Use of Simulated Learning Environments in Paramedicine Curricula

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Executive Summary

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Health Workforce Australia (HWA) is a national health workforce agency that forms part of the $1.6 billion health workforce package agreed to by the Council of Australian Governments (COAG) in November 2008. HWA was established in order to devise solutions that effectively integrate workforce planning, policy and reform with the necessary and complementary reforms to education and training. The Simulated Learning Environments National Project focuses on enhancing the capacity of clinical placements through the use of Simulated Learning Environments (SLEs). The planning process for the distribution of SLEs will be guided by a nationally developed and endorsed approach as to what aspects of the various professions' curricula are suitable for simulated learning. This Phase Two project the Use of Simulated Learning Environments in Paramedicine Curricula, will form part of a broader discussion paper including all participating professions.

A Project Governance Group was established and the project methodology refined. The following five phases to the project were developed:

Phase 1 Literature Review

- An extensive literature review was conducted into the use of simulation in paramedicine. The literature review identified opportunities for expanded use by highlighting the body of research (national and international) that indicates the efficacy of SLEs in a disparate range of settings.

Phase 2 Head of Schools Survey

- Heads of Schools were surveyed (n=13) to develop an overview of the pre-registration paramedicine degree course in their School and to determine the extent to which there were activities that could be complemented by SLPs, and if they considered there were any activities that could be replaced by SLPs. The process also identified scope for future opportunities for simulation and identified potential issues (e.g., benefits, challenges and risks) in introducing simulation from both a School perspective, and from a broader profession/industry perspective.

Phase 3 Stakeholder Consultation

- Ongoing formal and informal consultation occurred throughout the project period with key stakeholders. Following a formal call for submissions, responses (n=5) were integrated into the report.

Phase 4 Electronic Survey

- Nominees identified by Heads of Schools from each accredited School located in Australia were sent an electronic survey that enabled a mapping process to occur that identified current utilisation of SLEs and the associated benefits and challenges. In addition this phase identified skills/areas that were perceived to have the potential to be delivered (with funding) via simulated learning environments, which could meet competency standards. Thirteen responses were received (response rate of 91%).

Phase 5 Consultations on Findings

- Finally, a consultation phase occurred that included the Network of Australasian Paramedic Academics (APA) and the Australian College of Ambulance Professionals (ACAP).

Results indicate low and medium fidelity mannequins were both reported to be utilised by 72% of respondents either very often or always. Nearly all respondents utilise simulation as "skills-labs" and almost half of the respondents report they currently have a dedicated simulation suite. Over half of those that do not currently have a simulation suite are intending to develop one. Just over three-quarters of respondent's simulation occurs in an on-site simulation facility and in traditional learning laboratories. Nearly three-quarters of respondents identified they do not have equipment that is sitting idle or underutilised. Nearly all respondents identified they have between one and five individuals/instructors in their school who are trained to lead/facilitate simulation, and nearly three-quarters of respondents identified they have between one and five individuals/instructors in their school with expertise sufficient to train others to lead/facilitate simulation. None of the respondents currently have a professional development (training) program to up-skill instructors/staff and it was considered there is a need for certification/credentialing or a required level of training/understanding to ensure there was an understanding of the fundamentals of simulation terminology and concepts and to ensure there was a concrete base for knowledge and expertise.

Although most items were considered to be beneficial, the following five items all received the same rating average and were regarded as the greatest benefits to introducing SLEs:

- Assessment;
- Increase student confidence;
- Evaluate in safe environment prior to placement;
- Improve clinical reasoning rather than rote learn;
- Enhance clinical judgment;
- Increase student competence; and
- Better prepare students for clinical environment.

Respondents identified the following five items as their greatest challenges to implementing SLEs:

- Insufficient number of dedicated technical/support staff;
- Initial set-up costs;
- Cost – equipment;
- Insufficient numbers of trained staff to run simulation; and
- Cost – human.

The three primary reasons respondents currently utilise simulation is for assessment, to increase the competence of students, and to better prepare students' for the clinical environment. How respondents are currently utilising SLEs differs significantly from how respondents would like to utilise SLEs. The three primary reasons programs would like to utilise simulation are to:

- Foster greater levels of interprofessional practice;
- To provide situations that can (almost) replicate they dynamic pressures of work, and
- To enable the more efficient use of clinical placements.

The issue of sustainability is considered of paramount importance, and one element crucial to this, is that there is appropriate investment in human resources. The issue of appropriate dedicated technical/support staff is a primary issue, as is a heightened level of education among all staff to ensure people understand the methodology and pedagogical principles underpinning SLEs. Education should not just be focused on those who will become simulation instructors, but also to the faculty at large as curricular integration is essential.

There is a strong appreciation in the ability of SLEs to augment students' preparation for practice, yet there is also a considerable level of concern among some that it may come at the cost of "real" exposure to the prehospital setting. There is also a significant concern regarding the perception of industry and their position in relation to SLEs. Despite the strong sense that simulation can enhance but not replace simulation, 64% of HoS responses indicate that there are activities that can be replaced by SLPs.

While there is paramedic research activity, there is little robust research on the effect of SLEs on learning outcomes. Much of the research that does occur is not specific to prehospital environments and more emphasis is required in paramedic-specific contexts. While acknowledging the evidence supporting the use of simulation to facilitate the transfer of knowledge to performance is in its infancy, findings indicate that simulation is perceived to be a valuable method of learning, which has a positive effect on the clinical effectiveness of students approaching the transition to become paramedics. No studies definitively identify opportunities to expand the use of SLPs to achieve learning outcomes of clinical placements.

The five competency areas with the greatest potential to be delivered via SLEs and reach competency standards and/or meet clinical placement objectives were:

- Operates within a safe practice environment: Applies infection control procedures which minimise risks to patients and those treating them (91% very probable);
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Conducts appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely (91% very probable);
- Develops and maintains professional relationships: Effectively communicates throughout the care of the patient (81% very probable, 9% somewhat probable);
- Identifies and assesses health and social care needs in the context of the environment: Analyses the situation, gathers appropriate information and selects and uses appropriate assessment techniques (91% very probable); and
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Formulates specific and appropriate patient care and treatment actions (91% very probable).

The 10 most frequently identified skills that have the potential to be delivered (with funding) via SLEs, which could meet competency standards were as follows:

- Inhaled medications/oxygen therapy;
- Manual handling;
- Medication administration;
- Oral medication preparation and administration;
- Spinal precautions and spinal injury management;
- IV therapy;
- Vital signs;
- Basic life support;
- Cardiac arrest management; and
- ECG.

Heads of School, stakeholders and nominees that provided input into this report are very excited about the potential SLEs have for the ongoing development of both students' and the profession. The initiative is considered important and one of national significance to paramedic training and has the potential to lead to a greater level of "road–readiness" in paramedic students.

It is considered very important that students increase their exposure to SLEs and 81% of nominees considered either likely or extremely likely that simulation will enhance the capacity of clinical placements.

PROJECT RECOMMENDATIONS

The data in this report is rich and provides a valuable window into the state and understanding of simulation in paramedicine. The data is not dissimilar to data obtained in other countries. Specifically there is wide variance in the use and implementation of simulation-based education. The mental models for simulation are not uniform. This is multi-factorial and associated with issues such as funding, instructor experience, implementation strategies, executive buy-in, and poor curricular integration/standardisation.

This Phase Two project in the SLE National Project must appropriately inform forthcoming phases to ensure that sustainable strategies are prioritised and implemented. To this end, the Infrastructure and Development Phase (Phase Three) must be mindful of the challenges/risks identified within this report. More specifically, "buy first, and think later" models will almost certainly perpetuate and exacerbate the current high levels of SLE equipment underutilisation highlighted in this report. To avoid this in the future, funding should be deliberate and associated with a sustainable plan by the funding petitioner. Funding criteria and priorities that are most likely to ensure sustainable integration must be established. From the data and information collected in this phase the following recommendations should be considered:

1. **Recommendation One: DEVELOP STRATEGY TO INCORPORATE SITE VISITS**
   1.1. The current state of simulation varies across institutions. The level and quality of simulation-based education across sites is not uniform and as such local and regional site visits should be considered an immediate short-term goal. This process would gather vital information to determine the "simulation readiness" of each location. The process would concurrently both gather and provide site-specific information that would enhance the locations implementation ability and inform a state/territory and a national strategy. It is clear from international experience that a single uninformed national approach for a country the size of Australia is unlikely to succeed.
   1.2. Site-visits during the initial implementation phase would have the added benefit of providing further regional education, initiate regional/local discussions on program development, facilitate program growth, and address sustainable practice at state/local levels.
   1.3. Site visits would also be critical to providing support to institutions around embedding, throughout paramedicine curricula, skills and capabilities that meet competency standards and can be delivered via SLEs.

2. **Recommendation Two: INVEST APPROPRIATELY IN HUMAN RESOURCES**
   2.1. The appropriate utilisation of SLEs is predicated on the appropriate education and development of faculty, instructors, and operations personnel (n.b., including standardised patients).
   2.2. The need to have staff capable of writing scenarios is axiomatic, however, it is essential that people understand the methodology and pedagogical principles underpinning SLEs, and that they are capable of implementing them efficiently and effectively. Education should not just be focused on those who will become simulation instructors, but also to the faculty at large as curricular integration is essential.
   2.3. It is crucial to invest in multiple layers of people to ensure the endeavour is sound, sustainable, and efficient, yet it is also important to avoid role duplication to ensure the workforce is adequate for the delivery of simulation-based education.
   2.4. Sites with more advanced instructors should be encouraged to allow developing faculty to apprentice with them so that they have role models that they may work with as they develop. A structured apprentice model should be considered to ensure consistency and quality
   2.5. Consider a state-based simulation instructor development system to effectively ensure that faculty and educators can be trained while respecting regional and geo-political issues.

