Using ward-based simulation in cardiopulmonary training


Summary
This article assesses the role of ward-based simulation in cardiopulmonary resuscitation training. Based on an initiative introduced at the Royal Hospital for Neuro-disability, London, it supports many of the positive claims made about the value of simulation in such contexts. The role of simulation was audited on the basis of feedback from staff, who indicated that the opportunity to practise their skills in a realistic setting increased confidence in their abilities to respond to a real-life event and promoted critical reflection. Further analysis indicated that, as a learning resource, simulation compares well with real-life experience, but is most effective when deployed alongside frequent updates based on more traditional teaching methods.

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PIONEERED BY THE aviation industry, simulation is used to enable learning across a range of disciplines. Medical and healthcare fields have traditionally trailed behind other professions in using simulation as a teaching strategy (Rauen 2004), but have recently begun to make advances in this area. Over the past 20 years or so a substantial body of work has been developed (Woodward et al 1988, Johnson et al 1999, Bland and Sutton 2006) which advocates the use of such techniques in medical and healthcare contexts. The use of simulation is said to be particularly well suited to critical care because it allows nurses and other clinicians to practise their skills in a realistic way without endangering patients’ lives (Beyea and Kobokovich 2004, Rauen 2004, Bland and Sutton 2006).

This article assesses the use of ward-based simulation to support cardiopulmonary resuscitation (CPR) training based on an initiative at the Royal Hospital for Neuro-disability in London. It is a charity hospital in the independent sector with capacity for 260 patients.

Simulation in healthcare education
The word simulation, when applied to education and training, describes an approach that seeks to teach problem-solving, procedures or operations by immersing learners in situations resembling reality. What this generally means in medical and healthcare contexts is creating ‘an event or situation made to resemble clinical practice as closely as possible’ (Rauen 2004). As an educational technique, simulation draws on the theory of experiential learning and the pioneering work of Dewey (1938). Dewey identified four key concepts of learning: experience, democracy, continuity and interaction, and his basic premise was that all genuine education occurs through experience. According to this perspective, expertise can only be gained through sustained practice over time. Rogers (1970) also acknowledges that much learning comes from doing.

The concept of learning by doing is potentially problematic in many healthcare contexts, especially those involving emergency interventions where the patient’s life may be at risk (Long 2005). Practising such interventions in a real-life situation is neither in the best interests of the patient nor the student. Mistakes can be made that are critical to patient outcomes. This makes for a far from ideal learning environment. As noted by Hammond (2004), ‘little didactic teaching takes place in the midst of a crisis, and in an emergency, the student or learner is often moved to an observer role, as the instructor or more experienced clinician takes over’.

The appeal of simulation may seem obvious under these circumstances. Such an approach incorporates the benefits of real-life practice without the attendant risks or the relegation of the learner to observer status. It offers students
opportunities to practise and learn, and even make mistakes, without endangering the patient (Johnson et al 1999, Koerner 2003). By providing regular opportunities for practice in a realistic setting, it has been suggested that simulation can compensate for some of the weaknesses of traditional classroom-based training (Box 1). In particular, such an approach is said to help close the theory/practice gap because it encourages students to translate factual information into an integrated set of applied skills, with a high level of retention (Rauen 2004, Long 2005).

**Cardiopulmonary resuscitation**

The Royal Hospital for Neuro-disability is a specialist unit providing rehabilitative interventions and long-term care for people with neurodisability. It does not have an emergency department, an intensive care unit or any advanced life support facilities. Typically two or three CPR events are experienced at the hospital annually but there is no established emergency response team. Rather, all clinical staff are trained to provide CPR in the event of an arrest and arrange transfer of the patient by ambulance to the nearest acute hospital.

As part of the hospital’s mandatory training programme staff are expected to attend classroom-based CPR updates every six months (Resuscitation Council UK (RCUK) 2004). These updates are based on the RCUK’s Immediate Life Support Course (RCUK 2008) and also cover local policies and procedures. Training in safe defibrillation is included for all registered nurses.

Feedback from the wards, obtained from debriefing sessions after actual cardiac arrests, suggested that some staff lacked confidence when responding to such events and experienced high levels of anxiety and stress. Assessment of the staff during training also revealed poor retention of skills learned during previous sessions. As a result, the staff development team introduced ward-based simulation sessions to complement classroom-based updates.

A cardiopulmonary arrest situation is simulated every month on each of the wards using a low-fidelity life support mannequin. This allows for simple airway management techniques, chest compressions and safe defibrillation to be practised. The mannequin is placed in an available bed and the session facilitator accompanies a member of ward staff to the bed.

