

Supplementary material 1

The NetworkZ programme and implementation process

The NetworkZ course

The NetworkZ course full-day course comprising simulated scenarios, debriefs, presentations and group discussion the full-day NetworkZ course can be delivered as two half-day courses in order to minimise operational disruption and thus maximise acceptability. The long-term aim is for all operating theatre staff in New Zealand public hospitals to complete a full day of training at least every three years. The course is designed for the five surgical specialties with the largest number of surgeons: general, orthopaedics, otorhinolaryngology, urology and plastics. Obstetrics and gynaecology for which a simulation training programme (non-OR) already existed was not included.

Scenarios:

When implementation has been completed 25 simulated scenarios will have been developed from actual cases of co-morbid patients presenting for surgery with a range of conditions such as trauma, sepsis, abdominal and post-operative airway emergencies. Simulated scenarios last between 25 and 45 minutes and the scenarios are designed to be challenging and complex with multiple decision points for the entire team. Scenarios begin prior to induction of anaesthesia and include detailed case notes, supporting documentation, imaging and investigations. They take place in each team's actual operating theatre using available anaesthetic and surgical equipment, drugs and fluids and other consumable items, with formalised strategies to manage known risks of in-situ simulation.(37)

The simulations use the Laerdal 3G SimMan manikins (38) with moulage and custom built face masks and body suits, combined with surgical models to maximise fidelity, to convey different simulated patients and to provide appropriate surgical, anaesthetic and nursing tasks. Examples of the surgical models include a ruptured appendix, a traumatic leg amputation and, and a neck haematoma compromising the airway. The models permit surgical interventions including incision, haemorrhage

control, suturing, resection, and anastomosis. The manikin is pre-programmed to convey patient status at various phases of the scenario with supervisory control to respond to unexpected participant actions. A full surgical team participates in each scenario including at least one specialist surgeon and one specialist anaesthetist, three theatre nurses and an anaesthetic assistant. Surgical and anaesthesia trainees often participate as do health care assistants and post-anaesthetic care unit nurses.

NetworkZ faculty observe from behind a partition, screen or via video-link (depending on local facilities). Faculty control the manikin and surgical models in response to participant actions and answer participant phone calls for assistance or advice following scripts which replicate local processes. The scenarios are not recorded and there are no participant observers.

Participants are supported by a 'confederate' nurse or anaesthetic assistant who is in communication with the instructional team. The confederate assists with clinical tasks in the simulated environment such as taking blood samples or by discreet communication of physical signs unable to be replicated by the manikin or models (e.g. deviated trachea).

Debriefing:

The scenario is followed by a facilitated debrief with 2 trained NetworkZ instructors using three distinct phases: Phase 1 participant reactions; Phase 2 description, analysis, application; Phase 3 personal transfer to practice. Questioning approaches emphasise open questions and advocacy enquiry.^(39, 40) Debriefers refer to specific communication tools and teamwork behaviours from the Salas model⁽²⁴⁾ with the aid of wall-mounted posters. Systems issues identified in the debrief are recorded and reported back to the local quality improvement leader for follow up.

Interactive Presentations:

Purpose-designed trigger videos and animations are used to emphasise communication strategies and specific tools for briefing the team. The strategies and tools include ISBAR, closed loop communication, speaking up, and structured recapping. Participants are encouraged to explore their

different professional roles, perspectives and assumptions to develop strategies to work together more effectively.

NetworkZ instructor training

The NetworkZ course quality is assured by the requirement for instructors to demonstrate competency in ten domains of practice, using Entrustable Professional Activities (EPAs)(41) as an organising framework for the curriculum. These domains are: fundamentals of effective teamwork; creating a safe learning environment; conducting a scenario; identifying learning points while observing a scenario; conducting a debrief; evaluating learning; managing risk with in situ simulation; preparing the clinical environment for simulation, operating the simulation equipment; and maintaining simulation resources.

The EPAs are mastered using a blended approach to course delivery that includes face-to-face workshops, online learning and apprentice-ship style learning with observation and feedback from senior faculty. Instructor assessment includes online submissions and assessment of performance.

Implementation strategy

Our approach to implementation is multifaceted, incorporating multiple stakeholders; national bodies included central committees of the 20 New Zealand District Health Board (DHB) executives, the Royal Australasian College of Surgeons, the Australian and New Zealand College of Anaesthetists; New Zealand Nursing Council; and Institute of Anaesthetic Technicians. Approximately 12 months prior to the introduction of NetworkZ, the NetworkZ project team meet the DHB senior executive team, and negotiate a formal letter of agreement with the Chief Executive. This outlines the gift of a 3G Laerdal simulator and some surgical models to the DHB, provision of training and support by the NetworkZ project team and the expectations of DHB support for release of staff to attend training with provision of the training venue. In each DHB local project teams are established with connections to senior executive and quality assurance leads. A local group of instructors are nominated and undertake training. NetworkZ training in the DHB is initially supported by UOA faculty but gradually devolved

to local DHB instructors as they complete NetworkZ instructor training. After 12 to 15 months, DHBs assume full responsibility for running the NetworkZ course in their DHB. UOA maintains a role in quality improvement, quality monitoring, instructor training and course development.