Simulation Training for Rural Health Practitioners: a Transformative Approach

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Simulation training for rural health practitioners: a transformative approach

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ABSTRACT

This paper describes and analyses the transformative educational approach underpinning two courses in simulation training for rural health practitioners. The two-day courses (one in anaesthesia, and one in emergency care) have been developed and delivered by staff at the Simulation and Skills Training Centre, Monash Medical Centre, Melbourne, Victoria. The Centre is only one of three in Australia to offer a full-scale clinical environment using a realistic patient simulator to replicate a range of anaesthesia and emergency scenarios. It offers the only simulation courses designed specifically for rural practitioners. Since 1998, 100 rural general practitioner anaesthetists and 90 nurses have completed the Rural Anaesthesia Crisis Resource Management course. Since February 2000, 25 general practitioners and 25 nurses have completed the Rural Emergency Crisis Resource Management course. Evaluation has revealed very high levels of participant satisfaction, and substantial changes to rural practice in anaesthesia and emergency care. Aspects of the courses that have been found to promote these transformations include: preliminary site visits to the rural hospitals; small group-based learning involving teams of general practitioners and nurses from the same hospital; using a range of teaching and learning strategies based on adult learning principles (rather than a reliance on didactic teaching); using a high fidelity, simulated environment to replicate rural settings and scenarios; combining technical/medical skills training with the behavioural principles of crisis resource management; and providing ongoing professional support to rural participants.

INTRODUCTION

Adverse events (unintended injury or complications caused by health care management) and medical errors are acknowledged as significant public health issues. Research indicates that the percentage of adverse events per hospitalisation ranges from 2.9% to 16.6%, with around 50% of these adverse events being judged to be preventable. Workforce training and professional support have been identified as key components of a systemic approach to improving patient safety. Training and support in rural areas — particularly to staff from smaller hospitals — demands a distinctive approach.

The generalist nature of rural health practice means that practitioners have a diverse range of skill needs, many of which remain unmet. For example, one-third of general practitioners responsible for on-call work at rural hospitals have reported low levels of confidence about their emergency medicine skills, and see this domain as a high
priority for upskilling. It is widely recognised that rural health practitioners have difficulty accessing appropriate continuing education. Factors limiting access include geographical and professional isolation combined with logistical problems in arranging participation in programs. Research has also shown that continuing education for rural practitioners must be tailored to meet their needs. Relevant courses are those that address appropriate topics, take account of rural work environments and practices, consider a multi-disciplinary approach, are delivered flexibly, and incorporate generalisable skills.

However, comprehensive evaluations of rural continuing education programs are scarce. While a considerable number of process evaluations have been published, we know very little about the impact of these programs on practice, let alone on patient health outcomes. A major criticism of continuing education is that it relies excessively upon passive learning and didactic teaching methods, despite overwhelming evidence that these methods do little to change practice. It is also true that evaluation frameworks and methodologies for assessing the outcomes of continuing education programs are underdeveloped.

Simulation-based training for rural health practitioners

The Simulation and Skills Training Centre (SSTC) at the Monash Medical Centre in Melbourne is one of three such centres in Australia, and one of about 150 worldwide. The SSTC incorporates a realistic, high fidelity mannequin, controlled by a computer using physiological modelling, set in a fully functioning operating theatre or emergency department environment. Scenarios (such as medical emergencies or anaesthesia crises) can be devised with a high degree of controllability and reproducibility. The SSTC’s courses are based upon a training program devised in the late 1980s by a group of anaesthetists led by David Gaba at Stanford University and Palo Alto VA Medical Centre.

There are many advantages to simulator-based training, and simulation training may be particularly appropriate for rural health practitioners. The simulator room allows high fidelity and replicability of rural hospital environments. Procedures and scenarios can be devised to meet the specific training needs of participants. This overcomes the problem of the low frequency of actual critical incidents in the rural operating theatre and emergency department. Routine procedures can be repeated intensively, and uncommon but serious problems presented at will. This allows inexperienced practitioners, or those who practice specific procedures relatively infrequently, to gain increased exposure. Adverse events and errors can be allowed to occur that would otherwise demand immediate intervention. Reflecting on the consequences of one’s actions or inactions can be a powerful learning experience. Audiovisual recording, replaying and self-critiquing of performance further reinforces the learning outcomes. The behavioural skills learnt during simulation-based training are generalisable, and therefore pertinent to the nature of routine and emergency rural health practice. Above all, there is no risk of patient harm.

