Chapter 5.2.3

ADVANCED CLINICAL SKILLS: THE USE OF SIMULATION FOR THE DEVELOPMENT AND MAINTENANCE OF SKILLS FOR RURAL PRACTITIONERS

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Introduction

This chapter describes the use of simulation to support the acquisition and maintenance of advanced clinical skills in rural and remote medicine, with a particular focus on general practice (family medicine) practitioners. We adopt Gaba's (2004) definition of simulation as 'a technique to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate aspects of the real world in an interactive fashion' (1).

Simulation provides the opportunity for practitioners to rehearse the management of low frequency, high severity events, giving local teams the opportunity to analyse and develop their own performance together (2). We identify factors important for effective health care simulation and consider the importance of co-ordinated approaches to investment in human and physical resources. We draw on our experiences in Australia and use case studies to illustrate nuanced differences in advanced clinical skills programmes.

Rural medical practice and education

Although there is no single way to characterise rural medical practice and education, there are some elements that create specific challenges. The 'tyranny of distance' offers opportunities and challenges and these are well documented (3,4,5). Patient populations and hospital presentations vary greatly in regional areas of Australia, and health care services including the composition of health care teams are often vastly different to those in metropolitan areas.

A recent survey of the procedural skills of doctors in a regional area of rural Victoria showed fascinating insights into the scope of practice, perceived confidence and competence in skills (6). There was significant correlation between the frequency of certain skills and confidence with maintenance of these skills. The more complex the skill, the more likely respondents were to report a need for frequent rehearsal. Simulation was seen to be more appropriate than observation and other methods for maintaining skills. Nearly half of all doctors surveyed maintained competence in airway skills through practice in simulation, and two-thirds thought that these skills should be practiced in simulation at least every year (6).

Health care simulation education

Health care simulation education is driven by ethical imperatives prompted largely by a safety agenda, reduced working times and pressure on clinical placements (7). Additionally, there is growing evidence of the educational benefits of simulation for diverse clinical skills (2, 8-10). Although the case studies in this chapter draw on task trainers, manikins, simulated patients (SPs) and hybrid simulations (task trainers aligned with SPs), there are also electronic modalities (e.g. virtual environments, serious games and augmented reality) that are likely to have increasing prominence in offering repetitive practice and being available when and where required. Simulation has also emerged as an essential method for supporting interprofessional and team-based practice (11-18). Although there are many benefits to simulation, effectiveness is shown to depend on the quality of faculty[1] (19).

1 'Faculty' is another term for members of academic staff.

Strategic approaches to health care simulation

National, state and regional strategic approaches to planning and delivering health care simulation have been described for Australia (7) and have been facilitated by significant government investment in human and physical resources (20). To address initial simulation educator development, a national programme, NHET-Sim (21), has been funded with a mandate that 10% of the programme be offered in rural and remote areas. Simulation resources are often used suboptimally because faculty has not been supported in using them to promote effective learning.

An integrated approach at the CSDS

At a state level, the Queensland Health Clinical Skills Development Service (CSDS) (22) provides an integrated approach. The metropolitan facility includes extensive physical resources, a range of online programmes, and databases that manage over 1 500 simulators.

As an educational service hub, the CSDS provides and supports the delivery of standardised clinical courses for health care staff across the state – centrally and in hospital-based simulation centres. The latter are often contextualised for local needs especially in remote settings, with faculty receiving ongoing professional development. Mobile simulations and/or simulations embedded in clinical facilities are offered to assist transfer of learning. Facilities are locally owned and staffed, with the term 'pocket' simulation site used to describe the CSDS resources offered (simulation skills training, curriculum, simulators and audiovisual).

The CSDS model of delivery is designed to optimise economies of scale. The focus is on developing the support processes, governance and technologies to distribute instructional programmes, while reducing overhead and duplications (7).

Health care simulation for advanced clinical skills in rural settings

Effective simulation education identifies characteristics of best practice (Box 1). Using virtual environments before and after locally offered simulations, primes learners and offers repetition to assist with the application of newly learned skills.

