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Enhancing the uptake of learning through simulation in health

Cobie Rudd

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Enhancing the uptake of learning through simulation in health

Final Report 2013

National Teaching Fellowship
Professor Cobie Rudd
Edith Cowan University

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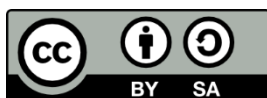
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List of acronyms and abbreviations

ACME	Advanced and Complex Medical Emergencies
AHWI	Australian Health Workforce Institute
ANZCA	Australian and New Zealand College of Anaesthetists
AusSETT	The Australian Simulation Education & Technical Training Program
CAVE	Computer automatic virtual environment
CHOGM	Commonwealth Heads of Government Meeting
COAG	Council of Australian Governments
CRN	Collaborative Research Network
CSSU	Clinical Simulation Support Unit
DoHWA	Department of Health, Western Australia
ECU HSC	Edith Cowan University Health Simulation Centre
EMAC	Effective Management of Anaesthetic Crisis
HSC	Health Simulation Centre
HSTS	WA Health Simulation Training Strategy
HWA	Health Workforce Australia
IHWC	International Health Workforce Collaborative
IPL	Interprofessional learning
NCSBN	National Council of State Boards of Nursing
NHET-Sim	National Health Education and Training in Simulation
NPA	National Partnership Agreement
PEARLS	Performance Enhancement via Augmented Reflective Learning in Simulation
SHRAC	State Health Research Advisory Council
SLE	Simulated learning environment
SSH	Society for Simulation in Healthcare
SVE	Simulation Valid Elements
WA	Western Australia
WA CTN	WA Clinical Training Network
WAVE	Wide Area Virtual Environment

Executive summary

The initial reason that a simulated learning environment (SLE) was pursued was to offer university-based health students a safe and authentic environment in which to learn and practise their skills. Since that time, some eight years later, experience has shown that an SLE needed multiple dimensions to its work, based on evidence. In addition, a new approach to applying and integrating learning through simulation within health curricula, that was replicable and affordable, was required.

This National Teaching Fellowship was awarded at a critical time for simulation-based learning in health in Australia. A number of simulation centres existed, many more were developing, and the Australian Government, through Health Workforce Australia (HWA), began expanding the capacity for learning through simulation with an allocation of \$75.92 million for both capital and recurrent investments across sectors. During the period of the fellowship, HWA provided grants in the health and education sectors for capital items such as simulation equipment, infrastructure, including fit-out and expansion of the simulation teaching space and further investment for simulation staff training, and research. The fellowship has been instrumental in identifying where there were gaps and proposing some solutions, in respect to gaining maximum benefit from both the HWA and other investment, to enhance the uptake of learning through simulation in health.

Firstly, the fellow devised a communication strategy combining the diffusion of innovations model and a market segmentation approach. This communication strategy aimed to assist simulation adopters to deliver succinct messages as to why investment into simulation could bring mutually desirable benefits to funders, decision makers and users. From the outset, it became evident that Australian stakeholders are currently seeking an evidence base to support simulation as a clinical training replacement and/or complementary educational strategy. Thus, the communication strategy phase also entailed undertaking a range of research projects, including a pilot study, to further build the evidence base to assist with embedding learning through simulation in health. Moreover, simulation as a disruptive innovation was a platform upon which to base some futures thinking. In line with this, the fellow devised a turnkey solution to deliver distributed, regionalised, simulation-based learning on a broad scale, at lower costs to bricks and mortar centres, without compromising the realism or fidelity of the immersive environment.

Secondly, the fellow developed a curricula renewal theoretical model that responded to a gap in the literature in respect to a contemporary ideological model. The fellow defines a contemporary model as one that serves current need, where simulation is used, not only as a complementary educational strategy, but potentially as an appropriate clinical training replacement for some skills and behaviour development. The Simulation Valid Elements (SVE) model delivers a new conceptual framework for envisaging how to plan SLEs and structure simulated scenarios encompassing human factors, as well as how to measure the efficacy of simulation. The fellow believes that unless simulation can not only be an adjunct to, but can substitute for clinical experience, then broader uptake and sustainability of the approach as a key educational technique in health will be constrained. Work to date in the area of conceptual frameworks for simulation has been done within nursing and medicine spheres, as is to be expected, given their historical trailblazing in the field. However, no conceptual model has been developed to position simulation-based learning as a potential replacement and viable complement to clinical experience. The SVE model, informed by simulation resource development and testing of same, identifies three elements that are considered critical to achieve realism of scenarios: emotional validity, environmental validity and situational validity, being the platforms upon which greater emotional and social intelligence and situational awareness can be cultivated. In this model, situational validity means two things: tailoring the scenario to the context, such as achieving high fidelity around the technical side of the situation (for example, an anaesthetic crisis); but just as important is offering valid approaches to portraying the context of the events and one's own and other's actions. Plus, it is proposed that conceptual fidelity and, in turn, validity, if achieved, can increase situational awareness development as much as skills-based learning.

Thirdly, the fellow developed and promoted a range of resources and tools, including a curricula enabler tool based on an analysis of all national reports commissioned by HWA (the 18 simulated learning curricula project reports for 20 professions); 17 major creative works using simulation in the form of audiovisual resources with facilitation manuals to guide educators in the integration of the resources into curricula (all available as open access); and a model for delivering simulation challenges was developed and tested (five simulation challenges were conducted with students and industry and evaluated). From this national fellowship, five new contributions to knowledge have emerged, as detailed below. Ten desired outcomes from simulation-based learning for the 21st century are proposed, notably: human factors integration; sequential scenarios; authentic and immersive learning milieu; higher order thinking skills development; translational research; simulation research informed curricula renewal; enhanced clinical training capacity using simulation; and transferable skills. These desired outcomes stem from the fellowship following key contributions to knowledge.

Firstly, it is of immense additional benefit when designing simulated scenarios to adopt a root cause analysis methodology and to incorporate a focus on identifying the personal reasons behind problems and how they might be resolved positively. For instance, drawing out how an individual's self-talk can in fact be at the source of the problem, and be the driving force behind attitudes and behaviour. Translated into practice, this means employing simulation as a tool to tailor cognitive and attitudinal development, including creating cultural empathy. Thus, the capacity of simulation to be a vehicle for social conscience messages that might help develop positive civic engagement cannot be underestimated.

Secondly, adopting a human factors focus and using simulation to provide a safe environment to explore what keeps us from sharing our concerns or being assertive is critical. For students, for example, this can mean learning to identify team, leadership and organisational system problems before they are in the workforce, either on clinical placements or as graduates. Implicit here, is using simulation to explore ways to problem solve, including how to deal with difficult people, intervene to avoid a near miss, and manage risks due to workforce shortages.

Thirdly, when embedding simulation within curricula to achieve maximum value-add, the focus should be on where skills development is most needed, namely, quality experiences that are hard to get from traditional clinical placements — such as how do you ask the hard questions, cross-check a colleague, voice concerns and identify mistakes. Moreover, there is a need to create opportunities to expose students to non-technical skills development such as teamwork and a system focus as a recognisable and formal part of their curricula.

Fourthly, there is evidence to suggest students exposed to simulation-based learning improve their clinical competency skills at a comparable, if not accelerated rate, compared to students undertaking traditional clinical placements. Students undertaking a mixture of clinical- and simulation-based learning express equally high levels of satisfaction with both forms of learning. Without doubt, there is a broad translational research agenda in this field and an urgent requirement for further evidence to justify investment and for formal recognition of the role of simulation in clinical training in respect to national registration and accreditation requirements.

Finally, the fellowship has developed and introduced a new conceptual framework (the SVE model) that profiles emotional validity, environmental validity and situational validity as critical elements germane to the training in human factors through simulation. Through addressing suboptimal communication patterns, improving situational awareness, and building emotional and social intelligence within the current and future health workforce, the aim is to have a positive impact on patient safety.

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1. Fellowship aims

The overall aim of the fellowship was, as the title of the fellowship suggests, to enhance the uptake of learning through simulation in health. More specifically, the first objective was to implement an overall change strategy aimed at helping people to communicate about simulation, how they wanted to use it and what the benefits might be. The second objective was to use simulation in a manner that would equip learners to ask the hard questions and, in doing so, demonstrate that simulation is more than an optional layer, but potentially a better way to teach some things. The third objective was to design a framework for curricula renewal and resource development, which has been identified as a key feature to make the process of uptake easier.

The fellow considers simulation presents a single solution for the two major problems facing health and all university health programs: the lack of quality clinical placements and the high number of adverse events and near misses. That is, simulation joins the safety and quality agenda to quality learning and teaching. As such, a number of factors were key considerations in the design of the fellowship, how it has been enacted and as concepts are reflected throughout how the findings are reported. The factors that are considered and integrated throughout the fellowship are:

1.1. Quality learning and teaching: lack of clinical placements

The discontent and frustration in the tertiary health education sector with the lack of clinical placements is palpable. Clinical experience is integral to the completion of education of many health professional groups to enable them become safe, competent practitioners (Baxter *et al.*, 2008), yet availability of sites where students can gain the requisite clinical experience is limited. The inability to meet educational outcomes through quality clinical placements in 'real world' settings can be alleviated, and in some cases done even better, through simulation. Simulation environments provide a unique, alternative context, particularly in relation to high-risk, low-volume experiences that students may not have experienced, or would not otherwise encounter.

1.2. Safety: adverse events and near misses

Simulated learning environments (SLEs) enable students the opportunity to repetitively rehearse skills in a safe environment (Murray *et al.*, 2008). The much-reported Institute of Medicine's landmark report *To Err is Human* (Institute of Medicine, 1999) outlined the remarkable impact of medical errors on patients' lives. Medical errors have been variously attributable to a vast array of situations from events as seemingly benign as hand hygiene to staff shortages, the design of working environments, diagnostic and medication errors, to work flow processes and fatigue. Importantly, the fellow was guided by research indicating that rather than poor technical skill, it was human factors such as suboptimal communication and organisational system and culture inadequacies that were implicated in up to 87% of the errors, adverse events and near misses that occur (Bion, Abrusci & Hibbert, 2010; Mercer, Whittle & Mahoney, 2010; Toff, 2010; Leonard, Graham & Bonacum, 2004).

1.3. Simulation and non-technical errors: human factors

Human factors are described as the systems, behaviours or actions that modify human performance and can be attributed to the individual, a team of individuals or the way individuals interact with the working environment (Fortune, Murray, Grant, Howarth & Leigh, 2013). Fortune *et al.* (2013, p.6) describe human factors in healthcare as operating on two levels:

- Level 1 relates to how human factors work in a specified system or environment (including ergonomics — how people interact with systems); and
- Level 2 refers to non-technical skills, which are cognitive, social and personal. Specific aspects included within this level are cognition and error, situational awareness, leadership and teamwork, personality and behaviour, communication and assertiveness, decision making, and the effects of tiredness and fatigue on human behaviour.

Although the focus of attention on non-technical skills is evident in other safety-critical areas (for example, aviation, military) it is less evident in healthcare, particularly in relation to Level 2 skills. Proceedings at a recent patient safety conference in Switzerland highlighted the lack of interest in human factors:

The vast majority of clinicians are involved in safety every day. Preventing harm to *individual* patients is central to most clinicians and belongs to the intrinsic motivation of health professionals. Ironically, the same clinicians are often reluctant to engage in system-wide safety initiatives. To many physicians, saving additional lives (through advanced therapy) seems psychologically more attractive than avoiding deaths through prevention of harm. It is much easier to enthuse surgeons about a new microinvasive device, or innovations such as fast-track surgery, than about the surgical safety checklist, team training, or structured handovers (Schwappach & Conen, 2012, p. 5).

The contemporary focus of human factors in healthcare reportedly had its genesis in the work of James Reason in 1995 when he stated that, “human rather than technical failures now represent the greatest threat to complex and potentially hazardous systems” (Reason, 1995). Over a decade later, the World Health Organization in their conceptual framework for patient safety again underscored the lack of attention given to human factor domains where “very little training” is provided to staff (World Health Organization, 2009 p.6). They identified organisational culture, managerial leadership, communication, teamwork, team leadership, situation awareness, decision making, stress, fatigue and work environments as key focus areas that require attention.

While the array of realistic, life-size, computer-driven, medium- and high-fidelity manikins that mimic a steadily increasing number of aspects of human physiology is remarkable, the possibilities beyond technical skills training has been further explored during this fellowship. As previously mentioned, a new conceptual model has been developed in respect to how simulation can be better used for human factors training, including to reveal internal self-talk. As a result of subsequent testing of different techniques, and in response to what the fellow considered some untapped potential for simulation, the Simulation Valid Elements (SVE) model is coined and then outlined and discussed fully in Outcome area two.

1.4. The fellowship in context: broader strategic policy alignment

In 2006, the Council of Australian Governments (COAG) agreed to a significant national health workforce reform package to enable the health workforce to better respond to the evolving care needs of the Australian community, while maintaining the quality and safety of health services. HWA commenced in 2010 as part of the evolving COAG strategy, to devise solutions that effectively integrate workforce planning, policy and reform with the necessary and complementary reforms to education and training. To build and operate new or enhance current SLEs, HWA developed a five-phased SLE national project: Phase 1 — Project initiation; Phase 2 — Identifying and sourcing SLE curriculum; Phase 3 — Infrastructure development phase; Phase 4 — Research, knowledge management and evaluation plan; and Phase 5 — Implementation plan.

During Phase 2 in 2010, identifying and sourcing SLE curriculum, of which three of the 12 projects were led by the fellow, data collected across all projects indicated a desire to: (a) utilise SLEs and programs where quality clinical experiences or events are unavailable; (b) foster greater levels of interprofessional practice; and (c) enable the more efficient use of clinical placements (HWA, 2010).

The fellowship then presented a timely opportunity to develop a framework and dissemination strategy to progress a number of the outcomes of the 2010 Health Workforce Australia Simulated Learning Curricula project to further embed SLEs in the development and delivery of health curricula across Australian universities.

The plan of activities was intended to serve as the 'glue' in some respects, to linking and integrating the five-phased HWA SLE national plan with other spheres of activity across sectors and countries. The fellowship intended to stimulate strategic change in higher education institutions through the development and application of an eclectic theoretical framework to achieve successful and sustained participation, and the uptake of simulated learning.

Essentially, the fellowship was positioned as a change management strategy to achieve adoption of simulated learning through the development of a curricula renewal model and dissemination strategy based on the diffusion of innovations model (Rogers, 1995). The fellow was intended to serve as a largely independent supporter and advisor to higher education institutions, HWA, accrediting bodies and individual leaders, to better understand how they were interpreting and, in turn, responding to what was desired/required in their efforts to make sense of the use of simulation in their own specific environment.

An engaged-focused approach was adopted to disseminate knowledge and reduce barriers to the uptake of innovations to stimulate the anticipated attitude and behaviour change necessary to build the application and acceptance of simulated learning as educational modality in healthcare education in Australia. Benefits were anticipated to the fellow's home institution and nationally, across health and education disciplines.

1.5. Outcomes and deliverables

Plan of activities

Although depicted as a linear process, the fellowship stages were often concurrent (see Figure 1). In the first stage, the design of a communication strategy, it was important to consider how potential adopters might explain learning through simulation and its benefits so it was easily understood by those they needed to convince (for example, key decision makers in their own organisations). It was self-evident that educators and clinical trainers (simulation instructors) needed a fundamental understanding of SLEs. However, a crucial role for the fellow was to help people translate the multitude of complex concepts around SLEs, patient safety and quality, student learning and clinical outcomes into a form that would be meaningful to their respective organisations.

Namely, a fundamental piece of work was required for communication, promotion and change management. Specifically, those wanting to progress with the simulated learning agenda needed to be able to break through the clutter, analyse the problems they faced, and develop messages to overcome barriers (for example, overcoming administrative scepticism, lack of sustained infrastructure funding).

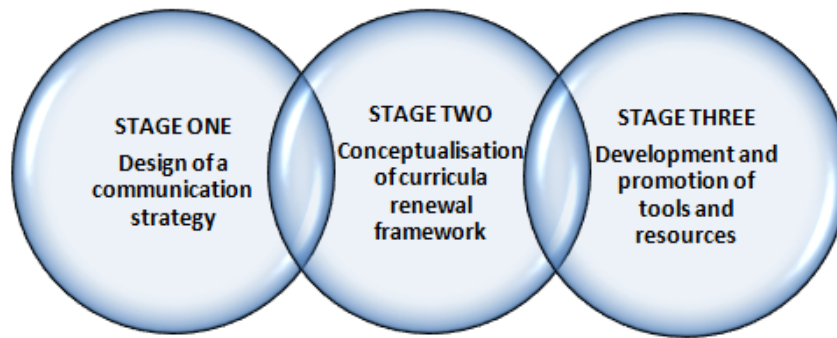


Figure 1 Fellowship plan of activities

In the second stage, the conceptualisation of a curricula renewal model, consideration was given to how adopters could embed SLEs and programs in their curricula. It was important to determine a range of factors, such as: to identify what course areas (stages/units) would be the best fit with simulation-based learning; to confirm alignments with the Australian National Registration and Accreditation Scheme (for example, meeting course accreditation standards); to determine which innovations could be shared across disciplines; and, importantly, to ascertain which skills areas presented the greatest potential to be adopted with the least resistance.

The third stage required the development and promotion of tools and resources to facilitate the uptake of simulation. It is important for adopters to determine which resources they needed and how to access them. This stage entailed the development of tools and resources and supporting implementers to identify which resources and tools are available, and where they are located. Not surprisingly, the outcomes and deliverables from the fellowship align with the three stages above, and are summarised as follows:

Outcome area one — Communication strategy

- Market segmentation
- Infiltration — changing mindsets (initial ‘grabs’/sound bites)
- Cross-fertilisation of ideas and knowledge — role of conduit
- Research
- Futures thinking/strategic foresight

Outcome area two — Curricula renewal

- Curricula renewal model — theoretical model

Outcome area three — Development and promotion of tools and resources

- Curricula enabler — a new tool based on the analysis of all the national SLE curricula projects
- Seventeen major creative works — resources to enhance uptake
- Simulation challenges — an engaging education method for testing some new concepts

The external evaluation can be found at Appendix A. Appendix B highlights the overall outcomes achieved over the duration of the fellowship at a macro (national, international), meso (state, universities) and micro (individual) level.

2. Outcome area one — Communication strategy

2.1. Market segmentation

The fellowship set out to address the question, ‘how do you do it?’ Essentially the fellowship was a change management strategy to achieve adoption of learning through simulation (in health). The Rossiter-Percy model to plan a communication strategy (Rossiter & Percy, 1997) was drawn upon for the planning in this regard. That is, at the outset the fellow specified the overall goal and specific objectives; pinpointed who the fellow needed to impact to achieve same; identified what beliefs and attitudes needed to be created, changed or reinforced; discovered what sorts of messages would influence adoption of the beliefs and attitudes; and ascertained where, how often and in what form did the messages need to be exposed to these people/groups.

Determining how potential adopters might explain simulated learning so it could be easily understood, and its benefits, by those they needed to convince, for example, key decision makers in their own organisations, initially required market segmentation. That is, those wanting to progress with the simulated learning agenda needed to be able to target the right audience, break through the clutter, analyse the problems their audience faced, and develop messages to overcome what were their targets’ real or perceived barriers.

A core principle in marketing, and thus in trying to promote anything, is an acknowledgment that different people are likely to respond differently to different products and services and to the way information is presented to them. Determining how to segment a market is important (Kara & Kaynak, 1997), although determining the specific benefits to various decision makers and how simulation will meet their idiosyncratic needs is crucial (Haley, 1968; Myers, 1976). Thus the division of the total market into relatively homogeneous but distinct segments, and honing the messages for those segments, together constituted a textbook approach to selectivity and concentration. In this case, it was targeted messages and reinforcing them; it is obvious that people, no matter how compelling the argument, in general do not adopt new ideas or technology based only on a single message.

