)} = 50 + (0.91 * \text{height (cm)} - 152.4) \text{ for men}$$

$$\text{PBW (kg)} = 45.5 + (0.91 * \text{height (cm)} - 152.4) \text{ for women}$$

From the reference (1)

Chumlea equations:

$$64.19 - (0.04 * \text{age}) + (0.02 * \text{lower leg size (cm)}) \text{ for men}$$

$$84.88 - (0.24 * \text{age}) + (1.83 * \text{lower leg size (cm)}) \text{ for women}$$

From the reference (26)

ONLINE DATA SUPPLEMENT

	Height (m)													
Men (<65 years)	1.94	1.93	1.91	1.89	1.87	1.85	1.84	1.82	1.80	1.78	1.76	1.75	1.73	1.71
Men (≥65 years)	1.87	1.86	1.84	1.82	1.81	1.79	1.78	1.76	1.75	1.73	1.71	1.70	1.68	1.67
Ulna length (cm)	32	31.5	31	30.5	30	29.5	29	28.5	28	27.5	27	26.5	26	25.5
Women (<65 years)	1.84	1.83	1.81	1.80	1.79	1.77	1.76	1.75	1.73	1.72	1.70	1.69	1.68	1.66
Women (≥65 years)	1.84	1.83	1.81	1.79	1.78	1.76	1.75	1.73	1.71	1.70	1.68	1.66	1.65	1.63
Men (<65 years)	1.69	1.67	1.66	1.64	1.62	1.60	1.58	1.57	1.55	1.53	1.51	1.49	1.48	1.46
Men (≥65 years)	1.65	1.63	1.62	1.60	1.59	1.57	1.56	1.54	1.52	1.51	1.49	1.48	1.46	1.45
Ulna length (cm)	25	24.5	24	23.5	23	22.5	22	21.5	21	20.5	20	19.5	19	18.5
Women (<65 years)	1.65	1.63	1.62	1.61	1.59	1.58	1.56	1.55	1.54	1.52	1.51	1.50	1.48	1.47
Women (≥65 years)	1.61	1.60	1.58	1.56	1.55	1.53	1.52	1.50	1.48	1.47	1.45	1.44	1.42	1.40

Measure between the point of the elbow (olecranon process) and the midpoint of the prominent bone of the wrist (styloid process). From the reference (27)

Figure Legends (online supplement)

Figure E1: Theoretical impact of the height measurement error on the protective ventilation implementation in male (upper panel) and in female (lower panel). Tidal volume really delivered (ml/kg of PBW) with a target tidal volume of 6 ml/kg PBW for different errors on height measurements and for different heights.

Abbreviations: PBW: predicted body weight

Figure E2: The error of the visual estimation were inversely proportional to the patient's height. *Solid lines* represents linear regression. Correlation coefficient: $r=0.52$, $P<0.0001$.

Additional Table

	Patients with height > 167 cm (n=49)	Patients with height ≤ 167 cm (n=51)
Female gender, n (%)	2 (4.1)	23 (45.0)
Age (year)	Min;Max 31; 80	Min;Max 50; 89
BMI (kg/m ²)	21.1; 49.1	20.8; 35.5
Height (cm)		
Based on height gauge (reference)	168; 188	149; 167
Based on lower leg	165; 185	145; 176
Based on forearm	155; 182	148; 175
Based on visual estimation	156; 183	152; 180
Based on measuring tape	163; 188	150; 177
Weigh (kg)		
Actual weight (Kg)	61.0; 146.2	41.0; 107.7
PBW based on height gauge (reference)	61.5; 82.4	42.4; 63.3
PBW based on lower leg	57.7; 79.6	39.3; 71.5
PBW based on forearm	47.9; 76.9	41.5; 70.6
PBW based on visual estimation	53.3; 77.8	45.1; 73.3
PBW based on measuring tape	59.6; 82.4	43.3; 72.8
Tidal volume 8 ml/kg (ml)		
TV based on actual weight	488; 1170	328; 861
TV based on height gauge (reference)	492; 659	339; 506
TV based on lower leg	461; 637	314; 572
TV based on forearm	383; 615	332; 565
TV based on visual estimation	426; 623	361; 586
TV based on measuring tape	477; 659	347; 583
Error on tidal volume compared to reference (ml)*		
Δ TV based on actual weight	-623; 80	-394; 33
Δ TV based on lower leg	-87; 67	-82; 82
Δ TV based on forearm	-73; 146	-73; 15
Δ TV based on visual estimation	-73; 102	-149; 347
Δ TV based on measuring tape	-124; 58	-138; 36

Table E1: Impact of the method of height measurement on tidal volume setting. Minimal and maximal values are reported in this table.