Box 1:
Elements of effective simulation (19)

1.	Feedback
2.	Deliberate practice
3.	Curriculum integration
4.	Outcome measurement
5.	Simulation fidelity
6.	Skill acquisition and maintenance
7.	Mastery learning
8.	Transfer to practice
9.	Team training
10.	High-stakes testing
11.	Instructor training
12.	Educational and professional context

Source: McGaghie W C, Issenberg SB, Petrusa ER & Scalese RJ (2010)

An additional consideration in offering health care simulation to doctors working in rural settings is blended approaches - that is, multiple learning methods in the same programme. The CSDS have produced scenarios with decision tree algorithms for Criteria Led Discharge; Basic Life Support and Advanced Life Support; while Ambulance Victoria has produced the EMDM Triage Game©. However, developing virtual environments is expensive and requires highly specialised skills. Collaboration with developers of serious games is likely to lead to best outcomes.

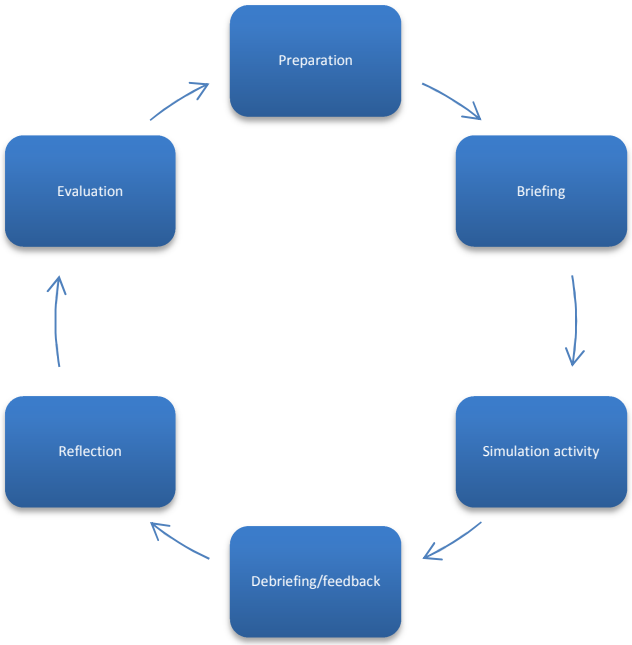
Although mobile simulation approaches (e.g. cars, vans, buses) have benefits by increasing access to simulators, programmes and faculty, these also have limitations. Programmes almost always need local contextualisation while co-facilitation is likely to increase engagement and build capability. Further, the more specialised the mobile unit, the more expensive it is to run – and there are limitations with the mobility of some simulators and technology. Examples of mobile simulation have been documented for surgical training (23, 24) and for other clinicians (25).

Where doctors are brought from multiple sites to a central location this may help to maximise peer exchanges.

Simulation programme design

Any educational programme requires careful design. After a needs analysis, it is important to make learning objectives explicit, consider human and physical resources (e.g. faculty, simulators, learning environments etc) and availability of learners. Systematically working through phases for simulation-based education assists planning (Figure 1)(26). The phases acknowledge features of simulation and contribute to the effectiveness of the educational experience.

Figure 1:
Phases in simulation based educational activities [26]



Source: Jolly B and Nestel D (2012)

During preparation, learning objectives are established and scenarios developed. Careful preparation and briefing is key to making sure that simulations run to plan, while the debriefing/feedback phase is critical to establishing the lessons to be learned. While the reflection phase is essential for participants to internalise these messages, for the faculty, the evaluation phase is critical to identifying what could be done to improve the simulation prior to its next deployment. There are several theories which inform simulation practice and are increasingly profiled in the literature - but this is beyond the scope of this chapter (8, 27-29).

Case study 1: Rural Emergency Skills Training in Gippsland, Victoria

The Rural Emergency Skills Training (REST) programme was developed in 2002 by prominent rural general practitioners (GPs) led by David Campbell, funded by the Royal Australian College of General Practitioners (30). Initially run under the auspices of Rural Workforce Agency Victoria, the Australian College of Rural and Remote Medicine now delivers REST as a national programme.

It is common practice for rural GPs to stabilise and then transfer a critically ill patient using skills, knowledge and resource limitations, as reflected in the REST course. The aim of the programme is to enhance skills in initial management of medical emergencies in rural areas (Table 1). It was designed to bridge the gap between courses such as the Emergency Management of Severe Trauma and the Advanced Paediatric Life Support and the reality of rural general practice.

