



Health
and Human
Services

ADVANCED MANUAL

A TRAINING MANUAL FOR SIMULATION EDUCATORS

Equipping Victoria's Health and Human Service professionals with the skills and knowledge to deliver simulation-based education.

Preface

In 2007, St Vincent's Hospital (Melbourne) was commissioned by the Department of Health and Human Services (DHHS) to design, develop and implement a training program for clinical skills trainers within Victorian Hospitals. The project aimed to equip Victorian health professionals, specifically hospital clinical educators, with the skills and knowledge required to deliver simulation-based clinical skills training.

Two courses were developed with supporting manuals. These manuals have been found to be useful as stand-alone resources for simulation educators to refer to in designing and teaching simulation-based education. In 2017, the Victorian Simulation Alliance (VSA), commissioned Health Education Innovative Solutions (HEIS) to update and contemporise the original manuals so that they would continue to be useful resources for all Victorian simulation educators.

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Every effort has been made to provide the reader with the most current literature references.

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Module 1 - Simulation-based Education

The use of simulation in health care education has become a core component in both undergraduate and postgraduate programs in the past two decades (Motola et al, 2013). It is now used in training, assessment and research (Piquette and Le Blanc, 2015, Khan et al, 2011). Simulation has been used within the military, space and aviation industries for many years (Bradley, 2006), with simulation training now a compulsory continuing education requirement for pilots. In particular, aviation has led the way by training teams in non-technical skills such as leadership and communication, which they have recognised can equally impact on safety.

Within health, simulation has been used for many years at its simplest level that is using models to assist in teaching anatomy. However, within modern healthcare education, anaesthetists were the first group to develop a simulation manikin with the ability to mimic patient conditions. The original manikins have come a long way to that of the more sophisticated computer programmed and physiologically modelled manikins of today.

This module explores the following topic areas:

- Definition of Simulation
- Why use Simulation?
- Underlying Educational Theory
- Types of Simulators
- Factors that improve the effectiveness of simulation
- Limitations of simulation based education

1.1 Definition

Simulation-based education (SBE), in the broadest definition of the term, encompasses any educational methodology which 'simulates', imitates, creates, or replicates the management of patients in the real clinical environment. Lopreiato et al, define simulation as "a technique that creates a situation or environment to allow persons to experience a representation of a real event for the purpose of practise, learning, evaluation, testing, or to gain understanding of systems or human actions" (2016, p34).

Simulation technology or the “simulator” refers to the device that assist the educator to recreate the real world. These devices can be manikins, computer assisted devices, models, or part task trainers.

Simulation education also encompasses the use of non-technical simulation aids such as simulated patients, which are specially trained actors or volunteers used to simulate “real” patients in the training environment. They are also called standardised patients or simulated participants, within the literature. Simulated patients are commonly used in nursing, medical and allied health programs for assessment and training purposes. Actors need to be specially trained not only in the condition they are to simulate but also in the interaction with the learner.

Simulations can occur in a variety of environments. They can take place in a specially designed simulation laboratory aimed at replicating a real clinical environment. They can occur in the real clinical environment where manikins or simulated patients are bought into a “real situation”. These simulations are referred to as “in situ” simulations (Piquette and Le Blanc, 2015). Simulations can also occur in a “virtual” environment via a computer interface (Bauman & Ralston-Berg, 2015).

Simulation based medical education (SBME) need not rely on manikins, people or models “it could as easily be a paper based activity” (Ker and Bradley, 2013). However, within this chapter the focus will be on technology or manikin based simulation programs and those with or without simulated patients. The abbreviation SBME will be used to refer to Simulation based medical education.

1.2 Why use simulation?

There have been a number of drivers to the increased uptake and interest in using simulation in health care education. Brigden & Dangerfield (2008) suggest that the rationale for using simulation can be summarised into educational, ethical and practical reasons. These reasons are summarised in the Table 1 with associated references:

Table 1: Drivers for using SBE

Educational Reasons	Ethical Reasons	Practical Reasons
<p>The safety movement has raised awareness of adverse event management and the need for training in this area of critical incidents/ adverse events (Ker and Bradley 2013).</p>	<p>Society and patient expectations have changed so that it is no longer seen as appropriate to practice on patients. Healthcare practitioners are expected to be competent before performing on a patient. Khan et al suggest "A see one, do one, teach one paradigm has become indefensible and practicing on animals let alone patients is no longer acceptable" (2011, p2).</p>	<p>There have been numerous changes to healthcare delivery including; the move to ambulatory and community settings, increased acuity within hospitals, day surgery etc., all of which mean that there has been a reduction in opportunities for healthcare workers to gain experience in the same breadth of patient care (Ker and Bradley, 2013).</p>
<p>A desire for standardised educational opportunities that can be available on demand (Motola et al, 2016)</p>	<p>Kalaniti & Campbell suggest "the ethical imperative for SBME may be stronger in paediatrics, since children are not capable of providing informed consent on their own, unlike other fields of health care" (2015, p42).</p>	<p>Reductions in working hours for healthcare practitioners also impacts on opportunities for learning. (Kothari et al, 2017).</p>
<p>Recognition of the need for interdisciplinary training opportunities (Piquette and Le Blanc, 2015).</p>	<p>Bradley and Postlethwaite (2003) state that "patients' acceptance of being passive, uninformed participants in medical education, a situation common in the past, no longer exists today" (p6).</p>	<p>New technologies in medicine have required different approaches to training e.g. endoscopic surgery (Ker and Bradley, 2013).</p>
<p>Ability to introduce skills acquisition in a planned and sequential manner and to allow deliberate practice (Brigden & Dangerfield, 2008)</p>	<p>Improved health outcomes and reduced adverse events (Marshall et al, 2015).</p>	<p>The need to practice skills in a controlled environment (Motola et al, 2016)</p>
<p>Reduction in stress due to safe learning environment (Brigden & Dangerfield, 2008)</p>		<p>The use of simulation to deliver training and education can be highly cost-effective and can be associated with significant medical care cost savings (Cohen, ER et al 2010)</p>

Educational Reasons	Ethical Reasons	Practical Reasons
Recognition of the need for team training (Berkenstadt et al, 2013, Marshall et al, 2015).		
Need for objective and reliable assessments of competence (Berkenstadt et al, 2013).		

Evidence from the literature as to the benefits of simulation has been well established.

These benefits have included:

- Well accepted by learners as a learning methodology (Piquette and LeBlanc, 2015, Cant & Cooper, 2010).
- The ability to provide a safe learning environment where learners can make mistakes, review their performance and gain feedback, without risk to patients (Piquette and Le Blanc, 2015).
- There is a decreased risk to patients as skills are learnt away from the patient prior to transferring them back to the health setting. "Simulation based education more often allows trainees to have their first encounters with real patients when they possess higher levels of technical and clinical proficiency" (Ziv et al, 2006).
- The ability to provide a more standardised environment for the learner to learn their skills compared to the clinical environment (Piquette and Le Blanc, 2015).
- "Improvement of knowledge, technical and nontechnical tasks, teamwork, communication skills, and system issues" (Piquette and Le Blanc, 2015, p471).
- Retention of skill acquisition and reduction in error back in the workplace for some skills e.g. insertion of a Central Venous Catheter (Barsuk et al, 2011).
- It can be used to assess "vulnerabilities in health care delivery" and system analysis (Ziv et al, 2005) and "to increase efficiency of healthcare systems through rehearsal and team exercises" (Khan et al, 2011, p2).
- The ability to train across all three domains of learning; cognitive, psychomotor and affective with clearly defined learning outcomes (Khan et al, 2011).
- The ability to provide varying levels of difficulty depending on the stage of the learner. Motola et al state that simulation is able to provide "planned and gradual increases in the difficulty of clinical problems presented to learners, with the opportunity for necessary repetition" (2013, p1519).

- Scenarios can be created to suit the learning objectives. There isn't a reliance on finding a patient with that condition. This makes the education experience focus on the learner's needs.
- Critical incidents or crisis situations (e.g. trauma), that occur rarely but require a high level of preparedness can be practised easily (Berkenstadt et al, 2013).
- The opportunity for rehearsal of more difficult techniques (Kothari et al, 2017).
- The environment can be manipulated as desired to enhance learning and unwanted distractions eliminated.
- Simulation provides opportunities for team training and interdisciplinary learning. (Ker & Bradley, 2007, Maran & Glavin, 2003).

However, what are the outcomes in terms of patients? Simulation-based education can be costly particularly where the simulators to be used are the more technologically sophisticated or where there is a need for a simulated patient education program. So what then is the cost benefit ratio for simulation? Is simulation more effective than other educational methodologies? What is the impact of simulation training on patient safety?

Research into simulation based education was initially criticised as being very superficial, concentrating on learner satisfaction rather than outcomes and as such it was difficult to draw conclusions regarding outcomes (McGaghie et al, 2010). The educational theories, as described earlier, intuitively support the notion of simulation as a rich learning tool. However, there is a paucity of evidence. In the area of virtual reality surgical simulator research has demonstrated reduced performance time, increased proficiency and transference of learning to the workplace (Kneebone, 2003). However, in the area of team training the variation in methodology used has made comparison of results difficult.

In their initial review in 2006, McGaghie et al were only able to find evidence of the benefit of repeated practice afforded by SBME. Likewise, Zendejas et al, (2013), were only able to find evidence of patient outcomes related to individual skill acquisition in simulation compared to no simulation.

In a recent literature review undertaken by Department of Health and Human Services Victoria, Simulation Based Education and Training Expert Advisory Group (2015), they reported the following outcomes from simulation training:

- reductions in patient related complications (e.g. cataract surgery, medication errors, hypoxic brain injuries at birth),
- reduction in patient mortality (e.g. ICU teams more likely to adhere to protocols, improved paediatric cardiac arrest survival rates)

- reduced lengths of stay associated with practicing new techniques prior to implementation with patients (e.g. antenatal ultrasounds, VR laparoscopy)
- cost savings from reduced infection rates (e.g. catheter related infections)

Ongoing research is required to continue to determine the impact of simulation on patient outcomes. McGaghie et al, suggest that “outcome measurement is one of the greatest challenges now facing the field” (2010, p56).

1.3 Underlying Educational theory

There are a number of educational theories which form the theoretical basis of simulation. The instructional design approaches discussed in the Clinical Skills Facilitators Basic Manual are relevant to the simulation setting, e.g. constructivism, however this section explores additional theories underpinning SBME.

Experiential Learning

Experiential Learning theory as espoused by Kolb (1984) describes experiential learning activities as opportunities for learners to acquire and apply knowledge, skills and attitudes in an immediate and relevant setting. Kolb describes a four-point learning cycle, which is continuous and involves:

1. Concrete experience
2. Observation and reflection
3. Forming abstract concepts
4. Testing in new situations.

Simulation in healthcare education is clearly an example of experiential learning (Morrison and Deckers, 2015, Pasquale, 2013). It provides the learners with a relevant and realistic patient problem to manage. Following the experience, the learners are able to observe their performance and reflect, whilst exploring with a facilitator hypotheses and new concepts. They can then test this experience by repeat simulations.

Instructional scaffolding

Bruner is credited with originating the term “scaffolding”, as providing the learner with a framework understandable to the novice that is later progressively removed as new understanding and technical skills are developed (Wood et al, 1976). Brydges et al, (2010) showed that using scaffolding theory that capitalizes on a systematic progressive

sequence of simulators, increasing in realism (i.e. fidelity) and information content, allowed students to progress in their practice and led to superior transfer of a broad range of clinical skills.

Reflection

David Schon (1987) describes two processes. Firstly, Reflection-in-Action which occurs at the time of the experience when a person uses past knowledge, skills and attitudes to assist them to problem solve the new situation. Reflection-on-Action, occurs after the experience and is facilitated by feedback from others, videotape analysis etc. Simulation allows for both types of reflection (Pasquale, 2013, Zigmont et al, 2011). Participants are required to draw on past experiences when solving the patient problem within the scenario and then are provided an opportunity to reflect in the debrief environment following the simulation.

Adult Learning Principles

Simulation addresses many of the principles of Adult Learning (Kothari et al, 2017, Wang, 2011 and Maran & Glavin, 2003,). It provides relevance to the learner which is guaranteed by the replicating of the real clinical environment (Kalaniti et al, 2013). This in turn increases the learners' motivation. Simulation programs also provide feedback on performance and an opportunity to reflect through the debriefing process. It can provide an effective educational climate which allows the learners to feel safe and encouraged to express themselves without judgement.

The importance of objective or facilitated feedback has been shown to be "the single most important feature of simulation-based education towards the goal of effective learning" (Issenberg & Scalese, 2007). Simulators can provide 'built in' feedback via a computer screen, haptics or readout. Alternatively, facilitators can give feedback in debriefing situations. Motola et al, 2013 suggest "feedback to learners is a critical component to ensure effective learning in simulation-based education" (p 1513). They suggest "Without a post-event reflective process, what the participants have learned is largely left to chance, leading to a missed opportunity for further learning, and making the simulation encounter less effective" (Motola et al, 2013, p1514).

The importance of deliberate practise for learning and skill acquisition has been shown by many and that practice must be accompanied by feedback and reflection (Kneebone et al, 2004, Motola et al, 2013, Kalaniti et al, 2013).

Social Constructivism

Another suggested underpinning educational theory for simulation comes from the work of Vygotsky a Russian psychologist who stresses the importance of “social interaction as a means of learning” (Ker and Bradley, 2013). As an important means of learning, the debriefing component of the simulation experience provides an opportunity to explore the social interactions that occur within a particular setting. There is also the opportunity to make these social interactions explicit.

1.4 Types of Simulators

Simulators are often classified according to their ‘fidelity’ or closeness to reality (fidelity will be addressed in detail in Module 2). Alternatively, the level of technology has been used to classify simulators (Maran & Glavin, 2003).

Types of simulators include:

- Anatomical models – these have spanned centuries in medical education starting with crude clay models (Bradley, 2006).
- Part task trainers – designed to simulate a part of the body and used to train specific individual skills e.g. insertion of an IV using an arm with veins to allow practice of the skill, or insertion of a urinary catheter using a pelvic model with appropriate anatomy to allow insertion (Bradley, 2006, Piquette & LeBlanc, 2015)
- Computer simulators – allow the learner to interact through a computer interface. Can be presented on a CDROM, DVD or online modality (Piquette & Le Blanc, 2015).
- Virtual reality (VR) – is the highest level of computer simulation and is usually combined with a part task trainer to increase the level of realism (Bradley, 2003). An example of a virtual reality simulator is one that allows the learner to practise an endoscopy or surgical procedure such as a cholecystectomy. The computer gives a visual image for the learner to watch and in some instances uses ‘haptics’ to provide the learner with a realistic ‘feel’ or touch feedback (Bradley, 2006).
- Kneebone (2003) discusses VR simulators with haptics; “New training devices with forced feedback improve the subtlety of ‘feel’ and loss of resistance when passing through ligaments in order to identify the epidural space. This may improve motor skills and lead to increased transfer to clinical practice”.