Simulation-based education for health practitioners draws upon pioneering work in the aviation industry where flight simulators are now well established for both training and performance assessment. Simulation programs that incorporate the principles of crisis resource management do so in the knowledge that health care systems are complex and
ill-structured. Operating theatre and emergency staff in rural areas need not only medical and technical skills, but also proficiency in the behavioural management of crises — particularly when there is less exposure to complicated medical cases, less specialist equipment available and no immediate access to specialist assistance. The principles of crisis resource management are:

- knowing your work environment;
- anticipating and planning;
- taking a leadership role;
- communicating effectively;
- calling for help early enough;
- allocating attention and using all available information; and
- distributing the workload and using all available resources.

The Rural Anaesthesia Crisis Resource Management course (RACRM) was piloted by the SSTC in April 1998. Since that time, 100 rural general practitioner anaesthetists and 90 nurses have participated in the two-day course. The Rural Emergency Crisis Resource Management course (RECRM) was developed following requests from RACRM participants. It was first delivered in February 2000; 25 general practitioners and 25 nurses have since participated in the two-day course.

The general structure of the two-day courses is:

- Day 1 — a series of 5 or 6 workshops on topics related to anaesthesia/emergency medicine using didactic lectures, videos, case presentations and group discussions. This is followed by practical sessions relating to the specific topics using a fully mocked up operating theatre/emergency department; and

- Day 2 — a didactic session on crisis resource management followed by a number of simulated scenarios. For the anaesthetic course, participants don actual operating theatre attire. Each general practitioner acts as the primary doctor with his/her nursing colleague for one scenario. At other times they may function as the “first responder” team — a doctor/nurse pair called in from elsewhere to help if required, unaware of what has transpired; or simply observe the scenario from another room. The scenarios are videotaped.

Each scenario is reviewed by the group and participants are encouraged to reflect on their experiences. A Fellow of the Australian College of Anaesthetists/Emergency Medicine from the Centre’s faculty acts as facilitator during these debriefings. Debriefings examine effective medical and technical responses specific to the particular scenario, as well as the generic behavioural issues relevant to effective crisis resource management.
AIMS

This paper describes and reports the results of the evaluation of two innovative and experiential continuing education courses for rural health practitioners. More specifically, the aims of this paper are to:

♦ analyse the teaching and learning philosophies which underpin the development and delivery of the courses;
♦ present evaluation findings which demonstrate the effectiveness of the courses; and
♦ identify the factors contributing to the high degree of effectiveness of the course.

To the best of the authors’ knowledge, these are the first simulator-based programs in the world designed specifically for rural practitioners.

METHODS

Data for this paper are drawn from a larger research project, the aim of which is to evaluate the effectiveness of the simulation courses for rural practitioners. There were five main methods employed for this paper:

♦ ongoing reflective inquiry by the staff designing and delivering the courses (the principal strategies are scheduled team discussions, and regular debriefing with an independent, experienced educational psychologist);
♦ observation of the courses over a period of 2 months by an independent, external evaluator (one of the authors);
♦ analysis of program documents (including funding submissions, course handouts, and additional reading material);
♦ post-course evaluation surveys distributed to all course participants (response rate of 57%); and
♦ journals (around 500 words in length) written by the first 20 participants of the RACRM course in 1998.

RESULTS AND DISCUSSION

Quantitative and qualitative data generated from the above methods yielded overwhelming evidence about the very high levels of participant satisfaction, the relevance to rural practice, and the effectiveness of the courses. The first part of the results section analyses the educational philosophy underpinning the RACRM and RECRM courses. Adult learning principles provide a framework for analysing the philosophy. These principles include the following.

