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Development of a Rural Inter-professional Simulation Course: an initiative to improve trauma and emergency team management in New Zealand rural hospitals

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ABSTRACT

BACKGROUND AND CONTEXT: New Zealand is a largely rural nation. Despite the regionalisation of trauma services, rural hospitals continue to provide trauma and emergency care. A dedicated rural inter-professional team-based simulation course was designed, as part of a wider strategy of using simulation-based education to address the disparity in experience and training for rural hospital teams providing emergency and trauma care.

ASSESSMENT: A pre-course questionnaire identified learning needs. Post-course evaluation and a follow-up survey assessed participants' perception of the course, and whether lasting changes in clinical or organisational practice occurred.

RESULTS: Three courses were provided over 2 years to 60 interprofessional participants from eight rural hospitals. The course employed an interprofessional faculty and used skill workshops and high-fidelity trauma simulations to address learning needs identified in pre-course research. Evaluation showed the course to be an effective learning experience for participants. The post-course survey indicated possible lasting changes in team performance and rural hospital protocols. This educational strategy also allowed the collection of research data for investigating rural team dynamics and interprofessional learning.

STRATEGIES FOR IMPROVEMENT: Further development of rural interprofessional simulation courses should include more diverse clinical content, including paediatric and medical scenarios. Participant access was sometimes limited by typical rural challenges such as hospital staffing and locum availability.

LESSONS: Rural simulation-based education is both effective for rural trauma team training and a vehicle for rural research; however, there are challenges to participant access and course sustainability, which echo the rural–urban disparity.

Introduction

Rural trauma and emergency care in New Zealand

New Zealand is a largely rural nation with a geographically dispersed population. Existing research suggests that the trauma burden in rural areas is at least as high, if not higher, than urban areas. Despite this, access to health services in rural areas is more limited. For example, rates of moderate-to-severe traumatic brain injury in rural New Zealand may be higher than urban

rates,[1] local access to computed tomography (CT) imaging is likely to be lower,[2] or even absent,[3] and trauma centres in New Zealand are without exception urban.

Clinical team training and performance may also differ between rural and urban areas. Much of the work that specialist teams manage in urban areas is managed by generalist teams in rural New Zealand. Rural teams must handle high-risk scenarios such as trauma and emergencies as part of their scope of practice; however, these situations are relatively infrequent. As trauma and emergency care is increasingly centralised to urban hospitals through coordinated networks of care,[4] team performance may be further hampered by lack of clinical exposure and experience, as high-risk scenarios become lower in frequency but not entirely absent from rural clinical practice.[5]

Access to education and research often mirrors access to health-care facilities, being centralised into urban teaching hospitals. Currently, there is no rural school of health in New Zealand. Although most urban New Zealand teaching hospitals now have dedicated training units and simulation suites, to date there is no coordinated approach to rural trauma team training. Therefore, rural–urban disparities in trauma and emergency care may be exacerbated by lack of exposure to difficult cases, poorer access to collegial networks of specialist support, and fewer opportunities for rural-specific education and training.[6] The aim of this project was to develop an educational intervention to address these perceived disparities.

Simulation-based education as a rurally targeted intervention

Simulation-based education is an evidence-based education method used widely in medical and nursing training, and used in several countries to train rural trauma teams.[7–9] There is evidence supporting simulation training for procedural skill instruction[10] and interprofessional team performance.[11,12] Compared with non-simulation-based instruction, simulation increases learner satisfaction and team skills in resuscitation.[13] There is sufficient evidence to suggest that better non-technical skills lead to better team function and better processes of care.[14] Simulation training improves various patient safety outcomes in different contexts,[15] but research specific to rural team training is limited. Rural team training in the United States (USA) has been shown to reduce time to transfer,[16] but there is less evidence to support patient-oriented outcomes.

