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Background: The Institute of Medicine's timely, effective, efficient, and safety domains can be jeopardized by improper operation of infrequently used operating room (OR) equipment. The Belmont Rapid Infuser® [Billerica, MA] (BRI) is a rarely used OR medical equipment with the potential to cause serious injury. The aims of this study were to evaluate our current training and certification for proficiency with the BRI and to compare rates of successful BRI assembly between anesthesia providers working individually or in pairs.

Methods: IRB approval was obtained. Requirement for informed consent was waived. Anesthesiologists and CRNA's were trained using our traditional curriculum, which consisted of an oral slide presentation, video, and live presentation outlining the assembly and features of the BRI. They were then tested by a written knowledge-based test (participants tested individually; Pass: $\geq 85\%$ correct) and a timed practicum consisting of BRI assembly to a fully functional state (participants randomized to testing individually or in pairs; Pass: correct BRI assembly in ≤ 2 min). The composite final score was a Pass on both components. The written test consisted of 13 multiple-choice questions, which were validated in a pilot group. The timed practicum was terminated at three minutes irrespective of the state of assembly completion. Trained clinical research coordinators scored the assembly based on critical components of the process and successful priming of the tubing to the patient connection. Proportions were compared with Fischer exact test using R software. A two-tailed $P < 0.05$ was considered significant.

Results: Data were available for 11 individuals and 10 pairs (total $N=31$). Previous experience with the BRI was not significantly different between individuals and pairs (Table 1). While participant confidence regarding the BRI was high at the completion of training, only two participants scored $\geq 85\%$ on the written test. Eight pairs and two individuals did successfully assemble the BRI, although none completed the process in less than two minutes. Pairs were significantly more successful at BRI assembly than individuals (Table 1; $P=0.009$). No participant achieved a composite final score of Pass. Previous experience with the BRI was not significantly different between individuals or pairs who passed the written test or successfully assembled the BRI.

Conclusions: The traditional approach to training in the use of medical equipment, consisting of a lecture and demonstration followed by testing of trainee proficiency in a simulated environment, was not successful in educating proficiency in the majority of trainees. The considerably higher rate of successful assembly of the BRI among paired trainees, compared to individuals, suggests that successful operation of critical, rarely used medical equipment may be facilitated by encouraging providers to manage such equipment in groups, rather than individually.

Table 1: Participant experience and the success with Belmont Rapid Infuser assembly

	Singles		Pairs		<i>P value</i>
	(n = 11)		(n=20/10 pairs)		
	Yes	No	Yes	No	
Independent assembly in past?	2	9	11	9	0.066
Used for patient care in the past?	3	8	7	12	0.702
Has assembled Belmont in the last 6 months?	0	11	1	17	1.0
Confidence in assembling Belmont after the training?	9	1	19	0	0.345
Written knowledge-based test score					
> 85%		0		2	
80-85%		1		4	
70-80%		8		4	
< 70%		2		9	
Successful assembly	2	9	8	2	0.009
< 2 minutes	0		0		
2 – 3 minutes	2		8		
Composite PASS (written knowledge-based test and Belmont assembly)		None		None	

The written knowledge-based test was tested on all participants (N = 31). The actual BRI assembly was tested as singles (N=11) or pairs (N=10).