



Benefits of ProSet proven: Prepacked central line kits reduce time needed mistakes during central line insertion

A study recently published by a research team¹ at the University of Tübingen, Germany, indicates that prepacked central line kits may significantly reduce the number of procedural mistakes and complications during central line catheter insertion. The kits increased the quality of the procedure and at the same time reduced the time required to perform the procedure. Particularly healthcare novices will benefit from these kits since central line placement is a complex procedure causing a high cognitive load as it involves many parts and steps. According to the so-called "split attention principle", cognitive load can be reduced by fusing many different sources of information into a single source². The ProSet by B. Braun takes this principle into account by providing a prepacked kit containing all necessary components for the clinical procedure.

Methodology

In a randomized, controlled, prospective and single-blind study thirty recent medical school graduates and medical students in their final year were randomly assigned to two groups of fifteen each. At the time of the study none of the participants had performed more than fifteen central lines insertions. While one group placed the central line catheter using a prepacked ProSet which contained all necessary components*, the control group used a standard kit which contained only the components for the catheterization of the catheter itself. The latter group thus had to actively select the additional components that are required to place the central line from usual cart. For safety reasons the lines were inserted in dummies. The study participants were assisted by equally inexperienced nursing students.

Table 1: Components of the kit

	Prepacked kit**	Standard kit***
Sterile covering	Drape 75 x 90 cm	
	Gown	
	Fenestrated drape 75 x 110 cm	
	Ultrasound cover	
Patient preparation	3 prep sponges	
	5 gauze balls	
	ECG cable	
Central line catheter insertion	Ultrasound gel	
	3-way stopcock	
	Syringe 10 mL	
	Scalpel	
	Needle 0.9 x 40 mm	
	Needle 0.7 x 30 mm	
	5 compresses	
	Syringe 3 mL	
	Triple lumen catheter (TLC)	Triple lumen catheter (TLC)
	Nitinol guide wire	Nitinol guide wire
Seldinger needle	Seldinger needle	
Dilator	Dilator	
Central line fixation	Catheter clip	Catheter clip
	Suture thread with attached curved needle size 2-0.75 cm	
	Needle holder	
	Adhesive tape	

References

- 1 Yelena Fenik, Nora Celebi, Robert Wagner, Christoph Nikendei, Frederike Lund, Stephan Zipfel, Reimer Riessen and Peter Weyrich: Prepacked central line kits reduce procedural mistakes during central line insertion: a randomized controlled prospective trial; BMC Medical Education 2013, 13:60
- 2 cf. van Merriënboer JJ, Sweller J: Cognitive load theory in health professional education: design principles and strategies. Med Educ 2010, 44(1):85-93
- 3 cf. Regehr G, MacRae H, Reznick RK, Szalay D: Comparing the psychometric properties of checklists and global rating scales for assessing performance on an OSCE-format examination. Acad Med 1998, 73(9):993-997

* The following items were not included in the kit: sterile gloves, mask, lidocaine, saline and syringes. A label listed the items that were not included.

** Prepacked kit: prepacked all-inclusive central line catheter insertion kit containing all of the necessary materials for insertion from preparation to cleanup.

*** Standard kit: central line catheter insertion kit containing only the separately packaged catheter components. The remaining items were available from the materials cart.

All procedures were recorded on video and the videos were evaluated by two experienced physicians. The evaluation was based on a 55-point checklist³ plus five additional quality indicators:

- Duration of the procedure
- Major technical mistakes with potentially negative impact on the patient
- Minor technical mistakes with no potentially negative impact on the patient
- Number of correctly performed procedures according to the checklist
- Breaks in the aseptic technique (each contact of sterile and non-sterile material)

Results

The prepacked kit group made 35% fewer major technical mistakes than the control group and adhered better to the process steps which were mapped on the checklist. And last but not least it took the participants of the ProSet group on average five minutes less than the control group (26:26 +/-3:50 min vs. 1:27 +/-5:57 min) to perform the procedure. Statistically not relevant but noticeable was the trend toward fewer breaches of aseptic technique during the procedure in the ProSet group (1.2 +/-0.8 vs. 3 +/-3.6, $p=0.06$).

Fewer complications by reducing the cognitive load

Central line catheter insertion is a frequent procedure that involves many different materials, components and process steps and thus produces a high cognitive load, particularly for novice physicians. Consequently, the error rate is high among inexperienced junior medical professionals. Prepacked kits can reduce the error rate because the novices do not have to focus on the active selection of the required components. This explains why in four out of five quality indicators the prepacked kits group achieved statistically significant better results than the control group.

Summary: added value of ProSet in clinical routine

The point of departure for the Tübingen research team was the fact that:

- Clinical novices have been shown to have a higher complication rate than experienced healthcare professionals when placing central line catheters and thus need all the support they can be given to minimize risks.
- The use of prepacked kits can be applied to other complex medical procedures.
- Prepacked kits facilitate the selection of materials and allow for homogenous interventional process.

The authors of the study conclude that the advantages of the prepacked kits outweigh possible additional costs and other potential drawbacks such as material surplus since frequently not all kit components are used.

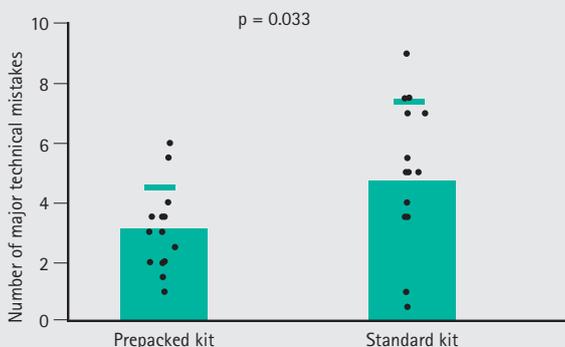


Figure 1 Major technical mistakes. Number of major technical mistakes in the prepacked and standard kit group. Results are displayed as mean \pm SD.