- Augmented Reality (AR) is a type of virtual reality in which synthetic stimuli are superimposed on real world objects usually to make information that is otherwise imperceptible to human senses perceptible. This can include head mounted displays or wearable computers projecting onto a human or simulator. In an integrative review, Zhu et al, (2014) showed that AR was used in healthcare education across healthcare professions, with a wide range of topics and for the purposes of practice, feedback and assessment. Acceptance for AR as a learning technology was reported among the learners and its potential for shortening the learning curve and prolonging learning retention (Zhu et al, 2014, p11). It is still considered as a novelty in the literature and AR applications lacked an explicit pedagogical theoretical framework.
- Integrated simulators or whole body manikins. These simulators are often referred to as high-fidelity simulators. They combine a whole body manikin with sophisticated computer software which allows the manikin to be programmed to mimic certain physiological conditions. The degree of integration of the software and the physiological modelling determines how automatic the responses to treatment are. This reality, in terms of responses to treatment, determines the simulator's degree of 'fidelity' or realism. (Bradley, 2006). Ker and Bradley (2013) differentiate this by classifying them as instructor driven or model driven simulators.

It is important to note that types of simulators are different to types of simulations in that simulators can be used in a variety of types of simulations. For example, a whole body manikin can be used in a simulation laboratory or "in situ" in a real clinical environment. A part task trainer can be used with a simulated patient in a hybrid simulation or on its own as a skill training exercise.

1.5 What factors improve the effectiveness of SBE?

In a systematic review by Issenberg et al (2005) from 670 articles only 109 met the criteria for inclusion in a Best Evidence Medical Education (BEME) review. However, this review and that of McGaghie et al, 2010 and Motola et al 2013, identified the following factors of SBME that influence the effectiveness of the learning:

- Providing feedback is the most important feature of simulation-based medical education.
- Repetitive and Deliberate practice is required.
- Curriculum integration - into either the standard medical school or postgraduate educational curriculum.
- Need to include a range of difficulty levels.
- Need to incorporate multiple learning strategies.
- It is better to use a wide variety of clinical conditions rather than a narrow range,
- Controlled environment –where learners can make, detect and correct errors without adverse consequences.
- Individualized learning – need for reproducible, standardized, educational experiences where learners are active participants, not passive bystanders.
- Defined outcomes –clearly stated goals with tangible outcome measures.
- Simulator validity – ensuring it is a realistic recreation of the clinical condition.

Beaubien and Baker (2004) discuss the use of simulation in healthcare team training and suggest additional ways to maximise the effectiveness of simulation training in this context. These include:

- Tailoring training needs, goals, content and evaluation to reinforce each other. This is a fundamental instructional design principle relevant to all courses.
- Use case studies and role plays to introduce the concepts of team training.
- Use lower technical simulators to practise the basic skills of teamwork.
- Progress to high fidelity simulators for the more complex team training in crisis situations and in time pressured environments.
- Use post training debriefs to reinforce lessons learnt.
- Training shouldn't be a onetime event.

Salas & Burke (2002) suggest that simulation training can be effective when:

- Instructional features are embedded within the simulation. This involves the use of 'event based approach to training' where events are embedded into the scenario at different time points and serve to provide learners with an opportunity to demonstrate a specific competency at these points. This also provides some control within the scenario and also an opportunity to have some standardisation across learners.

- Scenarios need to be carefully storyboarded. The authors suggest using a cognitive task analysis to help in determining content. Also there is a need to identify triggers in the script to assist in achieving learning outcomes.
- The simulation has opportunities to assess individual or team behaviours. There is a need to diagnose skill deficiencies.
- The learning experience is guided. The authors reinforce the need for targeted feedback to assist in achieving learning outcomes. Practise alone is not sufficient for learning.
- Simulation fidelity is matched to training requirements. This is dealt with in Module 2 Fidelity, however “the level of simulation fidelity needed should be driven by the cognitive and behavioural requirements of the task and the level needed to support learning” (Salas & Burke, 2002).
- There is a partnership between subject matter experts and training specialists. This is important in both the planning and implementing phases of course design.

Issenberg (2006) also argues that there has been an over emphasis on the training resources and their role in promoting effectiveness in simulation training. Two additional features are equally important. These are the educators using the simulation-based education and the degree to which the simulation is integrated into either undergraduate or postgraduate curricula. He argues that the educators need to be adequately trained in order to maximise the effectiveness of the simulation training.

Harden and Crosby (2000 as cited in Isenberg, 2006) define the roles of a simulation educator as being:

- Information provider
- Role model
- Facilitator
- Assessor
- Planner
- Resource Developer.

Blaznek coins the term “Simulation Anxiety Syndrome” which she describes as “characterised by an unfounded fear.....based on who is in control of the simulation and who is responsible for the process” (2011, p57). Clinical Teachers new to simulation need to be supported and clearly consideration needs to be given to clinical teacher development in order to assist them to develop the necessary skills to transition to effective simulation-based educators.

1.6 Limitations of SBE

Whilst there are a number of clear advantages to SBME there are some limitations which should be acknowledged. SBME is not intended to be a replacement for clinical experience (Ker and Bradley, 2013). Rather it is a valuable educational strategy to prepare health practitioners for the healthcare environment. Likewise, “simulation, by itself, is not a guarantee that adequate learning will occur” (Chiniara et al, 2013, p e1392).

Potential limitations to simulation-based education include:

- Cost of delivering training. The simulators themselves can be extremely expensive both in terms of purchase and maintenance. In addition, simulation-based training is faculty intensive and as such costs associated with having sufficient trained educators must also be considered. There are also resource costs associated with practising skills in the form of consumables.
- Manikin fidelity issues. Although simulators have come a long way in development, there are still some issues of fidelity which have not yet been solved e.g. skin colour doesn't change as it does in a real patient (Good, 2003). It is important to ensure the fidelity required for the learning objectives and the learner level of experience. (Chiniara et al, 2013).
- Technical expertise required to run simulators. The more sophisticated the simulator the more technical support required by educators to conduct the simulation-based education. They may be required to gain this technical expertise themselves or to purchase technical support time (Good, 2003).
- Evidence of transfer of learning from the simulation environment to the clinical environment is not conclusive. There is also some concern of the potential for negative learning and “abnormal risk taking behaviours being adopted by learners if their simulated experience, which is risk and harm free, is not tempered with the need for them to recognise their own limitations and to call for help in difficult situations” (Ker and Bradley, 2013). Ker and Bradley (2013) also discuss the need to provide opportunity in the simulation-based education for discussion about the generalisation of learning to the workplace to promote transference of learning.
- Psychological safety of participants. There is the potential for negative psychological effects for learners and appropriate debriefing is necessary to minimise this (Lockman et al, 2015).

- Time and room availability for in situ simulations (Charnin et al, 2016). There needs to be back up plans for rooms in case the clinical rooms are not available and there is a need to minimise work disruptions.
- Simulated patients – their ability to authentically imitate emotions and communication issues and common clinical encounters (Brennar, 2009). It should be noted that there is also a paucity of evidence regarding the transfer of learning in communication skills, from simulated environments using simulated patients to the real clinical environment and more robust studies are required to establish the cost benefits of this type of training (Kaplonyi et al, 2017).

Despite these limitations, simulation provides an important adjunct to learning “on the job”. As with any educational intervention, careful planning, consideration of the learning objectives and context in which the learning will take place are necessary to ensuring a positive learning experience for the learner.



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Module 2 - Fidelity in Simulation

The debate surrounding fidelity in clinical skills and simulation training has been topical in the literature regarding health professional education as well as industries such as aviation in which simulation first evolved. Manikins are labelled high, medium and low fidelity in an arbitrary manner and these terms create confusion amongst trainers and learners alike. Beaubien and Baker (2004) argue that the terms high fidelity simulation and simulation are being used synonymously and that this “overemphasises the instructional technology to the detriment of more substantive issues, such as the training goals, content and design.” (p151).

There is also an impression created that the higher the fidelity of the manikin the better the training outcome which is not necessarily so (Beaubien and Baker, 2004). Schoenherr and Hamstra (2017) suggest that “high fidelity is neither necessary nor sufficient to ensure effective training” (p117). Many studies have illustrated similar learning outcomes on low fidelity simulators compared to high fidelity simulators (Schoenherr and Hamstra, 2017). As clinical teachers we need to be aware that there are a number of factors which affect the efficacy of clinical skills and simulation training and fidelity is just one.

This module explores:

- Definition of fidelity,
- Classification of types of fidelity
- Relevant educational theories, and
- Methods to maximise fidelity.

2.1 Definition

Fidelity refers to the realism of the situation. Sorensen et al, define fidelity as “the degree of faithfulness that exists between two entities” (2017, p2). There are two aspects to fidelity in simulation and it is important to differentiate if you are talking about the fidelity of a manikin or the fidelity of a training experience/situation.

Simulation fidelity has often referred to the manikin and as such is defined as “the degree to which the simulator replicates reality” (Beaubien and Beker, 2004, p152). However, there is more to a simulation than the manikin so that the definition of fidelity of a simulation may be better defined as “the extent to which the appearance and/or behaviour of the simulation or simulator matches the appearance and behaviour of the real system” (Ker and Bradley, 2013, p 177). Some authors suggest that fidelity should refer to the engineering aspect (the manikin) vs the psychological aspect (the simulation) to avoid confusion (Schoenherr and Hamstra, 2017).

2.2 Classification of Fidelity

Rehmann et al, 1995 developed a typology of fidelity which includes three aspects:

1. Equipment fidelity – which relates to the physical characteristics of the simulator or manikin
2. Environmental fidelity – which relates to the extent to which the simulator duplicates sensory information eg motion cues, visual cues etc.
3. Psychological fidelity concerning the reality perceived by the learner.

Dieckermann, 2005 described another three-part typology being:

1. Physical – what can be measured e.g. weight and size
2. Semantical – relationship between variables e.g. the extent to which the blood pressure drops when fluid is lost.
3. Phenomenal – reality of feelings regarding the clinical situation. Dieckermann, 2005 also argued that what the trainer thinks is realistic is not necessarily what the participant thinks is realistic. This is often the experience post a simulation, where trainers are concerned with one aspect of realism and the learner is focussing on another aspect.

The International Nursing Association for Clinical Simulation and Learning (INACSL) (2016) define the following types of fidelity as:

- Psychological fidelity - “Factors such as emotions, beliefs, and self-awareness of participants; the extent to which the simulated environment evokes the underlying psychological processes that are necessary in the real-world setting for the participant” (p S42).

- Conceptual Fidelity - “all elements of the scenario or case relate to each other in a realistic way, so that the case makes sense to the learners (e.g., vital signs reflect the diagnosis). (p S42).
- Physical/Environmental Fidelity – “factors such as environment, manikins, room, moulage, equipment, noise, and/or props.” (p S42).

Pelletiera and Kneebone, suggest that fidelity is only fidelity “insofar as participants identify with such a perception that simulation appears faithful to reality.” (2016, p199).

There is obvious interrelationship between the variables. However, the importance of each aspect of fidelity should be linked to the desired outcomes of the training. For example, Beaubien and Baker, 2004, argue that the psychological dimension is the most important for team training. In addition, technology with good physical and environmental fidelity may increase psychological fidelity but not in the presence of poorly designed scenarios (Oser et al., 1999).

Nestel and Bearman (2015) discuss the educator and how they prioritise the various aspects of fidelity. They discuss:

- the positivist educator who may be focussed on the physical realism e.g. how the manikin reacts physiologically,
- the postpositivist educator who is more focussed on the psychological realism,
- the interpretivist educator who is more interested in how the learner interacts with the manikin, and,
- the critical theorist educator who may be more focussed on the physical appearance e.g. gender etc

They suggest that an individual educator may hold all these views but preference them according to the learning situation (Nestel & Bearman, 2015, p350).

In reality a number of factors influence the fidelity required in clinical skills training and simulations. These include:

1. The learning objectives - for example where the learning objective is to practise time critical decision making, the temporal aspect of fidelity will be important.
2. The level of the learner – the more experienced clinician will be more critical of the physical and environmental fidelity in order to achieve psychological fidelity.
3. Complexity of the situation e.g. individual skill training such as IV insertion vs team training in anaesthetics.

It is important to remember that perceptions of realism differ amongst the learners even though all experience the same simulation fidelity.

2.3 Relevant Educational Theories

Sorensen et al, suggest that the importance of fidelity is linked to the premise that the “closer the learning context resembles the context of practice, the better the learning” (2017, p3). The need for contextualisation of learning has been discussed in the Basic Clinical Skills and Simulation Manual, and the way in which fidelity to the real clinical environment can be enhanced by the use of lower physical fidelity manikins with simulated patients (Kneebone et al, 2002). Fidelity has also been suggested to increase relevance for the learner and hence impact on their motivation to learn (Chen et al, 2015).

In addition, the transference of learning from the skills environment to the clinical environment has been discussed since 1901 when Thorndike and Woodworth suggested “that skilled performance involves many elements, and transfer is dependent on the number of identical elements that exist in common between the practice task and the criterion task” (Grierson, 2014, p281). Ker and Bradley suggest a number of factors to aid transference of learning, with fidelity enhancing “suspension of disbelief” (2013, p23).

There has also been a suggestion that attention to environmental factors such as noise, numbers of staff, and physical size of the room can also influence transferral of learning (Ker and Bradley, 2013, p. 24). Likewise, “differences between the learning and retrieval environments reduce the likelihood of transfer” (Tetris et al, 2012, p140), yet another argument for the need for fidelity of the situational elements.

Grierson, 2014 takes an information processing approach to validating the role of fidelity and suggests two elements that are important to understanding the impact of fidelity on learning in simulation based education “the degree of specificity with which the simulation contains the sensory, cognitive, and/or motor information processing that occurs during criterion performance; and, second, according to the degree of variability and complexity that the simulation permits within that specific information processing relationship” (p 287).

Fidelity has also been suggested to effect the immersion in the simulated environment and hence the potential for learning, however there has been no direct relationship established between the level of fidelity and the effectiveness of team training (Beabien and Baker, 2004). In aviation, there has been some research that suggests “a high physical fidelity makes the simulation more acceptable to pilots” (Roscoe, 1991). While others suggest that

a skills or procedural trainer does not require high fidelity to achieve its goal (Johnson, 1981). The need for immersion depends on the goals of the educational experience and hence the need for fidelity.

As clinical educators we also need to be aware of the potential for negative transfer of learning (National Research Council, 1994). This has the potential to occur where learners are encouraged to practise in a manner different to the environment in which they work, e.g. being told not to dispose of sharps in the sharps container, because as the trainer, you want to reuse the equipment for the next training session. In this instance, an alternative would be to encourage correct disposal and retrieve the equipment after the training session is complete.

2.4 Methods to enhance fidelity

As a clinical educator there is not a lot that can be done to enhance the physical fidelity of a manikin. However, it is worthwhile to provide manufacturers with feedback on what learners consider realistic so that they can continue to improve this aspect of the realism. Clinical teachers “must identify what features of a simulator are critical to their learning objectives” (Schoenherr and Hamstra, 2017, p121).