The basis for the market segmentation for the fellowship was a simple demographics clustering of university decision makers, government decision makers, students and so forth. Some attention was paid to other bases for market segmentation too, for instance, that of attitudes and motives, and benefits sought. Thus, different messages to appeal to the different groups were devised. Of course, groups were not exclusive, and there was considerable overlap in some cases. The one-line ‘grabs’ intentionally highlighted the benefit of simulation to the various segments of groups or individuals who were decision makers, in some respect, in relation to the uptake of simulation. Each ‘grab’ was developed for the distinct characteristics of the market segment, with their specific agendas and priorities in mind, taking into account whether their attitudinal stance was positive, neutral or negative (if known). The aim was to devise initial statements that were easily grasped, resonated and persuasive, in turn, influencing an ongoing process of dialogue. Some of the ‘grabs’ naturally highlighted a benefit that was advantageous to multiple segments.

2.2. Infiltration — changing mindsets (initial ‘grabs’/sound bites)

As before, different audiences required different approaches. Locating and reaching members of some target segments was undoubtedly enhanced through positional power, but communicating with members of those target audiences in a way that was understood (and remembered) was the challenge. On the other hand, some audiences were already experts in the field, thus positional power had little or no impact; therefore the grabs needed to be a new way of looking at simulation that added value and this is where personal power came to the fore. Basically, the fellow had to demonstrate expertise in the

field, for example, in problem solving and through new applications of simulation, to gain some referent power through producing results that engendered emulation. Of course, the fellow had to be networked (with connection power) at a level where informational power was viewed as a special return to others from the role.

For decision makers, learning through simulation — what it is and its benefits — needed to be promoted in a way that was easily grasped when the fellow had ‘grab’ time (this was often in the lift with about 30 seconds’ air time). Convincing key decision makers, particularly to the point that they then owned the ideas and, more so, to the point where they even forgot where they came from, was the aim. This process started with the premise that it’s critical to be able to tailor and deliver messages that can break through the clutter and provide solutions to the problems decision makers face — and to do it quickly as their time was limited and sensory overload was a constant risk. As a result, higher education sector administrators, hospital administrators and other decision makers were provided with ‘grabs’ to position simulation as an option for investment or to augment their efforts to facilitate the uptake of simulation in their own environments. Users of simulation-based learning were also targeted; for example, students, because anecdotes about forward-looking learning approaches and advanced facilities, and in turn, increased enrolments, is a powerful inducement in higher education.

The process thus required an immediate, informal assessment of each individual’s situation so that the market segmentation approach could be implemented. Through the process of quickly and conceptually aggregating people into ‘segments’, with similar but distinct wants or needs, the fellow could immediately respond with idiosyncratic and honed messages that would assist them to “push their cart”. People needed a way to formulate messages to overcome barriers in thinking around simulation. One of the more common themes was the need to overcome administrative scepticism regarding the lack of sustained infrastructure, and ongoing operational funding for simulation as a key educational approach.

The post-fellowship grabs presented later in this document (see Table 6) together with the five key contributions to knowledge and the ten learning through simulation 21st century outcomes, provide an enlightening comparison when looking at where the fellow started with the grabs in Table 1.

Table 1 Initial grabs — why investing in simulation should be prioritised

Group/individual	Initial grabs — why investing in simulation should be prioritised
Chancellor and Council Members	<ul style="list-style-type: none"> We want our students to impress their future employers from day one; they need to be competent and confident to do that.
Vice-Chancellor	<ul style="list-style-type: none"> This will be a point of differentiation for ECU; our students will be graduates of choice.
Other Executive Team Members/Senior Staff	<ul style="list-style-type: none"> This idea has come from the student body; they want to practise their skills in a safe environment before they practise on real patients.
Politicians	<ul style="list-style-type: none"> Students get to practise here before they are working in the real world. Communication failure alone is responsible for over 70% of adverse events in health; our focus is on interpersonal skills, teamwork and leadership.
Senior administrators, policy makers and planners in health (and funders)	<ul style="list-style-type: none"> Simulation presents a single solution for two major problems facing health and all universities with health programs: <ol style="list-style-type: none"> The lack of quality clinical placements in health; and Adverse events and near misses. Simulation uniquely links the quality and safety agenda in health with quality learning and teaching.
Simulation early adopters	<ul style="list-style-type: none"> We know that communication failures are the leading cause of adverse events and near misses. Designing interprofessional simulations that focus on human factors can provide tremendous benefit to student preparedness and, in turn, clinical benefits.
Students	<ul style="list-style-type: none"> These facilities and this approach give you a distinctive edge; you will know what to do and how to perform in all the different roles expected of you, before you even graduate.
Simulation experts	<ul style="list-style-type: none"> I’m not an expert in simulation in that I don’t ‘do it’ in the traditional sense but I can see what it can do. I can see some new opportunities where we might lever additional support.

In many cases, people wanted more than answers to simple questions. Typically after conference presentations, people would wait in a queue to speak. Some would directly ask for help setting up a simulation facility; others needed specific direction to develop scenarios or ways to encourage people in their institution to 'get up to speed' with simulation. In some cases, people would receive immediate help with their query. Other situations would require participation later in teleconferences, or where more detailed assistance was needed, they would be linked to the team at the ECU HSC.

A great deal of contact with people involved discussions about how simulation could be best utilised for teaching purposes in their specific context. The fellow often needed to translate the problems they were experiencing in their environments into simulation-based solutions. People were very clear about the specific challenges they faced, but with minimal experience they were less able to operationalise the solutions utilising simulated learning contexts. The fellow needed to provide guidance and clarification on what the simulation resource would need to look like to help people overcome their specific difficulty.

The focus on government was a critical aspect of the fellowship to ensure those that have portfolio responsibility were provided with new perspectives on the challenges they faced and were appropriately informed regarding the potential array of new solutions. The fellow provided information to ministers and senior public servants about issues that were salient to them in both healthcare and education, and reminded them of the potential SLEs could have in alleviating some of their current challenges.

2.3. Communication: committees and advisory groups

A considerable body of work was allocated to strategic participation in committees and advisory groups that directly increase the uptake of simulation through resource allocation, and support and training of the simulation workforce to enhance their capacity to implement simulated learning programs (see Table 2).

Rather than set up an additional committee structure based around the fellowship's purposes, that already busy people would need to schedule in, it was deemed more appropriate to identify and become engaged in currently existing simulation entities. The remit of the groups were manifold. This permitted exposure to committees that have responsibilities at a state level for the coordination of simulation training resources across professions and disciplines and the overall direction of simulation in Western Australia (WA), and system-wide, cross-sectoral clinical training reform in WA. At a national level, there was, and remains, exposure to committees with responsibilities for advancing education, training and research in simulation-based learning; for example, the fellow was a Founding Member of the Australian Health Workforce Institute (AHWI) network, whose purpose is to build health workforce research capacity across Australia and New Zealand. Exposure to a global body as a non-executive director on the Society for Simulation in Healthcare (SSH) Board importantly ensured the fellow was ideally positioned to monitor international trends and initiatives on matters currently salient in the Australian context. Presence on this international board provided the Australian simulation community with a truly global presence and enabled the dissemination of crucial information in relation to accreditation and certification, newly developing technology, research and general issues within the healthcare simulation community. The International Health Workforce Collaborative (IHCWC) (RCPSC, 2013) is a global think tank which aims to promote exchange of policy approaches across countries in relation to health workforce planning; promote understanding of global trends that affect health workforce policies; and promote international collaboration in health workforce research, evaluation and forecasting.

Although longer dialogue was also possible during meetings/forums, short 'grabs' with people during the fellowship encouraged listeners to pursue a deeper appreciation of simulation and its benefits, in a way that was easily followed. While understandably onerous at times, attending 194 meetings (see Table 3) and an additional nine

conferences/workshop presentations (see Table 4), the cumulative effect was a furthering of the uptake of simulation as these opportunities provided a unique environment to engage with people and accentuate some strategic, and at times tactical, messages via ‘grabs’.

Audiences would be directed to the fellow’s website (ECU, 2012a) hosted at and supported by ECU, and with links to the funder (ECU, 2012b), the ECU Health Simulation Centre (HSC) (ECU, 2012c) and web-based deliverables emanating from the fellowship, such as interprofessional learning (IPL) through simulation (ECU, 2012d).

Google analytics commenced for the fellowship website (ECU, 2012a) on 10 June 2012. From 10 June 2012 to 31 December 2012, there were 957 page views, none of which were from outside Australia. From 1 January 2013 to 10 March 2013, there were 192 page views of the fellowship website, of which 6% were from outside Australia.

Table 2 State, national and international committees and advisory groups — snapshot

Area	Committee/group name	Remit
STATE	Immersive and Simulation-Based Learning Committee (ISL)	Works towards statewide coordination of simulation training resources across professions and disciplines. Funded by the Department of Health, Western Australia (DoHWA) and HWA.
	WA Clinical Training Network Steering Group (CTN)	The WA CTN aims to improve the system-wide management of clinical training and to promote access to clinical placements by building relationships, supporting reform projects and improving data gathering and communications. Forms part of the Clinical Training Reforms, which include the Clinical Support Supervision program, the Clinical Training Funding project and SLEs. Funded by DoHWA and HWA.
NATIONAL	Australian Health Workforce Institute (AHWI) Network	Nine parties (eight Australian universities and one international health workforce agency) with expertise in health workforce research, including simulation, have agreed to form a network to be known as the AHWI Network, which will be administered by The University of Melbourne. The broad, primary aims of the AHWI Network are to facilitate links in the areas of health workforce research through information sharing, joint research, providing a forum for independent debate on health workforce and health system reform, co-supervising higher degree research students, and building capacity in health workforce research.
	National Health Education and Training in Simulation (NHET-Sim) Expert Advisory Group HWA	Provides advice regarding training in simulation-based education for clinical/academic educators and technicians working in the health professions. Funded by HWA as part of the SLE programs that HWA is undertaking as a result of the work implemented under the National Partnership Agreement (NPA) on Hospital and Health Workforce Reform.
INTERNATIONAL	Society for Simulation in Healthcare (SSH)	As a Director on the Board for the international SSH, I have been in an ideal position to monitor international trends and initiatives on matters currently salient within the Australian context.
	International Health Workforce Collaborative (IHWC)	Membership of the IHWC is by invitation-only by the IHWC Organising Committee. IHWC is a global think tank to promote exchange of policy approaches across countries that address health workforce planning and that enhance the ability of each country to respond to workforce needs; promote understanding of global trends that affect health workforce policies; and promote international collaboration in health workforce research, evaluation and forecasting.

A number of factors demonstrate the sustainability of outputs that are a consequence of the national and state (Western Australian) committee membership throughout the duration of the fellowship, and general fellowship undertakings. The range of sustainable outputs includes, but is not limited to, the following:

- Strategic representation during the fellowship at 194 national and international event activities.
- Worked collaboratively to maximise cross-fertilisation between national and

international simulation representative bodies and higher education institutions to facilitate information exchange.

- Extensive lobbying of government (state, territory and Commonwealth) to champion simulation and promote strategic change.
- Simulation training delivered throughout Australia to health professionals, academics and technicians to increase the capacity of health simulation educators.
- Significant and enduring learning resources such as online learning modules were developed and are continuously being delivered to health simulation educators throughout Australia.
- In Western Australia, the WA Health Simulation Strategy 2011–13 was developed. The Clinical Supervision Support Unit commenced with a mandate to coordinate statewide simulation learning resources across professions, disciplines and sectors.
- The fellowship has had significant influence in the strategic direction of simulation funding throughout Australia through direct involvement with HWA, which will specifically create new capacities in funded organisations, and generally stimulate the uptake of simulation in Australia (see Appendix J).
- The fellowship played an instrumental role in the thinking around a centralised national simulation database in Australia that might result in long-term system enhancements. To this end, the fellow had an advisory role with HWA for the preliminary planning for the development of a national simulation in health e-platform with the aim of improving access to and distribution of simulation curricula as well as a national simulation directory. SimNET (the online portal for simulation education and training resources) was launched by HWA at the national conference (SimHealth 2012, in September 2012).

2.4. Cross-fertilisation of ideas and knowledge: role of conduit

The primary advantage of attending a disparate range of state, national and international committees and advisory groups was in tapping into the strategic orientation of each group to benefit other groups. Attending a great number of meetings permitted a greater flow of ideas and information between groups. The fellowship role was very much a conduit for foresight thinking; some of this was imaginative, some consensus-driven, and some of the futures thinking was agenda-driven. Subsequently, this tied in to consolidating the perception that the fellowship was supplementing conventional thinking and so helped influence audiences and obtain greater uptake of ideas/visions and knowledge transfer. When information was presented or discussed in one group, it immediately had an effect on other contexts, a situation that may take months or years otherwise. The cross-fertilisation that occurred through 'connecting' or 'linking' the meetings led to much more efficient use of group members' time. With enhanced processes to share ideas and information there was less need for individual groups to 'reinvent the wheel'.

The nucleus of expertise present within the groups was invaluable throughout the fellowship and one through which much sagacious advice was gleaned. Exposure to the range of groups resulted in unpredicted synergies and made the process of proactive engagement with a range of people an integral fellowship activity. Involvement in multiple advisory groups provided a depth and breadth of input not normally possible through one entity alone. This upshot of the fellowship continues, for example, with ECU being asked in October 2012 to host the national Simulation Australia showcase event in Perth (Simulation Australia Ltd, 2013) in March 2013 including the fellow as a speaker, along with speakers at executive or senior levels from the mining, defence and military training, and virtual environment industries.

Table 3 Simulation event activity exemplars

TYPE OF EVENT	ACTIVITY EXEMPLARS	N=193
Meetings: advisory groups/committees	<ul style="list-style-type: none"> Attendance at International/national/state meetings (i.e. AusSETT/SSH/ISL). 	73
Meetings: with other universities/hospitals	<ul style="list-style-type: none"> Advising on development of building of simulation centres/delivering simulation-based learning. Visits to progress collaboration, including simulation resource development and research. 	10
Meetings: discuss simulation-related areas	<ul style="list-style-type: none"> National database collaboration. National training program for simulation educators and technicians. HWA to discuss distributed simulation. Mining, oil and gas industry — disaster preparedness training. 	37
Other universities' and organisations' site visits to ECU HSC	<ul style="list-style-type: none"> Deputy Premier. National and international universities. Non-government agencies, such as Silver Chain Group (one of the largest not-for-profit health and community care organisations). 	18
Meetings: government departments/bureaucrats	<ul style="list-style-type: none"> Nominated by the WA Department of the Premier and Cabinet to host a Commonwealth Heads of Government Meeting (CHOGM) delegates' visit, profiling simulation at ECU. Discuss e-Learning platforms. Promote potential of simulation across portfolios. 	20
Meetings: other	<ul style="list-style-type: none"> American Chamber of Commerce. Royalties for Regions. US Navy. Airport — disaster preparedness. WA General Practice Education and Training. 	6
Meetings: ECU HSC/Collaborative Research Network (CRN)	<ul style="list-style-type: none"> Progress the breadth of simulation research, resource, development and training at ECU, including through the ECU HSC. Uptake across disciplines at ECU/embedding simulation within curricula. 	18
Chaired forums/presentations on simulation	<ul style="list-style-type: none"> Presentation to Mental Health Advisory Council/Injury and Trauma Health Network/Chair Day One, National Learning and Teaching Forum. 	5
Conference (not presenting)	<ul style="list-style-type: none"> Attended conferences (e.g. National e-Health Transition Seminar). 	4
Other	<ul style="list-style-type: none"> International promotional film of ECU HSC. 	2

Table 4 Simulation conferences/presentations during fellowship

DATE	EVENT	TOPIC	Number of participants
Sep 2011	SimHealth Conference, Sydney	<ul style="list-style-type: none"> Invited plenary: "Learning together: IPL — what is it? — what works?" (see Appendix F and Appendix G). 	500+ with 86 from 17 countries
Oct 2011	Paramedicine Australasia Conference, Sydney	<ul style="list-style-type: none"> Invited keynote: "Developments in SLEs and Interprofessional Practice". 	250
May 2012	2012 Leadership Group - included a tour of the ECU HSC.	<ul style="list-style-type: none"> Presentation to Leadership WA: provide leadership development to leaders from the corporate, not-for-profit and government sectors in WA. 	32
Sep 2012	Simulation Summit, Sydney	<ul style="list-style-type: none"> Invitational summit to showcase simulation to key opinion leaders in health education sponsored by HWA. 	62
Sep 2012	SimHealth 2012 Plenary presentation	<ul style="list-style-type: none"> Invited speaker: "Enhancing the uptake of learning through simulation in health" (Appendices F & G). 	496+
Sep 2012	SimHealth 2012 Workshop Presentation	<ul style="list-style-type: none"> Invited speaker: "Interprofessional Learning (IPL) through simulation. Human factors in health teams" (Appendices F & G). 	70
Nov 2012	Paramedics Australia, Perth	<ul style="list-style-type: none"> Invited speaker: "Enhancing the uptake of learning through simulation in health". 	40+
Nov 2012	Stream Presentation at HWA's Inaugural Conference, Inspire 2012: <i>Reshaping Australia's Health Workforce</i> .	<ul style="list-style-type: none"> Invited speaker: "Building Capacity in Clinical Training: Challenges and opportunities in interprofessional approaches to clinical supervision". 	500+ overall at Conference
Nov 2012	WA Health Conference	<ul style="list-style-type: none"> Invited speaker: "Simulation training in WA: stronger partnerships for a better future" (collaboration between ECU, CSSU-DoHWA and UWA) (see Appendix E). 	20+

Table 5 Research seminars, simulation challenges and workshops

EVENT	DATE	TOPIC	Number of participants	Number of higher education institutions represented	Number of other institutions represented
Fellowship research seminar series	Jun 2011	<ul style="list-style-type: none"> “Examining the impact of simulated patients on nursing students’ clinical reasoning” presented by Professor Tracy Levett-Jones. 	79	5	5
	Sep 2011	<ul style="list-style-type: none"> “Global developments in simulation” presented by Professor Karim Qayumi. 			
	Sep 2011	<ul style="list-style-type: none"> “Interprofessional learning through simulation” presented by Professor Michael Seropian. 			
ECU-hosted IPL simulation challenges	Jun 2011	<ul style="list-style-type: none"> “Collaborative communication in family centred care: Non-accidental injury of an infant.” 	402	11	8
	Sep 2011	<ul style="list-style-type: none"> “Interprofessional case management of chronic disease: Diabetes in the community.” 			
	Apr 2012	<ul style="list-style-type: none"> “Cultural empathy.” 			
	May 2012	<ul style="list-style-type: none"> “Suicide prevention in the health workforce.” 			
Simulation instructor / professional development workshops at the ECU HSC		<ul style="list-style-type: none"> Acute and Complex Medical Emergencies Instructor Course. 	96	6	7
	Sep 2011	<ul style="list-style-type: none"> “Simulation debriefing” facilitated by Professor Michael Seropian. 			
	Mar 2012	<ul style="list-style-type: none"> METI HPS MUSE Software Training. 			
	May 2012	<ul style="list-style-type: none"> AusSETT program — educators’ workshop. 			
	May 2012	<ul style="list-style-type: none"> AusSETT program — technicians’ and coordinators’ workshop. 			
	Aug 2012	<ul style="list-style-type: none"> Introduction to debriefing. 			
	Aug 2012	<ul style="list-style-type: none"> Advanced debriefing course. 			
	Sep 2012	<ul style="list-style-type: none"> Studiocode software training. 			
Oct 2012	<ul style="list-style-type: none"> Thai Lecturers Boromarajonani College of Nursing, Chakriral — simulation instructor training day. 				
Immersive simulation-based programs at the ECU HSC	Jun 2011 to Dec 2012	<ul style="list-style-type: none"> Advanced and Complex Medical Emergencies (ACME) course. 	211	N/A	50+
		<ul style="list-style-type: none"> Effective Management of Anaesthetic Crises (EMAC) course. 			
		<ul style="list-style-type: none"> Anaesthetic Crisis Resource Management course. 			
		<ul style="list-style-type: none"> Advanced Post-Anaesthetic Care Unit course. 			
		<ul style="list-style-type: none"> Immediate Life Support Course — ALS 1. 			
		<ul style="list-style-type: none"> Emergency Medicine Crisis Resource Management course. 			
		<ul style="list-style-type: none"> Intensive Care Crisis Resource Management course. 			
<ul style="list-style-type: none"> Advanced Life Support course — ALS 2. 					