3. **Recommendation Three: PROVIDE APPROPRIATE FINANCIAL RESOURCES**
   3.1. A lack of space to deliver simulation-based education is evident in some universities. Specific space requirements will be determined by the volume, frequency, type of simulation, and curricular need. As this can consume a great deal of available capital it is important to be innovative in developing the needed space to achieve the stated increase in simulation activity.
   3.2. Funds should be made available for the development of SLPs, maintenance of equipment and replacement of the (ongoing need) for consumables, but not necessarily high fidelity equipment. The report identifies a guide to potential resource requirements but would need to be based on, and informed by, the specific requirements of each location.
   3.3. Resource allocation must be mindful that many universities have, thus far, made significant financial investment in SLEs and this must be taken into consideration so they are not disadvantaged.
   3.4. Ensure funding is available beyond the initial allocation for infrastructure and resources to ensure the sustainability of SLEs.

4. **Recommendation Four: ENSURE RESOURCES ARE SHARED / ENHANCE COLLABORATION**
    4.1. Development of a pool of 'best practice' resources for general use (e.g. may include common simulation-embedded course-ware, infrastructure tools that facilitate shared product accessibility – inter-operable databases and systems built on a common platform and structure).
    4.2. The development of common course-ware/tools is essential in areas where placement needs are unmet through clinical placement experience / areas that are underserved (e.g., clinical handover, managing interprofessional / team conflict, dealing with aggression).
    4.3. Development of communities of practice where staff can share experiences and learn from experience of others.
    4.4. Important that a central (state or national) clearinghouse be developed where simulation can be monitored and effective implementation assured at a local level. This relates to item 2.4.
    4.5. The notion of shared resources should be paramount and be respectful of diversity and historical relationships yet encourage the development of new coalitions. Development should encourage and foster the development of SLEs through partnerships.
    4.6. It is important that the process engage industry and professional groups mapping SLEs to accredited competencies that have been developed by these groups thus maintaining high levels of validity and relevance.

5. **Recommendation Five: ENHANCE INTERPROFESSIONAL LEARNING (IPL)**
    5.1. It is important that a heightened level of streamlining of simulation activity occurs with other professions. This could include the expansion of existing IPL programs and facilities in universities and the development of interprofessional simulation centres across universities, with integration with health services.
    5.2. Work with other core professions to include IPL at the executive, faculty and student level.
    5.3. Leverage existing simulation infrastructure from different professions to evolve out of traditional silos and to promote appropriate consolidated interprofessional activity.
    5.4. Create a permanent interprofessional advisory council for the SLE project.

6. **Recommendation Six: IMPLEMENT APPROPRIATE LEVEL OF RESEARCH/EVALUATION**
    6.1. Metrics are required (and developed where necessary) to ensure appropriate evaluation of processes to monitor the implementation phase (Phase 5: Infrastructure Development Phase) and documents effectiveness in relation to:
        - Faculty outcomes
        - Student outcomes
        - Learning outcomes
        - Patient outcomes
        - Clinical capacity changes/shifts
        - Return on investment at each phase of the project

7. **Recommendation Seven: ENSURE EQUITY IN ACCESS TO SLEs AND THEIR POTENTIAL**
    7.1. Develop a mechanism through which rural and less funded programs have access to the SLEs and their potential (e.g., physical and electronic means)
    7.2. This includes the provision/upgrade of:
        7.2.1. IT equipment and access for students in rural and remote areas
        7.2.2. Mobile resources for rural and remote areas (to include postgraduate study and post qualification up-skilling)
        7.2.3. Links to expertise with regional universities, areas and programs where simulation resources are unavailable

8. **Recommendation Eight: CREDENTIALING OF INSTRUCTORS AND ACCREDITATION OF SLPs**
    8.1. A significant amount of training/understanding is required so that simulation-based methods can be effectively applied as an educational strategy to maximise utilisation of equipment, maximise capacity increases, and maximise learning outcomes for students.

- 8.1.1. Develop a shared vision of core competencies related to simulation instruction across all professions. This will ensure that appropriate standards are put into place to address issues relating to quality, development, and sustainability.
- 8.1.2. Identified clinical skills/simulation centres would have responsibility for credentialing instructors as part of a nationally-endorsed approach (e.g., certificate course, advanced certificate course, apprentice programs) and the model would need to operate/be integrated across health disciplines.

8.2. Simulation instructor courses should undergo a formal accreditation process. Although the schools in which Paramedicine sit would not be required to undertake accreditation, the courses that their instructors attend and the instructors conducting the courses would be accredited and certified, respectively.

8.3. The issue of accreditation or endorsement of actual simulation programs should be a consideration in the future. This may have significant political and fiscal implications that will need to be discussed further as the SLEs develop. This is consistent with international trends.

8.4. Adopting the process described in this section will provide additional interprofessional opportunities.

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Abbreviations

ACAP	Australian College of Ambulance Professionals
ACLS	Advanced Cardiac Life Support
CAE	CAE Health Care, a subsidiary of CAE (formerly Canadian Aviation Electronics Ltd)
CASN	Canadian Association of Schools of Nursing
COAG	Council of Australian Governments
ECU	Edith Cowan University
ETI	Endotracheal intubation
HoS	Heads of School
HWA	Health Workforce Australia
IOM	Institute of Medicine
IPL	Interprofessional Learning
MVL	Macintosh Video Laryngoscope
NAEMSE	National Association of Emergency Medical Services Educators
NHWT	National Health Workforce Taskforce
NSC-P	National Standard Curriculum-Paramedic (U.S.A.)
OHSU	Oregon Health and Science University
OR	Operating Room
OS&H	Occupational Safety and Health
OSCE	Objective Structured Clinical Examination
POGO	Percentage of glottic opening
RA	Rating Averages
RAAMC	Royal Australian Army Medical Corp
SLEs	Simulated Learning Environments
SLPs	Simulated Learning Programs
SPOTI	Scenario-Based Performance-Oriented Team Instruction

Chapter One: Background

National Health Workforce Taskforce and Health Workforce Australia
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.

The COAG package included the establishment of the National Health Workforce Taskforce (NHWT) to undertake projects, which inform development of practical solutions on workforce innovation and reform. The NHWT was hosted by the Victorian Department of Health. The NHWT was a time-limited project-based entity tasked to action and coordinate the achievement of agreed COAG requirements. Health Workforce Australia (HWA) is a newly-established national health workforce agency that forms part of the $1.6 billion health workforce package agreed to by the Council of Australian Governments (COAG) in November 2008. HWA was established in order to devise solutions that effectively integrate workforce planning, policy and reform with the necessary and complementary reforms to education and training.

Simulated Learning Environments Project
As part of the health workforce reform package, COAG announced that capital and recurrent funding would be available to build and operate new or enhance current Simulated Learning Environments (SLEs). The project is managed by HWA and focuses on enhancing the capacity of clinical placements through the use of SLEs. The project includes a focus on increasing accessibility to clinical training for regional and rural centres, e.g. via Mobile SLEs and insitu programs that can be developed as a means of providing these training opportunities in the more remote locations. The distribution and configuration of the SLEs will be finalised following a national planning process.

The planning process for the distribution of SLEs will be guided by a nationally developed and endorsed approach as to what aspects of the various professions' curricula are suitable for simulated learning. Once there is national agreement on the aspects of the curricula that can be delivered via SLEs, a planning and implementation process will commence, that will determine how the investment in new or expanded infrastructure will ensure equitable access by all students to SLEs. The implementation plan will ensure that existing centres are maximised and that new investment effectively and efficiently utilised, in addition to adopting sustainable business models to ensure ongoing viability.

The current phase is part of a five-phase SLE National Project that includes:

- Phase 1: Project initiation;
- Phase 2: Identifying and sourcing SLE curriculum (this phase);
- Phase 3: Infra-structure Development Phase;
- Phase 4: Research, Knowledge Management and Evaluation Plan; and
- Phase 5: Implementation Plan.

This Phase Two Project aims to identify and source SLE curriculum and it is anticipated the Paramedicine Simulation Curriculum Report developed as an output will form part of a broader discussion paper including all participating professions. The overall final discussion paper developed by HWA will summarise and describe the agreed aspects of all participating healthcare professional's curriculum which will meet clinical placement objectives and building clinical training capacity and capability.

Project Scope
In fulfilling the goals and objectives for this project the report will feature the following:

- Map of Simulated Learning Programs (SLPs) currently being delivered at each accredited School located in Australia based on project research and information from the NHWT university survey. The map will include the current use of SLPs in the clinical training of students and the potential future use.
- Literature Review including opportunities for expanded use of SLPs to achieve learning outcomes of clinical placements using national and international examples, supported by evidence, where available.
- Report on the outcome of stakeholder consultation including responses and issues raised
- Curricula elements that could, by accredited schools, be delivered via SLPs. These curricula elements should meet clinical placement objectives and therefore contribute to increased clinical placement capacity.
- The level of agreement from each accredited school on:
  - the curricula elements identified in (d) that could be integrated into the curricula and that would meet the accreditation standards;
  - Any perceived barriers to this curriculum being recognised and adopted for clinical training purposes;
  - The likely impact on clinical training days required in the course should these curricula elements be delivered through SLPs; and
  - The likely timeframes for implementation should these curricula elements be adopted.
- Recommendations encompassing:
  - Priority elements of the curriculum that could be supported by the SLE national project; and
  - Approaches to address barriers to effective utilisation and expansion of the use of SLEs in delivering the priority elements of the curriculum.

Chapter Two: Methodology

Edith Cowan University (ECU) has formed a project team of Australian academics with experience in simulated learning programs, and the team is seeking to work closely with all Schools involved in teaching clinical psychology in Australia and other stakeholders during this project.