In New Zealand, simulation training has been used for several years as part of the Rural Postgraduate Programme for vocational training in the speciality of Rural Hospital Medicine.[17] Although national projects such as NetworkZ[18] support surgical team training, a gap exists for simulation-based education specifically targeted to the rural hospital workforce. Rural interventions must specifically address the needs of rural patients, hospitals and clinical teams, rather than simply scaling urban interventions. Simulation-based education is expected to be particularly useful for rural hospital team training as it deals particularly with disparities previously described[6] and potentially has benefits beyond the direct effects of training, such as procedural skills maintenance, standardisation of equipment and procedures, and enhanced teamwork, to also enhance the ability to highlight latent threats in team performance, encourage a culture of safe interprofessional learning and promote rural-specific research.

WHAT GAP THIS FILLS

What is already known: Disparities exist in rural trauma and emergency care, and the networks and educational resources available to support rural teams. Simulation-based education is an evidence-based intervention.

What this study adds: A rural interprofessional simulation course successfully used simulation-based education to train real rural teams in technical and non-technical trauma skills. The course also provided a valuable networking opportunity, was a useful platform for faculty development, and a vehicle for ongoing rural research.

Simulation theory

The conceptual framework underpinning simulation-based education frequently draws upon the theories of Bloom[19] and Kolb[20] to understand the objectives and experience of learning, respectively. According to the revised Taxonomy of learning by Bloom[19] (Fig. 1), remembering and understanding are the simplest levels of learning. The ability of learners to apply or analyse knowledge is a better indicator of competence. Simulation-based education can help learners move from knowledge of an area of expertise, to its application in real clinical environments. The learning cycle described by Kolb[20] is currently the main conceptual framework used for experiential learning (Fig. 2). It describes a cycle of concrete experience, reflection, conceptualisation and experimentation. Simulation-based education can thus be understood as a process of experiencing a simulation scenario, debriefing (when reflective learning occurs) and implementing new behaviours during a subsequent simulation experience. Due to the need to create challenging experiences and intellectual discomfort as part of reflective learning, effective simulation-based education requires a heavy emphasis on creating psychological safety through the use of a safe container for learning and a robust debriefing technique.[21] Existing team hierarchies and behaviours may be deeply embedded through many years of practice, and challenging previously held assumptions requires a deep level of trust in both faculty and co-participants.

Figure 1. Revised Bloom taxonomy

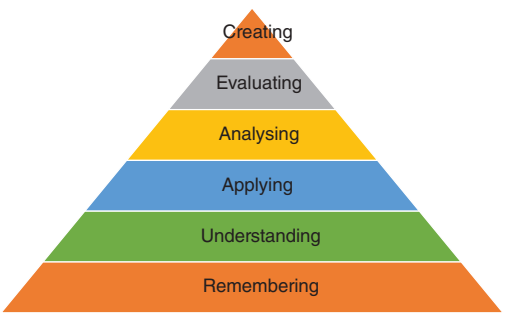
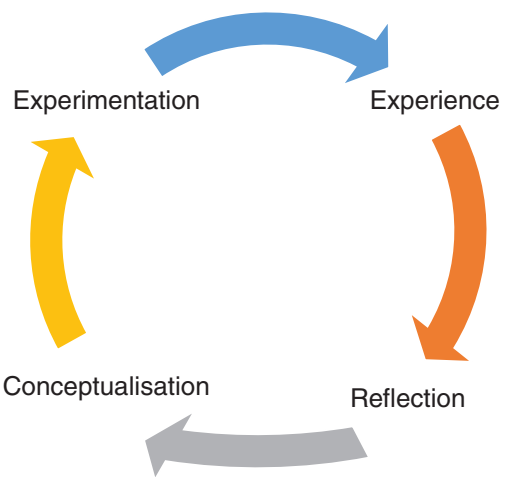


Figure 2. Kolb cycle



The Rural Inter-professional Simulation Course

This paper describes the first 2 years of the Rural Inter-professional Simulation Course (RiSC) project, an interprofessional course specifically designed for rural hospital teams. The clinical aim was to deliver a targeted interprofessional course, to improve clinician trauma skills and enhance rural hospital teamwork. Educational goals were to develop faculty skills and experience in simulation and debriefing, and to build a wider curriculum for rural hospital service improvement. Research goals were to use the project to foster research into rural teamwork and rural interprofessional educational practice.