2.5. Research

Despite the rapidly increasing uptake of simulation-based teaching methods globally, there is little robust evidence for best practice and use of the simulation to achieve optimum learning outcomes or supporting the use of simulation to facilitate the transfer of knowledge to performance. While some argue, “many of the tools educators currently use have never been validated” (Acker, 2008 p. 63) the lack of data to prove the validity of the tools and techniques used in simulation-based education is clearly constraining broader uptake of simulation.

Thus the requirements for more of an evidence base around simulation became critical for the fellowship and, as a result, the fellow has led/leads/co-leads multiple research studies that cover all domains, for example, the impact of simulation in higher education, health professionals' development and clinical outcomes; projects that are either under way or now completed.

[ECU CRN subproject: Integrated health services to enhance community-based healthcare](#)

The CRN program is part of a suite of initiatives established by the Australian Government to reform higher education teaching, learning, research and research training. The ECU CRN (comprising six subprojects) is a \$17.8 million investment, which includes \$5.6 million funding (see Appendix J) from the Department of Industry, Innovation, Science, Research and Tertiary Education Collaborative Research Networks Scheme (2011–2014) (see Appendix D), along with contributions from the partner universities (ECU, 2011–2014). The above subproject spans all major healthcare delivery disciplines and is providing an evidence base of significant national impact. For this subproject, ECU partners with The University of Queensland, The University of Melbourne and The University of Western Australia. The research focuses on:

- developing evidence-based models of healthcare, service delivery and the subsequent educational approaches required (teaching and learning informed by research), including IPL, experiential/work-based learning, and simulated learning; and
- augmenting the role of community engaged research in health, to drive institutional change in higher education and national health reform.

[SLE use in professional entry paramedicine student education pilot project](#)

Australian health educational stakeholders are currently seeking evidence that simulation-based learning might be appropriate as a clinical training replacement and/or complementary educational strategy. The above study under the fellowship was a pilot with paramedicine students, funded by HWA, to investigate simulation-based training versus clinical placement training (see Appendix C). The study was developed from the National Council of State Boards of Nursing (NCSBN) National Simulation Study, a multi-site, longitudinal study of simulation use in pre-licensure nursing programs throughout the USA. Unlike the US nursing study, the sample was paramedicine students to test three interventions, each with differing levels of simulation and clinical placement learning. The pilot study included the purposes of testing the actual processes and procedures of the study (process evaluation) and testing the potential efficacy of the intervention (being an adaptation of the NCSBN intervention for the Australian context) in terms of its impact on outcome variables (impact evaluation), within any limitations identified in processes and procedures. This pilot study is now completed and subsequently acquitted by HWA.

[Improving learning outcomes through simulation for suicide prevention training](#)

Focused on health professionals' learning, the above study is investigating whether it is possible to improve the learning outcomes of half-day suicide prevention training workshops, if augmented with interprofessional, practice, simulation-based video discussion materials. The study compares the learning outcomes of matched groups of health professionals undertaking each type of training and subsequent self-reported suicide-prevention behaviours at three-month follow-up.

[Improving outcomes for chronic obstructive pulmonary disease with simulation](#)

Awarded a State Health Research Advisory Council (SHRAC) grant funded by DoHWA, ECU is conducting a randomised controlled trial testing the efficacy and cost benefit of cognitive behavioural therapy (CBT) on the health outcomes on chronic obstructive pulmonary disease (COPD) patients. A learning through simulation resource has been developed within a CBT framework to address anxiety and depression in COPD patients.

2.6. Futures thinking/strategic foresight

The uptake of innovation is a staggered process. Although early adopters are often valued as visionary, it may be that in the slow uptake of SLEs, the early or late majority or even laggards may be advantaged by not jumping on board too quickly. They have not done what some of the early adopters did, which was to put all their eggs in the high-fidelity, static, state-of-the-art simulation facility basket. The early/late majority/laggards can sometimes learn in hindsight from the experience of those that have gone before them and in a sense 'skip a technology' and become the early adopters of different technologies. For instance, it may be that the allied health professions that have been late to take on simulation in the manner nursing and medicine have, will be advantaged through their uptake of distributed simulation and the use of virtual learning concepts and gaming technology as mechanisms to increase emotional and environmental fidelity. As frustrating as they are, laggards and late adopters are necessary, for they bring a level of temperance that is sometimes warranted.

As well as within disciplines, the adoption of simulation varies between established and newer disciplines. Disciplines with long histories in simulation had reservations that there was any value-add they hadn't already explored. For a new and developing field, this was a challenge as there was more closure to new ideas than predicted. The early adopters to SLEs were medicine and nursing and, as professions for the most part, it appeared potentially difficult to conceptualise simulation as anything other than manikins and emergency situations, given this was the customary approach to simulation for the large numbers within their respective professions. There was a resistance to new ideas, unless they perceived that they had conceived the idea. Although, at times, they find it testing as a group to embrace new ideas, there are, of course, many individuals within both professions that are very willing to implement simulation more broadly. Allied health groups are often more prepared to enter the field of simulation with fresh eyes on what it is, and can be, and more accepting of the potential applicability of simulation. Unsurprisingly, perhaps less established and emerging disciplines are more flexible about what simulation is and, therefore, more accommodating of the multiple ways simulation can be used.

The interest in, and uptake, both nationally and internationally, of the 17 *Interprofessional Learning through Simulation* resources developed throughout the fellowship (<http://www.ecu.edu.au/ipl-through-simulation>) demonstrate a couple of things. Firstly, the utilisation and feedback during the fellowship confirms that the approach taken (as evidenced in the SVE model) is atypical. Secondly, the sustained interest and feedback indicate impact well beyond the fellowship (that is, during January 2013, when many institutions were closed over the holiday period, there were a further 841 page views of the *Interprofessional Learning through Simulation* resources, of which 21% were from outside Australia. For February 2013, there were a further 1380 page views, of which 13% were from outside Australia). Accordingly, the fellowship highlighted new possibilities for simulation by increasing the focus (globally) on the importance of emotional and environmental fidelity in learning through simulation to increase situational awareness in students.

Distributed simulation

There are conflicting agendas on how to best integrate simulation activities. There has been an overemphasis on funding for high-fidelity manikins despite the high number of institutions reporting equipment remains underutilised due to a lack of resources and knowledge related to setting up and running simulated scenarios. Many institutions have overcapitalised on high-fidelity simulation situated in dedicated, static simulation facilities and remain less than amenable to proposals to utilise virtual learning concepts and gaming technology as mechanisms to increase emotional and environmental fidelity through distributed simulation.

Thus, not only has there been the above resource development, but also during the fellowship, the fellow has explored applying the SVE model to immersive environments, beyond fixed university/simulation environments. For example, the fellowship afforded travel across the United States in order to experience, firsthand, Wide Area Virtual Environments (WAVES), including work supported by a US Army Medical Research Acquisition Activity Contract and the initial prototype (a computer automatic virtual environment — CAVE) (USUHS, 2012).

**Photo courtesy of:
The Uniformed Services
University
of the Health Sciences
Bethesda, Maryland, USA**

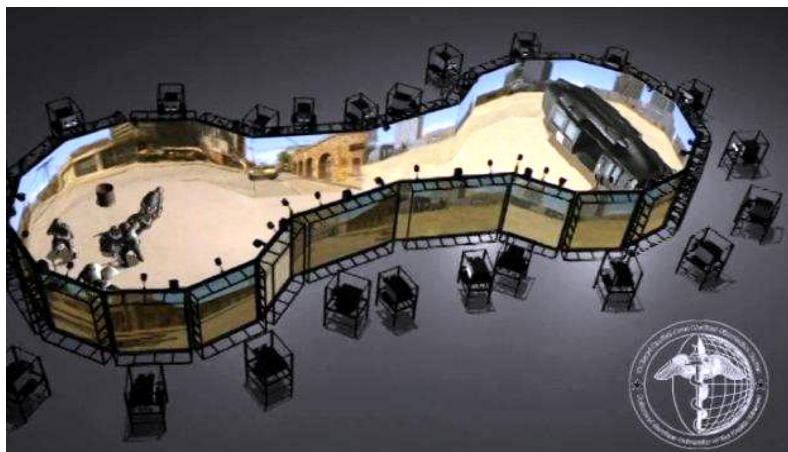


The WAVE was funded by a \$5 million Congressional grant, with additional support from the Uniformed Services

University of the Health Sciences. Prior to the construction of the WAVE, a smaller 3-screen prototype WAVElet funded by the Tri-care Management Activity (TMA) was built as a testing and development platform. The WAVE initiative aims to develop an immersive virtual environment that provides realistic conditions for team-based learning. The initial prototype is based on a CAVE-like system, using three vertical screens to display the immersive environment. To accommodate larger teams, the adjacent walls can be angled. Stereoscopic images are displayed using paired DLP projectors with polarised filters. Users wear lightweight, polarised glasses to view the scene in stereo. To handle very complex scenes at interactive frame rates, a scalable hardware configuration is adopted (A. Liu, personal communication, March 14, 2013).

This approach differs from systems using computer monitors and head-mounted displays in that all members of the team are in physical proximity, yet are still able to interact within a virtual space. A scalable, network-based rendering approach permits highly complex scenes to be rendered in real-time with minimal temporal mismatch between displays. Networked arrays of WAVES and WAVElets permit interactions between multiple teams in geographically disparate locations to participate in the same training exercise. This approach facilitates hands-off training and coordination between medical groups at different levels within the continuum of care (A. Liu, personal communication, March 14, 2013).

**Photo courtesy of:
The Uniformed Services
University
of the Health Sciences
Bethesda, Maryland, USA**



A concept for distributed sequential simulation

In response to what, to date, the fellow perceives has been a relatively limited application of these types of computer-supported immersive environments (to battlefield teamwork scenarios), the fellow subsequently developed a concept that has much broader and integrated potential for distributed simulation for Australia. This is about a disruptive innovation for education and training through simulation in the Australian context, that is, a disruptive innovation helping to create a new market and improving the application of simulation (and the products within) in ways the market has not expected. The model has mass exposure/immersion capabilities and offers authentic and affordable, easily accessible sequential simulated environments. It combines live, virtual and constructed simulation environments specifically applied, but not limited to, health. It is:

- ideal for regional environments;
- an innovation that makes hub and spoke concepts redundant;
- portable and quick to erect and customise; and
- replicable — can be rolled out nationally and application is unlimited.

It builds on HWA's (and other's) investment to date; for example, it gives infrastructure expenditure an implementation pathway that maximises utility. Thus the model devised offers a turnkey solution for areas with limited infrastructure and simulation-trained personnel. For instance, the model can be readily deployed, potentially by a third party and is able to be used immediately (it takes 15 minutes to erect). As a result, users avoid the cost, lead-in time and head power required to set up their own in-house simulation centre.

In addition, the concept for this distributed sequential simulation model has gained traction and, in February 2013, ECU was successful in receiving a grant from iVEC to purchase an iDome (iCinema, 2012), a compact immersive visualisation environment for video and/or computer-generated panoramic and spherical representations. iVEC is an unincorporated joint venture among the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Central TAFE, Edith Cowan University, The University of Western Australia, Curtin University and Murdoch University, and is supported by the Government of Western Australia. The iDome will be utilised at ECU, initially within ECU CRN research teams across health and education to test some of the approaches proposed by the SVE model; for example, the impact of sequential, scenario-based simulations and authentic immersive learning environments. Thus, this testing will provide a valuable opportunity to extend the findings of the fellowship into areas such as child health/prevention of bullying research and classroom interactions, and will more broadly facilitate research within and between a wide range of disciplines at ECU — including education, health, psychology, computing, serious (educational) gaming, policing and security, occupational health and safety, and engineering. The data, findings and outcomes from the initial pilot research, commencing in 2013 and subsequently finalised and acquitted by HWA, will place ECU in a strong position to develop strategic research collaborations and partnerships, and compete effectively for larger scale, cross-discipline studies.

Using combinations of live, virtual and constructed integrated approaches, potential partnerships with police are being explored for simulation-based professional development and research, especially in respect to de-escalating aggression and better handling of difficult situations and people with mental health problems. Similarly, a number of global simulation software, tools and solutions-focused companies, in the main from a defence-specific perspective, are potential collaborators.

[End of fellowship grabs](#)

As a consequence, a range of fellowship end point grabs, or media bites (see Table 6) have been constructed. Just as the initial grabs were important to 'sell' simulation, it is now equally, if not more important to convince a range of people of not only the value of such a fellowship, but to disseminate what the fellowship achieved — again, often when there is limited 'air time'.

It is useful to compare these end of fellowship grabs with the original grabs in Table 1, as it is evident there have been many contributions from this fellowship in respect to the original fellowship aims.

Table 6 Fellowship end point grabs — why investing in simulation should be prioritised and what did this fellowship find?

Group/individual	Fellowship conclusion grabs
Chancellor and Council members	<ul style="list-style-type: none"> • Simulation is emerging as a better way to teach and learn some things; we can manipulate the simulated environment to deliver realistic and better learning experiences. • There is evidence to suggest that students exposed to simulation-based learning improve their clinical competency skills at a comparable, if not accelerated rate, compared to students undertaking traditional clinical placements.
Vice-Chancellor	<ul style="list-style-type: none"> • The OLT considers the support that ECU has provided for the fellowship from the very start an exemplar of how a university can get the best out of the National Teaching Fellowship. • Simulation training hours in the ECU HSC increased from 993 hours in 2011 to 2621 hours in 2012; this represents an increase of 164%. The Centre had 203 healthcare professionals attend courses in 2012, an increase of 140 over 2011. • In September 2012, the ECU HSC underwent a successful accreditation review by the Australian and New Zealand College of Anaesthetists (ANZCA); the ECU HSC is the only centre in Western Australia accredited to run this highly prestigious program. • In 2012, ECU was successful in securing \$661,131 of capital funding for simulation-based equipment to enhance the learning and teaching and research environment at ECU. • The fellowship grant of \$350,000 has built capacity at ECU by generating \$6,478,880 of funding for the University for capital, infrastructure and research in simulation, which equates to a return of \$17.51 for every fellowship dollar. • From a community engagement perspective, in the 18 months, the fellow attended 194 strategic policy and planning meetings, gave seven conference plenaries/addresses and engaged with at least 8,120 individuals specifically on the program.
Other executive team members/senior staff/other universities	<ul style="list-style-type: none"> • Simulation is emerging as a better way to teach and learn some things; we can manipulate the simulated environment to deliver realistic and better learning experiences. • Students undertaking a mixture of clinical- and simulation-based learning express equally high levels of satisfaction with both forms of learning. • Simulation will save health schools/faculties dollars. The evidence is mounting that some traditional clinical training can be replaced with simulation. • Simulation-based learning has experienced a significant paradigm shift in the past couple of years. It has developed well beyond the notion of see one, simulate 100, do one (e.g. that basic clinical skills should be learned and practised on simulators before performing them in the clinical setting). • It is now not just about a simulation-augmented education and training paradigm, but more so a shift to evidence-based practice of integrating simulation into curricula where and when it is the most appropriate educational strategy.
Politicians	<ul style="list-style-type: none"> • Simulation-based learning means students can practise skills taught and experience mistakes, before interacting with an actual patient. • We now know that providing opportunities through simulation can improve communication, teamwork and leadership, and thus help address organisational system failures, near misses and adverse events.
Researchers/simulation leaders/evaluators	<ul style="list-style-type: none"> • ECU conducted a pilot study at ECU with students enrolled in three second-year paramedicine units to test whether simulation is a suitable replacement for some clinical practicum training. The first unit involved all simulation and no clinical placements, the second unit was 70% simulation and 30% clinical placement and the third unit comprised all clinical placement and no simulation. Students' levels of clinical competency were assessed at the beginning and end of semester using Objective Structured Clinical Examinations. Changes in the average levels of clinical competency resulting from varying exposures to simulation- and clinical-based learning were compared between groups. • Our results show that students undertaking a mixture of clinical- and simulation-based learning express equally high levels of satisfaction with both forms of learning. • Our exploratory investigations uncovered a wide array of methodological limitations that need to be controlled for, in similar field-based studies of simulation-based learning. • We need to take a realistic approach to evaluating simulation — who is it effective for and in what environments/situations?
Senior administrators, policy makers and planners in health (and funders)	<ul style="list-style-type: none"> • Some research we have completed is of organisational sustainability significance, not just for ECU, but all universities seeking, developing and funding clinical placements and supervision in health. In 2012, we ran a naturalistic study as a pilot, funded by HWA, with ECU students enrolled in three second-year paramedicine units. Our findings include: <ul style="list-style-type: none"> ○ Students undertaking a mixture of clinical- and simulation-based learning

	<p>express equally high levels of satisfaction with both forms of learning.</p> <ul style="list-style-type: none"> ○ <i>Prima facie</i>, the results suggest students exposed to simulation-based learning improve their clinical competency skills at a comparable, if not accelerated rate, compared to students undertaking traditional clinical placements. • Given the research was a pilot of the processes and protocols of undertaking simulation-versus clinical-based learning comparison studies in Australia, based upon our findings, we have made a number of recommendations for the Commonwealth Government and for future research. • We now know that providing opportunities through simulation can improve communication, teamwork and leadership, and thus help address organisational system failures, near misses and adverse events. • Taking a systematic and research-based approach to simulation will help optimise investment — both time and money.
Students	<ul style="list-style-type: none"> • Simulation can help you work out what are the real reasons behind problems. • Learning through simulation can help you learn how to behave when you are in the workplace, cognisant of the roles others play. • It can help you identify areas where you need to improve your own practice and give you the opportunity to try different approaches out in a safe environment. • It can help you learn and practise the hard stuff, like cross-checking a senior colleague you suspect might be making an error, or how to ask someone if they are thinking of killing themselves.

Chancellor and Council Members

- Simulation is emerging as a better way to teach and learn some things; we can manipulate the simulated environment to deliver realistic and better learning experiences.
- The evidence is mounting that some traditional clinical training can be replaced with simulation.

BMJ Educ. 2012;34:e617-e617. doi: 10.1136/bmj-2012-242961. Published online May 30.

Can simulation replace part of clinical time? Two parallel randomised controlled trials.

Walton K, Wright A, Morris N, Middleton J, Rivett D, Blacklock F, Jones A, Holmes T, O'Connor J, Watson G, Peterson B, Gill G

NCSBN National Simulation Study

The Oregon Health & Science University has begun to replace clinical time in the acute care setting with a simulation day.

Other Executive Team Members/ Senior Staff/ other universities

- Students undertaking a mixture of clinical- and simulation-based learning express equally high levels of satisfaction with both forms of learning.
- Simulation will save health schools and faculties dollars. The evidence is mounting that some traditional clinical training can be replaced with simulation.



Vice-Chancellor

- Simulation training hours in the ECU Health Simulation Centre increased from 993 hours in 2011 to 2621 hours in 2012; this represents an increase of 164%.
- The Fellowship grant of \$350,000 has built capacity at ECU by generating \$6,478,880 of funding for the University for capital, infrastructure and research in simulation, which equates to a return of \$17.51 for every Fellowship dollar.