Key to REST is recruitment of rural doctors to teach their peers. Based on the understanding that the approach to emergency presentations differs from that of other clinical presentations, a structured approach following the ABCDE paradigm is followed, with an emphasis on assessment and immediate intervention when life-threatening conditions are identified.

Scenarios

Scenarios are either medical or trauma and address either children or adults. They are based at local rural hospitals and usually adapted to reflect local facilities (and times).

Scenarios commence with a description of the scene where the illness or accident occurred, information about mode of transportation to the clinic (usually not by ambulance) and basic information about age and initial assessment observations. The participant is allowed time to prepare (calculate weight, fluid requirements etc.) prior to commencing the simulation.

There are some guidelines about how the scene will play out, depending on certain management requirements. For example, the patient will deteriorate if oxygen and fluids are not commenced promptly, whether there is a requirement for a chest tube, intubation or other interventions to treat the injured patient. Remaining information is provided by the faculty in response to the likely observations of the patient given the treatment provided by the participant.

Table 1:
Summary of characteristics of simulation phases for case studies

	Case study 1: **The REST Program, Gippsland, Victoria**	**Case study 2:** **Interprofessional simulation based education, Riverland and Mt Gambier, South Australia**
Learning objectives	Participants will be able to: 1. Improve their knowledge of emergency situations 2. Learn manual skills applicable to the management of emergency situations. 3. Rehearse the critical thinking required for the structured approach to the critically ill or injured patient 4. Have increased confidence in dealing with emergency situations by themselves. 5. Bring about a change in their attitude and approach to emergency situations in their practice. 6. Identify ways they can continue to practice and prepare for future emergency situations. *From REST Instructor Manual ACRRM February 2011*	Participants will be able to: 1. Manage commonly presenting emergencies in rural practice using best practice protocols when available 2. Demonstrate good quality Basic Life Support and Advanced Life Support 3. Demonstrate effective communication within the local team and with METSTAR retrieval services 4. Effectively use leadership skills and a healthcare team to manage an emergency.
Target participants	Two groups of doctors: • Established rural doctors who require emergency medicine training • Doctors new to rural practice o International medical graduates o General practice registrars o Urban doctors planning on working in rural settings e.g. providing locum relief for remote practices Preferred ratio is 4 participants to 1 instructor Groups usually have 18 to 25 participants	• General Practice registrars • Registered Nurses and/or Enrolled Nurses Preferred ratio is 4 participants to 1 instructor Groups usually have 8 to 12 participants

	Case study 1: **The REST Program, Gippsland, Victoria**	**Case study 2:** **Interprofessional simulation based education, Riverland and Mt Gambier, South Australia**
Setting	Any facility with sufficient rooms to allow five small groups to participate in skills training, use of wall dividers is acceptable in some larger rooms. One room to fit the whole group with lecture, presentation facilities and a table for demonstration scenarios	Simulation facility that has; • Clinical skills training room • Simulation room • Control room with and audiovisual capture • Debriefing room with audiovisual review
Programme length	2 full consecutive days	2 full days separated by 4-6 weeks
Faculty	5 faculty with one designated lead; All are experienced rural general practitioners (occasional exceptions – other Rural Doctors, paramedic)	3 faculty ideally interprofessional; All are experienced medical and simulation educators 1 admin support
Equipment/ Simulators	2 adult manikins; 2 pediatric manikins; 1 child manikin; 1 intravenous torso; 1 cricothyroidotomy head or animal carcass alternative (sheep or kangaroo carcass); defibrillator; heart simulator; some manikins must have advanced life support capability for endotracheal intubation; CPR capable manikins are required for the basic life support assessment	BLS/ALS manikins, Resusci Anne Simulator or SimMan; 1-2 simulated patients; clothing and wigs; moulage; resuscitation trolley; defibrillator capable of pacing, medications, airway equipment, intravenous equipment and fluids; oxygen and CPAP machine; chest drain & needle decompression trainer; difficult airway equipment including; cricothyroidotomy equipment and trainer; protocols/flow charts/Australian Medicines Handbook
Preparation	Standard equipment including cervical collars, oxygen masks and tubing, cannulae, syringes, chest tube kit, cricothyroidotomy kit and fluids with tubing are located in each simulation room; Either 4 or 5 rooms with participants moving between with scenarios repeated for each group in any room	Set up skills stations, manikins and scenario props: Train SP(s); Update program and scenarios as needed, distribute to faculty; Participants have pre-reading; Ensure all equipment working (Audiovisual, manikins)
Briefing	Participants are advised about the scenarios – 1 medical patient and 1 trauma patient; Demonstration scenarios performed by instructors and increases participants understanding of their roles in the simulation and expectations of the course	Communicate with participants running of day (scenario and de-brief); Orientate all participants to simulation room and equipment; Organise teams for each scenario (Leader and other roles); Confederate to give ISBAR handover to first nurse

