Executive Summary

Surgical simulation for training: skills transfer to the operating room
(update)

(Adapted from the report of the Review Group by Susan Dawe)

Background

To assess the evidence published since 2006 (ASERNIP-S report no. 61) to determine whether skills acquired through simulation-based training transfer to the operative setting.

Methods

Search strategy – Studies were identified by searching MEDLINE, EMBASE, CINAHL, The Cochrane Library and Current Contents from the period January 2007 to September 2011. 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 September 2011.

Study selection – Only studies that reported the use of simulation for surgical skills training, and reporting on the transferability of these skills to the patient care setting, were included for review. The articles must have contained data on 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, error rates, time to complete the task, achievement of performance to criterion levels (measured by various validated and non-validated global rating scales and/or task-specific checklists), patient comfort/discomfort scores, and intra- and postoperative complications.

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

Results

A total of 20 randomised controlled trials and three non-randomised comparative studies were included in this review. The review examined surgical simulation, and included studies with various training techniques in the surgical setting. There were differences in indications, simulation-based training methods, training times, and the amount of guidance and feedback provided to trainees. In most cases, simulation-based training was an add-on to normal surgical training programs (patient-
based training). Only two studies compared simulation-based training only with patient-based training only, and one other study used interactive seminar-based education as the comparator.

For laparoscopic cholecystectomy, bilateral tubal ligation, salpingectomy, Nissen fundoplication, diagnostic arthroscopy of the knee, and totally extraperitoneal inguinal hernia repair, camera navigation, participants who received simulation-based training prior to patient-based assessments performed better (higher global assessment score and/or shorter time to complete task) than participants who did not have this training. Simulator-trained groups generally made fewer errors than control groups in subsequent patient-based assessments.

For colonoscopy, cystourethroscopy, endoscopic sinus surgery, and transurethral resection of the prostate, participants who received simulation-based training appeared to perform better (higher global assessment score and/or shorter time to complete task) than controls in subsequent patient-based assessments.

There were no differences in time to complete task between simulator-trained participants compared with controls when performing oesophagogastrroduodenoscopy or nasolaryngoscopy. However, the simulator-trained group required significantly less assistance from the supervisor to complete the task during oesophagogastrroduodenoscopy than the control group. There was no significant difference between the simulator-trained participants and the controls for the flexible laryngoscopy procedure time on the standardised patient or the discomfort assigned by the standardised patient but the authors noted the data was positively skewed by two extremely high values.

For other surgical procedures, abdominal fascial closure, cardiopulmonary bypass weaning following cardiac surgery, phacoemulsification on cataract surgery, and knowledge, attitude and skills in the operating room, participants who received simulation-based training prior to patient-based assessments performed better (higher global assessment score and/or shorter time to complete task) than participants who did not have this training.

One study compared patient-based training with simulation-based training only for colonoscopy and found that participants who had trained exclusively on a simulator without any mentoring or supervision performed at an equivalent standard on the assessment procedure to those who had received patient-based training. One study compared patient-based training with simulation-based training for in-surgery laparoscopic camera navigation and found that simulator-based camera navigation training for laparoscopic surgery was as effective as, and more time efficient than, traditional teaching of this task.

**Conclusions**

Overall the current evidence demonstrates that simulation-based training, as part of a surgical skills training program and incorporating the achievement of reaching predetermined proficiency levels, results in skills transfer to the operating setting.

**Classification and recommendations**

On the basis of the evidence presented in this systematic review, the ASERNIP-S Review Group agreed on the following classifications and recommendations concerning the transferability of skills acquired through simulation-based training to the surgical setting:
Classifications

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

Clinical and research recommendations
It is recommended that further research be conducted into the transfer of skills acquired through simulation-based training to the patient setting, to strengthen the evidence base. Areas still requiring further study include:

- ‘the nature and duration of training required to deliver the greatest transfer effect
- the stage of training at which trainees receive maximum skill transfer benefits from different forms of simulation,
- the effect of different levels of mentoring during the training period on transfer rates, and
- changes in staff productivity as a result of simulation-based training’ (Sturm et al 2007)

Further research could also explore the way that simulation-based technical skills training environments might be used to train and assess non-technical skills, such as decision-making.

Review Group membership

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Important note
The information contained in this report is a distillation of the best available evidence located at the time the searches were completed as stated in the protocol. Please consult with your health care professional if you have further questions relating to the information provided, as the clinical context may vary from patient to patient.

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