There are a number of ways to improve the environmental and psychological fidelity. Examples are:

1. Use realistic resources – find out the environment in which your learners will be working and gather the resources they would see e.g. drug vials, patient charts, linen etc.
2. Learner attire – if you are doing an operating theatre session, the learners and staff should be in theatre attire to mimic the real environment. This should include where appropriate hats, footwear and gloves/masks.
3. Pre-scenario briefing – make sure that you set the scene prior to the training. This will assist the learner to get into role prior to the scenario commencing. This is important if you are doing a role play, a clinical skills session or simulation. It is also a time to develop a “fiction contract” which outlines to the learner what has been done to maximise fidelity but highlights the limitations e.g. the skin colour doesn't change (Rudolph et al, 2015).

The degree of engagement that the learners are willing to give the simulation (also known as the suspension of disbelief) encourages learners to put aside their disbelief and accept the simulated exercise as being real for the duration of the scenario.

(Lopreiato, J. et al 2016). Dieckmann et al., (2007) suggest that without a willingness to suspend disbelief too much emphasis is placed on the physical characteristics of the manikin at the expense of the learning situation.

4. Plan scenarios carefully so that as the educator you have anticipated equipment and assistance the learner may request. This will mean that you will be able to respond appropriately at the time. Also in order to ensure maximal fidelity of the scenarios “cases or scenarios should be reviewed by subject matter expert(s) and pilot tested before use with participants” (INACSL, 2016, pS7).
5. INACSL, 2016 suggest that psychological fidelity can be improved by ensuring the simulated environment is as close to possible with the clinical environment by things such as “an active voice for the patient(s) to allow realistic conversation, noise and lighting typically associated with the simulated setting, distractions, family members, other health care team members, time pressure, and competing priorities” (p S7).
6. The INACSL (2016) suggest that the use of more than one mode of simulation as in a hybrid simulation will also enhance the fidelity of the simulation e.g. using a part task trainer attached to a simulated patient (pS43).
7. Moulage – the make up or casts used to mimic clinical conditions also needs to be as realistic as possible and can enhance outcomes from simulation training (Damazo & Fox, 2015).
8. Use of sequential simulations which represent a patient’s journey provides a degree of fidelity from a conceptual perspective (Powell, 2016).
9. The role of confederates (faculty used in simulation in a particular role e.g. the nurse) – Schoenherr and Hamstra (2017) suggests “if confederates in a simulation act as if water is blood, then learners are more likely to perceive water as representing blood in the context of that task.” (p121). Therefore, training of the confederates may assist in improving fidelity of the simulation.



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Module 3 - Crisis Resource Management

Crisis Resource Management (CRM) has become a valuable tool in healthcare education by providing a training structure for individuals and teams aimed at improving performance in non-technical skills.

This module explores:

- Background and definition of CRM
- CRM principles
- Errors in healthcare
- Outcomes of CRM
- Integrating CRM and Human Factors into Simulation Scenarios

3.1 Background and Definition of CRM

CRM originates from the aviation industry. The National Aeronautics and Space Administration (NASA) has actively tried to learn from aviation crashes to develop systems to improve safety. Early attempts at this were cockpit checklists (Alexander, 2015). However, following a number of high profile aviation accidents in the 1970s, the aviation industry developed Cockpit Resource Management, followed by Crew Resource Management, to improve use of cockpit resources and crew non-technical skills to mitigate against human errors (Zeismann, 2013).

Crew Resource Management focussed on cognitive and interpersonal communication, not technical skills, to reduce error in the complex aviation environment (Alexander, 2015). Alexander (2015) suggests that Crew Resource Management was focussed on skills such as:

- Situational awareness – ability to identify specific factors that can impact on safe operation of the aircraft.
- Planning – includes subordinates in decision making whilst still maintaining a hierarchy.
- Interpersonal skills of communication and team building.

The airline and space industries incorporated Crew Resource Management principles in all facets of their pilot and crew training (Alexander, 2015). They also used simulation to teach and test these principles. Crew Resource Management remains a critical component of airline training programs to this day (Hicks, 2015).

In the late 1980's Dr David Gaba, an anaesthesiologist, and others from Stanford University started experimenting with simulation to teach Anaesthetic Crisis Resource Management Principles (ACRM) which were modified from the Crew Resource Management Principles (Hicks, 2015, Gaba, & DeAnda, 1988, Gaba 1992, Gaba et al, 1994, Gaba et al, 2001, and Howard et al, 1992). Simulation was used to teach these principles, particularly as they related to high risk crisis situations in anaesthesia. The adoption of CRM into curricula started in the higher risk areas of medicine such as; anaesthesiology, emergency, obstetrics, and critical care, however today is incorporated across many health care disciplines (Zeismann, 2013, Fanning et al, 2015).

Operationally Crew Resource Management is defined as the use and organisation of all available resources, including; personnel, equipment, skills, abilities and attitudes, in order to achieve a safe and efficient flight (Pizzi *et.al*,2001). Crisis Resource Management in a medical sense has been identified by Rall and Dieckmann (2005) to mean coordination of all available resources in order to protect a patient, either in a crisis or in a pre-crisis situation.

The difference between the two definitions is that Crew Resource Management does not imply a crisis. Rather that Crew Resource Management in the aviation sense is the normal behaviour a flight crew adopts to ensure safe flight operations and ensure “the avoidance, capturing, and mitigation of error and its consequences” (Hicks, 2012, p10). In the medical adaptation, a crisis is assumed as the focus as to why a team need to behave or change behaviour in order to bring about the best outcome for patient safety.

Jones 2010 suggest that CRM should be reviewed to not just relate to crisis situations but routine team behaviours. Gaba et al 2015, suggest that the term Crisis Resource Management Principles has led to misconceptions that CRM is only to do with crises. However, they state that “anticipation and planning is a key element of ACRM that includes recognizing risks, preventing anomalies, optimizing safety in ordinary patient care, and handling early states of deterioration to prevent the development of a full-blown crisis” (Gaba et al, 2015, p26).

3.2. Crisis Resource Management Principles

There are 11 Anaesthesia Crisis Resource Management (ACRM) Principles commonly referred to in the literature. Each of these is described briefly below (Gaba et al, 2015, and Fanning et al, 2015):

1. **Know the environment** – this involves being thoroughly familiar with the environment in which you work including; layout, equipment, personnel, resources and how to access them.
2. **Call for help early enough to make a difference** – it has been shown that teams often avoid calling for help until at times it is too late. So ACRM principles advocate calling for help early. This may be more staff, staff with specific capabilities etc.
3. **Anticipate and plan** – this involves thinking about potential eventualities before they occur and developing a plan to mitigate them. This is often referred to as pre-emptive thinking.
4. **Designate leadership** – this refers to determining who will be responsible for prioritising tasks, allocating tasks to team members, ensuring tasks are completed and keeping a focus on the “big” picture.
5. **Use all available information and cross check** – many sources of information change regularly throughout a clinical situation e.g. operation, and they require constant checking.
6. **Establish role clarity** – people need to know what their role is and whether this changes over time.
7. **Allocate attention wisely** – this involves reducing cognitive load by prioritising incoming information, and recognising that human attention can be limited and is often hindered by multitasking.
8. **Distribute the workload** – the leader needs to ensure that they are not consumed by tasks and are unable to oversee the “whole”. Tasks need to be distributed amongst the team and ideally the leader needs to be able to stand back and oversee. The leader also needs to avoid “overloading” one team member by keeping a track of task allocation.
9. **Mobilize resources** – this is about calling for resources in a timely manner. Some resources can take time to arrive so there is a need to recognise to call for these early e.g. blood products.
10. **Communicate effectively** – poor communication has been shown to cause adverse outcomes so ACRM principles promote effective communication including; time outs,

calm, clear and directed communication, using people's names, polite, closing the communication loop, and atmosphere of open exchange.

11. **Use cognitive aids** – this refers to the use of checklists, protocols and flowcharts to assist decision making.

3.3 Errors in Healthcare

The report "To Err is Human: building a safer health system" released in 2000 by the Institute of Medicine in America, raised an uncomfortable truth about the level of impact, caused by medical error in the American medical industry. They stated that "errors are common and costly, systems cause errors, errors can be prevented and safety can be improved, and medication-related adverse events are the single leading cause of injury" (Yip and Farmer, 2015, p 257). The report served to identify how complex modern day health care delivery has become and that this complexity leads health professionals into compromised situations where error can occur.

A recommendation from the Institute of Medicine report was to incorporate aviation style team training into the curriculum for health professional education (Sunders, et al 2007). The motivation to incorporate aviation style training may also be linked to the fact that aviation like medicine is also a high risk industry. However, the literature identifies that aviation aims to be a high reliability organisation (HRO) where threats and error are addressed with proactive measures not only to avoid such error in the future but also as a lesson to learn from (Cooper 2004). Zeisman et al 2013, suggest "Most errors are not from inadequate knowledge or procedural inability but rather deficient nontechnical skills, including team leadership, team communication, and team situational awareness" (p 753).

3.3.1 High Reliability Organisations (HRO)

Simulation literature embraces High Reliability Organisation (HRO) theory as a way to minimise patient risk within complex health care systems. HROs are defined as, "organizations that have the potential for catastrophic failure yet engage in nearly error-free performance" (Christainson et al, 2011). Christainson et al, 2011 state that "HROs behave in ways that sometimes seem counterintuitive – they do not try to hide failures but rather celebrate them as windows into the health of the system, they seek out problems, they avoid focusing on just one aspect of work and are able to see how all the parts of work fit together, they expect unexpected events and develop the capability to manage

them, and they defer decision making to local frontline experts who are empowered to solve problem” (p314).

The HRO model describes 5 principles that help to minimise complex, high risk industry failure rates (Prasanna, & Nagy, 2011). Christianson et al 2011 categorise these into problem detection and problem management:

- Problem Detection:
 - Preoccupation with failure, “using failure and near failure as ways to gain insight into the strengths and weaknesses of the system” (Christianson et al, 2011, p315),
 - Reluctance to simplify – avoiding tendency to explain away problems,
 - Being aware of the ‘Big Picture’ and the ability for problems in one area to cause problems in another area,
- Problem Management:
 - Reliance – developing the ability to manage the unexpected, and
 - Deference to expertise – recognising and using expertise in the organisation (not always the most senior person in a hierarchical system).

Sanchez and Barach, suggest the HRO principles suit the surgical environment because of the “pace of operations, expectations of superior levels of performance and safety, and the degree of uncertainty in surgery require a systems-based approach” (2012, p2).

Christianson et al, also consider Intensive Care Units appropriate places to apply HRO principles due to “the opportunity for error in the ICU is ubiquitous, and critically ill patients are especially vulnerable to harm” (2011, p316).

HRO principles are being applied across healthcare settings in response to the recognition that healthcare environments are high risk environments, with “a higher rate of near-misses and subsequent adverse events than most high-risk industries” (Van Spall et al, 2015, p292).

3.3.2 Types of Error

Oxtoby et al, 2015, suggest that errors can be seen “as the result of interactions between the cognitive limitations of an individual and the environment or system which influences their decisions” (p438). Rall and Dieckmann (2005) identify failures, errors and violations as areas where individual action can threaten patient safety.

- **Failures** - are seen to occur when the right action has been taken, and the individual is doing nothing wrong, but the result was the objective not being achieved. These are often system related (Oxtoby et al, 2015).
- **Errors** - There are three types of error;
 - Rule based – where people fail to use previously learnt solutions to problems (Oxtoby et al, 2015, p438),
 - Skill based - where people lack skills required to solve the problem, and,
 - Knowledge based – where working memory fails

Rall and Dieckmann (2005) point out that any of these errors can occur during the planning or implementation phases of a given action.

- **Violations** - The error occurs when an individual who knows what and how to do something, but disregards this in preference for a different way. The reasons for a violation error can be difficult to determine as the individual might have a disregard for safety, a lack of knowledge or developed a quicker way of completing the task. As such, a violation may occur with the best of intentions for an intended action to be performed with less risk than the current policy allows for.

One particular type of error that receives a great deal of attention is fixation error. Gaba et al, 2015 describes three types of fixation error:

1. **This and only this** - “persistent failure to revise a diagnosis or plan despite plentiful evidence to the contrary” (p46)
2. **Everything but this** – “persistent failure to commit to the definitive treatment of a major problem” (p46)
3. **Everything is ok** – “persistent belief that no problem is occurring in spite of plentiful evidence that it is” (p46).

3.3.3 Human Factors

Human Factors (also known as ergonomics) “uses scientific methods to improve system performance and prevent accidental harm” (Russ et al, 2013). Russ et al, 2013 suggest that there are two goals of human factors in healthcare include:

1. support the cognitive and physical work of healthcare professionals, and
2. promote high quality, safe care for patients (p802),

Russ et al, 2013 suggest that there has been a misconception in the use of Human Factors principles in healthcare. Contrary to the belief human factors is about teaching teamwork and communication in order to reduce errors, human factors “is about

designing systems that are resilient to unanticipated events” (Russ et al, 2013). Likewise using human factors to teach how to modify behaviour in the workplace is also a myth as it is about changing the system to support the healthcare worker e.g. “changing technologies, processes, tools and other inanimate work system components” (Russ et al, 2013, p803). Team training is only one element of Human Factors science (Waterson and Catchpole, 2015).

However, there is a recognition that human factors can cause error, that is human performance can cause errors. Training in the area of human factors has utilised analysis of errors to identify human factors that play a part and teaching skills such as teamwork, communication and situational awareness to mitigate these (Reynard, 2015).

What are the human factors attributed to error production? The literature discusses a number of human factors that can lead to error. They are often termed “non-technical skills”. Table 2 summarises these factors (Hinshaw, 2016).

Table 2: Human Factors

Human Factor	Description
Communication	Between individuals and teams. The exchange of information regarding the patient.
Situational awareness	Being aware of what is happening around you in terms of the environment, healthcare team, equipment or the patient.
Decision making	Process of coming to a judgement.
Teamwork	How the group of healthcare professionals function together as a team.
Leadership	The notion of who is the leader and that this is not necessarily the most senior person on the team and may change over time.
Assertiveness	The ability to speak up when concerned.
Ability to cope with stress and fatigue	This is an individual's ability to be aware of their own personal circumstances and to be able to recognise and manage their own stress and fatigue.

3.3.4. Relevance of Error and Human Factors to CRM training

The inclusion of Error and Human factors within a discussion of CRM is important in order to develop a broad understanding of why we are using CRM in health professional education.

As instructors we need to develop realistic scenarios that accurately represent the clinical environment that individuals work in. CRM as a teaching strategy should be coupled with an understanding of human factors relevant for that particular team. Care should be taken to identify these factors, as developing an understanding of them during the course of a CRM program may greatly aid transference of these lessons back into the work place.

It is also important to understand that participants arrive at the simulation centre with the same baggage as they do at work. The consequences are also similar in terms of negative performance; particularly as high fidelity programs can be quite stressful. Debriefing with knowledge of human factors greatly aids discussion and develops group insight as they view and discuss individual and group performance. Debriefing is discussed in detail in Module 4 of this manual.

3.4 Outcomes of CRM training

“The ultimate goal of all CRM simulation training is to increase patient safety and result in better patient outcomes” (Boet et al, 2014, p572). However, there remains a dearth of robust studies to validate the outcomes of CRM despite the high participant satisfaction and recognition of relevance of training, and the logic behind the premise (Doumouris et al, 2012, and Fung et al, 2015).