	Case study 1: **The REST Program, Gippsland, Victoria**	**Case study 2:** **Interprofessional simulation based education, Riverland and Mt Gambier, South Australia**
Simulation activity	Skills stations - enable practice of basic airway management, advance airway management, surgical airway, defibrillation, ECG recognition, interosseous and central line venous access and chest tube insertion Scenarios - feedback on signs and observations provided by the instructor; emphasis on assessment and treatment of airway breathing and circulation, intubation dependent on scenario and manikin specifications, cannulae not inserted into manikins during scenario but response to effect of fluids provided obtained by asking about current observations using structured approach ABCD etc.	Ice-breaker scenario Skills stations - resuscitation, simple and complex airway management, CPAP, cardiac pacing Scenario with 3 participants and other participants active observers in de-brief room using AV equipment
Debriefing/ feedback	Feedback is provided to participants throughout the course using positive and constructive detailed oral feedback Following the course, written feedback on skills station Formal mentoring arrangements	Each scenario is de-briefed using a variety of techniques but always participant led, non-judgmental and focus on positives. Use of video review Discussion on clinical and professional skills (communication, leadership and teamwork)
Evaluation	Pre- and post-program MCQ tests; Basic life support skills station, satisfactory participation in skills stations such as defibrillation and cervical spine immobilization, lead for two simulation scenarios during the course and Final assessment scenario; Post program evaluation forms are completed by participants and faculty	Pre- and post-program MCQ test; Post-program evaluation forms are completed by all participants and faculty
Frequency of offering	2-3 courses are held most months of the year throughout Australia	All GP registrars complete one, 2 day workshop in the first year of their training

Strengths and limitations

This course has created a network for rural doctors to improve and maintain their own skills in emergency medicine and gain teaching experience in simulation and providing feedback.

Many former REST faculty now populate universities and regional vocational training providers. The ability to instill confidence into the migrant medical workforce facing the management of rural emergencies is a benefit enhanced by the provision of rural education services for students and general practice registrars by educators trained through the delivery of REST.

While there is clearly a limit to the depth and number of emergency scenarios available per participant in a two-day course, the degree of improvement in confidence and skills observed in many participants over a weekend is considerable. Retention of newly acquired skills and knowledge is likely to be an issue, however, unless the participant is given opportunities to undertake further courses within a few months or is in a supported workplace with easy access to multiple emergencies both medical and trauma.

The programme, now offered nationally, requires transportation of manikins across Australia in heavy boxes that do not always fit into the lifts of older style venues.

Case study 2: Interprofessional simulation based education in Riverland and Mt Gambier, South Australia

The Sturt Fleurieu General Practice Education Training is designed for trainee GPs and aims to prepare participants for managing common emergency presentations. The programme was developed in 2002 in Adelaide at Flinders University. However, it was recognised that offering the programme rurally, where a proportion of participants were located, would be cost effective by reducing days away from practice, transport, accommodation and backfill costs.

Since 2007, experienced medical and simulation educators now support participants rurally in offering the two-day emergency simulation component of the programme. The challenges of working in a rural environment are shared and scenarios contextualised. This includes managing emergencies with smaller health care teams often working with less sophisticated equipment and, learning when and how to engage a retrieval team to transfer the patient for tertiary care (Table 1).

The facilitators are three local health care professionals. As the numbers of participants are relatively small, there was an opportunity to invite nurses as participants too. The programme aims to have equal numbers of doctors and nurses.

Scenarios

The workshop uses blended learning with preparatory reading, clinical skills stations and complex scenarios that replicate common accident and emergency presentations - cardiac emergencies, respiratory emergencies and major trauma. One scenario involves a simulated plane with a passenger, 'Annie' (manikin), who becomes unresponsive.