When the cardiopulmonary arrest is simulated, staff are expected to perform CPR while following local procedures. From this point on, the facilitator monitors staff performance, recording whether key activities are carried out and the time taken to complete them. At the end of the session, staff are encouraged to reflect on their individual and collective performance. The facilitator then provides feedback based on criteria specified by the RCUK and the team’s overall performance. Careful planning and collaboration with wards is required to ensure that the simulation sessions are conducted effectively, without detracting from patient care. The staff development team liaises closely with ward managers to identify appropriate dates and times for the sessions. In addition, one or two members of the ward team are excluded from each exercise to ensure continued patient monitoring and care. Sessions typically last no more than 30 minutes and the fact they are based on the ward means staff can be released to respond quickly to any emerging patient care issues. It was agreed with the ward managers at the outset that patient care would always take precedence and that the simulation session would be postponed if necessary.

**Evaluation survey**

For the purposes of evaluating the simulation exercise, staff members were given a short questionnaire which they were encouraged to complete at the end of the session. Assessment of the sessions was undertaken over a period of six months, from March to August 2006.

The questionnaire focused on attitudes to the exercise and the respondents’ confidence in their ability to react to a real-life CPR event. A total of 81 out of 84 participants returned completed questionnaires from 12 separate sessions. A small number of those who returned questionnaires did not answer every question.

**Box 1**

**Weaknesses of traditional training methods**

- Students often experience difficulty in translating classroom-based learning into real-life situations. They may find it hard to conceptualise the process or translate factual information into applied skills in real-life situations (Rauen 2004).
- Traditional classroom-based training, which is divided into discrete skill stations, may make it difficult for students to integrate their skills and respond effectively to circumstances as they unfold (Long 2005).
- Poor understanding may mean that skills are poorly retained (Koerner 2003). This problem is often exacerbated by a lack of opportunities to apply cardiopulmonary resuscitation skills in real-life situations.
- Whole ward teams cannot be released at the same time, which means staff are trained in a fragmented way and are not able to practise skills with other members of their team.
- Training typically takes place away from the ward, which means staff are not given the opportunity to practise skills in the environment in which they work.
with the result that the base number was not always 81. In addition, two informal group discussions were conducted with 16 members of staff who had participated in the sessions. Participants in the group discussion were selected on a voluntary basis although care was taken to ensure a good representation of different staff groups, including registered nurses, healthcare assistants and allied health professionals.

**Staff reactions to the simulation session**

All but one of the participating staff members (80/81) felt they had learned something important from the simulation session and that it had improved their ability to respond effectively to an actual cardiopulmonary arrest. A similar consensus (79/80) was evident in responses about the benefits of the session being based on the ward rather than in a classroom, and about the value of future sessions.

In their more detailed comments, participants indicated information that they had learned from the session, which included the use of particular pieces of equipment and the importance of communication and time management. The simulation session was frequently described as being ‘realistic’ or ‘like real life’ and much of its value was considered to be in the way that it offered staff an opportunity to practise their skills and consolidate theory-based learning:

‘Theory is different from learning the actual experience. We have been taught, yes, but to put it into action is a different thing’ (registered nurse).

In this way, the session was thought to provide a sense of familiarity with what a real-life emergency would be like and, as a result, many participants felt more confident that they would be able to respond effectively in the event of such an emergency:

‘It prepares myself and my colleagues mentally should an emergency occur’ (rehabilitation assistant).

The emphasis on familiarity and the realistic nature of the simulation was also evident in relation to the ward setting. As well as adding to the general sense of realism, the location of the session was welcomed on the basis that it gave participants the opportunity to practise with colleagues in their actual work environment and with those they will work with in a real-life event. This increased their familiarity with the logistics of local CPR procedures, including the time it took to reach the nearest telephone and collect relevant equipment. The simulation sessions provided an opportunity for staff to practise the skills needed to ensure good teamwork, such as effective communication and co-ordination of tasks, delegation and leadership, reinforcing Morgan et al’s (2007) claim that: ‘Evidence from safety research in high risk organisations has demonstrated that non-technical skills or behaviours must be studied because these cognitive and social skills have a pivotal role in maintaining safety, especially in critical care.’

Although much of the value attached to the simulation exercise was linked to its ‘realistic’ nature, part of its value also lay in the fact that it did not involve a real emergency. The simulation session was considered to be valuable because it was realistic, but not real. This point was emphasised by participants in one of the group discussions who felt that real-life CPR events did not provide a good basis for learning because the pressure of the situation allowed little room for reflection on the quality of the process. The simulation session, by contrast, was thought to be beneficial precisely because the life of a real patient was not at risk, so the quality of the process became the overriding consideration. Several participants described how they were able to reflect on the process during the simulation exercise, while others noted that they had been able to ‘learn from their mistakes’.

