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Simulation Based Mastery Learning Reduces Complications during Temporary Haemodialysis Catheter Insertion among Nephrology Trainees

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Aims: Traditional apprenticeship model of teaching in invasive procedures such as temporary haemodialysis catheter insertion (THDC) can result in propagation of errors and complications. Simulation-based training offers step by step standardisation of skills and allow trainees to repeatedly practice invasive procedures in realistic environment prior to performing it on actual patient. We aim to determine whether simulator based mastery learning (SBML) in ultrasound-guided THDC insertion skills improves success rate and reduce complications rate among nephrology fellows.

Methodology: This is an observational cohort study of first-, second- and third-year nephrology trainees in a tertiary care teaching hospital from September 2008 to September 2015. The intervention group (n=7) received a didactic and hands-on, competency-based simulation training course in ultrasoundguided THDC insertion. The historical control group (n=14) were trainees who received training through traditional, bedside, apprenticeship model. The primary outcome was successful THDC insertion and secondary outcome was the complication rates.

Result: 923 internal jugular catheters and 1588 femoral catheters were inserted by 21 trainees in the 96-month period. Successful internal jugular THDC insertion occurred in 100% of the intervention group compared to 99.7% of the control group (P=0.533). Femoral THDC success occurred for 99.2% of the intervention group versus 99.5% of the control group (P=0.509). The intervention group reported fewer overall complications 3.5% vs. 7.7% (P=0.010) and fewer arterial puncture 0.3% vs. 1.9% (P=0.039) for internal jugular THDC insertion. The complication of bleeding/hematoma formation was also lower during femoral THDC insertion in the intervention group. (0 vs. 1.2%, P=0.007). No significant differences occurred between time to first complications between the two groups in both internal jugular and femoral THDC insertion.

Conclusion: Simulation-based mastery learning program was more effective than traditional training in THDC insertion and is associated with decreased procedure related complications.