The learning outcomes include interpretation of the Good Samaritan Act and resuscitation in a confined space. Scenarios are delivered through manikins and hybrid simulations (task trainer and an SP). In one scenario, the SP has an anaphylactic reaction which forces a high level of communication and as the patient progressively deteriorates, if initial management is unsuccessful, the scenario moves onto a manikin to allow invasive procedures to be demonstrated.

Strengths and limitations

The two-day workshop uses a distributed model with four to six weeks between workshop days – which allows consolidation of skills, further reading and reflection on learning. This is also useful for general practices as it reduces the number of days out and caters for participants who learn at different rates.

Success of the programme includes the focus on creating a safe learning environment through non-threatening educational methods, investing time in introductions, paying attention to briefing for tasks, and facilitating interprofessional teams working together. From the first session, those involved could see the benefits of having a realistic rural team dealing with the emergency simulated scenario. It is now standard practice that all workshops are interprofessional and participants value the method (31-33).

Assessment is limited to knowledge of emergencies but does not assess any human factors, a focus of the scenarios. Retention of knowledge and clinical skills competency is outside the scope of the programme but is a first step for other advanced skills programmes.

The learning experience is always rated very highly and consistent themes include teamwork, leadership, communication and implementing a structured management approach**.**

Albeit a passionate faculty, the pool is small and there has been limited succession planning. Each rural site only delivers the programme once or twice annually, limiting opportunities to train more faculty. Sustainability is a challenge as the programme is resource intensive and therefore expensive, requiring faculty, SP, equipment wear and administration costs.

Broader applicability/implementation

These case studies demonstrate the complexity of setting up effective simulation programmes of advanced clinical skills in rural settings. They also draw on many of the elements in Box 1.

Although the programmes have similarities, there are also differences. In the first case study, the faculty are not necessarily local and are almost always medical while in the second case study, local interprofessional faculty offer the programme to interprofessional participants. In the first case study, simulators are transported nationally while in the second, local simulators are used. Both programmes offer some form of assessment. The programmes could benefit from pre- and post-programme virtual simulations.

Although neither programme documented needs analysis as part of their specific preparation, the REST programme was developed in response to generically identified needs and implemented nationally while the second programme is tailored for local needs.

Practice pearls

- As for most educational activities, it is important to conduct a needs analysis prior to the delivery of simulation-based educational programmes.
- Seek the experiences of others in simulation-based educational programmes and build on their successes.
- Consider the factors known to lead to effective outcomes for simulation-based education.
- Use a systematic approach to programme design to maximise the educational benefits.
- Ensure faculty is well supported in using simulation as an educational method.
- Develop a plan for sustaining programme delivery.

Conclusion

Simulations programmes need to target areas of need, with sustainable solutions that provide access and exposure to develop and maintain clinical knowledge and skills. A needs analysis prior to implementing simulation-based education is valuable. Aim for simplicity in simulations that target the learning objectives, and consider ways of adopting blended learning with priming and follow-up online resources.

As 'buy in' from faculty and participants is critical to sustainability, establishing programmes around local issues will increase success. Sustainability of simulation-based programmes involves strategic approaches to simulation educators, simulators and programme design. When deciding on the extent to which an existing programme meets the needs versus a newly tailored programme, ensure you document why an existing programmes does not meet needs, and assess how your changes have improved local outcomes.

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This article is a chapter from the ***WONCA Rural Medical Education Guidebook***.
It is available from www.globalfamilydoctor.com.

Published by:
WONCA Working Party on Rural Practice
World Organization of Family Doctors (WONCA)
12A-05 Chartered Square Building
152 North Sathon Road
Silom, Bangrak
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Suggested citation: Nestel D, Rogers L, Freeman K, Brotchie K,Watson MO. Advanced clinical skills: The use of simulation for the development and maintenance of skills for rural practitioners. In Chater AB, Rourke J, Couper ID, Strasser RP, Reid S (eds.) *WONCA Rural Medical Education Guidebook.* World Organization of Family Doctors (WONCA): WONCA Working Party on Rural Practice, 2014. www.globalfamilydoctor.com (accessed [date]).