In response to the evaluation the vast majority of participants agreed that the simulation session had given them a better understanding of what to do in the event of a real-life cardiopulmonary arrest. It had also increased their confidence in their ability to respond to such an event and had given them a better understanding of how to work as part of a team (Table 1). At the same time, the vast majority disagreed with the statement that the session had not really added to what they already knew and had left them unsure of what to do in the event of an actual cardiopulmonary event. As well as emphasising the general value of the simulation exercise, participants’ responses to the questionnaire echoed some of their more detailed comments. There was widespread agreement that the session had highlighted the need for more practice and this reinforced the suggestion that it had acted as a ‘wake up call’ for some staff. This supports Wilson et al’s (2004) statement that human-patient simulators are a valuable tool in critical care education that can help to identify weaknesses in student performance.

**Readiness to respond to a cardiopulmonary arrest**

Most participants felt they had been well prepared to respond to a real-life CPR event at the hospital. A total of 42% (33/79) indicated...
they had been very well prepared, 51% (40/79) that they had been fairly well prepared, just 5% felt (4/79) that they had been poorly or very poorly prepared, with the rest (3%, 2/79) feeling they had been neither well nor poorly prepared. Similarly, 62% (48/78) of participants felt they were very clear about the hospital’s CPR procedures, 36% (28/78) that they were fairly clear and only 3% (2/78) that they were very or fairly unclear.

The general feeling among participants was that they had been well prepared and were clear about the hospital’s procedures. This indicated increased confidence in their ability to provide CPR. At the end of the simulation session, approximately half (40/79) the participants felt ‘very confident’ that they would know what to do in the event of a cardiopulmonary arrest and almost all of the rest (38/79) felt ‘fairly confident’ that they would know what to do. Similar responses were given in relation to whether they had the necessary skills, their ability to apply these skills in an actual emergency and the ability to work as a team.

**Experience and the value of training**

To develop a more detailed assessment of the simulation exercise, participants’ responses to the questionnaire were considered in relation to their experience of real-life CPR events and their attendance at the update sessions.

Involvement in a real-life CPR event may promote experiential learning.

Given the emphasis that is sometimes placed on learning by doing, it might be expected that

### TABLE 1

<table>
<thead>
<tr>
<th>Attitudes to simulation</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neither/nor</th>
<th>Disagree</th>
<th>Disagree strongly</th>
<th>Mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td>This session has given me a better understanding of what I should do in the event of a</td>
<td>67% (48/72)</td>
<td>33%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1.7</td>
</tr>
<tr>
<td>cardiopulmonary arrest</td>
<td></td>
<td>(24/72)</td>
<td></td>
<td>(0/72)</td>
<td>(0/72)</td>
<td></td>
</tr>
<tr>
<td>This session has made me realise that I need more practice in cardiopulmonary</td>
<td>55% (39/71)</td>
<td>35%</td>
<td>7%</td>
<td>3%</td>
<td>0%</td>
<td>1.4</td>
</tr>
<tr>
<td>resuscitation</td>
<td></td>
<td>(25/71)</td>
<td></td>
<td>(2/71)</td>
<td>(0/0)</td>
<td></td>
</tr>
<tr>
<td>This session has not really added anything to what I already knew</td>
<td>3% (2/71)</td>
<td>3%</td>
<td>3%</td>
<td>69%</td>
<td>23%</td>
<td>–11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2/71)</td>
<td></td>
<td>(49/71)</td>
<td>(16/71)</td>
<td></td>
</tr>
<tr>
<td>This session has made me more confident that I shall know what to do in the event of a</td>
<td>59% (42/71)</td>
<td>35%</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
<td>1.5</td>
</tr>
<tr>
<td>cardiopulmonary arrest</td>
<td></td>
<td>(25/71)</td>
<td></td>
<td>(0/71)</td>
<td>(0/0)</td>
<td></td>
</tr>
<tr>
<td>Being able to put my knowledge into practice has given me a better understanding of the</td>
<td>58% (41/71)</td>
<td>41%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>1.6</td>
</tr>
<tr>
<td>cardiopulmonary resuscitation techniques</td>
<td></td>
<td>(29/71)</td>
<td></td>
<td>(0/71)</td>
<td>(0/0)</td>
<td></td>
</tr>
<tr>
<td>This session has left me unsure about what I should do in the event of a cardiopulmonary</td>
<td>6% (4/72)</td>
<td>4%</td>
<td>1%</td>
<td>54%</td>
<td>35%</td>
<td>–11</td>
</tr>
<tr>
<td>arrest</td>
<td></td>
<td>(3/72)</td>
<td></td>
<td>(39/72)</td>
<td>(25/72)</td>
<td></td>
</tr>
<tr>
<td>This session has given me a better understanding of how to work effectively as part of</td>
<td>64% (46/72)</td>
<td>33%</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
<td>1.6</td>
</tr>
<tr>
<td>team in the event of a cardiopulmonary arrest</td>
<td></td>
<td>(24/72)</td>
<td></td>
<td>(2/72)</td>
<td>(0/0)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Six respondents who agreed with all the statements shown here were excluded from the analysis on the basis that their answers were inconsistent and lacked validity (de Vaus 2001)
participants who had taken part in an actual CPR event would have greater confidence in their abilities than those who had not and would place less value on the simulation exercise. This was not the case, however, as participants provided similar feedback regardless of whether or not they had taken part in a real-life CPR event. All of those who had taken part in such an event indicated they had learned something important from the session, that it had improved their ability to respond to a cardiopulmonary event and that they would benefit from future sessions. Those who had never attended an update tended to be the most confident in their abilities to respond to a real-life cardiopulmonary arrest and those who had never attended an update tended to be the least confident (Figure 2). Such differences were particularly marked in relation to the acquisition of skills and their application. Participants who had attended a training update in the previous 12 months tended towards being ‘very confident’, while those who had never attended an update tended to be only ‘fairly confident’.