Researchers/ simulation leaders/ evaluators

- Our exploratory investigations uncovered a wide array of methodological limitations that need to be controlled for in similar field-based studies of simulation-based learning.
- We need to take a realist approach to evaluating simulation – who is it effective for and in what environments/situations.

Senior administrators, policy makers and planners in health (and funders)

- We now know that providing opportunities through simulation can improve communication, teamwork and leadership, and thus help address organisational system failures, near misses and adverse events.
- Taking a systematic and research based approach to simulation will help optimise investment – both time and money.

It is good we performed that in a safe simulated environment as often as we did

Great, we are finally working like a team



Students

- Simulation can help you work out what are the real reasons behind problems.
- Learning through simulation can help you learn how to behave when you are in the workplace, cognisant of the roles others play.
- It can help you identify areas where you need to improve your own practice and give you the opportunity to try different approaches out in a safe environment.



Politicians

- We now know that providing opportunities through simulation can improve communication, teamwork and leadership, and thus help address organisational system failures, near misses and adverse events.
- Simulation-based learning means students can practice skills taught and experience mistakes, before interacting with an actual patient.

ADVERSE EVENTS FOR MINORS BY WEEK & SEVERITY



I know I should, but I can't tell her she made an error

It is a safe environment – I can do my best until I get it right

Figure 2 End of fellowship grabs

3. Outcome area two — Curricula renewal

3.1. Curricula renewal framework: Theoretical model

The fellow identified in 2010, that while simulation modalities and technologies were increasing concurrent with the shortfall of quality clinical training opportunities in line with demand, there was an absence of a conceptual model for moving forward. That is, not only a conceptual/theoretical model to provide a context for how simulation could be progressively more integrated with, and embedded within, health curricula at both undergraduate and postgraduate levels, but also which model might help guide the development of simulation-based learning environments.

Since early 2010, in Australia, particularly, there has been significant investment in SLEs, with Commonwealth Government investment via HWA funding of \$75.92 million allocated for capital purchases and recurrent investment in the public, education, non-government and private sectors to develop simulated learning. Thus, it was timely with the fellowship to investigate the components required to advance simulation-based learning in the current context of a major government spend characterised by potentially an adequate array of simulation learning devices (for example, task trainers, manikins), in rapidly growing environments (for example, simulation centres and distributed models) combined with an international focus on the quality of simulation-based teaching and learning (for example, credentialing and accreditation of instructors and facilities).

As identified earlier, the fellowship devised a conceptual model, the SVE model, which introduces the use of three elements, not previously applied to the field of simulation. For example, situational validity is used to stress how dependent learning is on the context in which learning takes place. Similarly, the model uses the terms environmental and emotional validity to mean that the authenticity of both of these factors in simulation is likely to matter a great deal to how learning occurs and achieving the desired outcomes of attitude and behaviour change. It is important to note that the SVE is defined as a model specifically, because it is abstract and not directly observed, that it is yet to be tested, although it has testable concepts and propositions. In addition, from the fellow's experience, the SVE model is considered to have strong theoretical foundations, but it is also noted that strong variances exist in the application of concepts to simulation design and educational practices, thus the impact on learning outcomes from the application of this, or indeed other models, should be investigated.

In view of the above caveats, almost a decade ago, Jeffries (2005) flagged that innovative ways to teach students about the real world of nursing in a cost-effective, efficient, and high-quality manner were needed to prepare nurses for safe and efficient practice and the complexities of the workplace. Jeffries then went on to develop a framework to guide the design and implementation of simulation and to assess outcomes. The National League for Nursing/Jeffries simulation framework (Jeffries, 2005) describes five components (teacher, student, educational practices, design characteristics and simulation, and outcomes) associated with variables. While this framework is useful now, and was certainly beneficial in 2005, in contemporary simulation practice there remains a gap as it seems there is no simulation-specific conceptual framework that goes beyond a single discipline, nor one that might have global relevance (LaFond & Van Hulle Vincent, 2012). LaFond and Van Hulle Vincent (2012) correctly point out that generally when simulation studies have referred to theories in publications, learning theories are more often than not cited, such as Benner's novice to expert, Kolb's experiential learning, self-efficacy (social cognitive theory), and constructivist learning theory. Perhaps the key point of the National League for Nursing/Jeffries simulation framework is that it attempts to link simulation experiences to outcomes, whereas major and well-cited works such as Kneebone (2006) focus more on the processes for selecting appropriate simulation learning experiences. For instance, Kneebone suggests there are four key areas that underpin simulation-based learning. These are: 1) gaining technical proficiency through repetition; 2) expert assistance; 3) learning occurring

in a professional context; and 4) the affective or emotional component of learning, which is best alleviated through a supportive learning-environment (low stress) (Kneebone, 2006). However, most importantly, the National League for Nursing/Jeffries simulation framework does not address the concept of person (LaFond & Vincent, 2012) or the role of human factors' simulation-based learning.

Similarly, Cristancho, Moussa and Dubrowskil (2011) report on a process called "Aim-FineTune-FollowThrough": an approach to designing simulation-augmented surgical education and training programs. While the "Aim-FineTune-FollowThrough" process offers a systematic way of thinking about the design process for simulations, it is not a conceptual model; indeed, the authors highlight there is a technological focus in the field of medical simulation, and as such, make use of an analogy between curricula design and engineering product design. Again, it is a valuable contribution to show the commonalities across many disciplines in terms of moving from idea conception to practical implementation and a validation.

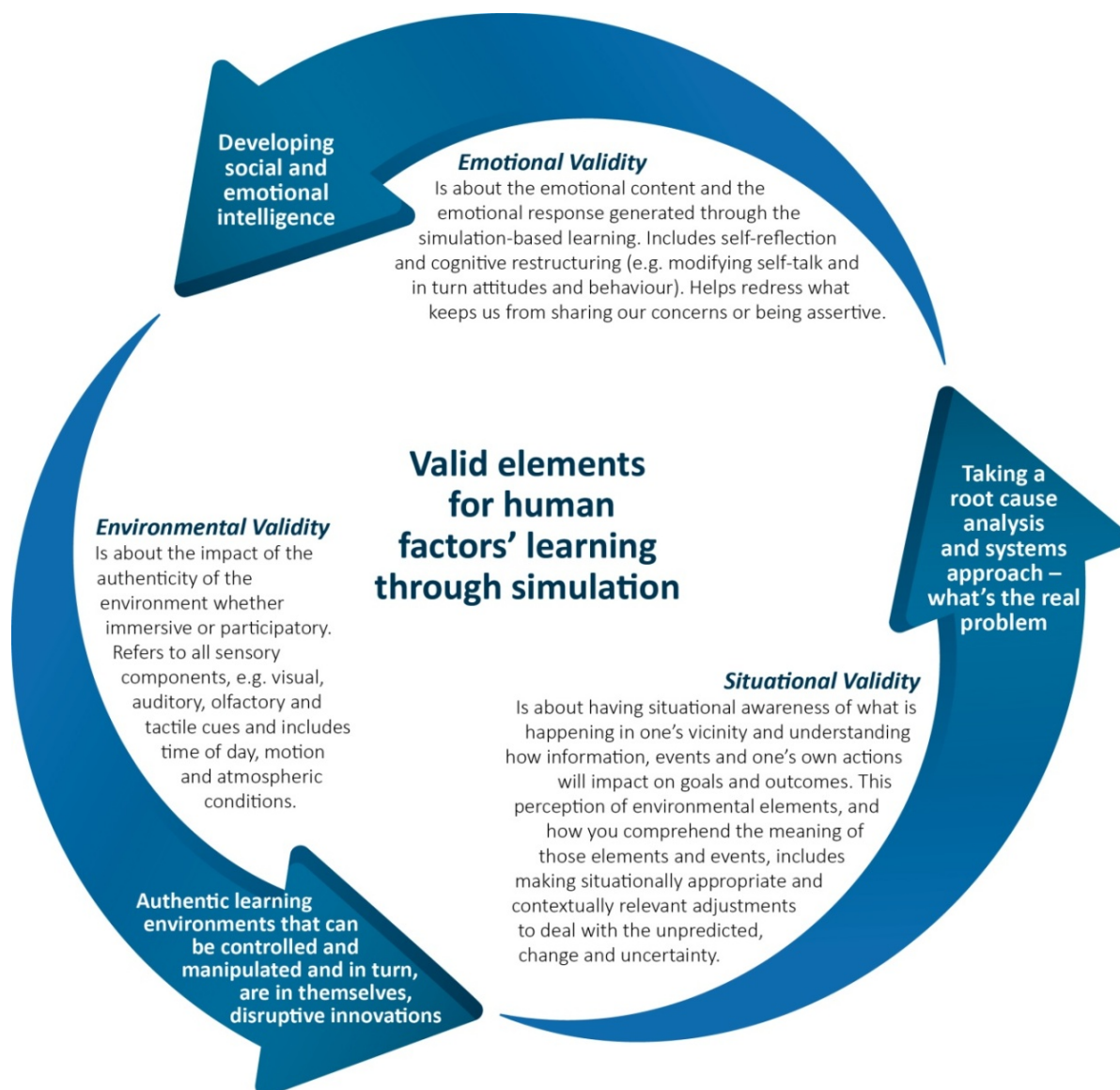


Figure 3 SVE model for curricula renewal to enhance uptake of, and learning, through simulation

The SVE model may have a role in not only conceptualising curricula renewal and research designs, but also in planning realistic evaluative approaches, that is, establishing who is what approach effective for and in what environments/situations.

In respect to the SVE model, by way of clarification, the fellow uses validity in preference to fidelity, on the basis that validity implies some measurement and this is appropriate, given the growing research imperatives surrounding learning through simulation. Thus, applied to education, and drawing on dictionary definitions, validity could be considered as referring to the extent that simulation is a 'valid', that is suitable, legitimate, official, well-founded, defensible and an authenticated way to teach clinical skills and human factors. In contrast, fidelity in a historical sense generally denotes how accurate a copy is to its source, or in the case of simulation specifically, the degree to which the state and behaviour of a real-world object, feature or condition is reproduced. Fidelity does not extend to capturing the research/teaching nexus so critical in education, yet, the fellow believes that the use of validity, as per the SVE model, easily encompasses the traditional meaning of fidelity as well as shifting the focus from simulation merely providing practice-based experiences to its role in richer learning or what is known as higher order thinking skills learning (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). In addition, given the increasing demand for robust measurement that simulation is not only worthy of investment but may be superior for some areas of learning and teaching, validity seems to be a more appropriate term for the future debates that will inevitably occur.

In an attempt to provide some definitions for the concepts within the SVE model, that is to illustrate and provide structure to the elements described in the model, propositions describing the concepts or the relationships between concepts are shown in Table 7. It is important to note that the examples of associated variables are not an exhaustive list, and the concepts and propositions require further investigation.

The SVE model is proffered as a starting point for discussion. It is unlikely there is disagreement that the teaching of human factors' education in the classroom has relatively low emotional impact and environmental realism, and often lacks context. Traditional human factors' learning has been didactic and invariably involved a focus on overarching theoretical perspectives, or at best, has included role play, media presentations (for example, videos) and/or the sharing of personal stories or narratives that focus on well-documented problem areas. Concepts at the heart of human factor education are not easily taught or learned and educators have typically struggled to determine how best to incorporate knowledge of human behaviour into curricula and bridge the gap between the two.

The degree of emotional engagement has been seen (and evaluated) to be high when actors are used to engender emotional connectedness through scenario-based learning. The construction of a realistic environment and cleverly created scenarios create an intimate correspondence and clinical relevance to healthcare environments. The degree of situational authenticity is high when the simulation experience permits/encourages you to heighten your awareness of environmental factors that impinge on your capacity to provide professional and appropriate healthcare. Developing situational awareness is as much about developing a state of mind, and thus is not always easily observed in others (Fortune *et al.*, 2013). However, a loss of situational awareness, for even one member of a team, can show itself in the loss of safety for many others and, in turn, adverse events. Simulation-based learning can be instrumental in identifying the importance of building situational awareness, and, in turn, identification of some potential cues that may indicate a loss of same, such as lack of leadership, confusion, fixation on one thing, incomplete tasks, ignoring of guidelines, communication failure and conflict. Thus, underpinning the SVE model is a belief that a combination of the three valid elements for human factors' learning through simulation (that is, emotional, situational and environmental validity) is essential for the development of higher order thinking skills and competencies.

Table 7 Concepts (elements), variables and propositions of the SVE model

Concept (element)	Examples of associated variables	Relational proposition
<p>Emotional validity (Role of emotional content and the response generated)</p>	<ul style="list-style-type: none"> • Pre-entry levels of social and emotional intelligence. • Selection of key messages that align with desired learning outcomes underpin simulation. • Scripting of scenarios. • Choice of actors, standardised patients (e.g. equity considerations). • Calibre of actors, standardised patients. • Whether immersive, simulation-based learning, participatory or observed. • Sequencing of events (e.g. sequential scenarios that follow an entire story/patient journey). • Level of self-talk demonstrated. • Debriefing. • Curricula/program follow-up. 	<ul style="list-style-type: none"> • Development will be dependent on the social and emotional learning that is facilitated/results from the simulation. • Emotional response and the engagement of the learner will be related to the realism including the level of sociological authenticity of how relationships and events are portrayed. • Capacity for self-reflection and learning from that reflection will be influenced by the quality of the debriefing and support available. • Consolidation of the learning will be influenced by how the simulations are integrated into curricula/learning and how opportunities are followed up. • Higher order thinking skills (e.g. judgement, creative and critical thinking, problem solving and visualisation).
<p>Situational validity (How information, events, and one's own actions impact on outcomes)</p>	<ul style="list-style-type: none"> • IPL/practice — attitudes towards, experience with. • Perception of simulation-based learning. • Perception and personal mental models (e.g. influence of past experience, expectations and briefing). • Innate abilities. • Personality traits (e.g. motivation, risk taking). • Personal goals. • Previous experiences with simulation-based learning. • Resilience/capacity to deal with unpredicted occurrences/change/uncertainty. • Personal comfort with self-awareness. • Preparedness/comfort working in teams and/or leadership roles. • Decision-making and interpersonal skills. • Defence mechanisms. • Barriers to change/new ideas. • Tiredness and fatigue. • Reflective skills (e.g. self-assessment, feedback acceptance). • Skills of debriefers; use of objective structured assessment of debriefing. 	<ul style="list-style-type: none"> • Learning will be dependent on calibre of application of root cause analysis as method of problem solving/process analysis method. • Sociological realism of interprofessionalism in scenarios. • Pre-entry levels of self-confidence and perception of competence will impact on willingness to engage/openness. • Perceived relationship between cognition and error. • Capacity for critical thinking may influence ability to connect cognitive, social and personal aspects of a situation. • Interplay between feedback provision skills and learner self-assessment. • Timing of simulation-based learning — capacity/opportunity to learn by practising skills and experiencing mistakes in simulations before/or after interacting with actual patients in similar situations. • Internal factors such as comprehension, perceived goals, perception will be impacted by external factors such as stress and workload. • Higher order thinking skills.
<p>Environmental validity (Authenticity of environment)</p>	<ul style="list-style-type: none"> • Physical location of simulation (level of realism). • Type of immersive environment (fixed/distributed). • Level of visualisation (e.g. within virtual worlds). • Level of interaction with environment (including with gaming technology). • Level of simulation equipment (e.g. task trainer/full human patient simulator/actors). • Level of technical support for simulations. • Authenticity of props/'sets'. • Sequential nature of scenarios versus 'skills station approach'. • Attitude of simulation educator/technicians. • Privacy/unanticipated interruptions/distractions. • Realism of/attention to sensory components. • Lack of complete preparation. • Adverse environmental conditions. 	<ul style="list-style-type: none"> • Authenticity of environment will depend on creativity of simulation educators/technicians, infrastructure, capital equipment and resources (i.e. institutional, professional, team support). • Systems integration (e.g. virtual reality, programming environments, scenario-based). • Risk of loss of engagement due to likelihood of distracters given goal is to recreate reality — attention of learners will be affected by distracters, including improper delivery of simulation. • Protecting learner safety in achieving environmental validity may override achieving realism. • Lack of attention to identifying potential sources of problems and threats could result in loss of safety for learners.

		<ul style="list-style-type: none"> • For educators to maintain constant and accurate perception of the environmental risks could be a distracter in itself for effective teaching and learning.
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The SVE model was developed after careful and deliberate observations during the fellowship and is intended to be an overall framework that postulates critical elements for human factors learning. The elements contained in the SVE model are generally descriptive and determining the explanatory power of the model is beyond the scope of the fellowship.

It is the fellow's aim to test the propositions, concepts (elements), concept variables and relationships among the concepts with a range of sample populations. A study/studies will be designed to measure simulation user groups' and learners' perceptions of both the applicability and efficacy of the SVE model. It may also transpire over time, that some studies can be conducted to also test any influence of the SVE model in users' and students' critical thinking, given that a range of relevant measurement instruments already exist. Further, an evaluation of the empirical adequacy of the SVE model, for example, to compare the results of research that uses the SVE model with the SVE model's assertions (that is, conceptual propositions) may also occur at a later stage, should any other studies use the model for their conceptual framework. The intent is to make the findings from all studies readily available through publication and conference presentations.

4. Outcome area three — Development and promotion of tools and resources

4.1. Curriculum enabler — a new tool based on the analysis of all the national SLE curricula projects

Initially a ‘roadmap’ was developed around each of the 20 disciplines included in previous HWA simulated learning curricula projects that identified common competencies and skills amenable to SLEs in the delivery of health curricula across Australian universities. Areas of commonality between disciplines were highlighted, with the more generic competencies being the primary areas of commonality. A multimedia presentation was then produced on one discipline (paramedicine) as an exemplar, which provided a visual demonstration of a decision-making tool/template that linked to resources intended to enhance skills and competencies. This Curriculum Renewal Enabler was conceptualised in the context of HWA’s National Simulation e-Platform (SimNET).

Such an enabler could interactively guide the healthcare educator or trainer through the required decision processes to locate and select suitable resources pertaining to discipline and stage of course (see Figure 4). Following initial input from the user, the platform can outline available materials, including details such as health field, style of resource, target audience, genre, instruction design, graphics style, duration and required hardware platform. Based on what is selected, the user is then presented with a recommended set of resources to employ the resource and be linked to relevant evidence.



Figure 4 Curricula renewal enabler

4.2. Seventeen major creative works: resources to enhance uptake

Based on feedback to date, the 17 resources (the *Interprofessional Learning through Simulation* resources) developed during the fellowship are viewed as noteworthy resources to support the facilitation of IPL for health students and health professionals through sequential simulation (see <http://www.ecu.edu.au/ipl-through-simulation>). Each resource consists of two components: audiovisual case studies and a facilitator manual, which can support an IPL tutorial. The resources have a high degree of utility in that they provide students with a direct and experiential means to facilitate IPL to improve practice.

A focus of the ECU HSC has been on non-technical (human factors) skill development, central to the scenarios developed, with specific attention on the role that suboptimal communication and leadership, and organisational system failures play in near misses and adverse events.

Although there is the expectation people will voice their concern if they see the potential for a problem in the workplace or intervene to avoid a near-miss event, we know many people do not. In the same manner, although it is expected people will reach agreement quickly and courteously in busy workplaces, in some circumstances this does not happen. These suboptimal situations may not occur every day in the workplace, but they are a real concern when they do.

The ECU HSC has used a root cause analysis approach to identify what the real problems are and how they might be resolved positively. Sequential simulations have then been developed to involve scenarios that start at the causal point where decision making/actions influence or directly cause an impact (for example, a crash, literally), and then follow the story throughout the entire journey across multiple settings.