Course development

Course design

A 3-day immersion course was delivered with procedural skills training, simulation scenarios, lectures and didactic content. Didactic content was minimal according to the pedagogical principle of the 'flipped classroom', whereby knowledge acquisition is left to participants to achieve pre-course and the emphasis is on the application of knowledge to practice. For this reason, it was recommended that all participants had previously attended an advanced trauma course. Skills sessions were included, which represented the major psychomotor skills that emergency and trauma teams need for both their clinical practice and their maintenance of professional standards. These included airway procedures, chest trauma

skills, vascular access skills and fracture splinting methods. High-fidelity simulation scenarios were designed around a similar skill set in order to layer the learning from the conceptual to psychomotor skills, to including the same skills within coordinated team practice. 'Native' interprofessional teams (team members who normally work together in their place of practice) were invited to attend the course from around New Zealand. For each course, four teams of five participants, containing two to three doctors and two to three nurses per team, travelled to Ashburton Hospital, Canterbury, where the course was delivered.

The RiSC course was designed to harness and strengthen existing knowledge commonly conveyed by existing courses such as Early Management of Severe Trauma (EMST)[22] or the Trauma Nursing Core Course (TNCC)[23] and translate this into the application of psychomotor skills and the non-technical communication, teamwork and leadership skills commonly understood as Crisis Resource Management.[24] A pre-course survey was used to inform simulation scenario design. Scenarios were written for rural authenticity; for example, limits were placed around accessibility of advanced imaging, blood products and backup. Teams were encouraged to enter the scenario in a staged fashion, reflecting the first and second on-call arrangements of a typical rural hospital, and handover to retrieval teams was facilitated. The professional needs of participants were met by ensuring the course fulfilled the revalidation needs of professional colleges such as the Division of Rural Hospital Medicine and the Australian College of Rural and Remote Medicine.

Facility

The location for the course was the simulation suite at the Rural Health Academic Centre in Ashburton. Simulation-based education can take place *in situ* in a real clinical workplace or away from the live clinical environment in a simulation laboratory. While *in situ* training is thought to be generally more effective and evidence supports a positive effect on patient safety outcomes,[25] it can be limited by competing for space and resources with live clinical activity and also necessarily can only apply to one institution. Conversely, laboratory-based simulation can be delivered to many different teams at the same time and without the pressure of real patients competing for resources. This has the added advantage of teams being able to network with and learn from colleagues around the country. Facility and training equipment relied heavily on multi-agency collaboration, with the University of Otago, Canterbury District Health Board and St John Ambulance contributing to the project.

Faculty development

A standardised approach was adopted for simulation and debriefing based on the Simulation Instructor Course provided by the Centre for Medical Simulation in Boston, USA.[26] Collaboration with other South Island organisations had identified this as a globally accepted educational standard for simulation faculty that would enable a consistent ethos and style of simulation and debriefing across the South Island, and enable an interprofessional faculty. By developing a collaborative and interprofessional educator team, we could add authenticity, create a robust faculty and boost educator confidence.[27]

Research development

From inception, the course was envisaged as a vehicle for educational research, alongside the core learning objectives. A framework was developed for progressively researching different levels of course impact, from individual and team skills and performance, to system and policy change at participants' local hospital sites, and patient outcomes. Initially, an in-depth evaluation of participant perceptions of the course effectiveness and its effect on clinical practice was performed. Subsequently, tools were identified and developed to more formally assess changes in interprofessional team performance (taskwork) and process (teamwork).[28] A confidentiality policy and research agreement was developed to cater for these different levels of research.

Ethical aspects

Ethical considerations were given to performing research within an educational course. In

particular, video recording required a security policy and password-protected and controlled access to recordings. A confidentiality recording and research policy was written and circulated to participants ahead of the course for their informed consent as research participants. During the course, a heavy emphasis was placed on creating a 'safe container' for learning.