The Project Steering Committee is as follows:

- Professor Cobie Rudd, Pro-Vice-Chancellor (Health Advancement), ECU;
- Associate Professor Moira Sim, Coordinator of Postgraduate Medicine and Director of the Systems and Intervention Research Centre for Health at ECU;
- Professor Ian Patrick, National President for the Australian College of Ambulance Professionals;
- Professor Malcolm Woollard, Professor in Pre-hospital and Emergency Care & Director, Pre-hospital, Emergency & Cardiovascular Care Applied Research Group, Coventry University, U.K., Adjunct Professor in the School of Biomedical Sciences, Charles Sturt University;
- Dr Madeleine O'Donnell, member of the Board of Directors of the National Association of Emergency Medical Services Educators (NAEMSE);
- Professor Judi Walker, Deputy Dean, Faculty of Health Science and Conjoint Professor of Rural Health, University of Tasmania;[1]
- Professor Peter O'Meara, Professor of Paramedic Practice and Leadership at Charles Sturt University;
- Professor James Vickers, Head of the School of Medicine at the University of Tasmania;
- Captain Matt O'Shea, Captain in the Royal Australian Army Medical Corp (RAAMC) and the
- Current S2 Doctrine for Special Forces Command;
- Associate Professor Richard Brightwell, Coordinator of Paramedical Science, ECU; and
- Mr Steve Johnston, Senior Lecturer in Paramedical Science, ECU.

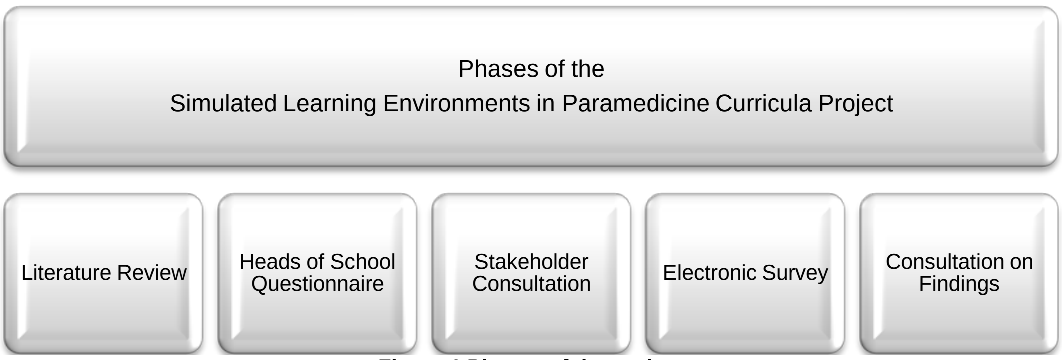

Figure 1 Phases of the project

Although the five project phases occurred in a linear process, at times the processes were concurrent, and included:

Phase 1 Literature Review (Chapter Three)

- An extensive literature review was conducted into the use of simulation in paramedicine. The literature review identified opportunities for expanded use by highlighting the body of research (national and international) that indicates the efficacy of SLEs in a disparate range of settings.

[1] Professor Walker remained involved in the project after she took up the position of Professor and Head, School of Rural Health at Monash University in early November, 2010.

Phase 2 Head of Schools Survey (Chapter Four)

- Heads of Schools were surveyed to develop an overview of the paramedicine degree courses in their School. The process also determined the extent to which there were activities that could be complemented by SLPs, and if they considered there were any activities that could be replaced by SLPs. The process also identified scope for future opportunities for simulation and identified potential issues (e.g., benefits, challenges and risks) in introducing simulation from both a School perspective, and from a broader profession/industry perspective. Lastly, Heads of School were asked to comment on how funding may be spent and if they considered they were providing innovative and/or high quality simulation.

Phase 3 Stakeholder Consultation (Chapter Five)

- Ongoing formal and informal consultation occurred throughout the project period with key stakeholders and included:
  - Attendance at key meetings (initial presentation of project, preliminary findings, consultation on findings);
  - Attendance at the Network of Australasian Paramedic Academics (NAPA) where a focus group was conducted to inform stakeholders of the project and gather findings/feedback; and
  - Call for submissions from stakeholders explaining the purpose of the project, defining its scope.

Phase 4 Electronic Survey (Chapter Six)

- Each accredited paramedicine program located in Australia was sent an electronic survey that enabled a mapping process to occur that identified current utilisation of SLEs and the associated benefits and challenges. In addition this phase identified skills/areas that were perceived to have the potential to be delivered (with funding) via simulated learning environments, which could meet competency standards.

Phase 5 Consultation on Findings

- Follow-up consultations with Australasian College of Ambulance Professionals (ACAP) to gather feedback on the draft findings.

Ethical Review

A submission was made to the ECU Ethics Review Board for the project: Simulated Learning Environments in Paramedicine Curriculum (Project Number: 6048 RUDD). The study was subsequently approved and once this had been granted the data collection proceeded as planned.

Reporting of Data

Quantitative statistics are reported in tables within each section area, or they are embedded in the sentence structure. The process of qualitative data analysis utilised Miles & Huberman's[2] interactive process of data reduction, data display and conclusion drawing/verification. Emerging thematic categories were constantly checked and verified. Finally, information was synthesised into the structure contained in the report.

Grammatical modifications (e.g., changing personal and possessive pronouns) were made where necessary to enhance clarity and ensure anonymity. Verbatim comments in the report will be reported in the following four ways:

As stand alone text:

"I felt simulation was a natural way to teach students"

2 Miles, M.B., & Huberman, A.M. (1984). Qualitative Data Analysis: A Sourcebook of New Methods. Beverly Hills, Sage Publications.

Embedded in the sentence structure:

For others, the training process was thought to be tedious and it was not thought to be an “easy way to learn” and seemed to be “anxiety provoking” rather than calming.

As textual exemplars:

For others, it was less burdensome and considered helpful (“it was easy to feel like it was a real situation”) and risk free (“I knew I could make a mistake and just do it all again if I needed to”).

As listed quotes in tables:

- I would like to know more about the student’s background
- I feel my knowledge would be enhanced with more training
- I didn’t know how to deal with it when I realised the scenarios needed to be developed

Chapter Three: Literature Review

Background

Alinier (2010) identified the first low-fidelity simulation study involving paramedics to be an investigation of the acquisition of cardiopulmonary resuscitation skills in 1964, using a resusci-Ann® mannequin (Winchell and Safar, 1966). Since that time, advanced mannequin technologies now enables student paramedics practice to occur *in situ* away from conventional simulation centres, in realistically staged disaster sites unfettered by cables and wires (Kobayashi, Patterson, Overly, Shapiro, Williams, & Jay, 2008). In the same way technologies have changed, the working environment in which paramedics are situated has profoundly altered. Educators are required to ensure paramedics can, at a minimum, deliver safe and effective health care to patients, are technically skilled, able to work in pre-hospital environments that are often sub-optimal, make rapid on-scene assessments, capable of theoretically driven problem solving and decision making, draw on expertise from a wide range of medical disciplines, posses a sophisticated understanding of human behaviour, and work in interprofessionally diverse circumstances.

To ensure health care workers are able to address the increasing complexity in which they work, educators are searching for innovative teaching strategies that will optimise clinical learning in an evolving health care delivery system (Elfrink, Kirkpatrick, Nininger, & Schubert, 2010). It has also been said that in many ways “today’s students are no longer the people our educational system was designed to teach” (Prensky, 2001, p. 1). Brooks, Moriarty, Welyczko (2010) caution that educational approaches to teaching and learning must be responsive to the changing context. A “more of the same attitude to service provision” in paramedicine (Ball, 2005, p.896) is not regarded as an adequate response to the challenges that healthcare educators face today.

One challenge faced by paramedic educators that requires immediate attention is to ensure students receive appropriate clinical experience. Clinical experience is required so theoretical knowledge is applied in ‘real’ settings in order that they become safe, competent practitioners (Baxter, Akhtar-Danesh, Valaitis, Stanyon & Sproul, 2009). The challenges to providing appropriate levels of clinical experience are manifold and this review will examine the use of simulated learning environments as a means to address the situation.

Many of the issues affecting the quantity and quality of clinical experiences are not specific to Australia and have been reported extensively in the literature and include: availability of clinical sites, increased enrolment, faculty shortages, a lack of physical space, lack of standardisation of clinical competence, highly variable learning experiences, fatigued clinical settings, reluctance of health professionals to supervise clinical practice, increased workloads and stress, shortened patient acuity and length of stay and competition for supervisors (Mitchell, 2003; Moore, 2005; Tanner, 2006; Canadian Association of Schools of Nursing, 2007, Baxter et al., 2009, McCall, Wray & Lord, 2009; Willis, Pointon & O’Meara, 2009; Institute of Medicine, 2010)

An example of the challenge involved in the teaching of paramedics arises in the area of intubation. Although widely considered to be a ‘gold standard’ for patient care, a dramatic reduction in the number of patients in which this intervention is performed in Anaesthetic Departments (where paramedic would traditionally be trained in this procedure) has created an urgent need to develop alternative educational strategies (Woollard & Furber, 2010).

The demands required of paramedic graduates is increasing as the need for graduates is becoming greater, yet this situation is occurring in a context where there is a limited availability of sites where students can gain valuable clinical experience. In outlining the changing nature of the Victorian paramedic workforce, Joyce, Wainer, Piterman, Wyatt & Archer (2009), who could be describing the characteristics of paramedicine in every state in Australia, state that:

- Demand for ambulance services has been forecast to continue to increase in the coming years (p.533);
- Substantial increases in paramedic student numbers are likely to place considerable pressure on Ambulance Victoria’s capacity to provide clinical placements (p. 537); and

- Some courses are reducing clinical placement hours in an attempt to accommodate more students (p. 537).