Suggested effects of CRM simulation training include:

- Reduced patient mortality in paediatric cardiac arrest (Boet et al, 2014).
- Reduced patient adverse outcomes (Fung et al, 2015).
- Transfer of CRM skills to the workplace (Boet et al, 2014).
- Error reduction in the clinical setting (Carne et al, 2012).
- Improved multiprofessional team behaviours and efficacy (Carne et al, 2012, Fung et al, 2015, Gillman et al, 2016, Coppens et al, 2017).
- Improved attitudes to CRM principles (Zeisman et al, 2013).

Ongoing robust research is required to confirm the outcomes of CRM Training using simulation.

3.5.1 Teamwork

Historically, CRM has been taught within professional or specialty silos, thereby missing the opportunity to learn from team-based interactions that are intrinsic to actual clinical practice. Interprofessional collaboration utilizes these interactions to ensure that different professions can work together in an effective manner. In recent years, simulation-based education for teams has been an increasingly recognized type of interprofessional education across a range of clinical contexts (Boet et al, 2013, p53).

Hunt et.al (2007) identifies that no one individual can expertly care for a patient independently. As such effective patient care requires a team; the healthcare team is always can be interprofessional or multidisciplinary team, that is there is more than one discipline of health professional within each team. Evidence in the literature suggests that “inadequate teamwork (and inadequate communication) represents amongst the most common reasons for preventable error” (Brindley, 2015, p21).

The definition of a team is a group of individuals that need to work together in order to perform a common goal (Hunt et al, 2007). A successful team should be able to complete more than one individual can, in an efficient, safe and reliable manner (Hunt *et.al*, 2007). By contrast a poorly performing team is likely to be antagonistic and ultimately ineffective at achieving a common task.

Obviously teams are a complex set of interactions between individuals and as such teams require training in order to perform at an optimum level. There is no better example of this than the military in the lead up to an enemy engagement.

The purpose of team training is getting every one working off the “same page” to develop a “shared mental model” of the objective, and each individual’s role in that mental model (Hunt *et.al* , Sundar et al 2007). Often training within healthcare is unidisciplinary. Team training is one area where it is crucial to undertake interdisciplinary training.

Sundar et al, describe mental models as “knowledge and mechanisms that can leveraged to describe, explain and predict events.” (2007 p 284). CRM is an example of mental model training, both in aviation and medicine.

There is extensive literature describing the characteristic of highly functioning teams and the requirements of individuals within these teams. Sundar et al (2007) identifies that individuals need to process, knowledge, attitudes and skills such as team monitoring,

knowledge of other team member's responsibilities and supportive attitudes toward team environments. However, Hinshaw 2016, suggests that "effective team-working is facilitated by good leadership skills which include modelling appropriate behaviour and the ability to 'actively listen'" (p369).

As for the teams themselves, Sundar et al (2007) noted the work of Salas (1999) in generating a list of characteristic of effective teams:

- Team Leadership
- Backup behaviour
- Mutual performance monitoring
- Communication
- Adaptability
- Shared mental models
- Mutual Trust
- Team orientation

Hunt et al (2007) in a literature review examining the characteristics of high performance teams, identified the following themes:

- Situational Awareness
- Leadership
- Followership
- Closed Loop Communication
- Critical language and Standardised Practises
- Assertive Communication
- Adaptive Behaviours
- Workload management
- Debriefing

Brindley, 2015 suggests that practical strategies for improving teamwork should include:

- **Climate and culture** – mutual respect, we not I
- **Establish Structure** – assigning roles, communicating clearly
- **Create Shared Mental Model** - so everyone is on the same page
- **Cross Monitor** – flatten hierarchy, encourage feedback and monitor progress
- **Maintain Resilience** – support each other with practice opportunities and debriefing

Simulation activities with specific attention to team characteristics have become an important strategy to improving patient safety (Hunt et al 2007). It is interdisciplinary teams that will depend on each other in a crisis and using simulation to train these teams will ensure commonality in thinking and approach to the critical event.

3.5 Integrating CRM and Human Factors into Simulation Scenarios

As educators, simulation instructors need to plan their scenarios and determine what learning outcomes they desire. These learning outcomes may be technical in nature with specific clinical knowledge and skills. Alternatively, they may be behavioural. From a team perspective, simulation scenarios need to be planned with CRM and human factors in mind.

Although there are many methods to introduce CRM and Human Factors into your scenarios, the following guide is provided for consideration. This is based on the assumption that you have already identified clear learning outcomes and that simulation is the best teaching and learning method to achieve those outcomes.

3.5.1 Planning

- Consider the scenario
 - What would happen in real life? E.g. sequencing, patient parameters etc.
 - Who would be involved? e.g. staff, patient
 - What factors would affect the outcome of the scenario e.g. number of people present at a cardiac arrest, team communication or team behaviours that you would like to simulate
 - What equipment is needed?
- What are your hospital policy and procedures that should be implemented in this scenario e.g. emergency protocols, drug protocols etc.?
- What stressors occur, if any, in this clinical environment?
- What can go wrong? What errors can and do occur in this environment?

With these factors in mind, the designing of the scenario needs to represent the issues of interest in clinical practice and team behaviour that you want to concentrate on. As a guide, we would not recommend recreating every potential error or stressor that can occur. Limit the scenarios so that it can be achieved in the allotted time without

participants feeling overwhelmed and so that it directly relates to the learning outcomes you have identified.

3.5.2 Pre Course

It is important to test a scenario before it is conducted for the first time with participants, in order to gauge how effectively it will run, and what issues arise that may de-validate it as a learning experience. If the scenario lacks situational fidelity the participants will not accept it.

Another issue is making sure the error situations you have created (for example - stressors such as oxygen failure) can be achieved.

The scenario test also provides an important opportunity for the scenario actors (confederates) to rehearse their role so that they are believable and create the environment required for the participants to produce CRM behaviours.

As the simulation trainer, you want to have confidence in the scenario to provide all attending with a credible environment that promotes team engagement, both in the scenario and debriefing.

3.5.3 Implementation

During the introduction it is important to discuss the CRM principles with participants. A common activity is to ask the group to consider what makes up their clinical environment. This can be achieved through discussion or with the aid of a PowerPoint presentation or a photo of their clinical environment.

The discussion can then work through from the simple identification of resources in the environment to the more complex environmental considerations that influence their decision making. In this way the CRM principles can be related to their own situation. Another option is to present a more formal presentation on the CRM and Human Factor issues and then develop through discussion how these relate to the participants.

3.5.4 Debriefing

During the debriefing phase, it is important to reflect on the use of CRM or how CRM could have been used during the scenario. From experience, this is where participants develop a personal understanding of CRM and consider how they will implement these principles in practice.

The debriefing phase is also an important opportunity for the trainer to discuss the relevant human factors seen in the scenario. As a result, it is important that the Human Factor issues have been considered and tested in the pre course phase. Groups can be very inexperienced with the Human Factors theory and will rely on instructors' knowledge and examples identified in the debriefing or review to develop their understanding.

3.5.5 Post Course

A handout with each of the CRM principles listed and relevant notes is an excellent adjunct to the simulation training. These have been known to appear on the notice boards of departments that attend CRM training.

In summary, the topics of CRM, error, Human Factors and effective teams are indeed complex. The use of simulation to train in these areas has shown to provide a useful opportunity to practice situations in which teams and individuals may be under pressure. It has been shown to influence behaviour of individuals and teams and is a well-accepted use of simulation in healthcare education at all levels.



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Module 4 - Debriefing in Simulation

Debriefing has been established as a crucial element in simulation based education, even the most important component (Kalaniti et al, 2015, McGaghie et al, 2010 and Motola et al, 2013). Dieckmann et al, suggest that “the post scenario debriefing is important to maximise learning and facilitating change on an individual and systematic level” (2009, p.287). Typically, the debrief occurs after the simulation scenario and affords the participants the opportunity to reflect on their performance, receive facilitator and peer feedback and to reinforce or plan changes in performance for a subsequent encounter of a similar clinical scenario. Faculty need to be specifically trained to facilitate effective post simulation debriefing in a way that supports the learners to reflect and learn from the experience.

This module explores:

- Defining debriefing
- The benefits of debriefing and the underpinning theoretical basis
- Models of debriefing
- Essential Elements for debriefing
- Faculty support
- Use of AV Recordings in debriefing

4.1 Defining Debriefing

Historically debriefing was used in the military to gather an account from individuals involved in a mission and to learn from it in order to plan future missions (Fanning and Gaba, 2007). Additionally, debriefing was used to assist military personnel in managing the effects of traumatic events as a psychological counselling approach. This was also adopted in the healthcare arena for assisting teams and individuals after critical patient incidents (Mitchell & Everly, 1993). Friedman (2000) describes psychological debriefing as an intervention conducted by trained professionals shortly after an incident that allows victims to talk about their experiences and to receive information on ‘normalising’ types of reactions to such an event.

In the context of simulation, debriefing can be defined as “the learning conversation between instructors and trainees that follows a simulation” (Szyld & Rudolph, 2013, p. 85). Motola et al, define a debrief as a “post-event facilitated reflection and analysis” (2013, p.1514).

Debriefing is “the process whereby faculty and students re-examine the clinical encounter” where it “fosters the development of clinical reasoning and judgement skills through reflective learning processes” (Dreifuerst, K, 2009, p. 109). Rudolph et al, 2008, suggest debriefing results in “new insights which are cocreated in a dialogue between instructor and students” (p. 1010).

4.2 Benefits of Debriefing and underpinning theory

The theoretical basis underpinning debriefing is the notion that learning requires reflection. Reflection is the “conscious consideration of the meaning and implication of an action, which includes the assimilation of knowledge, skills and attitudes with pre-existing knowledge” (Decker et al, 2013, p. 27). Zigmont et al, 2011, suggest that simulation alone will not result in learning and that for learning to take place the “individuals must actively reflect upon the experience, identify the mental models that led to behaviours or cognitive processes, and then build or enhance new mental models to be used in future experiences (p 52).

Debriefing is based on Kolb's Experiential Learning cycle in which the learners require a concrete experience, reflective observation, abstract conceptualisation and active experimentation (Kolb, 1984). Rudolph et al, suggest that reflection is a crucial step in the experiential learning cycle as it “helps the trainees to develop and integrate insights from direct experience into later action” (2007, p361).

Debriefing draws on the notion that people make sense of external stimuli through their own frames of reference and that these frames become the basis for subsequent actions (Rudolph et al, 2007, p 363). The debriefing allows exploration of frames, actions and results, and the exploration of new frames for use in future actions. Rudolph et al, suggest that the learning occurs when the instructor explores the frames, actions, result sequence and “collaborates with the trainee in developing alternative frames and actions for the future” (2007, p364).

Some of the espoused benefits of debriefing include:

- Opportunity for reflection (Decker et al, 2013, Zigmont et al, 2011, Rudolph et al, 2007, Cantrel, 2008).
- Opportunity to explore frames of reference and impact on actions (Rudolph et al, 2007).
- Opportunity to analyse performance in terms of knowledge skills and attitudes (Zigmont et al, 2011).
- Transfer of learning from the simulation to clinical practice (Zigmont et al, 2011, Decker et al, 2013, Dreifuerst, 2009, Neill et al, 2011).
- Learning from others involved in the simulation (Phrampus & O'Donnell, 2013).
- Opportunity for feedback (Dreifuerst, 2009, Rudolph et al, 2008, Cantrel, 2008).
- Opportunity to practice communication skills (Cantrell, 2008).
- Role perspective transformation (Morse, 2015).

4.3 Models of Debriefing

There are several models of debriefing described in the literature and it is not within the scope of this module to cover all models. Four models of debriefing have been chosen for discussion as exemplars:

- Rudolph's debriefing with good judgment (2007)
- Zigmont et al's 3 D model of debriefing (2011)
- Structured and Supported Debriefing
- Plus/Delta model and PEARLS (2015)

4.3.1 Rudolph's debriefing with good judgment

Rudolph et al, (2007) debriefing with good judgement model is widely used in simulation debriefing. The model postures that there is no such thing as "nonjudgmental" debriefing and promotes the premise that debriefing should be done with "good judgment". They argue that judgemental debriefing "places the truth solely in the possession of the instructor, error in the hands of the trainee and presumes that there is an essential failure in the thinking or actions of the trainee" (Rudolph et al, 2007, p. 365). Likewise, non-judgemental debriefing may lead to crucial learning being lost in the attempt to avoid critical comments.

Therefore, they suggest that debriefing needs to be done with "good judgement". The focus of the debriefing is shifted in three ways (Rudolph et al, 2007, p. 369):

1. Focus on creating a psychologically safe context.
2. Focus on not only actions but meaning making systems i.e. their frames of reference.
3. The instructors' sense making system is also open to question within the debrief.

The model “values the expert opinion of the instructors while at the same time valuing the unique perspectives of each of the trainees” (Rudolph et al, 2007, p. 369).

The model utilises an advocacy inquiry approach (p. 371):

1. Notice a relevant result – something that happened in the simulation.
2. Observe what actions seemed to lead to the result.
3. Use advocacy inquiry to discover the frames that produced the results.

The advocacy is the instructor's hypothesis and the inquiry is testing that hypothesis. e.g. “I noticed that the patient's saturations were falling however the focus at the time was on the bleeding. I was concerned that no oxygen was administered and am interested in what you thought the relevance of the falling saturations were?”

The following provides an example of how this model can be used as a 3 step approach:

Step 1 – get in touch with your judgment

- Note an unusual or poorly performed skill/behaviour. Observe your own initial response – “why is he doing that?”

Step 2 – set your stance

- Assume that the trainee meant to do the right thing
- Observe and be informed by your emotions, don't overreact

Step 3 – advocacy and enquiry

- State your concern; ask a question to find out why
- “I noticed that you did not attempt to call for assistance, I'm curious as to why?”

This approach to debriefing requires the instructor to make notes during the debriefing of “actions” and what they observed. They need to be prepared to state what they observed and then show genuine inquiry as to why this occurred.

4.3.2 Zigmont et al's 3D model of debriefing

Zigmont et al (2011) 3D model of debriefing is designed to “address the individual, the experience and both the micro and macro environments” (p56). There are five parts to the model:

1. Pre-briefing or introduction – this is where the ground rules of the debriefing are established and a safe learning environment (micro environment)
2. Defusing – allows the individuals to express the impact of the experience or the emotions so that they are ready for the debriefing. They argue that this often happens immediately after the simulation and that learners often “start this process on their own” (Zigmont et al, 2011, p60). Debriefers need to encourage the learners to express how they felt during and after the simulation. A safe environment is important to allow this to occur.
3. Discovering – this is the component that facilitates reflection and “abstract conceptualisation” which allows the learner to analyse and reflect on their behaviours and to identify models that impacted on their behaviours. This is a descriptive element of the debrief – what happened and why. It involves the group exploring individual and group mental models for behaviours.
4. Deepening – this is where the learner is helped to connect learning with potential changes in their practice i.e. the macro environment – the clinical context in which they work.
5. Summary – the key objectives and learning from the debrief.