**Discussion**

Responses to the simulation exercise indicate that, as a learning resource, it compares well with real-life experience, but is most effective when deployed alongside frequent updates based on more traditional teaching methods. Having taken part in an actual cardiopulmonary event did not seem to add to participants’ self-confidence, which suggests that any learning benefits associated with such experience were overridden by the training. Although the simulation exercise was welcomed by almost all participants, it played a particularly important role in boosting the self-confidence of those who had recently attended the classroom-based training updates provided by the hospital. As such, ward-based simulation is best used to complement, rather than replace, more traditional forms of CPR training.

The results of the evaluation support many of the positive claims that have been made about the value of simulation in the context of CPR training (Grenvik et al 2004 and Wayne et al 2005) (Box 2). There was almost universal agreement among staff that the sessions had helped to improve their understanding and skills, reinforcing the claim that simulation provides “a wonderful bridge between theory and practice” (Rauen 2004). Much of the appeal of the session was in the opportunity it gave participants to apply their learning in a realistic context, and the ward setting was particularly important in this regard. As well as providing a realistic
environment, the fact that the session was based on the wards was thought to encourage greater efficiency and improved teamwork. In terms of promoting good practice more generally, the simulation session appeared to fulfil a dual function: encouraging participants to feel more confident in their ability to respond to a real-life cardiopulmonary emergency, while also promoting critical reflection.

**Conclusion**

Following the evaluation, simulation has become a core part of the hospital’s CPR training. Investment has been made in a high-fidelity mannequin that offers more interaction with the students, and attendance at updates and training sessions is carefully monitored to ensure compliance. NS

**BOX 2**

**Perceived benefits of ward-based simulation**

- Promotes integrated learning in a realistic setting.
- Increases familiarity with the work environment and logistics of local CPR procedures.
- Encourages effective teamwork.
- Provides opportunities to practise skills without risking patient safety.
- Improves confidence, especially when used alongside traditional classroom-based interventions.
- Facilitates blended learning.
- Promotes critical reflection.
- Does not require staff to be released from the ward.

**FIGURE 2**

**Participants’ confidence in their abilities to respond to a cardiopulmonary arrest, by whether they attended updates**

<table>
<thead>
<tr>
<th></th>
<th>Not at all confident</th>
<th>Fairly confident</th>
<th>Very confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>2.6</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Skills</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Applying skills</td>
<td>2.4</td>
<td>2.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Team work</td>
<td>2.5</td>
<td>2.6</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**Key**

- Attended update in previous 12 months (n=49)
- Attended update, but not in previous 12 months (n=18)
- Never attended update (n=13)

**Overall:** How confident are you that you would know what to do in the event of a cardiopulmonary arrest? (n=79)

**Skills:** How confident are you that you have the resuscitation skills (for example chest compression and airway ventilation) that are required in the event of a cardiopulmonary arrest? (n=79)

**Applying skills:** How confident are you that you could apply these skills effectively in the event of an actual cardiopulmonary arrest? (n=78)

**Team work:** How confident are you that you and your colleagues on the ward would work effectively together as a team in the event of a cardiopulmonary arrest? (n=79)

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**References**

- Dewey J (1938) Experience and Education. Macmillan, New York NY.

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