Creative alternatives are being developed to ensure that students receive the necessary experiences to develop and practice their clinical skills (Baxter et al., 2009), and one such alternative, has been through the increased utilisation of simulation learning environments (SLEs).

What Is Simulation
Although healthcare has a long history with simulation, Gaba (2004) attributes the growing interest in simulation to its use in the high-risk areas of commercial aviation, nuclear power production, and the military. Simulation has been defined by Gaba (2004) as "…a technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion." Fibson (1985) similarly highlights the essence of simulation as "a replication of the essential aspects of reality so that reality can be better understood, controlled and practiced." Although there is as yet no common classification system for simulation, researchers have produced their own simulator typologies (Decker, Sportsman, Puetz, & Billings, 2008; Reznick & MacRae, 2006, Seropian, Brown, Gavilanes & Driggers, 2004).

Table 1 Modified summary of Simulation Typology (Decker, Sportsman, Puetz, & Billings, 2008)

Simulation Typology	Definition	Recommended use
Partial task trainers (low-tech simulators)	Models or mannequins used to learn, practice, and gain competency in simple techniques and procedures	To learn, develop, and evaluate competency in a specific skill (e.g., venipuncture, airway management or defibrillation); patient scenarios can be integrated into the learning experience to promote learners' development of critical thinking
Peer-to-peer learning	Peer collaboration used to develop and master specific skills	To learn, develop, and evaluate competency in basic health and physical assessment
Screen-based computer simulations	Computer programs used to (1) acquire knowledge, (2) assess competency of knowledge attainment, and (3) provide feedback related to clinical knowledge and critical-thinking skills	To learn, develop, and evaluate competency in a specific skill (e.g., auscultation of heart and lung sounds and dysrhythmia interpretation) and integrate this knowledge and skill into patient care scenarios that require critical thinking
Virtual reality	Combines a computer-generated environment with tactile, auditory, and visual sensory stimuli provided through sophisticated partial trainers to promote increased authenticity	To learn, develop, and evaluate competency in a specific skill (e.g., intravenous catheter insertion and performing a tracheal intubation)
Haptic systems	A simulator that combines real-world and virtual reality exercises into the environments	To develop and evaluate competency in a specific skill with real-time tracking of the practitioner's performance
Standardised patients	Uses case studies and role playing in the simulated learning experience; individuals, volunteers, or paid actors are taught to portray patients in a realistic and consistent manner	To develop and validate competency related to communication skills while completing an interview, performing a physical assessment, and devising a plan for a patient
Full-scale simulation (medium to high fidelity)	Simulation that incorporates a computerised full-body mannequin that can be programmed to provide realistic physiologic responses to a practitioner's actions; these simulations require a realistic environment and the use of actual medical equipment and supplies	To integrate and evaluate competencies, critical thinking, and clinical judgment related to the synthesis of knowledge, technical and communication skills, and interdisciplinary team in the management of patients with complex problems

Although a lack of consistency and definitions in the use of the terms simulation and fidelity has lead to much confusion (Bradley, 2006), 'fidelity' is described as the extent to which the appearance and behaviour of the simulator⁄simulation match the appearance and behaviour of the simulated system

(Farmer et al., 1999). Beaubien and Baker (2004) emphasise the psychological, environmental and equipment fidelity as all playing a part in determining level of realism, but stress psychological fidelity is possibly the most important in making the simulation real for students. The level of realism or "fidelity" of simulation lies on a continuum (Lammers, 2007). There are three primary categories of simulation; low-fidelity simulators which are simple mannequins or static models and are useful for introducing psychomotor skills. Moderate fidelity simulators are mannequins with heart and breath sounds and provide greater realism than low fidelity models. High fidelity simulators realistically simulate patients in appearance and response and to enable users to relate to the simulator in as similar a manner as possible to that they may encounter in real life.

The use of task trainers together with role play and peer-to-peer learning (see Table 1) have been the foundation of simulation activities through which health professionals have for many years learnt, practiced, and gained competency in simple techniques and procedures. The more recent development of high-fidelity simulated learning, according to Reilly and Spratt (2007), is to provide the participating trainee with the cues required to "suspend disbelief as they immerse themselves in a realistic, dynamic, hands-on, complex situation, requiring critical thinking, problem solving and decision making capabilities" (p.544). Technology has enabled simulation to get even closer to approximating what is 'real.' High-fidelity human patient simulators are computerised mannequins that look like real patients and are programmed to respond physiologically and to a lesser extent behaviourally to students' actions (Decker et al., 2008). When integrated into simulated scenarios, human patient simulators with their responsive computerised physiological functions provide a great degree of realism (Baker et al., 2008). In order to respond appropriately the student is required to integrate knowledge and attitudes, and then to observe the outcomes of their clinical decisions and actions (Baker et al., 2008). Full-scale simulations that are often possible in clinical simulation centres provide a recreated clinical environment (Walnder, 2007), close to lifelike yet simulated environment, that have a great many of the features and equipment students would experience in a "real" clinical situation. To add another dimension to enhance the reality of the learning experience, community actors are often used as standardised patients (Massias & Shimer, 2007). Kyle (2004) highlights the similarity between high-end medical simulation and theatre where:

> Clinical simulation facilities are theatres where plays of illness and treatment are imagined, written, rehearsed, staged, and criticised . . . [S]imulation scenarios need all the components of "real" theatrical productions: scripts, costumes, lines and action cues for all the participants (including the patient simulator), props, and a rehearsal audience for constructive criticism. (p. 96)

While standard simulation centres provides significant opportunities to enhance the learning experience, Lindsay (2006) highlights the environments they create are very dissimilar to paramedics' usual working environment. Out-of-centre simulation events, however, provide an additional dimension that has the potential to contextualise the experience for paramedics. While the majority of the care paramedics provide is to patients with medical problems in the setting of their own homes, more extreme contexts have been recreated through the use of mobile portable simulators (Kobayashi, Patterson, Overly, Shapiro, & Williams, 2008) and through the simulation of motor vehicle accidents that incorporate extrication vehicles that allow realistic rescue scenarios to occur (Langran & Carlin, 2006; Boyle, Williams, & Burgess, 2007).

The delivery of simulation while usually identified as either static, in-situ and mobile can be regrouped for ambulance services (Alinier, 2010). A scenario taking place in an ambulance during transport, which may be deemed 'in-situ' (real setting), may in addition be also considered as 'mobile' (the ambulance is moving) or possibly 'static,' as the ambulance is moving but the patient is static (Alinier, 2010). The majority of care paramedics provide is to patients with medical problems in the setting of their own homes. In these cases the bulk of the interventions are provided before the patient is moved to the ambulance, and increasingly paramedics with extended skills are providing completed care episodes to patients with minor illnesses and injuries and they are discharged at the scene.

The Development of Students

The clinical setting itself is a complex socio-cultural entity that presents numerous opportunities to engage or disengage in learning (Newton, Jolly, Ockerby, & Cross, 2010) and may not be the most favourable environment in which to learn (McKenna, French, Newton, Cross, Carbonnel, 2007; Ward-Smith, 2008). Students on placement report not being valued (Bradbury-Jones, Sambrook & Irvine, 2010) and paramedics understanding of, and ability to supervise students on placement, varies considerably (McCall et al., 2009). Some supervisors are unaware of students' learning needs (McKenna & Wellard, 2004) and students can be excluded from patient management (Boyle, Williams, Cooper, Adams, & Alford, 2008). ,

Students on placement or new graduates are in some cases regarded as an additional burden (McCall et al., 2009), and when the burden is at its extreme, the term "horizontal violence" has been applied to describe the bullying and aggression that can occur (Curtis, Bowen & Reid, 2007; Longo, 2007). The relationship with the paramedic supervisor is decisive (McCall et al., 2009), and staff make a critical contribution to students' education and determine how the clinical experience will contribute to the ongoing education of the student/graduate (Levett-Jones et al., 2006). It is vital then that students entering the clinical arena are as confident and competent as practicable and are optimally prepared for their placement experience.

Levett-Jones and Lathlean, (2009) importantly highlight how the development of confident, competent professionals with a healthy self-concept and a commitment to patient-centred care and self-directed learning is strongly influenced by the extent to which the students' clinical placement experiences promote and enhance their sense of belonging. SLEs provide an environment where students can become more proficient in many of the skills and functions required of them in the clinical situation. More prepared, the clinical experience may be more agreeable, and therefore dissuade students from dropping out (Ward-Smith, 2008). Prior experience with simulation, in heightening a students' preparedness for the placement, is also thought to be advantageous to relieve the pressure on mentors/preceptors during clinical placements (Moule, Wilford, Sales, & Lockyer, 2008).

Simulation and Risk

There is a dearth of research on medical and medication error in the prehospital environment (Hobgood, Bowen, Brice, Overby & Tamayo-Sarver, 2006), yet the studies that do exist highlight the need for an increased focus of attention in this area. Many errors that occur in the pre-hospital phase of care are the result of failures to identify and treat injuries (Batchelder, Steel, Mackenzie, Hormis, Daniels & Holding, 2009). In a drug calculation examination conducted with practicing paramedics (Hubble, Paschal, & Sanders, 2000) the average score was found to be 51%. A more recent review of undergraduate paramedic student's mathematical proficiency by Eastwood, Boyle, & Williams (2010), highlighted deficiencies still exist in the drug calculation abilities of the paramedics sampled. While technical and environmental conditions complicate the prehospital environment, the translation of strategies that minimise error that are effective in controlled medical environments do not necessarily work as well in emergency prehospital settings (Crossman, 2009).