(Zigmont et al, 2011, pp55-56).

The Discovering stage utilises the advocacy inquiry approach of Rudolph et al, 2007 model.

4.3.3 Structured and Supported Debriefing Model

The structured and supported debriefing model uses the GAS acronym: Gather, Analyse and Summarise (Phrampus & O'Donnell, 2013).

- Gather phase – the aim is to listen to what the participants felt about the scenario and elicit a narrative of feelings. Open ended questions are important here. Phrampus & O'Donnell, 2013 suggest this phase should be approximately 25% of the debrief.
- Analyse phase – the aim here is to facilitate the participants' reflection and analysis of their actions, focussing on the objectives and asking questions. This phase may utilise cognitive aids e.g. algorithms or clinical protocols etc. Phrampus & O'Donnell, 2013 suggest this phase should be approximately 50% of the debrief.

- Summary – the aim is to facilitate an understanding of lessons learned. Phrampus & O'Donnell, 2013 suggest this phase should be approximately 25% of the debrief.

4.3.4 Plus/Delta Model and PEARLS

The Plus/Delta model was previously described in the Basic Clinical Skills Teachers' Manual as a form of evaluation. However, this tool can also be used in post simulation debriefing.

It involves generating two lists:

1. What went well (the PLUS)
2. What could be improved (the DELTA)

Motola et al, 2013 suggest the lists can be generated by individuals and then collated or the lists can be generated by the group as a whole. The lists can be broken down into "individual, team, system, and other pertinent categories" (Motola et al, 2013 p. 515). The faculty can also add to the list.

The debrief should start with the PLUS to help create a positive environment and then focus on what could be improved. By getting the participants to generate the list, the focus of the debrief is on what the participants see as important. It is important to avoid superficial analysis and a focus on only technical aspects (Motola et al, 2013, p. 515).

Eppich and Cheng, (2015) describe a blended approach to debriefing which incorporates learner self-assessment, focussed facilitation to promote critical reflection and directive performance feedback (p.107). They use a structured debriefing script entitled PEARLS (Promoting Excellence and Reflective Learning in Simulation). This framework has four distinct phases similar to the other models; reactions, description, analysis, and summary. They incorporate the use of the Plus/Delta within the description phase to promote self-assessment and development of learner objectives for the debrief (p. 108). Likewise, they incorporate Rudolph et al's advocacy inquiry approach in the analysis phase particularly when the rationale for actions is unclear to the facilitator and requires exploration (p. 110). This model incorporates the strengths of the previous models and also presumes that an appropriate pre-debrief is provided.

4.4 Essential Elements for structuring the debrief

Regardless of the model chosen for debriefing there are a number of essential elements for all debriefs to ensure that they are as effective as possible.

4.4.1 Before the debrief – planning

The debrief needs to be tailored to the specific learning objectives that have been developed for the simulation. It is important to be able to plan for how to manage emergent objectives which can be more difficult to debrief, however, they can be handled by discussing issues that arise from specific events (Fanning and Gaba, 2007). Planning also needs to include how and when to debrief (Motola et al, 2013).

Debriefing can be conducted by a sole facilitator or by two facilitators (co-debriefing). Co-debriefing has advantages in providing 'two pairs of eyes' to ensure that everything happening in the room is noted. This avoids overlooking the quiet participant who is withdrawing from the debrief.

The co-debriefer's role is not simply a second in command position but it is to act as an observer, facilitator and interpreter. The debriefer and co-debriefer need to clarify their roles, expectations of each other and level of shared facilitation before entering the debrief. Gain agreement on how communication will occur during the debrief. This communication can be verbal ("I might let you handle this point"), or non-verbal (hand signal, gestures).

It is also important to plan how to manage aberrant behaviours e.g. the crying participant. These issues will be covered in Module 5: The Difficult Debrief.

4.4.2 Pre Debrief Briefing

The pre debrief briefing is an important aspect to ensure that the debrief is effective. It should include:

- An introduction – where expectations are made explicit in regards to roles of the participants and the facilitators.
- Ground rules - The ground rules should be established for both the simulation and the debrief. These can then be referred to and reinforced throughout the immediate preamble and during the debrief itself. The ground rules are important for assisting in creating a safe environment as "due to the culture of reproach and incrimination currently embedded in healthcare, it is essential that debriefing

provide an opportunity for learners to reflect on their actions in a safe and supportive environment” (Arafeh et al, 2010, p. 303).

Ground rules should include:

- Confidentiality – in regards to both the simulation scenario and events, the participants’ actions and the debrief discussion. This is important to maintain the integrity of the simulation which you may want to use again with other groups. It is also an important part of establishing a safe environment as learners need to feel trust in the process (Wickers, 2010).
- Respect – it is important that learners feel that their past experience is respected. Wickers (2010) suggests that learners need to be respectful in their verbal and non-verbal behaviours.
- Consent – this is particularly important where video recordings of performance are to be used, and “learners must be guaranteed that video will be kept in a secure location and disclosure of potential uses ...as required” (Arafeh et al, 2010, p. 303).
- Purpose - Debriefers explain the purpose and aims of the debriefing session and the link to the specific objectives. Explain what will be debriefed, e.g. the scenario, questions, comments re medical/technical & behavioural (e.g. CRM aspects).

4.4.3 The Debrief

It is important that the debrief is conducted according to the plan and in line with the specific objectives. In addition, faculty need to consider their demeanour and how they conduct the debrief. Dieckmann et al, 2009, suggest that “the role and behaviour (verbal and nonverbal) of the instructor influences the dynamics of the debrief” (p. 291). Likewise, Cantrell (2008) suggest the demeanour of the faculty influences the learning that comes from the debrief.

Models which can be used to structure the debrief have been previously discussed however some general tips for the debrief include:

Do:

- Face the speaker.
- Maintain eye contact.
- Use inclusive seating arrangements e.g. circle, semi-circle – so participants can see the facilitator and each other.

- Encourage participants to speak – be aware if one participant is dominating the conversation.
- Be open in physical positioning i.e. your non-verbal stance.
- Use behavioural communication cues e.g.:
 - Prompting - Verbal and non-verbal encouragement,
 - Mirroring - Use similar words to feedback,
 - Paraphrasing - Use different words to feedback the meaning, and,
 - Reflecting - Feedback the participant's expressed feelings, thoughts and reactions.
- Be aware and mindful of the diversity of the group.
- Allow sufficient time to allow participants to process their emotional response to the simulation (Decker et al, 2013).

Don't:

- Use shame and blame tactics.
- Criticise the speaker.
- Be sarcastic, condescending or show anger.
- Be judgmental.
- Interrupt.

4.4.4 Post Debrief

If possible, ensure an opportunity for faculty to review the debrief as this is an important learning opportunity for them and they may have their own feelings that need to be expressed. It is important to provide participants with additional resources should they wish to revisit the simulation experience, particularly if they have had a very emotive reaction to the experience. This may be outside support services such as counselling or one on one review of the recording after they have had an opportunity to reflect and process the experience. This will largely depend on the structures your individual simulation centre has in place.

4.5 Faculty Support

The faculty have been shown to be crucial in the success of debriefing post simulation. Decker et al, 2013 suggest that debriefing facilitators "require skill both in diagnosing learning needs and managing optimal group processes to adjust the level of facilitation to

that required by the group” (p. 27). As such, those debriefing need to not only understand best practice in debriefing but be provided with specific education in how to debrief, practice and validate their performance through feedback (Decker et al, 2013). They need specific skills in facilitation of the debrief such as redirection, normalisation and use of questions (Phrampus & O'Donnell, 2013).

Arafeh et al, (2010) and Dieckmann et al, (2009) suggest that videotaping debriefs can be helpful to instructors by providing an opportunity for them to self-assess. Alternatively, feedback from another debriefer may also assist them in developing their debriefing skills. Motola et al, (2013) suggest training for debriefers which can come “from reviewing the literature, debriefing training modules, and formalized instructor courses where the faculty member can participate in deliberate practice in debriefing” (p. 1516).

“The Debriefing Assessment for Simulation in Healthcare (DASH)” was developed at the Centre for Medical Simulation Harvard and is a published, validated tool to assess performance in facilitating a simulated debriefing (Brett-Fleegler et al, 2009). It aims to assist in not only evaluating but also developing skills in debriefing.

Some simulation providers have developed resources to assist the faculty in debriefing. Jaye et al, 2015 have published the “diamond” structure for debriefing. It is a handout for faculty shaped as a diamond. They describe the tool as a “two- sided prompt sheet: the first contains the scaffolding, with a series of specifically constructed questions for each phase of the debrief; the second lays out the theory behind the questions and the process” (Jaye et al, 2015, p. 171). Adjuncts to debriefing such as the ‘Diamond’, may be useful for new debriefers to assist them to stay on track and be reminded of the principles of debriefing.

4.6 Use of Audio-visual (AV) in debriefing

The use of Audio-visual (AV) recordings of the simulation within the debrief has been widely acknowledged as a useful addition to the debriefing process. Although research is unequivocal if debriefing with AV is superior to without (Fanning & Gaba, 2007). AV recordings can assist in the reflection process as “often learners are not aware of their actions or do not recall exactly what was said or done, and a recording can be used to recall events and illustrate a critical event during the scenario” (Motola et al, 2013, p. 1516).

However, it is important that the AV recording augments the debrief rather than dominates it and take away from the valuable discussions. Fanning and Gaba, 2007 suggest “If lengthy or unrelated video segments are played, it may stifle discussion of the key issues, and may detract from the focus of the debriefing session.” (p. 122).

Time is always an issue in debriefing post simulation and Arafeh et al, 2010, suggest “allowing a long discussion to occur before the tape is viewed can be problematic. The discussion may result in inaccurate representation of actual events requiring viewing the tape for clarification or may prompt repeat discussion of an objective that has already been reviewed” (p. 308).

Ideally, the use of AV recordings should be planned. Facilitators can note timings of specific events that they want to explore during the debrief to facilitate use of the AV recording during the debrief rather than showing the whole simulation (Motola et al, 2013).



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Module 5 - The Difficult Debrief

A fundamental assumption in debriefing after a simulation, is that participants are intelligent, knowledgeable and well trained. Another assumption is that they are reasonable people and willing participants who care about doing their best in their practice and who will also support and respect all of those actively participating in the simulated scenarios, and subsequent debriefs, to do their best. Some simulation centres make their assumptions explicit e.g. at the Centre for Medical Simulation Cambridge state “We believe that everyone participating in activities at the Centre for Medical Simulation is intelligent, well trained, cares about doing their best and wants to improve” (Rudolph et al, 2008, p. 1012).

For the most part these assumptions are true. Sometimes however they are not entirely founded.

This module considers:

- Why problems can occur during the debrief
- Reasonable vs Difficult behaviours
- Strategies to assist in avoiding difficult debriefs
- Difficult debriefing situations and potential solutions

5.1 Why Problems can occur

Debriefing after simulations involves a discussion of the events/actions that occurred and the reasons behind the decisions made. It also involves an exploration of the feelings and emotions evoked by the simulation. Post simulation debriefs, whilst planned in terms of objectives, are unpredictable by the nature of evoking participant discussion with open ended questioning techniques.

Facilitators of debriefs need to be aware of participant behaviours during the debrief by being “engaged in continuous assessment in order to maintain a safe learning environment for the participants” (Phrampus & O’Donnell, 2013, p82).

Difficult debriefs that are not managed effectively can lead to undermining of the learning and also can “undermine the facilitator’s credibility and discourage future participation if learners think that the debriefing was not a meaningful experience” (Arnold et al, 2015, p. 511).

Issues can occur from individuals. Examples include:

- Their willingness to engage in the simulation and “buy in”.
- The emotions evoked by the simulation.
- Their past experiences e.g. they may have experienced a similar situation to that portrayed in the simulation and this has triggered strong emotions associated with that past event.
- The ability of the individual to participate in group discussions.
- Relationship with the facilitator – feelings of being judged or that their reputations are at stake.
- The individual’s perception of their performance according to their aspirations as a clinician e.g. exhilaration or disappointment (Rudolph et al, 2008).

Likewise, issues can occur from a group perspective:

- Group dynamics – relationships between participants outside of the simulation environment that impact on their relationship within the simulation environment either friendships or adversarial relationships.
- Behaviours of group members within the group – e.g. side conversations, whispering (Arnold et al, 2015).
- Facilitator techniques - if judgemental this can cause defensiveness in the group.

Whilst there are strategies that can be used to prevent and mitigate difficult debriefs, there are also limitations and facilitators need to be aware of these.

5.2 Reasonable vs difficult behaviours

A useful clarification in managing difficult behaviours is to make the distinction between reasonable and difficult behaviours.

5.2.1 Reasonable Behaviours

Reasonable behaviours can result when people become upset, teary, withdrawn, shy or embarrassed. They may even have momentary lapses of being unreasonable, but are basically rational and reasonable people. It is reasonable in debriefing that participants

may exhibit behaviours such as those noted in response to the simulated scenario and/or to the debrief.

It is imperative that the debriefing team prepare for this primarily by accepting the normality of such responses.

5.2.2 Difficult Behaviours

Difficult behaviours can have a psychological basis. These behaviours are usually exhibited when people need to get a lot of attention, have a need to be argumentative, negative and disruptive and are often associated with unreasonable people.

Difficult behavioural presentations are the most challenging to manage. The psychological rewards for these participants are very strong and there are limitations as to the range of managing strategies that can be easily utilised.

Often these personalities may complain that their expectations have not been met and use the debriefing session to argue their complaint.

They may be upset with how the scenario has unfolded and unhappy with either their own or individuals' or the group's responses to various aspects of the simulated scenario and or debrief.

In addition, they may feel that their integrity has been questioned simply by virtue of their own expectations of their behaviour.

5.3 Strategies to avoid difficult debriefs

Useful to any debrief is the verbal reminder to oneself and the debriefing team regarding what the previously established debriefing objectives and ground rules are. Examples of these were discussed in Module 4 – Debriefing. However, specifically ensuring the following:

- Non-judgemental approach to debriefing – using the “good judgement” approach (Rudolph et al, 2007).
- Establishing a fiction contract with the participants where they agree to take the simulation seriously, “buy in” and “suspend disbelief (Rudolph et al, 2015).
- Normalisation – it is important that the facilitator attempts to normalise the reactions to the simulation and some of the actions and events that occur – even if

there are errors, acknowledging that good people make errors can assist (Rudolph et al, 2013).

Co-debriefers may be familiar with each other and their debriefing styles or they may be new to debriefing together. Regardless, the debriefing leadership team needs to discuss how they will support each other to handle situations that may arise. The debriefer and co-debriefer need to sort out logistical questions (such as the possible need to accommodate a distressed participant and who will accompany the participant and where they will take them). These are useful procedures to consider before the debrief takes place.

Discussion regarding whether the leading debriefer wants the co-debriefer to either diffuse or intervene or whether the leading debriefer wants to “go it alone” during a difficult debrief, also needs to be ascertained before the debrief occurs.