Assessment

A pre-course qualitative educational needs assessment was collected from participants using a survey contained in the application form. Immediate post-course qualitative and quantitative evaluation was performed online using the University of Otago's *OtagoInform* platform.[29] A questionnaire for capturing participant experience and evaluation of the course was developed using a five-point Likert-type rating scale, with responses ranging from 1 = Strongly Agree to 5 = Strongly Disagree. Specific qualitative feedback was also sought from participants regarding multiple aspects of the course. To assess ongoing changes, follow-up email and phone communication with participants collected qualitative feedback at both personal and service level at 3 months after the course.

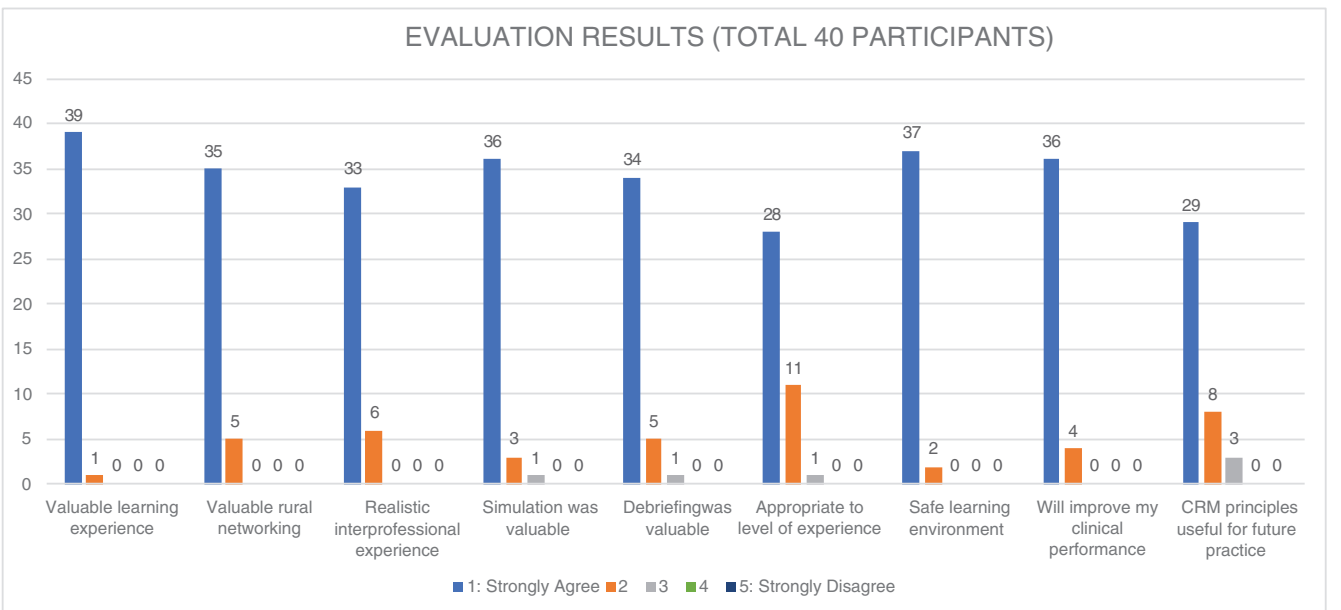
Table 1. Participants' challenges and learning needs

Theme	Details
Trauma	Multi-trauma Rapid Sequence Intubation and Difficult airway Intoxication or Unconscious patient Major chest injury Massive haemorrhage Spine injury Major burns
Critical care	Critical care in rural hospitals Retrieval and transfers Ventilation
Rural factors	Small trauma teamwork New or locum staff Major incident and overload Communication Feedback and debriefing
Other (not included in course)	Paediatric trauma Neonatal resuscitation Trauma in pregnancy The deteriorating patient Ultrasound

Results of assessment

Analysis of the pre-course survey indicated the commonest themes and detailed learning requirements (Table 1). While many of these could be catered for by the course design, which was centred around adult trauma emergencies,

Figure 3. Evaluation results from online questionnaire



several important clinical scenarios were omitted, including paediatric content. A feature of these learning objectives was that they were often based around the real-life challenges that the teams had previously faced in their rural hospital.