Gantt and Webb-Corbett (2010) describe the irony, where the same 21st Century hospital system provides both life-saving technologies and the potential for life-threatening errors. Simulation provides a context in which students can repetitively rehearse skills in a safe environment and as such promotes safe practice in an increasingly litigious society (Murray, Grant, Howarth & Leigh 2008) without the fear of harming a live patient (Schoening, Sittner & Todd 2006; Dillard et al., 2009). Simulation has been found to afford opportunities to increase knowledge, practise and develop skills in a safe environment (Moule et al., 2008; Strouse, 2010), improve medication calculations skills (Hutton, Coben, Hall, Rowe, Sabin, Weeks & Woolley, 2010), teach important patient safety principles and competencies (Henneman, Cunningham, Roche, & Curnin, 2007; Ironside, Jeffries, & Martin, 2009), develop skills in safe patient handling (Kneafsey, 2007) and teach hand washing and patient identification skills (Gantt & Webb-Corbett, 2010). Students' who have performed unsatisfactorily during clinical placement that require remediation can use SLEs to practice their skills to minimise the likelihood of error prior to returning to a clinical setting (Haskvitz & Koop, 2004).

Clinical Situations Otherwise Not Encountered
In his review of student perceptions of their clinical learning environments in the United Kingdom, Lewin (2007) noted that a persisting haphazardness in practical instruction" (p. 246) and there were "unacceptable variations" in clinical learning opportunities (p. 245). Clinical placements can often result in missed opportunities for learning (Andrews et al., 2006). A study published in 2009 with data from 21 paramedic students (McCall et al 2009) highlighted the unpredictable nature of paramedic work restricts the exposure students have to a variety of learning experiences while on placement. Salzman, Page, Kaye, & Stetham, (2007) reported a majority of paramedicine students in the U.S.A. completed less than half of the National Standard Curriculum-Paramedic *(*NSC-P) recommendations for ventilations on an un-intubated patient, psychiatric patient assessments, paediatric respiratory distress assessments, and obstetric patient assessments, and conclude that the majority of paramedic students are not completing the requirements of the NSC-P. In some cases clinical supervisors may not provide sufficient opportunities for students to apply their skills (McKenna & Wellard, 2004) and, trained as paramedics rather than educators, they may be unaware of students' learning needs (McCall et al., 2009). Competition from other health care students in the operating room limits the amount of exposure paramedics have to endotracheal intubation (ETI), despite paramedics often being the first to provide emergency care (Johnston, Seitz, & Wang, 2006).

The simulation environment importantly provides students with the opportunity to participate in varying clinical situations that they may not have experienced, or would not otherwise be encountered. High-risk low-volume experiences provide little opportunity for students to validate their skills and simulated experiences provide an avenue to provide students with exposure to potentially life-threatening clinical situations that are rarely experienced until the actual situation arises (Berndt, 2010). Simulation enables faculty to provide structured experiences to ensure students are offered a range of learning opportunities not always available in practice (Nehring, Ellis & Lashley, 2001; Moule et al., 2008). The ability to guarantee students' have experiences through SLEs they might otherwise not encounter during their clinical placement is crucial.

Human Factors / Interprofessional Learning
Traditionally simulation has been utilised to enhance psychomotor skills and clinical procedures, however, it is increasingly being used to teach and assess a greater variety of non-procedural clinical skills (Flanagan, Clavisi & Nestel, 2007). The focus on psychomotor skill and development of high-tech solutions has to some extent been promoted over other aspects of practice, such as what have been termed soft-skills or human factors such as communication and interpersonal skill development (Wellard, 2007). Paramedicine education has been said to be "heavy in clinical skills and light on soft skills" (Willis et al, 2009). Simulated learning environments have been utilised to help students anticipate personal reactions and develop appropriate coping mechanisms in end-of-life education (Hamilton, 2010), enhance work organisation and people management skills (Warland, 2010), improve decision making processes (Haigh, 2007), and to teach relational skills in family nursing (Eggenberger & Regan, 2010). Simulated environments through their ability to create multidisciplinary environments also play an important part in helping to bridge silos (Baker et al., 2008) and studies indicate multidisciplinary team skills teaching in simulated environments improves medical emergency team performance (DeVita, Schaefer, Wang & Dongilli, 2005), and fosters collaborative practice through interprofessional learning (Jeffries, McNelis & Wheeler, 2008; Reese, Jeffries & Engum, 2010). The collaborative approach is consistent with the World Health Organisation (1988) proclamation that interprofessional approaches are a key area of health professional development.

Challenges to Overcome
While students' perceptions of simulation are most often extremely positive, their experience is inextricably linked to the manner in which they are introduced to the concept of simulation and how subsequent sessions are conducted (Alinier, 2005). Some students are excited by the technology and the challenges that it affords, are willing to use it on the condition that it does not cause them discomfort or anxiety (Baxter et al., 2009). Some paramedics do find simulators stressful (Lammers, 2009), yet other students have reported that simulation increases their confidence (Baxter et al 2009). Some students feel uneasy when interacting with a lifeless mannequin that they consider is 'not the real thing' (Decarlo, Collingridge, Grant, & Ventre, 2008), preferring to talk to a 'real' person (Bantz, Dancer, Hodson-Carlton & Van 2007). Paramedics' evaluation of patient simulators indicated that as

a general concept, the educational experience with simulators was positive (Wyatt, Archer, & Fallows, 2007) and research with general health disciplines, that included paramedics, identified a general acceptance of patient simulators as a training tool (Bond, Kostenbader, & McCarthy, 2001). Notwithstanding, students have also highlighted the need for learning experiences within clinical simulation to be more authentic (Pike & O'Donnell, 2010). The lack of specific physiological and any emotional responses has been seen to be a clear disadvantage to holistic patient care (Hicks, Coke, and Li, 2009). The overuse of automated equipment has been thought to have the potential to de-skill (Shepherd, McCunnis, Brown & Hair, 2010) and some educators maintain that the spotlight on simulations detracts from time spent in real-world clinical settings (Nehring & Lashley, 2004). Research on simulation repeatedly indicates that simulation could complement but not replace the clinical experience (Hallal and Welch, 1984; Gomez and Gomez 1987; Love, McAdams, Patton, Rankin & Roberts, 1989; Sabin, 2001; Jeffries, Rew & Cramer, 2002; Morgan, 2006).

Given the challenges surrounding the provision of adequate placement opportunities, it has been suggested that an alternative model of paramedic education is warranted that includes simulation (Boyle, Williams, & Burgess, 2007). Although it has been suggested that the current pressure on clinical placements will not be solved through simulation or alternative venues (Willis et al 2009), some are suggesting that simulation could contribute to alleviating the burden by not entirely replacing practical hands-on clinical experience, but rather, replacing elements of clinical placements (Williams, French, & Brown, 2009).

Other concerns regarding the implementation of SLEs are the lack of supporting theory and evidence-based research supporting the use of simulation; and the time-consuming nature of creating scenarios, setting up the lab, and planning for role plays for already overwhelmed instructors (Sanford, 2010), initial costs and sustainability (Pattillo, Hewett, McCarthy, & Molinari, 2010), and competence levels of simulation instructors (Dieckmann, Rall, & Sadler, 2008).

Enrolling University Faculty

It is vital that faculty/trainers are themselves fully competent in the simulation skill they are utilising and aware of the strengths and limitations of any training medium they use (Maran & Glavin, 2003). It is important that faculty/trainers are able to combine elements of explaining, refereeing, coaching and discussing (Schoening et al., 2006), are adequately prepared to provide simulation training with clear guidelines on designing, developing, running and evaluation (Alinier et al., 2006; Shepherd et al., 2010), and that they allow students to learn from their mistakes (Alinier et al., 2006).

Although faculty are considered vital to the ongoing uptake of effective simulation-based education, a large number of nursing programs and faculty members are resistant to utilising simulation as a learning tool (Starkweather & Kardong-Edgren, 2008; IOM, 2010). Jeffries states that the most significant barrier to the use of technologies is "convincing faculty to use them" (IOM, 2010 p.22). A recent study by Adamson (2010) identified a lack of both time and support, and the lack of appropriate equipment as barriers faculty experience when integrating simulation into their courses. Although simulation has been purported to ease some of the burden on preceptors (Moule et al., 2008), many faculty find simulation to be a very time-intensive teaching method (Lammers, 2007). The importance of dedicated faculty to champion simulation has been highlighted (Katz, Peifer & Armstrong, 2010), and appropriate means to support faculty include the provision of appropriate resources, additional training and support from colleagues and administrators, and financial incentives (Adamson, 2010). Importantly, it has been stated that simulation is only as good as the faculty who use it (Fowler Durham & Alden, 2008).

Under Use of Equipment

Adamson (2010) considers the use of simulation has been remiss in highlighting the possible underutilisation of equipment. King, Moseley, Hindenlang & Kuritz, (2008) in their exploration of faculty beliefs, acknowledge underutilisation as a curricular issue, yet one that is also linked to resource allocation. Maran and Glavin (2003) highlight the number of new simulators that are purchased annually, yet lie under-utilised due to the lack of faculty who are aware of the educational principles that underpin simulation, and posit contemporary advances in technological innovation have eclipsed advances in instructional design and suggest this disconnect must be addressed.

Programs are thought to spend a disproportionately large amount of money on the initial investment in simulation equipment relative to the ongoing spending on maintenance and support, and as a consequence, simulation resources often not used to optimise their full potential (Adamson, 2010).