In the same way that simulation is highly amenable to improving technical competencies in high-risk, low-volume areas, it is also an ideal modality to raise situational awareness and permit students to practise the non-technical but nevertheless 'hard stuff' in a safe environment.

Forging new pathways to engender important qualities like cultural empathy, effective communication and teamwork is critical, but actually living them is different. We often know the qualities we need to display, but as Ralph Waldo Emerson poignantly highlighted, "We know better than we do" (Emerson, 1841). ECU evaluative data shows that high levels of emotional fidelity have been achieved through the scenarios to develop higher order values/skills by enhancing emotional and social intelligence.

While a one-off event is clearly not sufficient to change behaviour, embedded into a learning process and reinforced over time, the power of such an experiential, pedagogical approach is remarkable.

Involving a blend of cognitive, affective and behavioural domains, all necessary conditions for experiential learning, students, as Gentry (1990, p.14) elucidates, "get a feel for the 'messiness' and ambiguity associated with real-world situations".



In addition to being helpful to students, the ready-to-use resources have been reported to afford considerable time saving for professionals through the provision of subject-specific resources to facilitate learning. The 17 resource learning areas were identified in collaboration with clinicians, industry and students to deliver experiential learning in topic areas where quality clinical placements and experiences were deemed often hard to obtain, as follows:



- Assertive communication
- Case management of chronic disease
- Clinical handover
- Communication in family-centred care
- Creating cultural empathy
- Discharge planning
- Falls prevention
- Impact of healthcare teams on patient outcomes
- Importance of clinical reasoning
- Injury and trauma management
- Leadership and teamwork in medical emergency teams
- Making assumptions
- Mental health in the workplace
- Occupational therapy and speech pathology
- Providing a consistent message
- Reflective practice
- Role clarification

The resources page attracted 2066 page views in November 2012 and 948 page views in December 2012; a total of 3014 page views in two months. Twenty-one per cent of the page views were from outside Australia. The geographical diversity from which the IPL resources have been sourced, both across Australia and internationally, is a testament to the breadth of reach achieved during the fellowship.



The continued uptake and implementation of these resources after the fellowship demonstrates sustained impact. As has been mentioned, during January 2013, when many institutions were closed over the holiday period, there were a further 841 page views, of which 21% were from outside Australia. For February 2013, there were a further 1380 page views, of which 13% were from outside Australia.

4.3. Simulation challenges as an engaging educational method

Health simulation challenges

Five health simulation challenges were staged during the fellowship of 2011 and 2012. A total of 424 participants (students and industry representatives) attended these five simulation challenges, which covered a range of topics (see Table 5). This equates to approximately 1272 hours of simulation activity.

As an exemplar, “Just another party” was one health simulation challenge held during the fellowship (see Appendix H). Attendees included ECU students, as well as dignitaries representing ambulance authorities, paramedic education programs accreditation, the Australian College of Ambulance Professionals and the Paramedical Consultative Committee from across Australia. The audience viewed a pre-recorded, real-life event performed by professional actors, in which ambulance staff assisted a casualty post-assault at a night-time party. This was followed by a live streaming of the arrival at an emergency department, demonstrating sub-optimal skills of nursing and paramedical staff in handover and communication. This observational simulation was then used as the catalyst for facilitated discussion, where the participants identified areas for possible improvement. The participants questioned the actors, who remained in character, about their feelings, motivations and rationale behind their actions. After the participants gave feedback to the performers on how they could improve their practice, the scenario was re-enacted, with improved handover and communication skills, ultimately improving patient outcomes. The audience then discussed the changes made, how these impacted on the outcome and how to implement best practice in professional practice.

Structured debriefing by trained ECU staff from a mix of disciplines (for example, clinical psychology and mental health nursing), was conducted using advocacy and inquiry techniques to promote reflection through the Debriefing with Good Judgement methodology of debriefing developed by Rudolph *et al.* (2006). In 2013 the ECU HSC will utilise Performance Enhancement via Augmented Reflective Learning in Simulation (PEARLS), a framework for debriefing, which blends multiple, existing debriefing methods into one integrated approach (Cheng *et al.*, 2013).

Independent, quantitative evaluation data received across all simulation challenges from students indicated that:

- Ninety-five per cent of participants found it useful to attend the challenge;
- Ninety-eight per cent of participants felt the challenge made them value the importance of interprofessional collaboration; and
- Ninety-nine per cent of participants regarded the health simulation challenge as an engaging education method.



The independent evaluation data collected revealed that the simulation challenges were noticeable in that they stood in complete contradistinction to the normal classroom learning environment students' experience. The challenges were considered to be "interesting, stimulating and challenging". Few students had previously participated in simulations using standardised patient actors, nor had they had the opportunity to interact with actors to provide input into how initial suboptimal scenarios could be improved. The health simulation challenges highlighted for participants the significance of working interprofessionally and of the part teamwork plays in working collaboratively. In presenting the good and not so good aspects of teamwork, the scenarios provided participants with "a real-life look at the inner workings and processes necessary for an interprofessional team to work successfully together". Importantly, the scenarios provided the opportunity for students to see "how not to be in the workplace". It was said the challenges show "in stark contrast the difference between good and poor communication styles" and the range of human factors that lead to suboptimal outcomes for clients.

The heightened sense of reality provided by the actors was considered to be "a very engaging and interesting way to learn". Specific comments made by students in relation to simulation as a learning tool were as follows:

- "Visual learning with discussion is a good way to learn."
- "Very effective learning tool."
- "This is my second challenge and I was once again so impressed with the energy and value of the event as a learning tool."
- "Again, another successful initiative ... Your use/choice of actors is again skilled and your execution of the proceedings well formalised and run."
- "I love what you do. Gives us an example on how to behave as nurses and what roles we play in people's life."
- "Fantastic! Discussing the elements of care with all the other students and professionals helped me identify areas where I can improve in my own practice."

5. Learning as a consequence of the fellowship

Some key learning occurred directly as a consequence of the fellowship and, as per the Executive summary, were the basis for the five key contributions to knowledge that emerged.

Key learning (i): Initial perceptions

Managing the initial perception of some within simulation circles that a “simulation expert” was not conducting the fellowship was somewhat challenging at the commencement of the fellowship. Many were at first unaware as to the strategic direction the fellowship would take (that is, change management process). At that time, some presumed the process would be led by someone with a more intimate knowledge of simulation technologies, rather than, as was actually necessary, someone with evident simulation experience, and also importantly, previous exposure to change management processes.

Key learning (ii): Confluence of events

The collaborative working relationship with HWA during the fellowship was noteworthy. HWA’s commitment to the fellowship was remarkable as was the support provided during the period. The relationship developed with HWA informed the fellowship processes with a broader perspective and deeper understanding of the rollout of the Clinical Training Reform in Australia, particularly in relation to SLEs. Conversely, as the fellowship was across many of HWA’s reform projects, the fellowship process was a valuable touchstone for HWA that provided practical advice regarding strategic and operational matters that was grounded in the fellowship’s exposure across state, national and international simulation operations.

The strategic timing of the fellowship to coincide with the HWA Clinical Training Reform program including simulation was mutually beneficial. For instance, four of the projects and programs funded through the HWA Clinical Training Reform work group (clinical training funding, SLEs, Integrated Regional Clinical Training Networks, Clinical Supervision Support program) all potentially incorporate simulation activity.

Further, additional funding was being invested by HWA in national projects to develop a research base around the effectiveness of simulation training modalities and facilitate a wider adoption of simulation. This significant level of funding has engendered a dramatic increase in activity around simulation in Australia and specifically enabled ECU to gain leverage as a consequence of the fellowship to obtain simulation-focused funding (see Appendix J). As a result, it can be proffered that the fellowship grant of \$350,000 has built capacity at ECU by generating \$6,478,880 of funding for the University for capital, infrastructure and research in simulation, which equates to a return of \$17.51 for every fellowship dollar.

Key learning (iii): Resistance to embracement of change — the adoption curve and supporting the uptake of new ideas

There were sources of resistance to simulation and some of that resistance is understandable. Simulation and the advancing technologies in the field provide almost limitless capabilities, yet making sense of the technologies and devising the most appropriate and affordable ways in which they can be most appropriately utilised is challenging.

Confronting what Cialdini (2003) calls commitment and consistency was commonplace. There were situations where those who held a view and had expressed it publicly, then discounted or ignored contrary opinions or evidence, thus resisting change. Similarly, the fellowship dealt with the escalation of commitment (Staw, 1976), where decisions were

made to increase investment in the program, despite receiving negative feedback regarding the initial investment in the fellowship. Both were challenges not specific to the field of simulation.

Many if not most decision makers have past experience with innovations that have, at worst, failed altogether, or at least situations where many early promises were not realised. In addition, decision makers are inundated with the need to prioritise an endless array of new processes and procedures to improve patient safety, improve quality and reduce costs.

This complex environment presents many demands that are often at variance. While there is pressure from one direction to increase the uptake of simulation to reduce errors, improve clinical experience and produce safe, competent students, from another direction there is conflicting pressure to reduce expenditure. Despite institutional cultures largely being characterised by their tendency to fight to remain the same (Schön, 1971) and the reasons to not embrace SLEs being multifarious, the uptake of simulation across Australia has been remarkable in recent years.

For many, negotiating their way through the simulation adoption curve is challenging. Most people have conflicting priorities in their day-to-day work and lives, and the uptake of simulation may be another priority, on a long list of priorities. There is pressure to change and progress SLEs, yet there is also the conflicting demand to reduce expenditure. The uptake trajectory is not linear and while organisations learn much from what often seems a trial and error process, the learning curve inevitably requires that people have appropriate support. The fellowship process has provided a degree of support to many. To some extent pragmatic support and guidance is becoming progressively available within the simulation community through an increase in funding levels, resource materials, training, conferences, collaborative working, representative groups, simulation-specific journals and the articulation of policies. What has been made clear as a consequence of the fellowship process is the need for the simulation community to have a champion to work across projects, in the same manner as the fellowship role was utilised.

Key learning (iv): Broader than manikins: inadequate focus on non-technical skills

Professor David Gaba began his seminal 2004 paper “The future vision of simulation in health care” with the words “simulation is a technique — not a technology” (p. i2). As has been mentioned, there has been an inadequate focus on the value of non-technical (human factors) skill development through SLEs. Although the focus of attention on non-technical factors is evident in other safety-critical areas for example, aviation, military) it is less evident in health, despite literature indicating in medication errors alone, human factors and organisational inadequacies have been implicated in up to 87% of the errors that occur (Bion, Abrusci & Hibbert, 2010; Mercer, Whittle & Mahoney, 2010; Toff, 2010). While the array of realistic, life-size, computer-driven medium- and high-fidelity manikins that mimic a steadily increasing number of elements of human physiology is remarkable, the possibilities beyond technical skills training remains largely untapped and, as such, has been challenging during the fellowship. Simulation may be a better way to teach some things, particularly in relation to the more nebulous skills required in human factors’ skill development.

Key learning (v): Personal reflections on the fellowship — a subjective account

We are rarely permitted the luxury of time to think about important issues and, while ‘thinking quickly on our feet’ is valuable, it is almost overvalued. The depth and breadth of exposure to the world of simulation, presented by the fellowship, allowed time to think (very seriously) about what is occurring in this burgeoning field and to develop new understandings that informed my actions. Indeed, it was the value of this overt ‘permission’ for thinking time that must not be underestimated.

Although purportedly it is the journey that is of consequence, rather than the destination, the destination or deliverables matter very much. Without detracting from the deliverables, the fellowship has re-emphasised the importance of Donald Schon’s (1983) compelling urge for humankind to look more deeply in to our experiences, and connect with and articulate our feelings. The process of ‘looking more deeply’ is fundamental when exploring the human factors that represent a great threat within complex healthcare systems. It has also resulted in me being more open to other people and their experience in relation to simulation. It has encouraged me to genuinely question what I know and profoundly appreciate the input of others.

Taking on the fellowship with its undeniably broad sphere of activity was indeed a high-risk strategy. There were times during the fellowship I wished I had taken the advice I have given to my research students to keep the focus narrow with clear, predefined constraints.

During the course of the fellowship, people were not always waiting with open arms to be provided with potentially useful pathways for them to increase the uptake of simulation in their environment. In the same manner, those people that had decided simulation would benefit their organisations were equally not always clear on an appropriate pathway by which to implement simulation in their own environment. At the junctures where I considered it seemed implausible to continue, people surfaced that supported me and enthused me to continue in my direction. During the course of our working life these people stand out in contradistinction to the many people that do not. While shared resources are a very pragmatic and valuable support, so too is the often unmentioned support we receive from others. Part of our capacity to transform is predicated on the support we receive from others, and importantly, provide to others.

Change processes are replete with pathways that appear to warrant investigation, that end up as dead-ends, and conversely, pathways that initially look less hopeful which, over time, bear fruit. In a similar manner as proverbially described by Chen Yun when he commented on the reformation process in China, I too felt like I was “crossing the river by feeling for the stones” (Osno, 2010). I was pursuing pathways, often turning back on my tracks or sidestepping looking for an alternative course forward when I considered there would be little chance of uptake success. At times it was possible for me to identify individuals that were obstructive and at times I got it wrong.

Both education and healthcare are complex systems and in the same way failures or errors occur when all of the holes in each slice of Reason’s (1990) Swiss cheese model align, the same can be said for the uptake of simulation. The confluence of a very specific series of events is required, idiosyncratic to each organisation, before uptake can be assured. Each individual and the organisations in which they are situated vary dramatically in their capacity to develop simulation activities within their environment and it was not always possible to affect the chains of influence around decision makers.

6. Conclusion

While success is often measured through the accomplishment of significant achievements, seeing the very real impact SLEs have had on the people throughout the fellowship has been invaluable. For instance, the relief showing in the face of a student after a simulation challenge on suicide prevention when they realise it is OK to ask the difficult question: Are you thinking of killing yourself? It has also been rewarding to see how the development of specifically developed scenarios has been able to help solve learning and teaching problems experienced by very senior personnel.

Table 8 Outcomes — concluding commentaries

<p>Outcome area one – Communication strategy</p> <ul style="list-style-type: none"> Market segmentation Infiltration — changing mindsets (Initial ‘grabs’/sound bites) Cross-fertilisation of ideas and knowledge — role of conduit Research Futures thinking/strategic foresight <p>Concluding commentary</p> <p>For the first key outcome, a communication strategy was devised that aimed for attitude and behaviour change in funders, educators, clinical instructors, administrators and other decision makers. This communication strategy had three objectives: the first being to help simulation adopters to effectively communicate about simulation, how they wanted to use it and why. The second objective was to demonstrate to a range of players, including funders, that simulation as a tool was underutilised in the area where it might have the most impact — communication and self-management skills development. This second objective resulted in being a significant body of work and, in turn, a meaningful contribution to simulation-based learning on a global scale. That’s because within this objective, some key findings became apparent from the fellowship, such as:</p> <ul style="list-style-type: none"> • taking a root cause analysis and systemic approach to simulation helps to elucidate what might be the personal reasons behind problems, what might be the challenges, and what might be potential resolutions; • using simulation to illustrate how an individual’s self-talk might be the real problem can be instrumental in developing greater emotional and social intelligence; • applying simulation to demonstrate the roles that suboptimal communication and leadership, and organisational system failures, play in near misses and adverse events (e.g. what keeps us from sharing our concerns); and • showing how simulation can deliver messages that have a social impact message at the same time as meeting prescribed learning outcomes aligned to national standards and competencies. <p>The third objective was to demonstrate that simulation is more than an optional layer, but potentially a better way to teach some things. It was within this objective that some seminal research in Australia was undertaken.</p>
<p>Outcome area two — Curricula renewal</p> <p>Curricula renewal framework — theoretical model</p> <p>Concluding commentary</p> <p>For the second key outcome, a curricula renewal theoretical framework (the SVE model) was developed, which responded to a deficiency in the literature in respect to a contemporary ideological model not only for human factor-focused simulation, but one that can capture how simulation can not only be an adjunct to, but can substitute for, clinical experience. Accordingly, the SVE model focuses on what the fellow believes are the critical areas germane to achieving this end. The model delivers a new conceptual framework for envisaging how to plan SLEs, structure simulated scenarios, and measure the efficacy of simulations where the focus is equally on intrapersonal and interpersonal communication as well as other skills development (see Figure 3). This also entailed investigating where skills development was most needed, across health disciplines, that is:</p> <ul style="list-style-type: none"> • securing quality learning experiences that are generally difficult to obtain from traditional clinical placements (e.g. how do you ask the hard questions, cross-check a colleague, voice concerns, identify mistakes, deal with damaging leadership); • exploring ways to problem solve (e.g. dealing with difficult people, intervening to avoid a near miss, manage risks due to workforce shortages); • tailoring cognitive and attitudinal development (e.g. creating cultural empathy); and • creating opportunities to expose students for non-technical skills development such as teamwork and an organisational system and culture focus as part of their curricula. <p>Further, the SVE model provides a useful framework to guide the design, development and delivery of distributed, regionalised, simulation-based interactive learning on a broad scale.</p>

Outcome area three — Development and promotion of tools and resources

- Curricula enabler — a new tool based on the analysis of all the national SLE curricula projects.
- Seventeen major creative works — resources to enhance uptake.
- Simulation challenges – an engaging education method for testing some new concepts.

Concluding commentary

For the third key outcome, a range of resources and tools were developed and promoted, generating significant global engagement (that continues to be measured). These resources included a curricula enabler tool, 17 major creative works with facilitation manuals to guide implementation, and a method for delivering simulation challenges.

From the start of the fellowship, it was proffered that simulation presents a single solution for the two major problems facing health and all universities with health programs: the lack of quality clinical placements and the high number of adverse events and near misses that occur. That is, simulation joins the safety and quality agenda to quality learning and teaching. That pitch remains the same to this day, albeit with further evidence to back it up, and with considerable and increased opportunities available for knowledge transfer.

Table 9 Five key contributions to knowledge

• Design simulated scenarios adopting a root cause analysis methodology and incorporating a focus on identifying the personal reasons behind problems and how they might be resolved positively.
• Adopt a human factors' focus and use simulation to provide a safe environment to explore what keeps us from sharing our concerns or being assertive.
• When embedding simulation within curricula to achieve maximum value-add, the focus should be where skills development is most needed.
• New evidence has been generated that suggests students exposed to simulation-based learning improve their clinical competency skills at a comparable, if not accelerated rate, compared to students undertaking traditional clinical placements.
• The fellowship has developed and introduced a new conceptual framework (the Simulation Valid Elements) that profiles emotional validity, environmental validity and contextual validity as critical elements germane to the training in human factors through simulation.

The original outcomes for the fellowship were not only met in a broad sense (see Table 9 and Appendix B), but some specific new contributions to the field knowledge for simulation and, in turn, education (see Figure 3 and Figure 5) will perhaps be the lasting legacy. From this fellowship, two specific new contributions to the field of knowledge for simulation and, in turn, education, were delivered; five key contributions to knowledge (see Table 9) and ten recommendations for learning through simulation into the 21st century (see Figure 5).

Stemming from the five key contributions to knowledge (see Table 9), are ten recommendations for learning through simulation into the 21st century (see Figure 5).

Figure 5 aims to capture the key messages that would underpin new models for learning in health in the future that might facilitate better engagement and preparation of students by not only extending their thinking, but also embedding opportunities for reflection and debriefing to consolidate learning; a core component of learning through simulation. In turn, it is envisaged there would be improved integration of student experiences across higher education and clinical practice settings and greater critical thinking, responsiveness and resilience.

The fellowship set out to enhance the uptake of learning through simulation in health. Through a targeted communication strategy, the analysis of embedding simulation into curricula nationwide, devising a curricula renewal model, developing resources, research and futures thinking, the fellowship has been a catalyst in this regard. The fellowship facilitated the development of approaches and strategies to help make it easier for universities, learners and educators to integrate simulation, in some way. There have been some new contributions to knowledge as a result and the forging of many new alliances to help take the fellowship's recommendations forward.