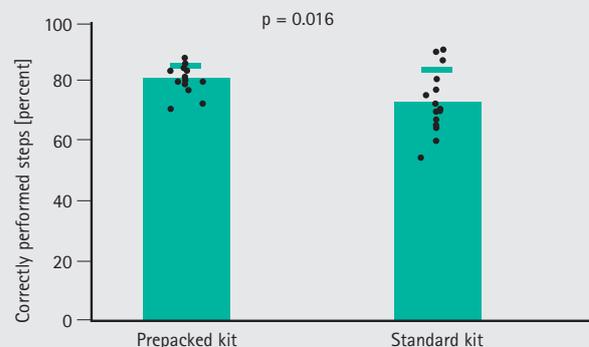


Figure 3 Correctly performed steps. Number of correctly performed steps in the prepacked and standard kit group. Results are displayed as mean \pm SD.

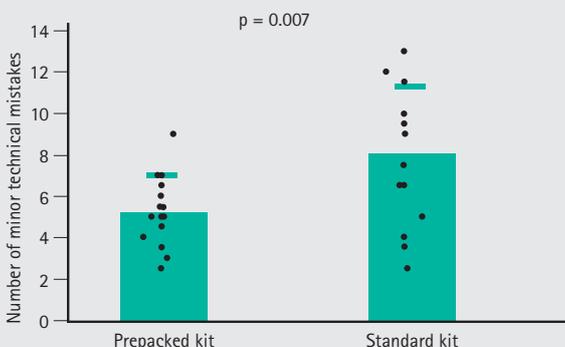


Figure 2 Minor technical mistakes. Number of minor technical mistakes in the prepacked and standard kit group. Results are displayed as mean \pm SD.

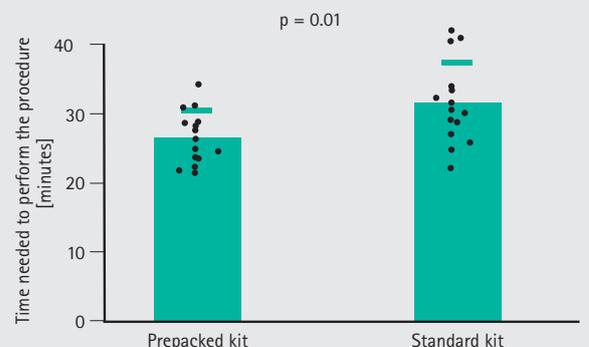


Figure 4 Procedure duration. Procedure duration in the prepacked and standard kit group. Results are displayed as mean \pm SD.

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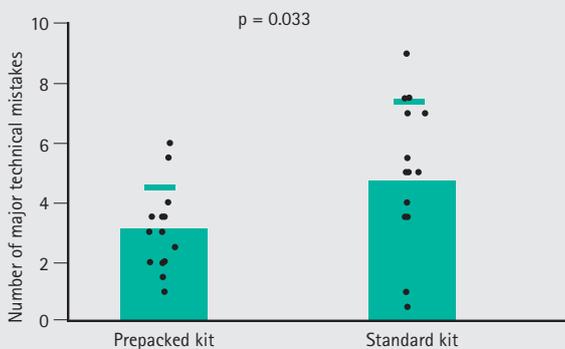


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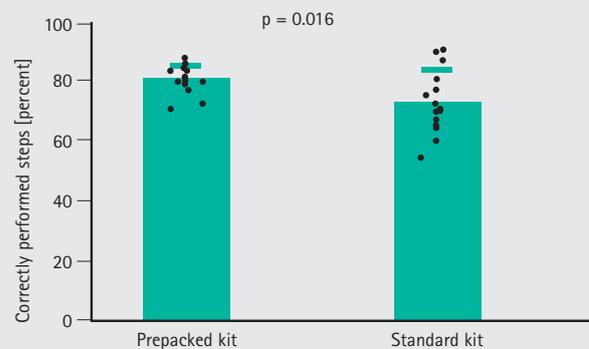


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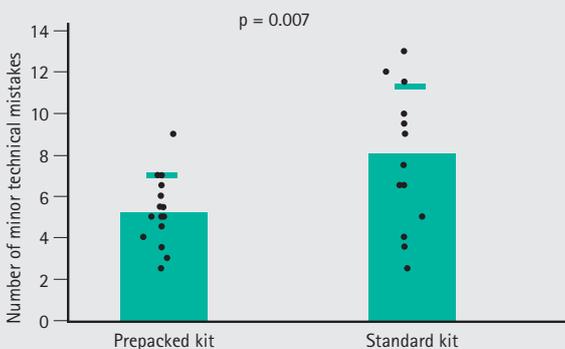


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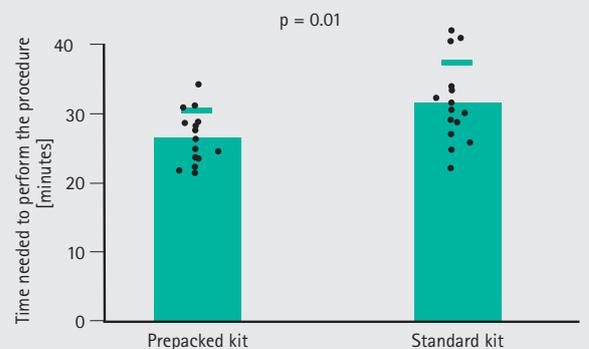


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