Paramedicine Research
Despite rapidly increasing use of simulation based teaching methods, there has been surprisingly little research on the effect of simulation based facilities on learning outcomes. Although the instruments to assess technical and non-technical skills have been shown to be reliable during paramedic simulation training (von Wyl, Zuercher, Amsler, Walter & Ummenhofer, 2009), McFetrich (2006) highlighted that most evaluations used observation or self report satisfaction questionnaires and more evidence of the educational and clinical value of simulators is needed. The adoption of new simulation initiatives requires adequate resources, time and attention to be successful (Baxter et al., 2009) although the time and resource intensive nature of embedding simulation into curricula precludes many educators from taking the time necessary to implement controlled research studies to evaluate programs appropriately (Radhakrishnan, 2007). Lewis, Davies, Jenkins, and Tait (2001) highlight that many research conclusions are invalidated due to research design flaws (e.g., lack of control groups, small sample sizes), which they consider does not invalidate simulation learning, but rather requires a more critical approach when implementing results. It has been said the research methods utilised are underdeveloped (Schmitt, 2002) and determining the effectiveness of simulation education difficult due to a lack of robust evidence in the literature (Cant and Cooper, 2010). Nehring and Lashley (2009) importantly highlight the challenges inherent in measuring performance in a controlled setting as compared to the real life clinical setting where unpredictable and simultaneous events occur, preventing control of all extraneous variables. A recent review of currently published evaluation instruments for human patient simulation suggests the lack of valid and reliable instruments is impedes the uptake of simulation (Kardong-Edgren, Adamson & Fitzgerald, 2010).

There is a preponderance of research on simulation in medicine relative to nursing and allied health groups (Flanagan, Clavisi, & Nestel, 2007), but scant evidence regarding its use in paramedicine (Gordon et al., 2005: Smith & Eastwood, 2009). Of the 458 articles selected for a review of simulation in healthcare by Flanagan, Clavisi, & Nestel, (2007), the vast majority (95%) used simulation in medical populations (e.g. medical students, trainees and professionals). A smaller number of studies evaluated simulation in nursing (13%), and fewer still among allied health groups (10%). Although there is debate over the term ‘allied health’ in relation to paramedicine (Willis, Pointon & O’Meara, 2009), paramedicine was classified in the research conducted by Flanagan et al. with 11 other vocational categories (i.e. physiotherapy, occupational therapy, pharmacy, social work, dietetics, psychology, podiatrists) and indicates the limited research in the area of simulation and paramedicine.

Although medicine enjoys a broader consumption of simulation techniques and a more outcome oriented and evidence-based research agenda (Schiavenato, 2009), paramedicine is not alone in their lack of evidence for best practice and use of the simulation to achieve optimum learning outcomes. In their recent critical review of 32 research studies on the effect of practice on standardised learning outcomes in simulation based medical education, McGaghie, Issenberg, Petrusa & Scalese (2010) contend that to advance the field of medical education research more rigorous methods and more rigorous journal editorial policies are essential. It has been suggested there is a dearth of funding for research (Dikelmann and Ironside, 2002; CASN, 2010), and the call for more research to determine best practices and use of the simulator to achieve optimum learning outcomes is resounding (Brannan, White, & Bezanson, 2008; Zungalo & Corcoran, 2003, Borneuf & Haigh, 2010; CASN, 2010; IOM, 2010). In their College of Paramedics (British Paramedic Association) position paper regarding the Joint Royal Colleges Ambulance Liaison Committee recommendations on paramedic intubation, a core skill in paramedicine, Woollard and Furber (2010) in highlighting the current lack of knowledge, stated:

> …such mannequins are becoming increasingly sophisticated, and certainly provide the opportunity to train in the context of more realistic prehospital scenarios and patient positions than conducting the procedure on a relaxed patient at waist height in a well-lit anaesthetic room. Before making changes to the delivery of intubation by paramedics, it seems reasonable to suggest that research is conducted into skill acquisition and

> competence following training using state-of-the-art simulator mannequins, either alone or in conjunction with significantly reduced numbers of intubations in anaesthetised patients. (p. 168)

Acker (2008) acknowledges the lack of data to prove the validity of the tools and techniques used in simulation based education, but asserts, "many of the tools educators currently use have never been validated" (pp. 63). Similarly, Peggy Ward-Smith (2008) concedes the lack of evidence base to support simulation is not unique and that many nursing interventions are not based on sound research evidence.

Simulation Literature

Notwithstanding the research limitations previously described, a significant body of literature identifies how students feel about using simulation and its strengths and limitations in their education. Studies evaluating simulation based on students' perceptions are overwhelmingly positive (Johnson, Zerwic, & Theis, 1999; Ker, Mole, & Bradley, 2003; Weller, 2004; Mole and McLafferty, 2004; Baxter et al., 2009). Through the use of simulators, especially intermediate and high fidelity simulators, students and faculty describe an elevation in student's self-confidence/self-efficacy (Bremner, Aduddell, Bennett & VanGeest, 2006; Schoening et al., 2006; Bantz et al., 2007; Linder & Pulsipher, 2008; Pike & O'Donnell, 2010). Research also indicates that simulation leads to an increase in critical thinking, knowledge, decision making (Nehring and Lashley, 2004; Schoening et al., 2006; Lasater, 2007; Reilly and Spratt, 2007) and students feel engaged in their learning because it reflects reality (Lasater, 2007; Nehring and Lashley, 2004; Reilly and Spratt, 2007).

More specifically, recent research has indicated the efficacy of SLE in a disparate range of settings including: to prepare students to competently measure blood pressure in real-world environments (Bland & Ousey, 2010), emergency preparedness (Morrison & Catanzaro, 2010) identify the most common performance deficiencies in paramedics' management of paediatric emergencies (Lammers, Byrwa, Fales, and Hale, 2009), in the assessment and management in the emergency care of children with special health care needs (Spaite, Karriker, Seng, Conroy, Battaglia, Tibbitts, & Salik, 2000), training first responders in a mass casualty event through immersive virtual reality simulation (Wilkerson, Avstreih, Gruppen, Beier, & Woolliscroft, 2008) and disaster management competency and interprofessional attitudes (Atack, Parker, Rocchi, Maher, & Dryden 2009).

More specifically:

- Hall, Plant, Bands, Wall, Kang, & Hall, (2005) conducted a study with paramedic students (n = 36) to identify success rates at endotracheal intubation (ETI) on either a human patient simulator or on human subjects in the operating room (OR). Students were randomised into either the patient simulator (SIM) for 10 hours, or performed 15 intubations on human subjects in the OR. Formalised testing occurred in the OR where all students conducted 15 intubations. The primary outcome was the rate of successful intubation. Overall the intubation success rate was 87.8% in the SIM group and 84.8% in the OR group. First attempt success rate was 84.4% in the SIM group and 80.0% in the OR group. Hall et al. (2005) conclude that in the OR paramedic students trained in ETI on a simulator are equally as effective as students trained on human subjects.

- Gordon et al. (2005) conducted a 10-month study of 497 paramedics that attended one-day stroke classes, that included three hours of lectures and five hours of simulation enhanced interactive training and small-group sessions. To increase paramedics' stroke knowledge and paramedic skills with stroke patients, four case scenarios were developed. Three lay actors and one paramedic actor were utilised as standardised patients. Both pre-post scores and post course observations indicated there was a significant improvement in the ability of paramedics to take histories, complete neurological examinations, and communicate interprofessionally regarding patients with focal brain syndromes.

- Batchelder et al. (2009) conducted a pilot study of the effects of simulation as a tool for teaching doctor-paramedic teams (physicians N=6, paramedics N=6) to deliver pre-hospital anaesthesia safely. Exposed to 43 full immersion, high-fidelity simulations over a 12-day period, course performance score comparisons (at day 4 and days 9/10) indicated an increase in total time (from arrival on scene to inflation of the tracheal tube cuff), a decrease in the number of safety critical events per simulation, and an improvement in crew resource management behaviour scores. Although total time from arrival on scene to inflation of the tracheal tube cuff increased, authors consider the increased time represented a concomitant increase in safety and quality and the change represented and improvement. Participants reported increased confidence. The authors caution against attributing improvements exclusively to the use of simulation, and note that with repeated practice and exposure to clinical environments improvements would also be expected without simulation.

- Aziz, Dillman, Kirsch, Brambrink (2009) investigated the effectiveness of the Macintosh video laryngoscope (MVL) via the TELE PACK system for facilitating intubation by 25 novice paramedic students in a simulated environment rather than the operating room setting. Students were randomised to attempt laryngoscopy with either a conventional Mac3 blade alone or the Mac3 blade with MVL with the mannequin in both normal and supine positions. Participants achieved a significantly improved percentage of glottic opening (POGO) using the Mac3 blade plus MVL compared with the Mac3 blade alone. Findings indicated that the MVL improved the laryngeal view for novice users in a simulated setting and the improvements were greater in more challenging scenarios (i.e., neck stiffened).

- Lee et al., (2010) conducted a Advanced Cardiac Life Support (ACLS) study with 30 non-English-speaking international paramedic students. The control group (N=15) was taught a traditional ACLS course and the remaining students (N=15) received scenario-based performance-oriented team instruction (SPOTI). After being tested using ACLS megacode, an average of 85% of the core skills were met in the control group and 93% in the SPOTI group. The SPOTI group scores were superior at airway opening, assessment of breathing, signs of circulation, and compression rates, and scored higher on rhythm recognition than the control group. The control group performance levels were higher in providing appropriate drug dosages relative to the SPOTI students. The SPOTI group achieved higher megacode core compliance scores than control students, although the researchers noted statistical significance was not achieved due to the small sample size.

- Lavelle, Denning, Ihnken, Benney, & Loberg (2006) conducted a study with 20 critical care RNs and paramedics on a six-week critical care flight orientation. After identifying which elements of the course could be enhanced through simulation, scenarios were developed to accelerate learning of critical processes, thinking skills, communication and teamwork. Experienced staff, healthcare providers and family were standardised patients. The process of simulation/debriefing was considered a safe and efficient means to conduct orientation and simulation was perceived to be a strong modality to augment the level of bonding required in medical air transport runs. Staff observers reported that participants in this orientation that included simulation displayed higher levels of confidence, skill and communication behaviours relative to previous groups that had not received the same simulation orientation. Faculty also reported the simulation orientation this cohort experienced quickly enhanced their situational awareness, and a rapid movement of orientees to intermediate level practice was noted.