Figure 5 Recommendations for learning through simulation into the 21st century

There is no doubt that simulation is an emerging priority in health education and training that requires a considered and consistent approach to diffusion of change. Although as Schön (1973) correctly asserts, it is incumbent upon institutions, as learning systems, to be responsive to the ever-changing context:

We must, in other words, become adept at learning. We must become able not only to transform our institutions, in response to changing situations and requirements; we must invent and develop institutions which are 'learning systems', that is to say, systems capable of bringing about their own continuing transformation (pp. 28–9).

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Appendix A External evaluator's report

EVALUATION REPORT — Professor Julie Warn AM, Director, WAAPA

AIM of the FELLOWSHIP

To activate the uptake of simulated learning in health.



OVERVIEW

The critical lack of clinical placements in tertiary health education has been the key driver in the utilisation of simulated learning environments. Whilst use of simulation has become well developed and much of the scoping and mapping activity around curricula has been completed, a change management strategy to achieve adoption of simulated learning has been lacking.

The work undertaken during the course of this Fellowship has produced a new model and articulated desired outcomes for the future.

EVALUATION

I have been involved as an Evaluator from the outset of the project and have maintained contact on a regular basis with Professor Rudd and her team through scheduled monthly meetings, regular email updates, telephone calls and attendance at seminars and workshops with a range of participant groups. I have regularly received reports of activities, meetings and events pertaining to the project for analysis. This documentation has included feedback from participants, which has been extremely positive, appreciative and encouraging. The development of a virtual environment and particular websites for reference were useful additional tools e.g. through the ECU Health Simulation website a regular newsletter is disseminated broadly across Australia, industry, the higher education sector and other key stakeholders

Early in the project it was apparent that there was potential for an even greater impact than originally predicted at the time of nominating for the Fellowship. Professor Rudd's engagement in a number of reference and advisory groups served as a useful vehicle to disseminate the project's original purpose and to garner views on how change might best be attempted. Gaining funds through an internationally competitive process to establish an Australian Train the Trainer program meant that consultation with all Australian universities and jurisdictions could occur and be instrumental in identifying early adopters to take up learning through simulation.

Realising that research and testing of approaches was required for a curricula framework to be conceptualised, Professor Rudd undertook the widest possible range of relevant stakeholder consultations, targeting specifically the higher education sector and professional and accrediting bodies. Student engagement across all health disciplines was also a key component of consultation. It became apparent that there was a lack of Australian evidence to enable a broader uptake of simulation. In order to address this Professor Rudd developed a strategy to meet this need [detailed in progress reports], successfully applying for supplementary grants and establishing a transnational collaboration with the US [The National Council of State Boards of Nursing] National Simulation Study.

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During the Fellowship, three successful research applications involving testing interventions in the three critical domains [higher education, health professionals' development and clinical outcomes] to provide the evidence base for enhanced uptake of learning through simulation, would be instrumental in identifying tensions between vision, intention and realisation, often related to organisation / discipline-specific barriers to change, thus influencing how to equip implementers to drive attitudinal and behavioural change. For example, to respond to how adopters might be better placed to embed learning through simulation, Professor Rudd led the first Australian research study to test if, and how, simulation might replace clinical placements.

For the success of this Fellowship it was important for Professor Rudd to play a key role in the development of a national platform to assist learners and teachers to easily access a wide variety of resources to integrate simulation into curricula. Health Workforce Australia's [HWA] national simulation in health e-platform project provided an appropriate opportunity and Professor Rudd was integrated into early discussions with HWA around the e-platform development, including canvassing and providing a global simulation perspective.

Early in the evaluation stages of the Fellowship, it was recognised that it would be important to engage with key influencers for the outcomes of the Fellowship to be viable. In her report, Professor Rudd provides details of the extensive national and international representation of the Fellowship and describes their particular contributions. Also provided are details of the broad range of national and international meetings at which the Fellowship has been represented. Key stakeholders who engaged with this project include Health Workforce Australia, Commonwealth Department of Health and Ageing, Commonwealth Department of Industry, Innovation, Science, Research and Tertiary Education, Department of Health WA, the Val Lishman Health Research Foundation, the State Health Advisory Research Council, Australian Society of Simulation in Healthcare, Australian Health Workforce Institute and Edith Cowan University.

One of the key components leading to the successful outcomes of this Fellowship was Professor Cobie Rudd herself. It was quite apparent throughout the project that she has a unique ability to bring people together to enable vital aspects of the work to move forward. Her ability to infiltrate networks, to obtain additional funding and to motivate teams to produce relevant work was vital.

The resources that have been developed during the Fellowship period are a significant repository to support the facilitation of Inter Professional Learning [IPL] for health students and health professionals through sequential simulation, and the IPL through simulation resources page is an excellent resource to facilitate learning in this area. The continued uptake and implementation of these resources demonstrates sustained impact, and the geographical diversity from which the IPLs have been sourced, both across Australia and internationally, is a testament to the breadth of reach achieved during the Fellowship period.

The key contributions to knowledge which have emerged from this National Fellowship are detailed in the Executive Summary. From an evaluation perspective it is quite clear that, closely measured against the original scope of the project, the outcomes far outweigh the initial objectives. This has been possible because Professor Rudd has seized on opportunities as they have arisen and this has contributed greatly to the body of knowledge in this field.

In conclusion, I confirm that each of the Aims of the Fellowships Program has been comprehensively met. This particular Fellowship based on activating the uptake of simulated learning in health has met the objectives of:

- Identifying an educational issue across the higher education system and facilitating an approach to address the issue
- Devising and undertaking a significant program of activities to advance learning and teaching in Australian higher education
- Stimulating strategic change in higher education institutions
- Raising the profile of learning and teaching in higher education and the prestige associated with the pursuit of excellence in teaching
- Showing leadership in promoting and enhancing learning and teaching in higher education and exploring new possibilities
- Establishing and building on national and international partnerships in learning and teaching in higher education
- Fostering national and international collaboration and collegial networking for sharing research, innovation and good practice in teaching and learning
- Contributing to the growing community of scholars in higher education teaching and learning.

The evidence for the above is comprehensively demonstrated through the findings documented in the interim and final reports.

A handwritten signature in cursive script, reading "Julie Evans", written in black ink on a light-colored background. The signature is fluid and elegant, with a horizontal line underneath the name.

Director, WAAPA
18th March 2013

Appendix B Fellowship outcomes at macro, meso and micro levels

OBJECTIVES	MACRO (NATIONAL, INTERNATIONAL)	MESO (STATE, UNIVERSITIES)	MICRO (INDIVIDUAL)
<p>First objective: To enhance uptake of learning through simulation across sectors:</p> <ul style="list-style-type: none"> Implement an overall change strategy aimed at helping people to communicate about simulation and how they wanted to use it. Establish and build on existing networks for two-way communication. 	<ul style="list-style-type: none"> Non-Executive Director at the International Society for Simulation in Healthcare. Member of the Australian Simulation Education & Technician Training program (AusSETT). Expert Advisory Group member for the National Health Education and Training in Simulation (NHET-Sim) project. Engaged federal ministers. Hosted site visits to ECU HSC from international organisations interested in simulation. Presented at national conferences. Invited to attend the 2013 14th International Health Workforce Collaborative (one of 20 Australians). 	<ul style="list-style-type: none"> Led a WA Collaborative Research Network (subproject included a focus on simulation). Steering group member at the WA Clinical Training Network. Member of the WA Immersive and Simulation-Based Learning Committee. Engaged state and local government ministers. Engaged across government agencies to promote simulation. Hosted site visits to ECU HSC for state/national organisations interested in simulation. Received \$7.9m in advancements at ECU HSC and CRN during fellowship for: <ul style="list-style-type: none"> Capital equipment Clinical supervisor training and development Simulation in clinical training (research) Simulation in professional development (research) Improving clinical outcomes (research). 	<ul style="list-style-type: none"> Provided 'grabs' to committee members, conference/workshop attendees to enhance all parties' understanding of how to communicate with their institutions.
<p>Second objective: Use simulation to equip learners to ask the hard questions and in doing so, demonstrate that simulation is more than an optional layer, but, rather, potentially a better way to teach some things:</p> <ul style="list-style-type: none"> Develop appropriate simulation resources to augment learning. 		<p>Simulation resources:</p> <ul style="list-style-type: none"> Developed 17 IPL through sequential simulation resources for health students and professionals (nationally and internationally accessed resource). 	
<p>Third objective: Embed simulation across health curricula:</p> <ul style="list-style-type: none"> Design a framework for curricula renewal and resource development — a key feature to make uptake easier. 	<ul style="list-style-type: none"> 'Roadmap' developed identifying core competencies/skills across disciplines. Curriculum Renewal Enabler concept designed — potential portal for SimTech. Developed a conceptual framework for curricula renewal to enhance uptake of, and learning, through simulation. 	<p>Research:</p> <ul style="list-style-type: none"> Multiple research studies commenced to develop evidence base in relation to SLEs. Conference presentations. Presented across sectors (e.g. to Mental Health Advisory Council, UWA on technology assisted learning). 	<ul style="list-style-type: none"> ECU simulation challenges and ECU seminar series/workshops on simulation attended by total of 500 students/industry representatives. 3614 participant hours of simulation-based clinical training through ECU HSC during fellowship.

Appendix C SLE use in professional entry paramedicine student education pilot study

SIMULATION VERSUS CLINICAL PLACEMENT

The scarcity of quality undergraduate clinical placements limits training opportunities for students to cover the breadth and scope of required experiences to integrate theory with practice in a sequential way. Simulation has been widely suggested as a viable alternative but at present the evidence base is lacking for the extent to which simulation can and cannot replace clinical practicum without compromising students' clinical competency. Most studies to date have suffered from a lack of valid comparison groups and over-reliance on subjective rather than objective measures. A systematic review of simulation studies from 1995 to 2006 concluded "At best, a simulation equivalent can be used as an adjunct for clinical practice, not a replacement for everyday practice" (Laschinger *et al.*, 2008). However, this conclusion was beyond the scope of the review as none of the examined studies actually compared simulation-based learning outcomes directly to those resulting from clinical placements. Professor Rudd is currently heading a team of researchers and PhD students to establish a firmer evidence base to this effect, with such being directly aligned with the National Teaching Fellowship project (Enhancing uptake of learning through simulation in health).

Paramedicine pilot study

The first investigation was conducted with the assistance of Health Workforce Australia (HWA) funding (\$192,194) awarded to Professor Rudd in February 2012 (see Appendix J).

The aims of this pilot study were:

- To provide an evidence base around how simulation might be appropriate as a clinical training replacement, in addition to being a complementary educational strategy.
- To test an intervention as part of building an evidence base around embedding learning through simulation in health.



ECU ran a naturalistic comparison study with three pre-existing Edith Cowan University (ECU) second-year paramedicine units involving either: 40 hours of simulation and no clinical placements; 100 hours of simulation and 44 hours of clinical placement; or 144 hours of clinical placement only. Students' levels of clinical competency were assessed at the beginning and end of semester using Objective Structured Clinical Examinations (OSCEs). Changes in the average levels of clinical competency resulting from varying exposures to simulation- and clinical-based learning were compared between groups.

This pilot study is completed and was subsequently acquitted by HWA.

Clinical scenarios

Four high-fidelity scenarios were developed to assess students' clinical competence. These were developed as the result of a brainstorming session with paramedicine lecturers at ECU. In combination, these four scenarios cover the 11 clinical competencies for paramedicine as identified in the *HWA Use of Simulated Learning Environments in Paramedicine Curricula* (2010) report (Rudd *et al.*, 2011), for which learning outcomes could be met via simulated learning environments. The criteria for competency in each skill were then linked to the Council of Ambulance Authorities (CAA) Professional Competency Standards (The Council of Ambulance Authorities, 2010). The four scenarios involved: a) Cardiac arrest development, b) Primary survey for an asthmatic, c) Anaphylaxis assessment, and d) Spinal immobilisation with fractured leg.

Procedure

At the beginning of semester, participants' clinical competencies were assessed via OSCE for one of the four scenarios. All scenarios were undertaken in standardised conditions in the Simulation Suites in the ECU Health Simulation Centre. Participants' actions were video-recorded via three high-definition video cameras and later reviewed independently by two assessors. At the end of semester,

students were randomly assigned one of the three remaining competency tests and their performance was again assessed in the same fashion.

Summary of findings

- Students exposed to simulation-based learning improved their clinical competency skills at a comparable rate compared to students undertaking traditional clinical placements. However, the naturalistic setting of the study meant a number of factors beyond the control of the investigators introduced new confounders that ultimately meant these results should be considered as suggestive rather than conclusive.
- Our exploratory investigations uncovered a wide array of limitations when attempting to use a naturalistic method to investigate this field of enquiry that will need to be controlled in future field studies of simulation-based learning.

Discussion

This was one of the few studies to date that has attempted to use objective measures with direct comparisons between students' exposure to simulation versus clinical practicum. The results of this study replicated those of a contemporary study that compared simulation to clinical practicum in physiotherapy undergraduates and found no difference in learning outcomes from either mode of learning (Watson *et al.*, 2012).

FUTURE RESEARCH

A PhD candidate, for whom Professor Rudd is principal supervisor, is now pursuing this research area further with his research thesis entitled: *Investigating the impact of the simulated versus clinical environment on learning outcomes via a mixed-methods approach*. The research involves a combination of: in-depth interviews with students, clinical course coordinators and supervisors; analysis of clinical placement student diaries; and comparisons of a number of measures for evaluating clinical simulations.

Comparison trial

Learning from the limitations identified from the pilot study, the student has begun a comparison trial with a single cohort of first-year paramedicine students split into two matched groups participating in simulated- or clinical setting-based education. The study has incorporated participation in the research into the unit curriculum for the 2013 teaching period, which has retained higher participation rates. The crossover study has randomly assigned students into one of two groups undertaking three days of clinical versus simulation-based learning. As part of the study protocol, four OSCEs have been included in the unit as part of student assessments; these will be compulsory for all students. Results of the study should be available by the year's end.

Cognisant of findings from previous simulation-based research, Professor Rudd and her team will also conduct a further two aligned studies funded through the Clinical Simulation Support Unit, Department of Health Western Australia, described hereafter.

Novice versus expert practitioners

The level of distraction in students undertaking low- (minimal storyline, minimal equipment) versus high-fidelity (structured story lines, confederate actors, realistic props) simulation-based scenarios will be assessed using a 2 X 2 study design comparing first versus third year paramedicine students. The extent to which students attend to relevant symptom cues versus getting distracted by non-relevant cues will be assessed via Mobile Eye-XG eye-tracking glasses while undertaking simulation-based scenarios. Students' performances will also be recorded via three HD cameras recorded on to a single split screen. To assess the impact of distraction on clinical performance, the video footage will be used to measure students' time-to-action using Studiocode (v.5) video tagging software and clinical competency will be assessed by OSCEs. These measures will provide three continuous variables that indicate the ratio of time spent looking at relevant versus non-relevant cues, time-to-action in seconds, and an aggregate OSCE score. It is hypothesised that novices will be more distracted by non-relevant cues when participating in high-fidelity simulation-based scenarios while experienced students will be more likely to ignore these and focus on relevant cues only. It is further hypothesised that the greater distraction will result in slower time-to-action and overall clinical competency scores. If these hypotheses are supported, it will recommend the avoidance of high-fidelity simulations for the teaching of clinical skills to novice students until further into their education.

Differing levels of simulation fidelity

A randomised-comparison trial with stage four nursing students will be undertaken to determine physiological responses and their performance during varying levels of simulation fidelity. The results of this study will determine whether in simulation-based learning activities:

1. varying fidelity impacts on student arousal
2. varying arousal impacts on participant performance.

Nursing student volunteers will be randomly assigned to one of four study groups:

1. part-task trainer (n=30)
2. standardised patient (n=30)
3. simulated patient (n=30)
4. full-scale simulation (n=30).

Measures collected will include demographics, heart rate, salivary cortisol and clinical performance. Free cortisol in saliva is a valid indicator of the neuro-endocrine system that controls the reaction to stress. It is hypothesised arousal will increase with increased simulation fidelity, and increases in arousal will lead to a decrease in clinical performance. The project is likely to provide data on how varying levels of fidelity affect clinical performance in simulation and the extent arousal influences clinical performance.

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Rudd, C., Freeman, K. & Smith, P. (2011). *Use of Simulated Learning Environments in Paramedicine Curricula.*, in *Health Workforce Australia*. Retrieved from <https://www.hwa.gov.au/sites/uploads/sles-in-paramedicine-curricula-201108.pdf> (Accessed 27-02-2013).

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Appendix D Collaborative Research Network

The Edith Cowan University (ECU) Collaborative Research Network (CRN) is a \$17.8 million investment, which includes \$5.6 million funding from the Department of Innovation, Industry, Science, Research and Tertiary Education Collaborative Research Networks Scheme (2011–2014), along with contributions from the partner universities. It is part of a suite of initiatives established by the Australian Government to reform higher education teaching, learning, research and research training. Professor Cobie Rudd leads one of the six subprojects of the CRN — integrated health services to enhance community-based healthcare worth over \$900,000 (DIISRTE funding). This subproject spans all major healthcare delivery disciplines. One of the major aims of the subproject is to develop evidence-based models of healthcare education, with a heavy emphasis on simulation-based clinical training and interprofessional learning (IPL).

To date, the subproject has attracted \$404,000 in competitive research grants and an additional \$21,000 in consultancies for related research. It has also attracted two PhD students undertaking their research in simulation-related topics.

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COLLABORATIVE RESEARCH NETWORK (CRN)

Integrating Health Services to Enhance Community-Based Care project through:

- Increased collaborations with partner universities and the wider community
- Further developing the evidence base for health services
- Contributing to building a sustainable, flexible and responsive health workforce
- Research publications and grants
- Supervision of higher degree by research students

The CRN program is supported by the Department of Industry, Innovation, Science, Research and Tertiary Education.
(http://www.research.ecu.edu.au/ori/crn/health_service.php)

THE UNIVERSITY OF MELBOURNE **THE UNIVERSITY OF QUEENSLAND AUSTRALIA** **THE UNIVERSITY OF WESTERN AUSTRALIA**

PARTNERS

Edith Cowan University

Professor Cobie Rudd
Pro-Vice-Chancellor (Health Advancement) and
Australian Government Office for Learning and Teaching
National Teaching Fellow (2011–12)

Associate Professor Owen Carter
CRN Research Director

Dr Natalie Strobel
CRN Research Fellow

The University of Melbourne

Professor Peter Michael Brooks
Director, Australian Health Workforce Institute

The University of Queensland

Professor Jill Thistlethwaite
Director, Centre for Medical Education Research and
Scholarship

Associate Professor Jared Dart
Clinical Service Development and UQ Liaison

The University of Western Australia

Professor Fiona Lake
Head of School, Medicine and Pharmacology
Eric Saint, Professor of Medicine

Professor Grant Waterer
Professor of Medicine
University of Western Australia Consultant Respiratory
Physician, Royal Perth Hospital

RESEARCH ACTIVITY TO DATE

Title: Investigation of the merits of simulation-based video materials on interprofessional practice on community-based suicide prevention training

Funder: Val Lishman Health Research Foundation

Investigators: Professor Cobie Rudd (ECU)
A/Professor Owen Carter (ECU)
Dr Natalie Strobel (ECU)
Professor Jill Thistlethwaite (UQ)

Amount awarded: \$220,000

Year: 2012–2014

Title: A randomised controlled trial testing the efficacy and cost benefit of cognitive behavioural therapy on the health outcomes of chronic obstructive pulmonary disease patients

Funder: State Health Advisory Research Council (SHRAC)

Investigators: Dr Natalie Strobel (ECU)
A/Professor Owen Carter (ECU)
Professor Grant Waterer (UWA)
Professor Cobie Rudd (ECU)
A/Professor Li Ping Chung (UWA)
Dr Maxine Braithwaite (ECU)

Assoc. investigators: Ms Karen Banks (SMAHS), Dr Jenni Ibrahim (Health Consumers Council)

Amount awarded: \$140,000

Year: 2012–2014

Title: Using eye tracking and time-to-action to assess level of distraction in novice students undertaking low- versus high fidelity simulation-based learning.