*The error was calculated for a target of 8 ml/kg with the following formula: tidal volume with height reference – tidal volume with other methods. Negative values correspond to overestimation of the tidal volume.

Abbreviations: BMI: body mass index; PBW: predicted body weight; TV: tidal volume

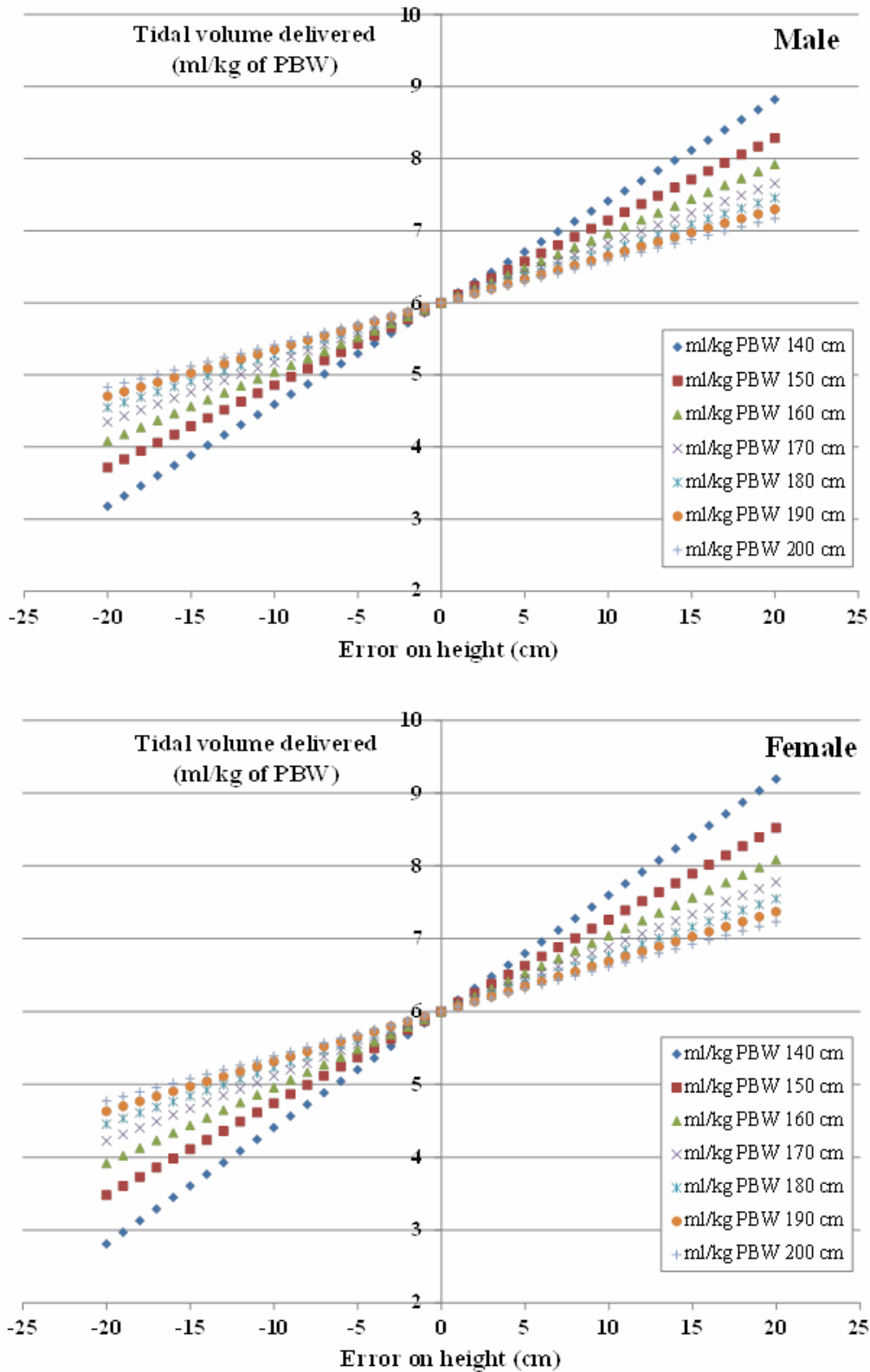


Figure E1: Theoretical impact of the height measurement error on the protective ventilation implementation in male (upper panel) and in female (lower panel).

