“Weighing-Cam”: A new mobile application for weight estimation in paediatric resuscitation

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Aim

We evaluated the validity of a newly developed mobile application (ie, the weighing-cam) for paediatric weight estimation.

Patients and methods

We developed the weighing-cam that estimates the weight of patients using a smartphone camera and displays the drug dosage, device size, and defibrillation energy on the screen of the smartphone according to the estimated weight. We enrolled a convenience sample of children aged <16 years presenting to two paediatric emergency departments. The children’s heights and weights were measured, and then one researcher estimated the weights using the weighing-cam. Using measured data, we calculated the weight estimated by the Broselow tape. We compared measures with mean percentage error (MPE), mean absolute percentage error (MAPE), root mean square percentage error (RMSPE), and percentage of estimated within 10% (PW10) and 20% (PW20) of actual.

Table 1 Performances of the weighing-cam vs Broselow tape

Statistics	Weighing-cam		Broselow tape	Difference (Weighing-cam vs BT)	
	n=480	n=309	n=309	Mean	95% CI
MPE, % (SD)	0.99 (11.29)	1.68 (11.05)	3.66 (12.27)	-1.98	-2.91 to -1.05
MAPE, % (SD)	5.06 (7.15)	5.38 (7.45)	7.14 (8.02)	-1.76	-2.45 to -1.06
RMSPE, %	11.32	11.16	12.79		
95% LOA, kg	0.80–1.25	0.82–1.25	0.81–1.31		
PW10, % (95% CI)	69.2 (65.0 to 73.3)	68.0 (62.7 to 73.2)	58.9 (53.4 to 64.4)	9.1	3.0 to 15.1
PW20, % (95% CI)	92.5 (90.1 to 94.9)	93.2 (90.4 to 96.0)	88.7 (85.1 to 92.2)	4.5	1.3 to 7.7

Results

A total of 480 patients participated in this study. The weighing-cam demonstrated smaller bias (mean difference: -1.98% for MPE and -1.76% for MAPE, respectively) and a higher proportion of estimated weights within 10% and 20% of actual weights (mean difference: 9.1% for PW10 and 4.5% for PW20, respectively) than the Broselow tape. The weighing-cam estimated the weight inaccurately in underweight and obese groups (PW10: 47.8% for underweight and 30.8% for obese). However, the weighing-cam showed the better performances in term of the accuracy and precision than the Broselow tape in all stratified subgroups by age or BMI percentile.

Conclusions

The weighing-cam may be a more accurate weight estimation tool for children compared with the Broselow tape. The weighing-cam may be useful for paediatric resuscitation in the out-of-hospital settings such as disasters.

Fig. 1. Bland-Altman plots constructed using log-transformed weights for the weighing-cam based on total children (A), the weighing-cam based only on 309 children for whom the Broselow method is applicable (B) and Broselow tape (C).