Funder: Clinical Simulation Support Unit, Department of Health WA

Investigators: A/Professor Owen Carter (ECU)
Dr Natalie Strobel (ECU)
Mr Brennen Mills (ECU)
Professor Cobie Rudd (ECU)

Amount awarded: \$10,000

Year: 2013–2014

Title: Determining physiological responses and performance of undergraduate students during varying fidelity in simulations.

Funder: Clinical Simulation Support Unit, Department of Health WA

Investigators: Dr Natalie Strobel (ECU)
A/Professor Owen Carter (ECU)
Mr Brennen Mills (ECU)
Professor Cobie Rudd (ECU)

Amount awarded: \$10,000

Year: 2013–2014

PhD research students in field of simulation:

Student: Brennen Mills

Title: Investigating the impact of the simulated versus clinical environment on learning outcomes via a mixed-methods approach

Discipline: Interdisciplinary health sciences

Principal Supervisor: Professor Cobie Rudd

Co-supervisor: A/Professor Owen Carter

Years: 2012–2014

Abstract: Increased demand on global healthcare systems has resulted in more students requiring undergraduate clinical placements in Australia, to the point that demand now exceeds supply. There is a clear need to reproduce the learning outcomes of clinical experiences via innovative means. Simulation-based education is frequently suggested as one solution. Few studies have compared the outcomes of simulation-based training versus training in real clinical settings. It is, therefore, proposed to explore this gap in the literature by systematically comparing the learning outcomes of students split into two matched-groups participating in simulated- or clinical-based education. This will be achieved via a mixed-methods approach using a combination of: in-depth interviews with students, clinical course coordinators and supervisors; analysis of clinical placement student diaries; and comparisons of a number of measures derived from Kneebone's conceptual framework of evaluating clinical simulations.

Student: Tina Phan

Title: A randomised controlled trial testing the efficacy of simulation-based cognitive behavioural therapy videos on the health outcomes of chronic obstructive pulmonary disease patients

Discipline: Medical sciences

Principal Supervisor: A/Professor Mel Ziman

Co-supervisors: A/Professor Owen Carter, Dr Natalie Strobel, Professor Grant Waterer

Years: 2013–2015

Abstract: Chronic obstructive pulmonary disease (COPD) is a progressive and irreversible condition. As such, there is a high prevalence of anxiety and depression in COPD patients. Cognitive behavioural therapy (CBT) has previously been demonstrated to be efficacious for anxiety and depression but few COPD patients receive such treatment, despite high prevalence. This project will conduct a randomised controlled trial to compare the outcomes of COPD patients given no CBT, traditional CBT or traditional CBT enhanced with simulation-based video materials. It is hypothesised that simulation-based video enhanced CBT will lead to better health outcomes for COPD patients.

Appendix E Abstract from WA Health Conference

Title: Simulation Training in WA: Stronger Partnerships For A Better Future

The Clinical Simulation Support Unit (CSSU) was established in January 2012 as a Western Australian initiative made possible through funding made available by Health Workforce Australia as an Australian Government initiative. The CSSU takes a cross-sectoral consultative and responsive approach to coordinating health simulation training resources in Western Australia.

Simulation education/training has been internationally recognised as fundamental to clinical training for health professionals. It offers significant advantages over traditional forms of training, with increased focus on:

- quality of care and patient safety;
- increased breadth and depth of training;
- more flexibility;
- greater control of case mix, competency attainment and assessment;
- more focus on true causes of adverse events; and
- increased opportunities for interprofessional learning.

With increasing need to train more health professionals without compromising safety and quality, simulation learning provides additional capacity to train and assess these practitioners. Simulation is applicable across the clinical training continuum, with:

- high-fidelity surgical and anaesthetics training;
- education for multidisciplinary teams on identifying and managing deteriorating patients;
- new clinical skill acquisition, for example cannulation; and
- human factor components, for example effective communication within teams.

Western Australia poses unique training challenges: geographical isolation, rapidly expanding population and public expectations of access to world-class health services. Statewide consultation in 2011 found gaps in simulation training across courses, staffing, equipment and facilities existed. Today, links with organisations outside the public health system are strengthened, with various providers coming together to form a cohesive, efficient and effective service to meet Western Australia's needs.

Working in conjunction with Health Workforce Australia, the CSSU brings together and facilitates communication between the training organisations and the workforce, public, private and non-government. It collects, maintains and analyses simulation training data on equipment, staff and courses, is working towards a detailed evaluation of existing gaps, and developing strategies addressing current and future health simulation training needs. The joint nature of this presentation offers testimony to the intent on working in partnership with simulation stakeholders.

Appendix F SimHEALTH 2012 Conference

In September 2012 I attended the *Annual Conference of the Australian Society for Simulation in Healthcare* (SimHealth 2012) in Sydney. This year's conference theme of "Making Teams Work" built on SimHealth 2011's theme of "Patient-Centred Simulation", by bringing together national and international experts from a range of clinical, educational and research disciplines together with policy makers and health services. Keynote speakers, invited speakers and panellists presented across themes of teamwork, patient safety, innovation, interprofessional learning, workforce development and research.

I presented two sessions:

1. A plenary session to present outcomes from the fellowship. The title of the paper presented was *National Teaching Fellowship 2011–12, Australian Government Office for Learning and Teaching: Enhancing the uptake of learning through simulation in health*. Following the plenary I also sat on the panel discussion on Curriculum integration and working in collaborative teams.
2. Workshop presentation: Interprofessional learning (IPL) through simulation. Human factors in health teams. This workshop aimed to launch resources to support educators in the facilitation of IPL among students and practitioners with an interest in developing their skills and knowledge of interprofessional practice. During the workshop, 17 IPL resources were launched. These resources were completed under my leadership in this fellowship term and were developed through the ECU Health Simulation Centre and the Interprofessional Ambulatory Care program, funded by the Australian Government under the Increased Clinical Training Capacity (ICTC) program.

Just over 70 participants attended the workshop, with 44 providing comments on an evaluation form. From the evaluation forms, 28 disciplines were listed as being present at the workshop, across medicine, nursing, midwifery and allied health, undergraduate, postgraduate, clinical and non-clinical roles.

Overall, 93.2% (n=44) participants rated the workshop good/very good/outstanding. When asked to comment on the workshop having provided useful guidance on how to integrate simulation resources into curricula programs, 95.4% (n=41) agreed or strongly agreed with the statement and 97.7% (n=42) agreed or strongly agreed with the statement that the workshop demonstrated how IPL could be enabled/enhanced through the use of the resources. Of the responses, 97.7% (n=42) indicated that those participants would share knowledge of the resources with other colleagues.

Qualitative comments in response to the question about which aspects of the workshop participants found the most beneficial to their learning included:

- Being exposed to the fantastic resources that are available from this initiative. Great presentation — enthusiastic and passionate, I hope to use them soon!
- Opportunity to discuss in groups and review real clips. Question opportunities in the larger group. Practical nature of the workshop and interaction of the three great facilitators.
- Listening to process involved — truly a collaborative and invaluable collection of resources.
- All aspects of the workshop. Excellent presentation/presenters/resources. What an inspiring team — thank you.
- Great demonstration of a well-planned resource and well-executed program.

- The process involved in developing IPL resources and showcasing an innovative approach to application of simulation to education.
- The structure was great to hold attention. The clear explanation and user-friendly aspect of the simulation challenge. The fact that I can implement what I saw today.
- Learning about the development of the resources and how they can be utilised across many disciplines.
- By collaboration opportunities are generated to spread the educational tool in a more professional way but also with evidence basis management.
- New ways to immerse students in simulation rather than the traditional sense.
- Wider understanding of the use of simulation in healthcare education. Useful discussion on future requirements to cope with numbers, impact on (potential) required hours of professional practice in accreditation. Thank you.
- Excellent innovative workshop/project. It is evident in the quality that you have put a lot of hours into these resources. Thank you for presenting your work.
- Fantastic — the most beneficial workshop for my practice/education so far.
- Well done — you guys are inspiring and great role models for educators. Thank you.

Appendix G Plenary paper SimHEALTH 2012

SIMHEALTH 2012

NATIONAL TEACHING FELLOWSHIP 2011-12, AUSTRALIAN GOVERNMENT OFFICE FOR LEARNING AND TEACHING: “ENHANCING THE UPTAKE OF LEARNING THROUGH SIMULATION IN HEALTH”.

Professor Cobie Rudd
Pro-Vice-Chancellor (Health Advancement) ECU and

National Teaching Fellow, Australian Government Office for Learning and Teaching

I guess some of you are asking what is this Fellowship and why did she receive this award?

- The Australian Government Office for Learning and Teaching (OLT) funds and supports a Fellowships' Program that encourages significant programs of work that have national and international benefits.
- These are highly competitive, require nomination from the Vice-Chancellor/President of your university, have a demanding selection process, and come with significant funds to support your work.
- In 2011, the Government awarded five of these National Teaching Fellowships. I was one of the five recipients, and received the maximum funding available of \$350,000 to enhance the uptake of learning through simulation in health.
- The Fellowships' Program supports individuals who are considered to have the expertise and leadership skills to identify issues across the higher education system and facilitate approaches to address the issues.
- Fellows are expected to undertake a significant program of work that will
 - advance learning and teaching in Australian higher education;
 - stimulate strategic change; and
 - foster collaborations on an international scale for sharing research, innovation and good practice.

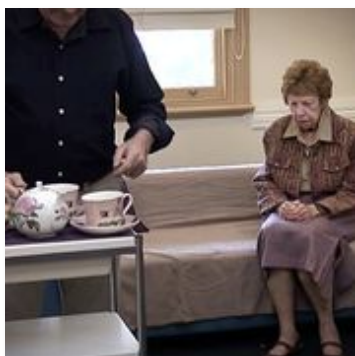
So, why me? I'm not an expert in simulation in that I don't 'do it' in the traditional sense but I could see what it could do.

In my view, simulation presented a single solution for the two major problems facing health and all universities with health programs:

1. The lack of quality clinical placements in health; and
2. Adverse events and near misses.



That is, simulation joins the safety and quality agenda to quality learning and teaching.



In line with this, we had already taken a root cause analyses and systems approach in that I had particularly wanted to look at what were the personal reasons behind problems and how they might be resolved positively. For example, was it dealing with a difficult person, or was it **an individual's self-talk** that was the real problem? Thus I had been focussing for some time on the roles that suboptimal communication and leadership, and organisational system failures, play in near misses and adverse events as well as delivering messages that had a social impact message. The focus on drawing out self talk through simulation is critical for me. When talking about situational awareness, we ask **“What keeps us from sharing our concerns or being assertive”?** I'd suggest it's our self talk e.g. “they won't listen to me” or “I might look like I'm stepping over into their turf” etc.

So, our work is a little different in that regard, I think, and as a result, we've been profiled by the State Government, Department of the Premier and Cabinet, and I quote, "as an exceptional Western Australian initiative", for example for the Commonwealth Heads of Government Meeting (CHOGM) delegates to visit last October.



Objectives

My Fellowship work program has aimed for attitude and behaviour change in funders, educators, clinical instructors, administrators and other decision makers.

I employed three objectives to achieve the desired attitude and behaviour modification.

My first objective was for an overall change strategy aimed at helping people to communicate about simulation and how they wanted to use it.

- On that note, I had succeeded in getting significant financial support for simulation, both from my home university and also external agencies. I had demonstrated that by combining the diffusion of innovations model and a market segmentation approach, I was able to explain what learning through simulation is and its benefits, in a way that was easily grasped when I had 'grab' time (this was often in the lift with about 30 seconds air time). I was able to convince key decision makers – and even to the point that they then owned the ideas (and more so, to the point where they even forgot where they came from). It's critical to be able to tailor and deliver messages that can break through the clutter and provide solutions to the problems decision makers face – and do it quickly (because they are generally in sensory overload). As well, the messages need to be developed to overcome barriers in thinking, such as overcoming administrative scepticism about the lack of sustained infrastructure and operational funding for simulation as a key educational approach. In 2007, my University put \$45M into the construction of an integrated health and wellness new building with extensive simulation facilities, knowing there were potential issues in terms of recurrent operational funding, but due diligence was done in respect to risk assessment and things proceeded. We are now in a position where all rooms / suites are used to maximum capacity all the time, including significant activities out of hours – that is full utilisation. Hence, as a result of the community engagement, usage rates, and externally generated income (not just for projects and research, but also for infrastructure, capital items and refurbishment and upgrades), I've gained traction in getting the commitment to ongoing staffing as well as the support of the business development team in the University factored in as well - which I'd be lost without.

My second objective was using simulation to equip learners to ask the hard questions – and in doing so, demonstrating that simulation is more than an optional layer but more potentially a better way to teach some things.

- This has seen us develop up sequential simulations that use a root cause analyses approach to identifying what the real problems are and how they might be resolved positively. When I say sequential simulations, I mean that the scenarios start at the causal point where decision making/actions influence or directly cause an impact (e.g. a crash literally), and then follow the story throughout the entire journey across multiple settings. All our simulation work is interprofessional. The roles that suboptimal communication and leadership, and organisational system failures play in near misses and adverse events, have been germane to the scenarios we've used, as has, high levels of emotional fidelity. We're aiming for developing those higher order values/skills, that is, enhancing emotional and social intelligence. I'll be playing some segments from these resources throughout this

presentation, and alert you that there could be footage that may offend some people, but we simulate real life using colloquial language.

My third objective was designing a framework for curricula renewal and resource development, which has been a key feature to make uptake easier.

- The curricula renewal work has built on the Health Workforce Australia (HWA) funded Simulated Learning Curricula projects to date and is a conceptual map (e.g. a portal to navigating your way to find resources, which I'll show later in this presentation) that shares the same objectives as HWA's National Simulation e-Platform project (SimNET) and other international work in simulation and technology enhanced learning initiatives. In conjunction, there's been a parallel OLT funded project we've led that maps potential learning from Aboriginal storytelling to curricula.
- The resource development I mentioned refers to a range of resources, including 17 interprofessional learning through simulation resources (and there's a workshop in the next session on these, Session 18, Workshop 7) and 41 multimedia Indigenous stories.

So, what has been achieved? My program of work has three outcomes areas:

1. Establishing and building on existing networks for two-way communication;
2. Embedding learning through simulation across health curricula; and
3. Enhancing uptake of learning through simulation across sectors.

Outcome Area 1: Establishing and building on existing networks for two-way communication

The cross-fertilisation between a number of national projects I'm involved in has been a major value add in terms of gaining advice for my work. As well, this resulted in unpredicted synergies and made engagement with a range of people an integral activity, not some sort of additional structure I had to set up and that already busy people needed to fit in. My involvement in multiple advisory groups in itself has provided me a depth and breadth of input I would not normally have achieved through one entity alone. For example, this is just a snapshot of the groups I'm part of:

- A Collaborative Research Network (with a subproject including a focus on simulation research);
- The WA Clinical Training Network;
- The International Health Workforce Collaborative;
- The WA Immersive and Simulation-based Learning Committee;
- As a Director on the International Board for the Society for Simulation in Healthcare; and
- As a Founding Member Australian Simulation Education & Technician Training Program and now as an Advisory Group member for the National Health Education and Training in Simulation (NHET-Sim) project.

Outcome Area 2: Embedding learning through simulation across health curricula, has been approached by:

- looking at where skills development was most needed – e.g. what quality experience is hard to get from traditional clinical placements - such as how do you ask the hard questions – cross-check a colleague, voice concerns, identify mistakes;
- exploring ways to problem solve, e.g. dealing with difficult people, intervening to avoid a near miss, manage risks due to workforce shortages;
- tailoring cognitive and attitudinal development, e.g. creating cultural empathy; and
- creating opportunities to expose students for non-technical skills development such as teamwork and a system focus as part of their curricula.



For example, asking hard questions



This one's personal ... and timely, given it's about mental health in the workplace and tomorrow is R U OK?Day – the national day of action dedicated to inspiring us to ask each other 'Are you OK?'

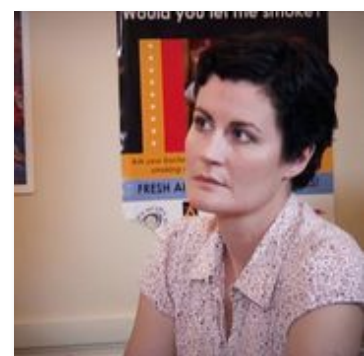
As a student, I was never quite sure how to ask the hard questions. In mental health, I used to worry that if I was faced with someone with suicidal ideation – if I asked them if they were going to kill themselves, or if they had a plan to – would my words give them ideas? I'd wonder ... where was the script when you had to ask a single surviving family member if they were aware that all their relatives had been killed in the accident?

So, using simulation to show what happens when you don't ask the required/right questions and showing what happens when you do, has proven a very powerful learning approach. For example, after a live simulation challenge as per the video you are about to see, mental health in the workplace, evaluation feedback sees students reporting learning to:

- Be confident in asking the right questions and be aware of boundaries;
- Work as a team/take care of other members in the team;
- Suicide is preventable. It is important to know how to deal with suicide in the workplace;
- Be aware of the indicators. Take time to talk – but remember you are not a counsellor – you should refer them;
- Don't be afraid to ask "THE" question.



We've also explored problem solving using interprofessional learning through simulation (we've developed 17 national resources). These interprofessional learning through sequential simulation resources are now being embedded across health curricula at both undergraduate and postgraduate levels. The resources have been developed to be flexible in use, enabling educators or trainers to give participants the opportunity to learn with, from and about one another through case studies based on real life events which we don't sanitise and always design so the social context of the person's situation is profiled. Each resource is accompanied by an evidence-based facilitator's manual and they are nationally available – open access - that was the deal (<http://www.ecu.edu.au/ipl-through-simulation>). Similar case studies have been developed for Health Simulation Challenges; these are incredibly well received as health students and health professionals are engaged in interactive live simulation events together.



Within this domain, I particularly wanted to show through simulation how our **self talk** guides our behaviour and how we can rectify negative/self defeating behaviours through cognitive restructuring.