♦ Purposeful, meaningful and relevant learning. Course content is based upon extensive consultation through preliminary site visits and ongoing professional consultation to rural health practitioners. The simulator environment and the
scenarios reinforce the clinical relevance of the curriculum. Rural general practitioners and their nursing colleagues from the same hospital participate together in the course to replicate real-life situations.

♦ **Voluntary participation.** Participants are motivated to learn, despite their anxieties about performance during simulations and debriefings. RECRM was developed following recommendations from RACRM participants.

♦ **Active involvement in learning.** Participants learn through initial site visits conducted by instructors. These visits allow the instructors to view the working environment and practices of the prospective participants, as well as giving the opportunity to provide specialist advice on anaesthetics and emergency medicine. During the courses, participants are active, experiential, collaborative learners. They review their own performance guided by skilled debriefing. Participants physically practise the skills and knowledge in a replicated environment.

♦ **Setting clear goals and objectives.** Learning objectives are clearly stated in program documents. The courses are not designed or used to assess performance. Course instructors strive to maintain a balance between the needs of rural general practitioners and their nursing colleagues, as well as between the medical/technical aspects of the course and crisis resource management.

♦ **Provision of feedback.** Videotaping and reviewing scenarios accompanied by skilled debriefing provides immediate and effective feedback in a supportive, learning environment. Feedback is sensitively handled, always mindful of the fact that general practitioners and nurses from the same hospital are present.

♦ **Reflective learning.** Participants have the opportunity and are encouraged to think critically and constructively about their learnings both during and after the course. A “pause and discuss” approach is frequently used. The principles of crisis resource management require more than memorisation of information; they actually challenge the way participants view their environment and how they operate in that environment.

♦ **Problem-based learning.** Problems are structured to reflect the real-life issues and settings confronting rural general practitioners and nurses. This approach integrates the various stages of learning: memorisation, interpretation, analysis, synthesis and evaluation of knowledge.17

Table 1 presents the results of 12 items selected from 34 items in the post-course evaluation surveys. The 12 items have been selected because of their relevance to the effectiveness of teaching and learning strategies employed in the RACRM and RECRM courses. For each item, a 5 point Likert scale was used with responses ranging from “1 = strongly agree” to “5 = strongly disagree”. A favourable response was considered to be either “strongly agreeing” or “agreeing” to a positively-worded statement, or “strongly disagreeing” or “disagreeing” with a negatively-worded statement. The reverse was considered to be an unfavourable response. Means and standard deviations are presented for each of the 12 items.
Table 1  
Responses to items in the post-course evaluation survey (N=137)

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Statement</th>
<th>RACRM (n=115)</th>
<th>RECRM (n=22)</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Mean  Stdev</td>
<td>Mean Stdev</td>
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<tr>
<td>Realism and relevance</td>
<td>1  The anaesthesia machine was appropriately functional as I would expect in my practice.</td>
<td>1.56 0.84</td>
<td>N/A</td>
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<td></td>
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<td>1.73 0.81</td>
<td>1.86 0.77</td>
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<td>1.86 0.77</td>
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<td></td>
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<td>1.76 0.67</td>
<td>1.68 0.99</td>
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<td>1.68 0.99</td>
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<tr>
<td>Contribution to knowledge</td>
<td>4  I encountered situations that I now want to learn more about through reading, lectures, conferences.</td>
<td>1.42 0.71</td>
<td>1.86 0.89</td>
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<tr>
<td></td>
<td></td>
<td>1.42 0.71</td>
<td>1.86 0.89</td>
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<td></td>
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<td>1.43 0.58</td>
<td>1.41 0.91</td>
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<td></td>
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<td>1.43 0.58</td>
<td>1.41 0.91</td>
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<td></td>
<td></td>
<td>1.43 0.65</td>
<td>1.32 0.48</td>
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<td></td>
<td>1.43 0.65</td>
<td>1.32 0.48</td>
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<tr>
<td>Value of the course</td>
<td>7  This course is suited for team co-ordination training.</td>
<td>1.35 0.6</td>
<td>1.19 0.4</td>
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<td></td>
<td></td>
<td>1.18 0.5</td>
<td>1.45 0.91</td>
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<td>1.45 0.91</td>
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<td></td>
<td></td>
<td>1.36 0.6</td>
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<td>Expected outcomes</td>
<td>10 I expect that the knowledge gained about the scenarios will be helpful to me in practice.</td>
<td>1.40 0.59</td>
<td>1.64 0.95</td>
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<td>1.40 0.59</td>
<td>1.64 0.95</td>
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<td>1.36 0.53</td>
<td>1.57 0.81</td>
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<td>1.36 0.53</td>
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<td>1.30 0.58</td>
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<td>1.30 0.58</td>
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Table 1 shows that all items were favourably assessed by participants. Items one to three relate to the extent to which the simulation centre replicated participants’ work environment in their rural hospitals, and the degree of realism it elicited. Open-ended questions in the post-course evaluation survey and the 500 word journals provided abundant qualitative data to substantiate these ratings. For example, participants wrote:

A consistent feature throughout the presentations was relating the topic to our usual operating theatres and considering issues such as existing resources, specialist support, protocols for crisis management and transfer times. This ensured a high degree of relevance to rural practice.

I was initially taken aback by the seriousness of creating as true to life environment as was done (ie, wearing theatre attire, the theatre set-up, drugs etc.). But as the course progressed, I was able to appreciate the significance of such detail. It really helped to make the experience more real.

Items four to six in Table 1 measure the extent to which the teaching strategies have contributed to both specific and general knowledge, and the participants’ desire to continue to seek out related knowledge. There was substantial qualitative data showing that knowledgeable didactic teaching, reinforced by intense experiential learning, and followed by competently handled debriefing sessions were powerful methods. A typical comment was:

The debriefing was a very important part of each scenario. It allowed input from peers watching the event. Viewing one’s own reactions on video is a powerful way of appreciating weaknesses and identifying areas yourself where you could improve.
Items seven to nine also show high favourable ratings. These three items relate to the value of the course. Specifically, the items measure team-based learning, the extent of learning, and the potential benefit of the course for other rural health practitioners. One of the distinctive features of the RACRM and RECRM courses is that doctors and nurses from the same rural hospital are co-participants. The rationale for team-based learning is that the course attempts to replicate the situation back at the workplace, and that team-based approaches maximise the capacity to apply new skills and knowledge. Participants strongly endorsed this collaborative approach:

It was very helpful having a local anaesthetic nurse involved in the exercise. It created a real team approach. I am now more confident in the nurse’s abilities and more aware of how to use her skills to effect in a crisis. I feel the course really improved her own confidence, too.

The final set of three items in Table 1 pertain to expected outcomes from the courses. Participants believe that knowledge gained from the scenarios and knowledge about crisis resource management will be applied back in the rural hospitals. There was a strong belief that this will improve safety. Isolated rural practitioners also greatly valued the ongoing professional link with staff at the SSTC, enabling continuing specialist consultation. Comments by participants included:

The simulator experience has definitely made me more vigilant, but also much more confident that, should a crisis arise, I will be able to cope and perform a lot better.

I have learnt to recognise that when all is not as it seems then to step back mentally and reassess as a conscious step may solve a problem far quicker than concentrating on an incorrect answer or diagnosis which is not solving the problems but which is focusing your vision. The trick is to recognise that you need to reassess.

I feel very confident that they (SSTC staff) would all be very supportive colleagues in a difficult management setting either at the time or in a later debriefing. This cannot be overemphasised.

Survey respondents also reported that the courses had prompted them to introduce practical changes in their hospitals. While the extent and sustainability of these changes has not yet been determined, some reported changes included: disseminating information to colleagues; updating equipment; conducting regular equipment checks; purchasing new and specialised equipment; improved communication between staff; and applying the principles of crisis resource management to everyday practice.

The final aim of this paper was to identify the factors contributing to the high degree of effectiveness of the courses. Analysis of the evidence indicates six inter-related factors, many of which are not common to continuing education programs for rural health practitioners.

