



Title	Surgical Simulation for Training: Skills Transfer to the Operating Room
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Reference	Report number 61. ISBN 0-909844-83-6. Link to full text report: www.surgeons.org/asernip-s/publications.htm

Aim

To assess whether skills acquired via simulation-based training transfer to the operative setting.

Conclusions and results

This review included 12 randomized controlled trials and 2 nonrandomized comparative studies. It looked at simulation as a concept and included studies with various training techniques in the surgical setting. Differences were found in indications, simulation-based training methods, training times, and the amount of guidance and feedback given to trainees. Most simulation-based training was an add-on to normal surgical training programs. Only one study compared simulation-based training with current training methods (patient-based training).

For laparoscopic cholecystectomy, participants who received simulation-based training prior to conducting patient-based assessment generally performed better than their counterparts who did not have this training. This improvement was not universal for all parameters, but the untrained group never outperformed the trained group. Trained groups generally made fewer errors and reported fewer instances of supervising surgeon take-over than the untrained groups did.

For colonoscopy/sigmoidoscopy, simulation-based training prior to patient-based assessment gave participants an advantage over their untrained controls, particularly in the initial stages of learning.

For catheter-based intervention in occlusive vascular disease and TEP hernia repair, participants seemed to benefit from simulation-based training when later conducting patient-based assessment.

For endoscopic sinus surgery, no differences in performance were found between simulator-trained residents vs controls.

The study that compared patient-based training vs simulation-based training for colonoscopy/sigmoidoscopy found that participants trained in the assessment procedure performed better than those trained exclusively on a simulator without any mentoring or supervision.

Recommendations

Evidence rating: The evidence-base in this review is rated as average. Studies varied in quality and did not have comparable simulation-based methods for the same indications, resulting in an inability to draw solid conclusions.

Methods

Search strategy: MEDLINE, EMBASE, CINAHL, the Cochrane Library, and Current Contents were searched from inception to December 2006. The Clinical Trials Database (US), NHS Centre for Research and Dissemination Databases (UK), National Research Register (UK), Meta Register of Controlled Trials, and the Australian Clinical Trials Registry were also searched in December 2006.

Study selection: Only studies that reported on the use of simulation for surgical skills training, and on the transferability of these skills to the patient care setting, were included. The articles must have contained training and/or measures of performance in the simulated setting and measures of performance in the operative setting. Measures of surgical task performance included accuracy of skills, time to complete technique, efficiency of movement, error rates, and achievement of performance to criterion levels.

Data collection and analysis: Data were extracted by one researcher using standardized data extraction tables developed *a priori* and checked by a second researcher. Statistical pooling was not appropriate due to the heterogeneity of the included studies.

Further research/reviews required

Research is recommended on the transfer of skills acquired via simulation-based training to the patient setting, eg, the nature and duration of training required for maximum transfer effect, the stage at which trainees benefit most from different forms of simulation, the effect of different levels of mentoring, and changes in staff productivity.