In preparing for the debriefing session, it is also important to consider a pre debriefing planning session. Knowing your learners is an important mitigating factor to difficult debriefs (Arnold et al, 2015). Provide time, an environment and an opportunity to get to know your participants. This may occur early in the day during the preamble to the simulated scenario. Together, the debriefing leadership team can observe participants with the view to placing certain individuals with others, for example: to mix confident with less confident participants, separate friends and co-workers or take some time to consider what combination of participants will work best. Facilitators may need to consider professional role stereotypes (e.g. who is normally the leader) and seniority issues in interprofessional and intraprofessional teams respectively.

5.4 Difficult Debrief Situations and potential ways to manage

The following examples of difficult post simulation debriefs come from the authors' experience. Suggested strategies are examples only and as previously stated facilitators need to be aware of the limitations of debriefing and their own personal limitations (Arnold et al, 2015).

5.4.1 The participant that is excessively critical of their own performance.

- Help the participant to normalise his or her experience by reminding the participant and the group that the simulated environment is a difficult environment for all participants and that although the fidelity is high, so is the expected pressure and stress that participants may experience.
- Remind the participant that the simulated scenario looks to all of the participants' roles, actions and responses and that he or she has not been singularly targeted.
- Focus and explore with the participant what they did in the scenario. Try and draw out what happened in the scenario rather than how they felt about their performance. e.g. "I noticed that you are not happy with your performance. What I would like to do is look at what you did and why you did it. We will then see what we can learn from this."
- Stay with factual enquiry and encourage the comments about the facts.
- Acknowledge what you thought worked well. It is often at this point that other group members also contribute positively to what their memories and experiences were of the participant's behaviours. This group support can often be triggered by a generalising question e.g. "has anyone else felt pressured to perform tasks in a crisis that they were inexperienced in?"
- Reiterate the objectives of the debrief, e.g. looking at a number of factors, including medical/technical, behavioural, team etc. Highlight examples of where the participant was able to demonstrate good judgment.
- Be aware that the reaction may be founded in wider non-scenario based (i.e. personal) issues. Ask the participant if they would like to continue with the group debrief or to have an individual debrief.

5.4.2 The participant that is excessively critical of someone else's performance.

- This is a very difficult situation as the motivation for the behaviour is not always clear, e.g. personality conflict, malevolence, poor team player etc. Recognise that there are real limitations.
- Ask the participant to discuss the behaviours that he/she is criticising rather than focusing on the individual. e.g. "What did you find unacceptable about what John did?" Rather than "So you think that John is incompetent?"

- If the participant is offensive and acrimonious in his/her manner, refer the participant to the Ground Rules of debriefing. Ground Rules should include not being personally critical, maybe also 'Demonstrate good will' 'Treat your co-participants with respect.'
- Acknowledge that the participant has a right to voice his/her criticisms but that they need to be constructively expressed in the context of a learning environment rather than a punitive one. Re-clarify the goal of the debrief – "John, what we are looking for is constructive comments so that we can all improve our performance. Do you have any suggestions as to our options when presented with a difficult airway?"

5.4.3 The crying participant.

- Do not ignore the crying participant. This will only confirm their self-belief that they are being inappropriate when in fact they may be having a 'reasonable' response to anxiety, self-judgment or the simulation process.
- Stay with the participant by acknowledging the difficult nature of the exercise and using empathic enquiry to find out what is going on for the participant. This can be helpful in supporting the participant to return 'mentally' back to task.
- Ask the participant if they would like to continue with the group debrief or leave the group and potentially to have an individual debrief (Arnold et al, 2015).
- If they would like an individual debrief decide who will lead this and ensure that there is an appropriate room available to conduct this debrief. In the privacy of a separate room, offer some refreshment and ask the participant if they would like to talk about what has caused them to cry. This process can be a diffusing of concerns or emotions for the participant and an opportunity to debrief on the current situation or to disclose other concerns. Be empathic and listen. If it is clear that the participant is unrealistic in terms of his/her performance during the debrief, offer support and feedback. At the end of the session, encourage the participant to re-join the group or next simulated scenario. If they refuse or are incapable of continuing with the day, offer an alternative time for them to come back to the centre to resume their program and advise them that you will be in telephone contact in the next day to enquire how they are going. Offer your contact details as well as that of the Simulation Centre.
- Consider identifying outside supports e.g. psychology counselling service.

5.4.4 The participant that does not think that they have done anything wrong but who in your opinion has been unsafe.

- Use empathic enquiry to draw out the facts of what the participant believed happened during the simulated scenario.
- Help the participant then identify what they actually did in the scenario by reflecting what your observations were of his/her behaviour.
- Use reflective questioning. e.g. "I noticed that you did not check the drug ampule before you administered it to the patient. Many ampules look similar, was there a reason as to why you didn't check?"
- If the participant is argumentative, in the first instance, keep your emotions under control by focusing on the behaviour and not the person.
- Listen for any valuable information and validate that information.
- Use the participant's name to bring them to task or to even interrupt them.
- Using "I" language, state clearly what you think a safer action would have been.
- If this is a "grey area" do not try to be the expert, recruit the group to assess options with a goal of coming up with the "best and safest" option.
- If a "black and white" clear break of accepted practice occurs, this is where widely accepted guidelines are useful (institutional, national, international etc.) "The drug checking protocols are in place to protect you. There is abundant evidence showing the high rates of adverse drug events when they are not followed."

5.4.5 The participant who laughs at the whole experience as hasn't seen it as real.

- Remind the participant about the objectives of medical simulation and the debriefing session. Remind them also of their responsibility to their fellow group members.
- Be clear in maintaining the position that this is a serious process and that the assumption is that all participants who agree to engage in it will regard it as serious and as an opportunity to explore skill performance in a high fidelity environment. Facilitators should avoid being "drawn into a discussion of validating the simulation's level of realism" (Arnold et al, 2015, p. 516).

- If it is the debriefing leadership's opinion that the participant is unable to engage in the experience acknowledge this to the participant and check to see if this is in fact the case.
- If it is and the participant is not disruptive move on to debriefing other participants.
- If the participant is disruptive and unwilling to engage advise them that they have the option of sitting the debrief out and provide counselling for the participant immediately after the group debrief.
- If the participant is willing to re-engage continue with the debriefing process.

5.4.6 Additional difficult scenarios

Other potentially difficult situations can include the quiet or withdrawn participant, the overbearing participant, or the participant who side tracks the debrief (Arnold et al, 2015). These situations will require facilitation skills such as refocussing, encouraging, use of probing questions, asking side conversations to be shared with the group etc. In interdisciplinary conflicts the facilitator should remain neutral, re-establish the ground rules and acknowledge both points of view as valid (Arnold et al, 2015). Where there are hierarchy issues e.g. between junior and senior nurses, the facilitator should ask for opinions from the more junior members of the team first (Arnold et al, 2015). Arnold et al, 2015 suggest that "individuals in vulnerable positions may feel that the stakes are too high to expose potential problems in fear of retribution" (p. 517).

5.5 Conclusion

Most debriefs are conducted without difficulty. Participants are usually eager to discuss their performance and to learn from the simulation they have engaged in. However, as a debriefer there is a duty of care to the participants and it is important to be aware of potential aberrant behaviours and to have strategies ready to address these. Centres should have back up plans to manage participants that there are ongoing concerns about. This may include post session follow up by facilitators, or access/referral to an external psychologist. It is useful to have a policy developed to address this potential situation (Module 6).



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Module 6 - Using Audio-visual Equipment

Information Technology (IT) and Audio-visual (AV) equipment has become an important element of simulation-based education and facility design. There is increased utilization of AV technologies for clinical skills training, particularly with the advent of the combination of teaching communication and procedural skills simultaneously (Kneebone et al, 2002) and for Video Assisted Debriefing (VAD) post simulation scenarios. AV recording can occur within the clinical skills or simulation laboratory, or in the workplace within a clinical environment.

This module explores:

- Uses of AV recordings,
- Limitations, and,
- Considerations of effective use of AV

6.1 Uses of AV Recordings

There are a number of potential uses for AV recordings in the simulation/clinical skills context, including:

- To record a learner's performance so as to provide feedback / assessment.
- To pre-record examples of 'correct' vs. 'incorrect' performance. These can be real examples or simulations and used as a:
 - Stimulus for discussion,
 - Demonstration for the novice learner, or
 - Faculty development – used to illustrate specific events which occur within simulation scenarios so that faculty can develop skills in adapting and managing simulations.
- Scenario validation– to observe how a scenario functions and critically appraise so as to refine for future use.

- Video assisted debriefing (VAD). Krogh (2015) found that expert debriefers share a belief that video is an adjunct to debriefing. The optimal use of VAD in a single debrief is at most a few short clips, with learners oriented to the educational purpose of the particular extracts illustrating a particular behaviour or action. This is due to the potential for the video recording to take away from the discussion of the debrief (Motola et al, 2013).
- To allow the learner to reflect on their performance and self-assess against standards or criteria. Motola et al, 2013 suggest “Often learners are not aware of their actions or do not recall exactly what was said or done, and a recording can be used to recall events and illustrate a critical event during the scenario” (pg1516). Bussard, 2016 describes using video recordings of simulations for learners to view independently without faculty and reported that this was beneficial in helping nursing students’ clinical judgement.
- As introductory material at the start of a program to provide an overview or context to the learning, stimulate interest and motivation to learn, or provide background information.
- As an independent learning aid – AV recordings can be made of an expert performing a skill with or without narrative. This recording could model individual components of a skill or the skill in its entirety. This can then be viewed by learners before attending the clinical skills laboratory for instruction as an independent learning exercise.
- As a link for other learners not involved directly in a simulation scenario. Simulation facilities often stream live AV feed from the simulation suite into another room for additional learners to view. As part of a commitment to providing a safe learning environment, only learners that are part of the overall group from the commencement of the program and who will be involved in the debriefing, should be allowed to watch others as they participate in a scenario.
- Video archived simulations - as a record for research and later analysis (Adamson et al, 2012). Many studies are now using AV recordings of simulations to be analysed subsequently by experts with validated checklists. This allows analysis to be retrospective. Consent from participants must be gained at the time of the simulation. Gough (2016) has embedded Video-reflexive ethnography (VRE) methodology in simulation-based education to explore performance, behaviours and personal experiences of participants.

- For training/development of standardised/simulated patients to achieve consistent and accurate role portrayal, review techniques and maintain reliability.

AV recording has been particularly useful in the teaching and learning of skills requiring communication. For example, taking a history from a patient, providing patient education and breaking bad news etc. Tasks requiring fine motor procedural skills require sophisticated AV equipment to capture the subtleties of the movements and allow educators to provide appropriate feedback.

6.2 Limitations

Whilst use of AV has many advantages, simulation educators need to be aware of the limitations of AV recording which include:

- Some learners find being recorded intimidating, so that their performance is affected, particularly the behaviours they exhibit. Cumulative use of AV recording can reduce the effect of this as learners become more familiar and less anxious.
- There is a need to maintain confidentiality on behalf of the learners and as such the security of recordings once taken is an important consideration. Wazonis (2015) suggests “faculty should carefully consider the potential threat to privacy and confidentiality of students with video-assisted debriefing” (p118). If using VHS, DVD or USB media, a secure cabinet is required for storage. Computer hard disc, server or cloud based storage options present challenges and security issues need to be considered in this context. Centres should also have a clear policy on discard and usage of recordings (see Module 7 – Managing Clinical Skills and Simulation Facilities).
- Technical expertise is required particularly where more complex AV equipment is being utilised, such as video tagging.
- Audio-visual technical issues can affect the learning experience such as – debrief room losses of the live feed, loss of audio, inadequate audio volumes etc. This can be due to issues such as wireless connectivity and contingency plans are necessary to avoid this impacting on the simulation learning experience (Canales, 2015).
- The high cost of infrastructure and maintenance of AV equipment.

6.3 Considerations for effective use of AV

The following considerations are given to assist in maximising the effectiveness of the use of AV recordings in simulation education. The ease of use needs to be considered as not all users will be highly skilled AV technicians (Seropian, 2003). In addition, systems should be analysed to determine if they are both robust and reliable.

In all settings there needs to be a clear video recording policy and consent procedure which informs learners on how the video recordings will be used, stored, retention and by whom they will be viewed (Dongilli et al, 2015).

6.3.1 In the simulation laboratory setting

Cameras – consideration should be given to the:

- Positioning - need to be able to see the entire room in order to capture all that is occurring in a simulation.
- There needs to be an ability to zoom in and out to capture fine procedural tasks or subtle changes in the simulator e.g. depth of breathing, heart rate etc.
- Wiring – if possible wiring should be concealed for safety reasons and also for fidelity issues.

Audio – consideration should be given to the:

- Ability to record conversations as this will be important in the subsequent debriefing and reflection by learners.
- Avoidance of background interference 'noise' e.g. footsteps on a linoleum floor, noise from air-conditioning units etc.
- Use of lapel microphones to better isolate individual conversations. Attention is required to ensure that these are not interfered with e.g. a stethoscope around a neck can cause loud banging noises to be recorded. Consideration should be given to the type of audio mixer used as this can allow adjustment of the microphone and speakers (Thorkelson, 2015).
- Overhead audio – this will be necessary to mimic emergency calls, as within a hospital setting, or to provide participants with information about the manikin, where fidelity is lacking, to assist with their diagnosis e.g. "patient is sweating profusely".

It is important if possible that there is linkage with patient monitors so that patient vital signs can be simultaneously recorded (Seropian, 2003). This adds a valuable resource when giving feedback and exploring participant clinical reasoning.

6.3.2 In the clinical setting

- Patient consent – real patients need to give informed consent to be videoed. Also other staff in the vicinity that may be videoed, even inadvertently, should also give consent. Educators should discuss with their local communication manager the Facility's policy on AV recording prior to undertaking this venture. The communication manager may be able to assist in developing an appropriate legal form.
- Type of equipment to purchase. The AV equipment chosen for portable use needs to be lightweight, sturdy and yet able to produce a recording of sufficient quality for the intended use. An inferior recording with poor sound or visual quality affects the learning experience and the efficacy of feedback during the debrief. The audio is often the major issue in portable equipment and advice on additional audio aids is recommended, in particular lapel microphones.
- Transport of equipment – AV recording equipment should be transported to the clinical setting with care. Mobile trolleys can assist to address both care of the equipment and staff occupational health and safety (OH &S) requirements.
- Extension cords and power boards – organisers need to plan for contingencies and consider accessories that may be required in a portable situation.

There are many commercially available IT/AV integrated software/ hardware systems available. They vary between digital and analogue systems, wired or wireless, fixed or portable, ease of use, quality of audio verses visual, and overall cost. Where possible it is strongly recommended that facility designers/ users/ educators seek expert advice, visit other facilities, consult widely prior to purchase and consider the constant changes in new technologies when designing centres and programs. This will avoid unnecessary expenditure on equipment that is not fit for purpose.

Along with understanding the curriculum program needs, objectives of any AV system should be to:

- “Record audio and visual fact and context accurately,
- View and record multiple viewpoints,
- Provide reliable, durable, and easy to use equipment,

- Create recorded material that is appealing
- Store recorded material" (Seropian, 2003, p1700)



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Module 7 - Managing Simulation Facilities

Simulation facilities require careful management to ensure a quality experience for the learners that attend. This module explores both policies and procedures along with resource requirements that should be considered when managing such a facility. It will be useful not only to those starting out but as a check for established facilities.