In 2017 and 2018, three RiSC courses were delivered to a total of 60 participants, with 27 doctors and 33 nurses taking part, from eight rural hospitals around the North and South Islands of New Zealand. Course evaluation was received from 40 of 60 participants (response rate 67%). Responses were positive overall (Fig. 3). Qualitative feedback identified areas for improvement, including technical issues such as audio-visual quality, and course delivery issues such as themes for future scenario-based learning.

Results from the post-course survey at 3 months (Table 2) suggested that the RiSC course remained useful to participants, their teams and their organisations. Four hospitals sent more than one team to attend the course.

Strategies for quality improvement

As clinical practice in pre-hospital and emergency care is rapidly evolving, future iterations of the course will require regular revision of content to reflect the contemporary practice environment. Our research indicates an appetite for simulation-based education in other clinical domains. Future courses will contain a selection of new simulation scenarios that reflect these learning needs, although the scope of the course is limited to adult trauma.

Opportunities exist to apply this model of course delivery and faculty development to other clinical contexts. These include developing other learning objectives for acute medicine and paediatrics, and other locations including in situ in rural hospitals using mobile simulation and audio-visual equipment. By increasing the network of involved rural teams, opportunities also exist to use RiSC courses to develop standardised rural emergency practices, while team-based research will allow development of recommended rural approaches to Crisis Resource Management and emergency care.

Lessons and messages

The Rural Inter-professional Simulation Course was developed to address a perceived disparity in trauma and emergency care in rural New Zealand. Using rurally focused simulation-based education, we hoped to close the gap between urban and rural trauma and emergency team performance. Three courses over 2 years trained 60 interprofessional participants from eight rural hospitals. Evaluation indicated that the learning objectives matched learning requirements, and participants found the learning experience to be realistic and valuable, including simulation and debriefing, Crisis Resource Management content and networking with rural colleagues. Participants believed that the course would improve their clinical practice, and after 3 months, lasting changes were evident. These positive findings are comparable to results from other countries, where courses specifically designed for rural health care practitioners (rather than scaled or adapted from urban courses) have demonstrably increased participants' confidence and perceived competence to work in rural or remote practices.[9] The course was also a useful platform for faculty development in simulation-based education and

Table 2. Themes of post-course feedback

Themes	Example comments
General	'A lot of the lessons have been implemented, it has definitely led to changes which I really think is due to a team going down together.' 'A really good course. Especially because the nurses are with you together. And it's done in rural place, understanding is better.'
Personal	'I feel the couple of real life situations I've personally been involved with since have gone better as a result.' 'I feel a lot more confident and competent after the course. We were able to bring back skills and suggestions to our Dept.'
Teamwork	'We talk more about 'the team' which within itself shows we are still thinking within that perspective.' 'I notice our nurses being more confident and empowered to speak up in difficult situations.'
Procedures	'We have our pharmacist looking at how we can manage a trauma box with drugs required so that we do not have to keep going back to the drug room to check out drugs.' 'Just after the course we had a man with a fractured femur whom we had in a Sager splint - so it was very useful to be familiar with this splint.'
Organisation	'It has helped us develop a little team who are empowered to take forward the agenda locally.' 'We have started monthly simulation meetings.. It is much better!'

a vehicle for ongoing research into rural teams and interprofessional education.

The project faces sustainability challenges, including a high faculty–student ratio and a resource-intensive learning context, as is typical of simulation-based education. Both faculty and equipment provision depended on multi-agency collaboration, which added to the value, but also the complexity and cost of course implementation. The course was also limited by the same factors it was designed to mitigate – those of rural disparity. Expressions of interest outnumbered teams able to attend, often for logistical reasons, and one course was cancelled when subscribed teams could not access roster cover in order to take educational leave. Although benefiting from rural authenticity, the rural simulation suite was less well developed than equivalent urban university settings. Although faculty development and exploration of effective low-cost audio-visual solutions was part of initial course development, further work is needed. Rural limitations of staffing and equipment are commonplace, and simulation-based education relies heavily on audio-visual technology for an effective learning experience. Further research will be useful to determine the durability of practice changes, and whether changes in patient-related outcomes can be detected.

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Conflicts of interest

The authors declare no conflicts of interest.

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