As flagged earlier, a parallel project has been;

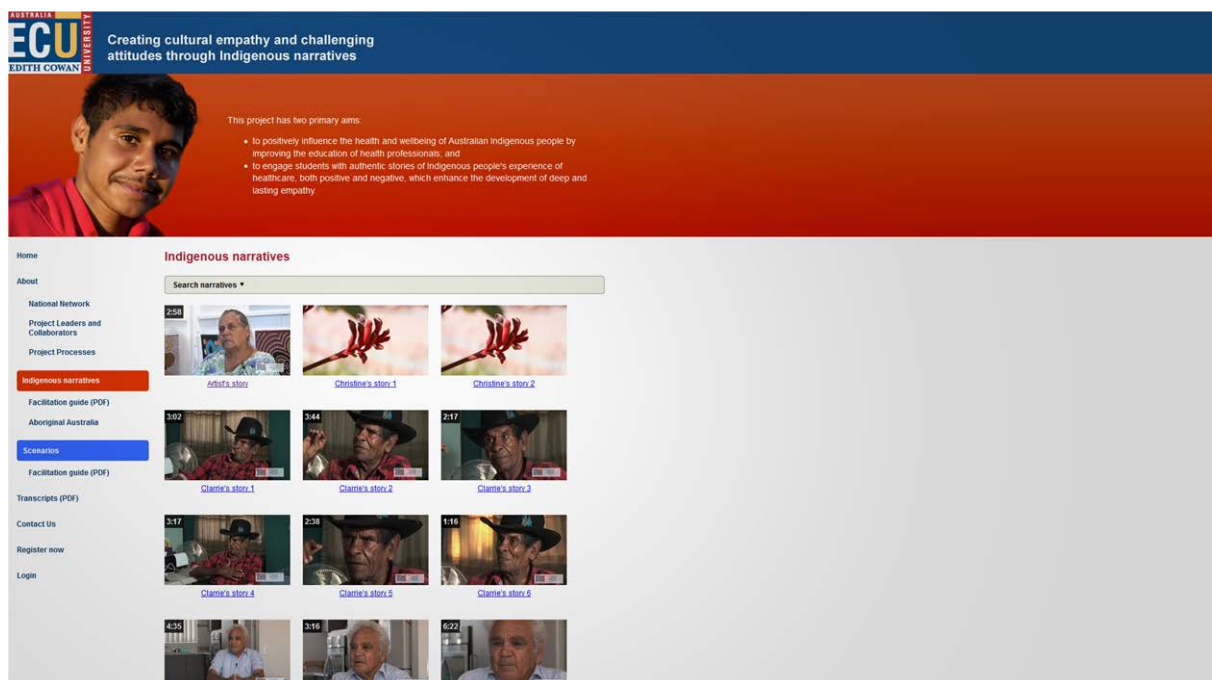
Creating cultural empathy through Aboriginal storytelling including simulation challenges (<http://altc-betterhealth.ecu.edu.au/>)

This project has aimed to:

- positively influence the health and wellbeing of Australian Indigenous people by improving the education of health professionals; and
- engage students with authentic stories of Indigenous people's experience of healthcare, both positive and negative, which enhance the development of deep and lasting empathy.

To achieve the development of this open-source model for transformative learning of cultural empathy (through narrative), we have achieved the following:

- Finalised 41 Indigenous narratives about experiences within health systems, including obtaining final informed consent from the story providers for use of these multimedia resources;
- Developed supporting materials, such as facilitator's guides and the search criteria;
- Designed and launch of the project website enabling the narratives and scenarios to be used for teaching and learning;
- Produced three simulated scenario-based resources focussed on creating cultural empathy (a fourth one on the way);
- Established a National Network of educators; and
- The evaluation of the project will be instrumental in mapping where these resources can be integrated across health curricula. There's no shortage of interest – anyone can access the resources online – in a relatively short time, 551 people have registered on the website.



And then, finally, another deliverable for Outcome Area 2 has been the development of a Curricula Renewal Enabler that's being conceptualised in the context of Health Workforce Australia's (HWA) National Simulation e-Platform (SimNET). Based on the HWA Simulated Learning Environments Curricular Projects, we've been developing a concept for navigating your way around a web-based resource directory such as SimNET. The preliminary work completed summarises and prioritises the outcomes of the 19 HWA Simulated Learning Curricula reports. The areas that may be delivered via SLEs have been divided into 'competencies' and 'skills' and the commonalities identified and form the basis of the decision-making enabling tool.



The premise being that such an enabler would interactively guide the healthcare educator or trainer through the required decision processes to locate and select suitable resources pertaining to discipline and stage of course. Following initial input from the user, the platform can outline available materials, including details such as health field, style of resource, target audience, genre, instruction design, graphics style, duration, required hardware platform, etc. Based on what is selected, the user is then presented with a recommended set of resources to employ the resource and be linked to relevant evidence.

Outcome Area 3: Enhancing uptake of learning through simulation across sectors.

There have been two key deliverables to date in this area:

The first being the combination of virtual learning environments with immersive simulation to devise an affordable distributed simulation model that can accommodate mass immersion particularly for regional areas; and

- The second deliverable being research to build the evidence base around the learning outcomes and cost of simulation.

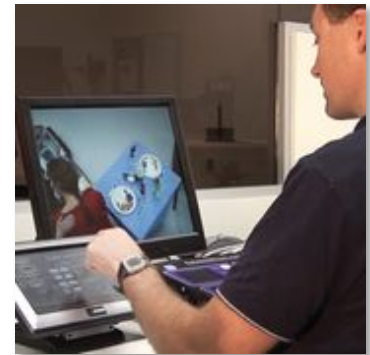
In respect to a distributed simulation concept for Australia, it's a concept that can provide mass exposure / immersion capabilities, makes hub and spoke concepts redundant, is portable and quick to erect and customise, is affordable and can deliver sequential scenarios, can accommodate actual presences and virtual presence combined, and has unlimited application. It's needed to build on HWA's (and others') investment to date, that is it gives infrastructure expenditure an implementation pathway that maximises utility. Basically this concept is a disruptive innovation that creates a new model of distributed simulation that would help better utilise all the simulation equipment out there than is presently the case. Here's a student experience with this concept.

The second deliverable in Outcome Area 3 was on the research front.

It's clear to us all that there is a requirement for more of an evidence base around simulation. So, this has been critical for the Fellowship over the past year. As well as leading a Collaborative Research Network project with the University of Queensland, University of Western Australia and University of Melbourne that includes investigating the educational approaches required for interprofessional learning, work-based learning and learning through simulation, we're involved in multiple studies that cover all domains, e.g. the impact of simulation in higher education, health professionals' development and clinical outcomes, e.g.:

- We are currently conducting a study with paramedicine students, funded by Health Workforce Australia, to investigate simulation-based training versus clinical placement training. The research question is to determine which provides more efficient acquisition of clinical competencies. Here we compare the relative per-day-rate of clinical skills acquisition for paramedicine students undertaking all simulation-based learning (100% simulation group) versus half simulation-based and half clinical placement training (50% simulation group), versus all clinical placement training (0% simulation group). This is a trans-national

collaboration with the US and the National Council of State Boards of Nursing study. We're also investigating if simulation based learning is as effective as clinical placement to achieve the same level of proficiency, and if there is any additive benefit of clinical placements on top of simulation- based training or if simulation- based learning alone is sufficient.



- Another study, focused on health professionals learning, investigates whether it is possible to improve the learning outcomes of half-day suicide prevention training workshops if augmented with interprofessional practice simulation-based video discussion materials. Here we compare the learning outcomes of matched groups of health professionals undertaking each type of training and subsequent self-reported suicide-prevention behaviours at 3-month follow-up.
- We have been awarded a State Health Research Advisory Council (SHRAC) Grant funded by the Department of Health Western Australia to conduct a randomised controlled trial testing the efficacy and cost benefit of cognitive behavioural therapy on the health outcomes on chronic obstructive pulmonary disease patients. A learning through simulation resource is being developed within a cognitive behavioural therapy framework to help with anxiety and depression in COPD patients. It is being developed in a similar format as the national resources (i.e., ineffective/effective scenarios).

So in conclusion, what were the challenges at the start and, were there different ones along the way?

- There were challenges where others with long histories in the field had reservations there was any value add they hadn't already explored. For a new and developing field, this was a challenge as there was more closure to new ideas than predicted.
- Ongoing contrast between the established health disciplines and the newer disciplines e.g. allied health.
- And then there was the Principle of Commitment and Consistency (Cialdini 2003) – that is those who hold a view, have expressed it publicly, and now discount contrary opinions or ignore evidence – and dealing with the escalation of commitment (Staw 1976) is a challenge and of course, is not a specific to the field of simulation.

What were the lessons learned?

The Fellowship granted me 'permission to just think' and the 'space' to strategically position some new potential solutions/float ideas.

- The cross-fertilisation between various national and international projects I'm involved in was critical for impact.
- The need for research as we're at the stage of requiring evidence to justify investment and for formal recognition of the role of simulation in clinical training in respect to national registration and accreditation requirements.
- Finally, we've created new career pathways - the ECU Health Simulation Centre is the largest employer of actors in Western Australia. At present, the ECU Health Simulation Centre provides more roles than any other theatre company, and indeed even more than the combined roles offered through a number of agencies. As well, our roles are preferred due to the



social conscience impact of our work – the casting agencies have told me their actors have a blanket rule – “if a job comes up in simulation there, clear our schedules”.

End.

References:

Cialdini, R. B. 2003, *Influence: Science and Practice*, 4th Edn, Boston: Allyn & Bacon.

Staw, B. M. 1976, “Knee-deep in the big muddy: A study escalating commitment to a chosen course of action”, *Organizational Behavior and Human Performance*, 16(1): 27-44.

Funded by:



Supported by:



Appendix H Case study: Paramedicine simulation challenge

Aligned with the National Teaching Fellowship, and a key area that reports to me in my Pro-Vice-Chancellor (Health Advancement) role, is the ECU Health Simulation Centre.

The ECU Health Simulation Centre is recognised internationally as a specialist in providing human factors based simulation programs using professional actors. A component of our work is conducting Health Simulation Challenges; the purpose of these challenges being to embed learning through simulation, which completes the cycle — theory, simulation, simulation, simulation and then practical experience [the See One, Simulate 100, Do One, Teach One analogy (Qayumi A. K., 2011)].

ECU has tried and tested the Health Simulation Challenge model, having staged five Challenges during 2011-2012, with a total of 424 participants (students and industry representatives) and equating to approximately 1,272 hours of new clinical training through simulation. Our technique of using professional actors to portray health care professionals consists of three phases. Phase 1 is where initially a scenario is streamed live to a group of participants which demonstrates sub-optimal skills in areas such as communication, leadership or teamwork. Phase 2 is when this observational simulation is then used as the catalyst for discussion in the second phase of the program where our skilled debriefers work with the participants to critique the scenario, identifying areas for possible improvement. Key to this phase of our methodology is the interaction between the participants and the performers. Face to face, the participants question the performers, who remain in character, about their feelings, motivations and rationale behind their actions. This ability to question is akin to the participants questioning their own practice in a safe, de-identified environment. After the participants give feedback to the performers on how they could better improve their practice, phase three sees the scenario re-enacted, with improved communication, teamwork or leadership skills, which ultimately improves patient outcomes.

The rare opportunity to question health professionals about their choices and actions and providing suggestions for an improved path of action provides the students with a safe opportunity to explore the debrief of a simulation, widely accepted as the “heart and soul” of the simulation experience (Fanning & Gaba, 2007).

Professional actors are used because of not only their ability to create believable characters within roles, create atmosphere and communicate emotions to an audience, but very much for their ability to direct the audience’s focus, their capacity for improvisation and the skills to remain in character during the above interactive questions times – skills which ECU’s work to date in this field has identified as critical in achieving maximum authenticity and thus the desired learning experience and outcomes.

A case study of one of the Health Simulation Challenges is detailed below.

Paramedicine Simulation Challenge

Topic: Just another party

Date held: Monday 15 October 2012

Number of participants: 63 paramedicine students (plus guests and staff)

A number of industry leaders also attended the event, including:

- Dr Simon Towler, Chair of Paramedical Science & Postgraduate Medicine Consultative Committee, previous Chief Medical Officer, Department of Health WA, intensive care physician;
- Stephen Gough ASM, Director Paramedic Education Programs Accreditation, Council of Ambulance Authorities, Victoria;
- Tony Walker, General Manager Regional Services, Ambulance Victoria;
- Ian Patrick, National President, the Australian College of Ambulance Professionals, General Manager of Clinical & Non Emergency Operations, Metropolitan Ambulance Service (MAS) Victoria; and
- Brendan Quirk, Director, Education and Training, St John Ambulance Northern Territory.

The audience viewed a pre-recorded real-life event performed by professional actors, in which ambulance staff assisted a casualty post-assault at a night-time party. This was followed by a live streaming of the arrival at an emergency department, demonstrating suboptimal skills of nursing and paramedical staff in handover and communication. This observational simulation was then used as the catalyst for discussion, where the participants identified areas for possible improvement. The participants questioned the actors, who remained in character, about their feelings, motivations and rationale behind their actions. After the participants gave feedback to the performers on how they could improve their practice, the scenario was re-enacted, with improved handover and communication skills, ultimately improving patient outcomes. The audience then discussed the changes made, how these impacted on the outcome and how to implement best practice in professional practice.

The pre-recorded material and the performances on the day have been provided to the School of Medical Sciences to support further education and discussion about the importance of interprofessional skills in paramedicine.



Evaluation summary

A selection of student responses to the question “What did you like best about the health simulation challenge?”

- That we could put in input and it was taken on board by the actors.
- Very engaging, good to see a realistic display.
- Opportunity to give criticism/feedback and analyse the situation.
- The ability to interact with the actors and influence the outcomes of the challenge.
- It was realistic and interactive.
- I picked up things I thought could be improved but hearing what everyone else noticed in the forum setting was great.
- The realistic nature and professional conduct of the actors.
- That this was realistic and they showed both an ineffective and effective way of doing things.
- The interactive aspect of the simulation.
- It was a fantastic way to learn. It was engaging and fascinating to participate in. The actors were really good, especially during the questioning session, having that session really helps highlight the importance of taking the simulation seriously.
- Interaction with actors and seeing change in communication between the two simulations.
- When we were given the opportunity to ask questions and make recommendations.
- The interaction and being able to see the scene done twice.
- Observing and interacting with a simulation that can be a realistic situation on-road. This simulation is valuable because it is/can be memorable and may directly relate and impact on one’s own professionalism.
- The realistic approach during feedback allowed a better educational event.
- The ability to interact and change the outcome.
- The interactive nature as a learning tool — excellent for students who have a more ‘hands-on’ learning style.
- I really liked how we were able to interact with the characters. To see what they were thinking and why they did or didn’t do something.
- Clear to see the vast change in front of us. It was great to ask our own questions. Actors were also fantastic.
- It was good to see what can happen when healthcare professionals don’t communicate with each other and how it can change. Very interactive.
- The fact that it uses real-life cases in real-life scenarios, which allows a realistic view of what happened.
- The video and the actors when they came live to answer the questions. It was very interesting.
- The reality of the simulation and the skills by the actors/actresses.

A selection of student responses to the question “Any other suggestions or feedback?”

- It was professionally run and fun.
- Great job and a wonderful way to learn.
- Fantastic way to learn! Would love to attend many more.
- The simulation challenge was very enjoyable and well worth my time. Thank you for running such a wonderful and well run event. Will come again!
- Very enjoyable and worthwhile. Thank you.
- A great opportunity for learning, very interesting and participation is great.

Summarised evaluation

For this challenge, 100% of participants responded agree/strongly agree to the question “simulation is an engaging education method” and to the question “I will be able to implement skills learnt in this session into my future practice”, 100% of participants responded agree/strongly agree.

References

Fanning, R. M., & Gaba, D. M. (2007). The role of debriefing in simulation-based learning. *Simulation in Healthcare*, 2(2), 115–125.

Qayumi, A. K. (2011). Presentation at Edith Cowan University: *Simulation — An Effective Tool for Healthcare Education and Patient Safety*, 5 September, Perth, Western Australia.

Appendix I Funding awarded to specifically advance simulation, including at ECU, over the fellowship period

May 2011 – December 2012: Total \$7,980,820

Provision of e-learning package to Department of Health WA and Health Workforce Australia

Funding agency: Department of Health Western Australia and Health Workforce Australia
Grant awarded: December 2012 \$385,000 over nine months

Project: To develop five simulation resources that will deliver training to undergraduate and postgraduate health professionals in the area of interprofessional learning.

Provision of clinical supervision training program

Funding agency: Department of Health Western Australia

Grant received December 2012: \$33,750

Project: To develop and deliver a one-day training course for health-based clinical supervisors statewide, using simulation to contextualise clinical supervision experiences and cement learning theory.

Val Lishman Health Research Foundation under the CRN project

Funding agency: Val Lishman Health Research Foundation

Grant received September 2012: \$220,268

Project: Investigating the merits of simulation-based video materials on interprofessional practice in community-based suicide prevention training.

State Health Research Advisory Council (SHRAC) research translation

Projects grant

Funding Agency: Department of Health Western Australia

Grant received September 2012: \$154,000

Project: A randomised controlled trial testing the efficacy and cost benefit of cognitive behavioural therapy on the health outcomes on chronic obstructive pulmonary disease patient.

Allocation to Edith Cowan University of surplus funds for the simulated learning environment program

Funding body: Immersive and Simulation-based Learning Committee, Department of Health Western Australia

Grant received September 2012: \$20,000

Extension of funding to continue the Interprofessional Ambulatory Care project under the Clinical Supervision Support program

Funding agency: Health Workforce Australia

Grant received July 2012: \$550,000

Vice-Chancellor's Award for Service to Students 2012 (for the Interprofessional Ambulatory Care program including learning through simulation challenges and resource development)

Funding Agency: ECU

Grant received July 2012: \$5,000

Capital funding for equipment under Health Workforce Australia

Funding agency: Department of Health Western Australia/Health Workforce Australia

Grant received May 2012: \$190,839

Project: Audiovisual digital upgrade and Studiocode video tagging software to enhance simulated learning environment.

Capital funding for equipment under the Health Workforce Australia

Funding agency: Department of Health Western Australia/Health Workforce Australia

Grant received May 2012: \$88,924

Project: AudioVisual Digital Upgrade to enhance simulated learning environment.

Provision of clinical training placement days to various healthcare sites

Funding agency: Department of Health Western Australia

Grant received May 2012: \$450,120

HWA clinical training reform 2012 mid-cycle funding round

Funding agency: Health Workforce Australia

Grant received May 2012: \$140,704

Project: Expansion of learning through simulation on regional scale.

Capital funding for simulated learning environments

Funding agency: Department of Health Western Australia/Health Workforce Australia

Grant received 7 February 2012: \$381,369

Project: Decommissioned ambulances, stretchers, defibrillators, SimMan 3G and anaesthesia monitor to enhance learning through simulation.

Simulated learning environment use in professional entry paramedicine student education pilot project

Grant received September 2011: \$192,194

Study aim: To provide evidence that demonstrates simulation is a suitable replacement for clinical practicum training, replicating the US National Council of State Boards of Nursing (NCSBN) National Simulation Study.

Mobile Health Service

Funding agency: Health Workforce Australia

Grant received July 2011: \$496,936 (nationally competitive round)

Project: To expand clinical training hours by 12,167 days over three years across disciplines.

National training program for simulation educators and technicians

Funding agency: Health Workforce Australia

Grant received July 2011: \$878,000 (partnership of five institutions, Rudd, CJ one of five leads)

Project: To develop a national training program for simulation educators and technicians Australia-wide following internationally competitive process.

Department of Health clinical training initiatives 2011

Funding agency: Department of Health Western Australia

Grants received: \$1,385,000 (awarded to Rudd, CJ as submission coordinator), including regional training and simulation initiatives.

Collaborative Research Network

Funding agency: Commonwealth Department of Industry, Innovation, Science, Research and Tertiary Education

Grant received May 2011: \$5,615,052

One of six CRN leads (Rudd, CJ): \$991,092 — Integrated Health Services to Enhance Community-Based Care, including a research focus on interprofessional learning (IPL), experiential/ work-based learning, and simulated learning.

High fidelity statewide simulation state government contract

Funding agency: Government of Western Australia

Initial grant received April 2011: \$916,089

Second grant received April 2012 to extend services to June 2013: \$501,535

Project: To deliver high and medium fidelity courses statewide, including the Effective Management of Anaesthetic Crises and Advanced and Complex Medical Emergencies, which are run in conjunction with the Australia & New Zealand College of Anaesthetists and the Australasian College of Emergency Medicine respectively.

National Teaching Fellowship

Funding agency: Australian Government Office for Learning and Teaching, Commonwealth Department of Education, Employment and Workplace Relations

Grant received May 2011: \$350,000

Project: To enhance the uptake of learning through simulation in health.