7.1 Policies and Procedures

Policies and procedures are essential for ensuring high quality clinical education and simulation programs that comply with best practice and evidence based guidelines. Policies can be defined as “the rules that govern the operations of an organization”, whereas procedures describe “general operating processes and include how specific policies are implemented” (Dongilli et al, 2015 p. 225).

If your organization is seeking accreditation with a peak body your policies and procedures need to comply with their frameworks/ standards. Examples of peak bodies/ societies offering accreditation include:

QualSim Framework

“The QualSim Framework is an emerging, useful standard for simulation in an Australian healthcare training context. Developed in consultation with industry, adherence ensures high-quality training environments for people who save lives. QualSim is a project for health programs to self-assess against the framework developed to identify best practice. The QualSim project is a SimAust initiative lead by Australian Society for Simulation in Healthcare (ASSH) and funded by the Department of Health.” Simnet. (2017). QualSim Quality framework for health simulation. Retrieved from <http://www.simnet.org.au/index.php>

International Nursing Association for Clinical Simulation and Learning (INACSL)

INACSL has developed the INACSL Standards of Best Practice: Simulation. The INACSL Standards of Best Practice: Simulation “were designed to advance the science of simulation, share best practices, and provide evidence based guidelines for implementation and training” INACSL. (2017). Standards of Best Practice: Simulation. Retrieved from <https://www.inacsl.org/i4a/pages/index.cfm?pageid=3407>

Society for Simulation in Healthcare (SSH)

“SSH Accreditation is a peer-reviewed, customized evaluation of your healthcare simulation program. This accreditation examines simulation program's processes and outcomes in assessment, research, teaching/education, and systems integration.” SSIH. (2017). SSH Accreditation of Healthcare Simulation Programs. Retrieved from <http://www.ssih.org/Accreditation>

It is essential that your centre provides a safe learning environment and as such you need to consider the policies and procedures which will facilitate this. They need to be developed to protect participants and educators alike and are tailored to be relevant to your local context.

This section provides suggestions and examples of policies and procedures aimed at creating a safe environment. It is not a comprehensive list and managers are encouraged to share their experience in policies and procedures they have found necessary.

- Confidentiality
- Video recording and Photo release
- Pre briefing/Induction orientation/Familiarisation
- Embedded Simulate persons/confederates/role players' policy
- Faculty/educator development and code of conduct

7.1.1 Confidentiality

Maintaining confidentiality, promoting professional behaviour and encouraging mutual respect, facilitates an environment in which participants can ask questions, and clarify concerns without fear (Sittner et al, 2015 p 295).

Participants are asked to sign a Confidentiality agreement for two main reasons:

- to prevent participants from discussing each other's performances outside the simulation/debrief area. It is important to create an environment where people can

learn from their mistakes, discuss their performance openly and self-appraise without fear of ridicule. This is partly achieved by the opening induction procedure to the program, however is formalised by getting participants/learners to sign a confidentiality form which states this implicitly.

- scenarios take considerable time and expertise to develop and often used in future training sessions. As such, it is important that future participants remain unaware of specific details relating to the scenarios, so that their training/learning is not compromised.

A sample confidentiality form is included in Appendix 1.

7.1.2 Video Recording and Photo Release

The use of AV is covered in Module 6; however, it is important to note that the recordings require careful management to adhere to privacy legislation. Dongilli et al, (2015) suggests that facilities require a policy regarding AV recording since “the participant should be aware of the recording policy, if and when the video will be distributed to and to whom, and informed when videos will be retained, destroyed, and deleted.” (p. 360)

There may be occasions when you wish to use recordings, for example to advertise your courses, for staff training or as a stimulus for discussion by another group of participants. As such, you will need a policy for gaining written consent for the use of the recordings.

Recordings should be kept for a defined period of time to allow participants the opportunity of reviewing if desired. Sometimes learners reflect on their performance after they leave the centre and wish to revisit an element of their simulation experience at a later date. They can be allowed to do this independently or with an educator on request.

Once recordings are no longer required they can be destroyed or taped over.

Recordings of individual learners for skill acquisition or practice can be given to them as a record of their performance and be used for comparison, however recordings of teams are not as easily distributed to individuals without prior consent of all those in the recording.

7.1.3 Pre briefing /Induction/Orientation and Familiarisation

Participants in simulation will require an induction/orientation to the course and the facility so that they understand what will be happening, what the expectations are on them as learners and who to go to if they have concerns. Rudolph et al, (2014) argue that “establishing a so called safe container, in turn, allows learners to engage actively in

simulation plus debriefing” (p. 339). Commencing the briefing by establishing “ground rules” not only sets the scene for an environment of dignity and mutual respect, but promotes a learning environment of psychological safety. A sample induction and orientation process is found in Appendix 1.

Suggested inclusions in an orientation procedure are:

1. Facility Orientation
 - a. Housekeeping - e.g. location of skills rooms, debrief room, simulation room, lunch room, bathroom amenities
 - b. Occupational health and safety considerations e.g. fire safety procedure and escape routes
2. Faculty and participant Orientation
 - a. Introduction to staff and their roles.
 - b. Introduction of fellow participants/learners.
 - c. Code of conduct – shared group ground rules
 - Use of mobile phones.
 - Talking whilst others are talking.
 - Respect for others opinions/observations
 - Confidentiality agreements and consent to record
3. Conduct/ use of role players / confederates within the simulations (see 7.1.4).
4. Policy regarding contact of participants after the course. There may be times when you want to follow up a participant that you are concerned about. You need to have a procedure for doing so and a policy that makes clear when and why you may contact a learner.
5. Simulation room orientation to manikin simulated patient and surrounds, including
 - Personal protective equipment,
 - Safety considerations within the room,
 - Locations of sharps containers,
 - How to send for help if needed,
 - How to obtain vital signs, and,
 - What procedures can or cannot be performed on manikin or simulated patient.

Familiarisation can be done in the simulation setting, or alternatively participants can be provided with a handout or access to pre course online video footage of these features.

7.1.4 Embedded Simulated Persons/ confederates/ role players

Terms such as role player, confederate, actor and embedded simulated persons are commonly used to describe “individuals assigned to directly interact with learners within a simulation scenario.” (Sanko et al, 2015 p. 213). Unlike trained simulated patient/standardised persons embedded simulated persons (ESPs)/role players are often fellow faculty or any available personnel and thus need to be carefully considered and briefed on their role within a simulation in order to ensure the success of the scenario.

ESPs can play an important role in simulation scenarios, to:

- Assist in achieving objectives of a scenario,
- Increase realism of the scenario,
- Guide the progression of a scenario, or
- Increase the complexity of a scenario.

Careful choice of ESPs is necessary to make sure that they have the required knowledge and skills for a role. For example, using a lay person to play the role of a nurse is unrealistic as they will not know the correct terminology, let alone have the required skills. This will detract from the realism of the simulation. Likewise, careful briefing is required to ensure that the ESPs:

1. Stay within role – expanding outside the role can affect the effectiveness of the simulation. For example, if you want someone to play an inexperienced nurse, who is there to provide assistance as guided but not to offer opinion or to take a lead role, you need to make sure the ESP understands that if they go outside their role and start to suggest treatment options etc., the learners will not be implementing the intended clinical reasoning processes themselves.
2. Avoid overacting – this can detract from the realism of the simulation and potentially make the situation appear a farce.

Sanko et, al (2015) identify 10 “recommendations aimed at improving the performance of all levels of ESPs from novice to experts, as well as enhancing the effectiveness of scenario coordinators who guide ESPs scenario production personnel who interact with ESPs and simulation centre directors who employ ESPs (2015, p). The recommendations are:

1. “Do allow learners to make mistakes: There is no better setting for mistakes than simulation.
2. Do not Ad-lib for drama sake: There is a time and a place, but not usually in simulation.
3. Do adapt to learners’ behaviours: The scenario should be scripted, but learners’ responses’ are unpredictable.
4. Do use communication devises: They help keep the ESPs and scenario on track, but beware of their pitfalls.
5. Do know your learners: Their level of training should guide the ESPs’ words and actions.
6. Do use realistic props and costumes: They always tell a story and provide valuable clues.
7. Do commit to the character: ESPs are playing roles to send messages to the learners, not playing themselves.
8. Do pay attention to nonverbal clues: Emotional responses contribute to learning.
9. Do not be the star of the show: Simulation is all about the learner improving.
10. Do find ways to improve: rehearse before, debrief and evaluate after simulation.”
(Sanko et al, 2015, pp. 216-223).

A written policy can assist everyone to feel comfortable with the role and expected behaviour of the ESP.

A sample ESP policy is attached in Appendix 1 of this manual.

7.1.5 Faculty development and code of conduct

Skilled faculty are crucial to the success of any clinical skills and simulation education program. The INACSL Standards of Best Practice: Simulation Facilitation state “Facilitation of a simulation-based experience requires a facilitator who has the education, skill, and ability to guide, support, and seek out ways to assist participants in achieving expected outcomes”. Training of faculty is essential and there are a number of different local and international faculty programs available using mixed delivery methodology and which cover all aspects of simulation.

However, once trained faculty must pursue continuing education and assessment of his/her facilitation skills, along with ongoing reflection and assessment of self-performance (Jefferies et al, 2015).

A policy with specific faculty standards should be established within your simulation program and be recognised at an organizational level. It should be aimed at supporting quality programs through a structured pathway/framework for development of these key staff members.

Part of providing a safe learning environment for participants/learners is ensuring that all faculty/educators act in a professional manner. At times amusing situations occur within simulations. These situations are not always related to what a learner is doing, but could be an unanticipated event with the simulator or behind the scenes. Faculty need to know that laughter heard by participants either during or immediately after the simulation, can be emotionally damaging even if that laughter is not directed at them.

Participants will be feeling a certain element of vulnerability by performing in front of peers, educators and being videotaped. As such, faculty need to be aware of this and act accordingly.

A faculty code of conduct can assist new members of staff to understand the facilities expectations of them and may include statements regarding:

- Respect for participants,
- Behaviour before, during and after a simulation,
- What to do if a participant becomes distressed, and
- Staff support mechanisms available for them.

7.2 Resources

Part of managing a clinical skills/simulation facility is the ability to identify resource requirements. In order to identify resource requirements, you need as strong understanding about the:

- Mission and vision of the facility
- Goals or purpose of the centre
- What is being taught and how
- Audience: how many at a time, what professions
- Location i.e. in a hospital or a standalone facility

In addition to addressing the above point, the Basic Clinical Skills and Simulation Teachers Manual outlines how to design a course and this is a good starting point to assist with identifying resource requirements.

What is the overall aim of the sessions offered by the skills/simulation area? What range of skills training is to be conducted within the context of curricular outcomes?

- Communication skills
- Clinical reasoning skills
- Documentation skills
- Patient assessment
- Procedural technical skills
- Team training and leadership skills

This section explores facility resource requirements including:

- Physical facilities
- Operational considerations
- Training resources

7.2.1 Physical Facilities

Once you know the type of courses you want to run you will have a clearer idea of the type of training rooms you will need and will ensure that form meets function. Examples of training rooms include;

- Clinical rooms
- Operating room
- Clinical skills laboratory/rooms
- Control room – depending on the technical needs of the facility
- Storage
- AV/IT cupboard
- Debriefing room
- Multipurpose room
- Tutorial rooms

In addition, consideration should be given to ancillary rooms necessary during training programs, such as:

- Change rooms / locker facilities / bathroom
- Flexible catering area
- Reception
- Meeting rooms

If possible, keep the design of the physical environment flexible to maximize opportunities to facilitate different teaching/learning strategies such as small group work, role plays, facilitated discussions, clinical skills teaching, debriefing or conducting medium to high simulation scenarios? Resources that can assist you with developing this flexibility include:

- Movable wall dividers
- Stackable chairs
- Trolleys for manikins/part task trainers
- AV Considerations
- Tables on wheels
- Portable white or smart boards
- IT Infrastructure (including Wi-Fi)
- Booking system – that articulates the location and resources needed.

Designing a facility within a current space can be more difficult due to building constraints, however, where possible the same principles should be applied.

7.2.2 Operational considerations

Operating a clinical skills and simulation facility is a complex process which requires strategy, policies and procedures, coordination, resource management and quality assurance processes. Managers of these areas are encouraged to develop clear operational guidelines.

INACSL Standards of Best Practice: Simulation: Operations (2017) have developed a list of criteria necessary to meet their standards:

- “Implement a strategic plan that coordinates and aligns resources of the SBE program to achieve its goals.
- Provide personnel with appropriate expertise to support and sustain the SBE program
- Use a system to manage space, equipment and personnel resources.
- Maintain and manage the financial resources to support stability, sustainability, and growth of the SBE program’s goals and outcomes.
- Use a formal process for effective systems integration
- Create policies and procedures to support and sustain the SBE program.” (pp681-687).

Other operational issues to consider are more practical such as:

- Is the location accessible to the users? E.g. those with disabilities.
- Are the users only from the facility or are there external users?
- Is the facility easy to find? Do you have a map with location and car parking?
- Opening hours - when are courses to be conducted? If courses are conducted out of hours is special security access required?
- Booking procedures - is anyone allowed to use the facility or do they need to have a facility staff member present?

These lists are only a starting point. Researching and understanding the variety of options in simulation is essential. Technology constantly changes and it is important to be aware of the emerging simulation technologies in conjunction with the changing landscape of healthcare. It is also important to visit other simulation facilities to learn from others and explore their operational approaches.

7.2.3 Training Resources

Resource requirements for simulation and scenario based skills training are dependent on the:

- learning objectives of the course,
- learning activities designed to help learners achieve the learning objectives,
- space available,
- audience: both the discipline and the number of participants, and,
- budgets.

These factors should all be taken into consideration before the initial purchase of any equipment and when gathering together resources for a specific course.

In relation to budget constraints it is important to determine “must have” resources and “nice to have” resources. Think laterally, is there out of date resources e.g. drugs, that you could get from pharmacy rather than buy (more examples are provided under 7.2.5). It is also a good idea to speak with other simulation experts to ensure that you are obtaining the right resources at the right price and not over complicating the simulation. For example, if your main objective is for mandatory basic/advanced life support training and assessment, a basic half torso manikin will suffice over a full body high fidelity manikin.

It is also important to consider who will be the potential users of the resources? The target audience, disciplines and number of participants are significant in terms of resources available for different types of programs. As previously stated in Module 2 on Fidelity, the more experienced the group the more demanding of fidelity they will be.

- Undergraduates – generally are larger in number. May require more part task trainers, or reconsider arrangement of group size or the teaching strategies used (demonstration vs practice).
- Postgraduates – tend to be smaller groups utilising a combination of clinical skills teaching and simulation scenarios, but may require more sophisticated part task trainers with improved fidelity.
- Continuing education groups – may utilize more team based and leadership training.
- Interprofessional groups – utilise sharing of resources.

7.2.3.1 Equipment

The technology of simulation and simulators is evolving constantly and as such the range of models and manikins available for clinical skills training and simulation is rapidly increasing. The equipment required will depend once again on target groups, aims and costs.