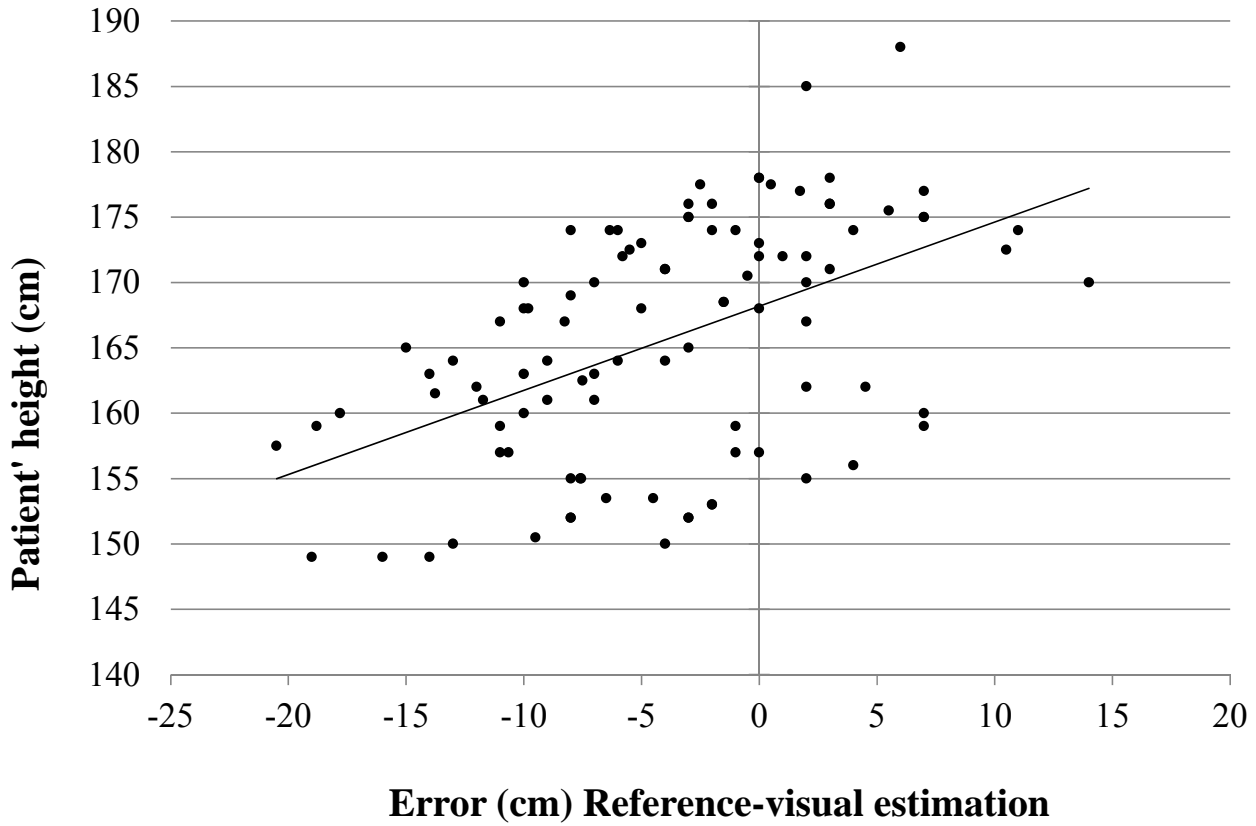


Figure E2: The error of the visual estimation were inversely proportional to the patient's height. *Solid lines* represents linear regression. Correlation coefficient: $r=0.52$, $P<0.0001$.