♦ The philosophy of the courses is based upon adult learning principles.
♦ The simulator provides an intense, realistic, relevant, replicable experience.
♦ The courses are tailored to meet local education needs.
♦ Preliminary site visits are supplemented by ongoing professional networks and consultation.
The course provides medical and technical knowledge as well as exposure to the principles of crisis resource management (which are rarely taught in undergraduate or specialist courses).

The courses bring together small teams of doctors and nurses from the same rural hospitals as co-participants.

CONCLUSION

The results of this study provide significant new evidence about the value of simulation-based training. The findings indicate that the SSTC staff utilise a highly effective teaching and learning approach to meeting the continuing education needs of rural health practitioners. In many ways, the courses are transformative: they challenge the standard approaches to program design, content, delivery, and team-based, multi-disciplinary participation. This key finding substantiates the results of an evidence-based review of the effect of continuing medical education strategies: widely used delivery methods have little impact on improving professional practice. The simulator-based courses are innovative, experiential programs that have attracted high levels of expressed participant satisfaction. The findings also indicate a clear intention by participants that they will apply their new knowledge and skills in their rural hospitals. However, the results described here are not definitive. First, the representativeness of the participant samples are unknown. Second, there is inconclusive evidence to date about the impact of the course on practice.

Research on the use and effectiveness of simulator-based training for health professionals is relatively scant. Participants report favourably on the simulator environment. Using both technical and behavioural ratings, the clinical performance of anaesthetists can be assessed from videotapes of simulations. Research demonstrates that anaesthetist teams successfully carried out the appropriate technical actions. There is also good inter-rater agreement on technical performance. Experienced anaesthetists make fewer errors than novices in simulated scenarios, but they made the same type of errors. Failures and unplanned incidents occurred in both groups. Other researchers assert that patient risk can be reduced substantially by, among other things, the use of anaesthesia simulators both in training and for periodic recertification. Because most critical incidents are due to human error rather than equipment failure, they argue that formal training should include recognition of adverse events and medical errors and the responses to them. However, simulation training has not yet been validated as a training technique which may lead to either practice changes or improvements to patient health outcomes. Indeed, there are considerable definitional, methodological and professional issues in obtaining valid and reliable data on practice and patient safety.

This research is inconclusive regarding the ultimate aims of the continuing education: that is, the impact of the courses on practice and the outcomes for patient safety. For instance, we do not know whether an intensive, experiential learning course over two days will lead to behavioural changes back in the workplace. If it does lead to change, to what extent are the changes sustained over time? It is also unclear which factors pertaining to the course are most influential in contributing to any changes. Furthermore, what forces within the workplace are likely to facilitate or hinder
attempted changes? These questions clearly prompt the need for a more sophisticated, rurally sensitive theoretical model of the effectiveness of continuing education strategies. Empirical evaluative research also needs to focus on assessing the impact and outcomes of these programs. Work is currently progressing on these two fronts as part of a broader study of the rural education programs delivered by the SSTC.

This research has a number of implications for the provision of continuing education courses to rural health practitioners. First, the design and content of the education program must be based on detailed knowledge of the specific local context rather than a generalised rural context. In other words, instructors should gain an understanding of the individual participants, their working environment and learning needs. The SSTC staff achieve this through preliminary site visits, and the maintenance of ongoing professional support networks. Second, the teaching and learning approach needs to fully embrace adult learning principles. By moving beyond a reliance on traditional passive and didactic strategies, learning outcomes will be enhanced. Third, program relevance and impact are improved when the teaching and learning space replicates the rural working conditions. Simulation-based training provides the technology for replicable scenarios. Team-based learning involving doctors and nurses from the same hospital challenges existing practices. Fourth, the curriculum should include specific medical and technical knowledge as well as more generalisable skills which can match the generic abilities required in rural health practice. To satisfy this, RACRM and RECRM incorporate training in crisis resource management. These courses represent a paradigm shift in rural continuing education. They are an important part of a systemic approach to patient safety,

**REFERENCES**


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