- Ravert (2002) conducted a review of medical and nursing literature to identify quantitative studies related to determine the effect of computer-based simulation on learning. Of the 513 references that met the inclusion criteria, four studies were conducted by registered nurses, using samples of nurses. Across both medical and nursing studies, seventy-five percent of the studies indicated positive effects of simulation on knowledge acquisition and/or skills training.

- Harder (2010) in her systematic review of health care education identified 23 articles published between 2003-2007 relating to the effectiveness of high-fidelity patient simulators as an education tool for clinical skills and performance. The review noted 10 studies were conducted with practicing health care professionals and 13 with students. Overall, 16 were conducted in nursing, six in medicine, and one in an interdisciplinary environment (i.e., nursing, medicine, respiratory therapy). Simulation, as opposed to other education and training methods (e.g., traditional psychomotor skills laboratory sessions with task trainers, computer-based programs, and lecture classes), in the majority of the studies increased the students' clinical skills. Three studies indicated there was no difference between traditional teaching modalities and simulation, although none of the studies identified there was a decrease in the simulation group.

- McCaughey and Traynor (2010) conducted a descriptive survey of 153 third year undergraduate nursing students who were approaching the transition from nursing student to staff nurse, to evaluate the role of medium to high fidelity simulation in the preparation for clinical nursing practice. Seventy-two percent (n=67) of nursing students who agreed that SLE experience prepared them for the transition from student to qualified nurse and 92.5% (n=86) acknowledged their confidence was enhanced. They conclude that their study strengthens the case to utilise simulation as a means of linking theory to practice.

- Cant and Cooper (2010) in their recent review of the quantitative evidence for medium to high fidelity simulation in nurse education relative to other educational strategies, found that all studies showed simulation techniques were a valid method of education. Although only half of the studies that employed control groups found additional gains in knowledge, critical thinking, perceived clinical confidence or satisfaction. Although they acknowledge the limitations of their research, where best practice guidelines are adhered to and relative to other strategies for teaching and learning (e.g., case studies, student group interactions) simulation may have some advantages over other methods (Cant and Cooper, 2010).

Simulation and Practice Learning
Tanner (1987) questioned whether the judgements made during simulation were representative of the process that would occur in actual clinical practice. There are very few studies that definitively demonstrate transfer of simulation-based learning into the clinical environment and limited empirical evidence to support its effect on clinical practice (Murray et al., 2008), and the degree to which simulation can enhance practice learning is under consideration. In his report on simulation in healthcare Flanagan et al. (2007) concluded:

- There are very few studies that demonstrate transfer of simulation-based learning into the clinical environment
- There is little in the way of rigorous research on the use of simulation to explore decision-making, communication and teamwork/leadership skills
- In terms of professional groups there is almost no research in terms of the use of simulation for allied health professionals, and relatively little in nursing compared to medicine
- The role of simulation in continuing professional development, competency assessment and remediation is still relatively under-explored

While acknowledging the evidence supporting the use of simulation to facilitate the transfer of knowledge to performance is in its infancy, findings indicate that simulation is perceived to be a valuable method of learning, which has a positive effect on the clinical effectiveness of students approaching the transition to become registered (McCaughey & Traynor, 2010). However, it is the actual, rather than perceived impact of simulation on placement performance that is yet to be established (Baillie and Curzio, 2009). The degree to which skills acquired during simulation transfers to practice is often supported only by anecdotal evidence (Alinier et al., 2006). Despite the dearth of studies to show transfer of skills from simulation-based activities to clinical practice, there are a number of studies that have addressed the issue both directly and indirectly:

- Conradi, Kavia, Burden, Rice, Woodham, Beaumont, Savin-Baden, & Poulton (2009) conducted a study on virtual patients (VPs) delivered through a virtual world platform with 10 first-year direct entry paramedic students with no prior experience of Second Life (SL), and a second cohort of 10 mixed first and second year paramedic students. The group work involved making decisions regarding arrival at the 'accident scene,' evaluating the situational context, deciding where to park the ambulance and determining if back up was required and if/how a patient should be transported to hospital, and finally, completing a handover card at hospital. Notwithstanding technical issues experienced during the study (e.g., relatively high technology demands), students reported feeling engaged effectively in the learning process and considered SL had the potential to provide a more authentic learner environment than classroom-based problem-based learning (PBL).

- Alinier, Hunt, Gordon and Harwood (2006) conducted a study of undergraduate nursing students (N=99) and compared the performance of students in traditional clinical settings with those that received clinical experience (control) and clinical plus simulation experience (experimental). Results using the Objective Structured Clinical Examination (OSCE) indicated that students in both groups improved their clinical performance; although, the experimental group improved their performance on the OSCE 14 to 18 percentage points (95% CI 12.52-15.85) compared to seven to 18 points (95% CI 5.33-9.05) in the control group. In this study Alinier et al compared clinical experience with clinical experience plus simulation, and not clinical experience and simulation.

- Radhakrishnan, Roche, & Cunningham (2007) conducted a study of the learning outcomes of students using the Laerdal SimMan HPS. A convenience sample of second-degree, senior baccalaureate nursing students was utilised to compare their clinical performance with and without HPS exercises. Students were randomly assigned to the intervention or control group. Students involved in the study had previously completed 320 hours of internships. Performance addressed safety, basic assessment, prioritisation, problem-focused assessment, appropriate interventions, delegation, and communication. Results indicated that in safety and basic assessment, students in the intervention group scored higher, although the control and intervention groups' performances were similar in other categories (e.g., focused assessment, interventions, delegation, and communication (Radhakrishnan et al., 2007).

- Moule et al., 2008 conducted a study with 69 adult and children’s pre-registration first and third year nursing students. Their research question was “Can the use of simulation support pre-registration nursing students in familiarising themselves with clinical skills before consolidating them in practice settings” (Moule et al., 2008, 791). As a Nursing and Midwifery Council pilot site they were commissioned to investigate the extent to which designated practice hours for simulation would support the development of a range of clinical skills (e.g., basic life support, manual handling, infection control, clinical decision making and managing violence and aggression) amongst pre-registration nursing students. The group attended five simulation sessions and Moule et al. assert that quantitative and qualitative results indicate “simulation can support the development of knowledge and skills in a range of clinical practice scenarios, offering opportunities for skill rehearsal, feedback and testing prior to consolidation in practice” (2008, p796).

- Baillie and Curzio (2009) conducted a study with 88 control students who undertook their usual clinical placements and 179 students that undertook a simulation programme. Students that participated in simulation stated that it increased their ability and confidence and reported not feeling disadvantaged by the reduced clinical placement hours. Both facilitators and students rated the simulation programmes very positively. Although at the completion of the placement most simulation students reported feeling confident in their skill level, at the completion of the placement period there was no significant difference between the confidence of the simulation and control group. Baillie and Curzio (2009) conclude that simulation is at least as effective as a conventional practice placement.

- Hicks, Coke & Li, (2009) conducted a randomised controlled study of undergraduate nursing students (N=58) taking a critical care nursing course. The aim of the study was to examine differences between traditional clinical experience and simulation as teaching methods, and identify how simulation learning affects knowledge, clinical performance, and self-efficacy compared to those with traditional clinical experiences. Students were randomly assigned to either simulation alone (30 hours), clinical alone (30 hours), or a combination of simulation and clinical (15 hours each). Results indicated that all groups had statistically significant decreases on knowledge scores although the simulation group appeared to retain the least. Hicks et al found the differences in clinical performance were not statistically significant, although the simulation group did not perform as well as the combination and clinical groups. Students in the simulation and combination groups had statistically higher self-confidence scores than students in the clinical group. Although the evaluation showed significant increase in self-confidence and perceived abilities by the students, Hicks et al highlight that this perception is not enough in determining higher level problem solving, decision making, and psychomotor skills and conclude that the effects of simulation on the clinical performance of nursing students remain inconclusive.

Chapter Four: Heads of School Feedback

Method
Heads of Schools were sent a letter requesting their assistance and involvement in the project. The letter to each Head of School (N=13):

- Identified the project team;
- Highlighted the aims and objectives of the project;
- Explained future phases of the project;
- Explicated the project timeline;
- Requested their specific feedback as Heads of School in providing high level feedback; and
- Requested they provide a nominee from their School to complete a forthcoming electronic survey.

Eleven responses were received (85% response rate).

Questions
Nine questions were developed that required qualitative and quantitative responses. The set of questions was purposely kept brief to ensure maximum participation. The questions were as follows:
- Please provide (or attach) an overview of the pre-registration paramedicine degree course in your School (name of course/s, duration, total number of hours that comprise clinical education / assessment)
- Do you think that there are any activities that can be complemented by simulated learning programs (SLPs)?
- Do you think that there are any activities that can be replaced by SLPs?
- What skills/attributes can only be taught in clinical environments?
- Where do you see the opportunities for simulation in the future?
- What do you think would be the benefits, challenges and risks in introducing simulation from a School perspective?
- What do you think would be the benefits, challenges and risks in introducing simulation from the broader profession and industry perspective?
- Funding for infrastructure development and implementation for simulation is being made available. How do you think it might be best spent?
- Do you consider you are providing something innovative and or high quality in simulation in paramedicine?

Results: Heads of School Feedback
Q1. The table below details the Head of School questionnaire responses regarding the pre-registration/entry to profession courses offered in each school/faculty, the course duration and the number of hours that comprise clinical education/assessment. The table indicates the various categories of pre-registration courses offered and includes both the mean clinical education/assessment hours and range of clinical education/assessment hours for courses within each category.