The range of equipment includes:

- simple anatomical models e.g. heart, airway
- examination equipment e.g. ophthalmoscopes, ECG machines, neurological examination equipment, neurodynamic,
- part task trainers e.g. IV arm, cricothyroidotomy model, torso for chest tube insertion, airway trainers,
- computer based simulators,
- haptic trainers
- virtual reality and augmented reality trainers
- surgical trainers e.g. laparoscopic simulators, and
- full body simulators

Equipment can be purchased from a wide range of suppliers. These are examples (not a comprehensive list) of companies who produce simulators and part task trainers:

- Laerdal

- Simulaids
- Lifeform
- Gaumard
- METI (Medical Education Technologies Incorporated)
- CAEHealthcare
- Mediquip
- Limbs and things
- Koken
- Simbotics
- Blue Phantom

7.2.3.2 Storage, Labelling and Handling

Appropriate storage and maintenance will benefit the life of the equipment and your budget.

OH&S issues must be considered in regards to storage of equipment. Guidelines should be followed for the prevention, identification, assessment and control of risks arising from manual handling activities in the workplace. EQUIPNational Guidelines Standard 15, Criterion 5 Safety Management Systems, “states safety management systems ensure the safety and wellbeing of consumers / patients, staff, visitors and contractors” (Retrieved from <https://www.achs.org.au/programs-services/equipnational>)

The cleaning and decontamination of equipment should comply with institutional guidelines and national standards.

Effective labelling of equipment and an accurate record of usage will aid in planning for future purchases. Depreciation of equipment should be factored into yearly budget planning. Cataloguing and usage tracking records help guide in planning for maintenance and replacement of equipment. Utilising existing institutional resources such as a library cataloguing system can be effective.

Table 3 provides an example of a simple record of usage sheet.

Table 3: Example Record of Usage sheet

Clinical Skills Equipment Record of Usage								
Item Name	Code	Program name	Course Duration (hrs)	Profession Undergrad Post grad or CPD	Number of Participants	Internal or External	Sign out Contact details	Sign in
IV arms	IV 3,4 & 5	IV Insertion	2.5 hrs	Nursing Post Grad 2	9	Internal	xxxxx	
Airway model	A1	Suctioning	2 hrs	Physio Post Grads	6	Internal	xxxxxx	
Torso Models	T 2 & 3	Femoral line insertion	1.5 hrs	Medical PGY2s & 3 s	4	Internal	xxxxxx	

7.2.3.3 Consumables

There are costs associated with practicing many skills, in particular the consumables. When purchasing part task trainers, the cost of replaceable parts, type of manikin used, and range of applications should be considered. For example:

- Does the IV arm require new replacement pads or can one be purchased with multiple use skins?
- Is purchasing an Intra-osseous manikin with multiple replacement parts as cost effective as using chicken thighs? How does this choice effect the learning outcomes – i.e. are they as effective. This may require input from clinicians to determine the method with the greatest clinical fidelity.
- Can an airway manikin be used by more than one discipline thus maximising its cost effectiveness?

A great source of consumables can be within your own institution. A “donation” box placed in various departments will help gather resources such as:

- Pharmacy – for expired stock e.g. IV fluid bags, normal saline ampoules and drug packaging (may need to be stored in locked cupboard according to local regulations). The simulation facility will require a policy on the use and storage of expired medication. There needs to be consideration given to safety and labelling. Medications can be substituted with simulated medications (e.g. sweets for tablets, water for IV fluids) and marked clearly “FOR SIMULATION USE ONLY”. No simulated medications should be used in in-situ scenarios because of the risk of simulated medications in clinical settings. Pharmacy can often also make up labelled medication boxes or jars into which simulated tablets can be put.
- Radiology/Cardiac catheter labs- for unused guide wires.
- Anaesthetics/Theatre – unused opened giving sets/gowns/gloves and old instruments.
- ICU for unused but opened central lines or Swan Ganz catheter sets.
- The general wards for expired general stock and replaced equipment etc.
- IT Department/Bioengineering – for old computers and decommissioned stock as props. E.g. defibrillator able to read rhythm but shock delivery capability has been disconnected. ECG machines, ventilators and syringe pumps will also help add fidelity to the environment. Biomedical Engineering will often have decommissioned ECG leads and pulse oximetry probes which can be used in simulation to provide a visual prop for patient monitoring.

Labelling of IV fluid bags and drug ampoules with various size sticky labels typed with relevant details provides great flexibility to use donated stock. A purchase of a commercially available crimper – to reseal drug vials could be a cost effective investment if using large amounts of limited supply drugs. e.g. Dantrolene can be substituted with Orange Tang powder or castor sugar for antibiotics.

7.2.3.4 Supporting Documents

Fidelity is enhanced if supporting documents used in scenarios are those that the participants are familiar with, such as;

- patient history chart,
- observation charts,
- ambulance handover documentation, and,
- various pathology and x-ray ordering forms.

Laminating some forms can assist in their longevity and reuse ability.

7.2.3.5 Moulage

Moulage is from the French word meaning casting or moulding and in the context of simulation it refers to creating simulated wounds to increase the realism. Damazo and Fox (2015) summarises “there are many choices – from elaborate theatrical make up, masks, and effects to simple changes. - that can help reinforce or provide cues to improve convincing aspects of simulation fidelity.” (p. 579) Understanding the objectives of the scenario and having a clear outline of the time required for set up and clean-up will help determine the details and types of moulaging required.

Moulage kits for trauma make up and imitation wounds are available commercially. Fancy dress/ costume shops also offer an array of makeup and prosthetics.

Consideration should be given to the cost of moulage consumables. While commercially available moulage kits often are more expensive, they will generally have a longer shelf life. Using supermarket grocery items is cost effective, but consideration needs to be given to the risk of food allergens within the workshop environment. Programs using moulage in simulation should consider having a policy relating to the use moulage products and their disposal.

Table 5 provides a few examples of homemade recipes that are cost effective, however can only be used once as they will deteriorate if stored for too long:

- Fake blood - Chocolate topping/ golden syrup/ red food colouring/ pink food colouring/ yellow food colouring.
- Vomit- Winter vegetable soup +/- beer added. Tea with yellow dish soap and coffee grounds.
- Maelena – combination of betadine, red food colouring and cornflour for consistency.
- Glass fragments – silicone or gelatine or clear toffee broken into pieces.
- Urine – tea (degree of strength depending on required concentration).

7.2.3.6 Costumes

Dressing of the manikins, simulated patients / participants or ESPs enhances the fidelity of the scenarios.

This can be achieved economically through donations or a visit to the local opportunity shop for the purchase of wigs, hats, handbags, sunglasses, various sporting outfits, full female and male outfits and pyjamas etc.

Scrubs and theatre apparel should be sourced through hospital linen supply and budgeted accordingly.

7.2.3.7 Audio-Visual Resources

The AV equipment list provided is aimed at those centres developing a basic but highly functional mobile AV system for multiple uses. This list does not provide for centres wanting to develop a standalone built in system. Larger facilities that have the need for a built in system would benefit from visiting similar centres and getting advice from AV specialists. Table 4 displays an example of AV Requirements which could be used.

Table 4: Examples of AV requirements.

Equipment	Type	Advantages / Comments
Smart phone or tablet	iPhone, iPad, Android etc. (noting an appropriate adapter cable is required to display the video on a screen or monitor)	<p>After some familiarisation with the recording functions / App of the particular device, it is very economical to use an existing device to record and then playback via a screen or monitor utilising an appropriate adaptor cable.</p> <p>These devices generally have high quality video and adequate audio recording abilities.</p> <p>Often it's possible to purchase 3rd party external microphones to provide better audio and hand held stabilisation devices that assist with image stability when recording.</p>
Sports style cameras	GoPro	<p>GoPro cameras provide an excellent wide angle recording capability and can be "installed" higher in the corner of a room using a small tripod with bendable legs or one of the many fixing adaptors that can be purchased.</p> <p>The internal microphones are generally very good but some models will also support an external microphone through a proprietary adapter cable.</p> <p>It is possible to purchase a remote or a smart phone app to remotely start and stop the recording.</p> <p>Using a proprietary adapter cable the recording can be readily played back on a screen or monitor, or in most cases the SD memory card can be easily removed and played through a Laptop / PC with a card to USB adaptor.</p>

Equipment	Type	Advantages / Comments
Compact video camera or video capable still camera	Sony, JVC, Nikon etc.	<p>Can provide excellent quality recordings, have built in image stabilisation, and can be mounted on a tripod.</p> <p>The internal microphones are generally very good but many models will also support an external microphone through an adapter cable.</p> <p>Using a proprietary adapter cable the recording can be readily played back on a screen or monitor, or in most cases the SD memory card can be easily removed and played through a Laptop / PC with a card to USB adaptor.</p>
TV Screen or Computer Monitor	<p>LCD Computer Monitor with built in speakers (or with a small portable speaker that connects to it) that has HDMI / Display Port video inputs</p> <p>Wall mounted TV Screen with HDMI / Display Port video inputs</p>	<p>This is an important piece of equipment to allow you to replay the recording.</p> <p>An LDC Monitor with HDMI / Display Port video inputs is great for this application and easy to transport. The best option is that the Monitor has built in speakers but most have a 3.5mm audio output jack that support a portable speaker or sound bar.</p> <p>Most wall mounted TV Screens will have HDMI / Display Port video inputs. The remote is used to change the input source and the built in speakers are usually quite good.</p>
Tripod	A tripod that will extend to 164 cm or higher	<p>A tripod is important to load the camera as high above the action as possible. The higher the camera the greater the view of the simulation area below.</p> <p>Most Tripods extend to about 150 – 164 cm.</p> <p>Tripods should be placed and secured (taped to tables to extend the height if required).</p>

Equipment	Type	Advantages / Comments
		<p>The Tripod camera fitting should be compatible with the Camcorder. This is the screw that connects the camera to the mounting plate and connects to the tripod.</p> <p>Tripods should provide a wide range of movement on the horizontal and vertical planes. Some will enable the camera to tilt from side to side.</p>
Power Board and Extension cords		<p>Best to provide these items with the AV kit rather than rely on another area to supply.</p> <p>2 extension cords and power boards:</p> <ul style="list-style-type: none">• 1 for the AV equipment• 1 for the Simulation system



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Appendix 1 – Sample Forms

Add logo

Confidentiality Form

Session Name:

Date: / /

During your participation in the session at, you will likely be an observer of the performance of other individuals. As a participant in these activities in whatever role, you are asked to maintain and hold confidential all information regarding the performance of specific individuals.

By signing below, you acknowledge to having read and understood this statement and agree to maintain the strictest confidentiality about any observations you may make about the performance of individuals.

In addition, we ask that you refrain from discussing details of the scenarios you have participated in and/or witnessed. These scenarios take considerable time and expertise to develop and will be used in future training sessions. As such, it is important that future participants remain unaware of specific details relating to the scenarios, so that their training/learning is not compromised. We appreciate your support regarding this issue.

Print Name	Signature	Position	Contact Details

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Sample Induction Procedure

Add logo

Induction Procedure

It is important that the principal facilitator completes the following process prior to each simulation program.

1. Provide a welcome to the session
2. Introduce all staff present on the day
3. Encourage participants to introduce themselves to the group, briefly including current work, past simulation experience etc.
4. Housekeeping – Discuss the layout of the facility including relevant fire and safety evacuation procedures and housekeeping
5. Discuss the program and how it will run.
 - a. The objectives of the session
 - b. An acknowledgement that the situation can be stressful and that participants may feel stress as part of participating in the scenarios. Whilst we try to minimise this stress as much as possible some stress is inevitable. If the instructors are concerned about a participant, they will approach him/her to offer some support and on occasion may follow up a participant after a course.
6. Discuss the importance of Confidentiality – both of other participants and scenarios, have participants sign agreement.
7. Consent for video or photo release if applicable
8. Give orientation to Manikin/ simulated patient and environment

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Sample Familiarisation Procedure

Systematic Approach to Orientation to Manikin and Surrounds

<p style="text-align: center;">D</p> <p style="text-align: center;">Danger</p>	<p><u>Safety for Participants</u></p> <ul style="list-style-type: none"> • PPE available/ Sharps disposal • Cords from monitor near the simulator e.g. anti trip • <u>Safety for Simulator</u> • No invasive procedures on the simulator unless specified • Defibrillator is live (yes, no)
<p style="text-align: center;">R</p> <p style="text-align: center;">Response</p>	<p>Response from Simulator:</p> <ul style="list-style-type: none"> • Have manikin talk, say hello • Explain how eyes don't open, depending on which manikin is being used
<p style="text-align: center;">S</p> <p style="text-align: center;">Send for Help</p>	<p>How to call for help:</p> <ul style="list-style-type: none"> • Local assistance – phone systems • Emergency buzzer • (overhead voice)
<p style="text-align: center;">A</p> <p style="text-align: center;">Airway</p>	<p>Airway:</p> <ul style="list-style-type: none"> • patent when talking • OPA can be inserted • Teeth/ tongue • Size 7.5 ETT
<p style="text-align: center;">B</p> <p style="text-align: center;">Breathing</p>	<p>Breathing / Respiratory rate:</p> <ul style="list-style-type: none"> • Rise and fall of chest • O2 Sats / CO2 • Breath sounds – wheeze, creps unilateral • Needle decompression site • Chest tube insertion site

<p>C</p> <p>Circulation</p>	<p>Circulation:</p> <ul style="list-style-type: none">• Pulses – press one side at a time• HR - monitor• ECG 3 lead and 12 lead• BP - monitor• Cannulation / IVC site, venepuncture sit
<p>D</p> <p>Defibrillation/ Drugs</p>	<ul style="list-style-type: none">• Defib if needed Safety• Drugs• Where to source• How to give
<p>E</p> <p>Exposure/enviromment/extras</p>	<p>Exposure:</p> <ul style="list-style-type: none">• Temperature• GCS• Environment• Bed controls/ CPR release

Created by Tess Vawser (2017)

Sample ESP/Role Player Policy

Role-playing/Embedded Simulation Persons in the Simulation Scenarios

Role-playing in the simulation scenarios is an important component in regards to:

1. Ensuring fidelity of a certain situation, and
2. Controlling the learning environment so as to ensure learning objectives can be met.

As such, a person's assigned roles should be fully briefed by the principal instructor prior to the start of the scenario. This should include:

1. The purpose of the scenario – i.e. the learning objectives
2. The role to be played
3. The level of the learner and expectations of actions
4. Specifics about the role, e.g. level of emotion, distracters etc.

At this time, the role player should ask for clarification if required and/or make suggestions regarding the role. However, NO VARIATION to the role should occur during the scenario, without the express instructions from the principal instructor.

The person role-playing should stay "in role" until the end of the scenario is announced by the principal instructor.

Role players should not comment on the scenario at the end of the session. They should assist participants to make their way to the debrief area, but they should NOT offer comments as this can undermine the debriefing process.

The Scenarios are serious, scripted events with specific objectives. Occasionally, a funny incident may occur during the simulation. Laughter however is NOT appropriate. Role players should be aware that participants can interpret this as having their performance "made fun of". Obviously this is not what we would like to see happen.

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