Table 2 Breakdown of clinical education/assessment hours

Item	Mean Hrs	Range
• Clinical Laboratory	• 283 hours	• 50 – 750 hours • (median 239 hours)
• Simulation	• 190 hours	• 48 – 320 hours • (median 233 hours)
• Clinical Placements	• 624 hours	• 200 - 1625 • (median 530 hours)
• Other (e.g. online simulation, theory, or not specified)	• 1087 hours	• 200 – 2500 • (median 560 hours)

Q2. Do you think that there are any activities that can be complemented by simulated learning programs (SLPs)?

Yes	Examples
• 100%	• Clinical Skill Development • Professional Practice • Clinical Judgement/reasoning • Major Incident/mass casualty • Experiencing rare clinical cases • Communication • Assessment • Teamwork • Time management • Mental Health Scenarios
No	**Examples**
• Nil	• N/A

Q3. Do you think that there are any activities that can be replaced by SLPs?

Yes	Examples/suggestions
• 64%	• Appropriate use has the potential to substitute for a % of clinical placements • Even if clinical placements were obtained, many cases that can be presented in SLP's might rarely be experienced by novice paramedics. SLP can address such shortfalls • Manual Handling • Simulating cases for problem based learning allowing the opportunity to reflect • Psychomotor skills • Complex medical/trauma cases • Mass casualties
No	**Examples/suggestions**
• 36%	• Simulation should be used to augment rather than replace.

Q4. What skills/attributes can only be taught in clinical environments?

Predominant themes	Examples
• Professional Practice	• Industry culture • Shift work • (The effect of) fatigue • Interprofessional practice • Team work
• Communication	• Breaking bad news
• Performance under pressure	• Time management
• Reality (environment, emotion, logistics)	• Visual assessment (patient looks pale, drowsy etc...) • Situational awareness • Driving under emergency conditions • Although these things can be replicated with careful planning, it is unlikely to be achieved in a busy teaching unit without excessive resource allocation

Q5. Where do you see the opportunities for simulation in the future?

Predominant themes	Examples
• Enhanced student clinical learning	• Interprofessional Learning • Opportunity to significantly develop and refine skills • Developing and embedding a greater variety of "Soft Skills" (also known as human factors) into the curriculum • Consistency in training

• Enhanced Capacity	• Coping with high numbers of students and limited clinical placements
• Commercial opportunities	• Involve other emergency services and key stakeholders in the education of paramedics through simulation • Collaborative links can be strengthened by allowing others to share simulation facilities and activities
• Assessment	• Assessment of leaning outcomes • Improving and increasing opportunities for assessment • recertification
• Preparation for clinical placement	• Augmenting and preparing for clinical time • To complement clinical placements • demonstrate competency prior to clinical placement
• Risk Management	• perfect practice to reduce risk • reduce patient management error rate
• Embracing technology	• Using human patient simulators • New equipment and procedure testing

Q6. What do you think would be the benefits and challenges in introducing simulation from a School perspective?

BENEFITS

Predominant themes	Examples
• Preparation for practice	• Better prepared and more confident students prior to clinical placements • Increase training and case exposure • Lessen the financial and logistical pressures that seeking and securing clinical placements • Enhances learning in the clinical setting • Student satisfaction • Interprofessional opportunities
• Safe Learning Environment	• Allows student learning to occur in a safe setting prior to real application
• Risk Management	• Reduction in Clinical risk • Reduction in OS&H risks

CHALLENGES

Predominant themes	Examples
• Cost	• Resource intensive • Start up costs • Getting HoS on board
• Resources (Physical)	• Temptation to purchase high tech equipment • Limitation of equipment
• Logistical	• Scheduling, competing demands
• Resources (Staff)	• Dedicated simulation staff • Staff training • High staff to student ratio
• Quality	• Measuring student outcomes • Lack of credibility in recognition of simulation as an augmentation to clinical time

RISKS

Predominant themes	Examples
• Resources (staff)	• Dedicated staff
• Reduction in clinical placement time	• Used to replace clinical hours • Simulation being accepted as a replacement for real clinical time
• Quality	• Large numbers of students per group due to funding or staff shortage • Absence of an effective simulation environment can reduce the effectiveness and realism of the scenario • That organisers are unaware of the time commitment required in the planning stages before any activity is

	used, and that they get lulled into the belief that simulation equals expensive equipment.
• Costs	• Set up and maintenance costs

Q7. What do you think would be the benefits and challenges in introducing simulation from the broader profession and industry perspective?

BENEFITS

Predominant themes	Examples
• Preparation of students for practice	• Increased confidence • Increased work readiness • Should provide greater "road readiness"

CHALLENGES

Predominant themes	Examples
• Quality	• The requirement for minimum standards • Significant planning to initiate and implement well
• Costs	• Cost of some of the high fidelity equipment e.g. SimMan • Funding and maintenance of equipment
• • Credibility/acceptance	• Educating industry to the advantages of increased levels of simulation in programs • Ensuring the industry is comfortable with SLP

RISKS

Predominant themes	Examples
• Credibility/acceptance	• If SLE are not embraced by the paramedic discipline there is a real risk of falling behind other health disciplines in terms of professional recognition • Industry expectations without the support of infrastructure
• Reduction on clinical placement time	• Industry perceives simulation as a replacement to clinical placements • Ensuring that simulation does not replace clinical time, but augment it.

Q8. Funding for infrastructure development and implementation for simulation is being made available. How do you think it might best be spent?

Predominant themes	Examples
• Staff training	• Simulation training for staff • Developing a national SLE facilitators competency framework to ensure consistency • Appropriate education for leading simulation users/facilitators must be factored into the implementation process • The main priority is staffing a facility without the appointment of experts in simulation
• Facilities	• Dedicated paramedic high-fidelity simulation laboratory • Mobile ambulance simulator • Facilities that are Interprofessional • Video/audio recording capabilities
• Research	• Investigating the efficacy of learning and skills retention • Researching effective SLP innovations • Developing evaluation tools

Q9. Do you consider you are providing something innovative and/or high quality in simulation in paramedicine?

Yes	Examples
• 73%	• 2 x ambulance simulators

	• 5 x mobile simXpress • High fidelity sim lab for assessment • Standardised Patients • Partnerships with other simulation centres • Use of actors and moulage • Use of prepared latex suits to aid character development
No	**Examples**
• 27%	• Lack of equipment and staff – funding issues

Discussion

Thirteen Heads of School were asked to respond to the survey, and eleven responses were received (85% response rate). Eight different undergraduate programs were identified with a program length of 3 years and a mean number of clinical education and assessment hours of 1695hrs. All respondents believe that SLEs can complement their current teaching activities, with 64% of respondents stating that there are activities that can be replaced by the use of SLEs. There was a consensus that skills related to professional practice such as shift work, fatigue and industry culture could only be taught/learnt in the clinical environment.

Simulation was considered to have great potential to enhance student learning through embedding human factors skill development into curricula, and through the opportunities simulation provides to increase interprofessional learning. Respondents considered this would result in increased student confidence and also result in increased “work or road readiness.” In terms of preparation for clinical placements, simulated learning environments would assist in preparing students’ for the clinical placement, and enable students to demonstrate competency prior to entering the clinical environment.

The use of SLEs and risk management also emerged as a common theme. Respondents commented that SLEs could result in a reduction in both clinical and OS&H risk.
Resourcing simulation activities in terms of both physical and human resources was seen to be a challenge to the introduction of SLEs. Respondents saw a need for dedicated and appropriately trained simulation staff to develop and facilitate SLP’s, with the development of a national SLE facilitators competency framework which would ensure the quality and consistency of the simulation activities. Paramedicine has specific requirements in terms of physical resources, with respondents calling for mobile ambulance simulators and high fidelity simulation facilities that reflect the working environment of paramedics.

Chapter Five: Stakeholder Feedback

Method
A comprehensive list of stakeholders (n=24) was developed (see Appendix 2) and a call for submissions was sent to each stakeholder requesting their assistance and involvement in the project. The letters were sent to each stakeholder that:

- Identified the project team;
- Highlighted the aims and objectives of the project;
- Explained future phases of the project;
- Explicated the project timeline; and
- Requested their participation.

Responses (n=5) were received from:

- Council Ambulance Authorities;
- Australian College of Emergency Medicine;
- CAE Health Care, a subsidiary of CAE (formerly Canadian Aviation Electronics Ltd)
- National Council of Ambulance Unions; and
- Student Paramedic Association.

Questions
Three questions were developed that required qualitative responses. The set of questions was purposely kept brief to ensure maximum participation. The questions were as follows:

- Funding for infrastructure development and implementation for simulation is being made available. How do you think it might be best spent?
- Do you see any opportunities for your organisation to partner with a university to participate in a simulated learning program?
- Any further comments?

Funding for infrastructure development and implementation for simulation is being made available. How do you think it might best be spent?

Themes	Examples
• Research	• Funding would be recommended for research members to observe a course and discuss the development and assessment of these courses to assist in development of pre-hospital scenarios. • A national coordinated development framework, such that any funds made available from HWA could be used by Academia with industry support to see the development of professional tools, with a sustained developmental roadmap and high quality user support. We would hope that this would minimise the risk of too many small uncoordinated projects attempting similar things with resources that are below critical mass to be effective at a national level.
• Facilities	• The development of high fidelity interprofessional simulation centres located in recognised educational settings • There is a current shortage of health services available to rural and remote Australia. Funding is required to develop mobile simulation training facilities to enhance IPL and clinical skills in remote areas.

Do you see any opportunities for your organisation to partner with a university to participate in a simulated learning program?

Yes – 100%	Examples

•	• Help develop scenarios, assist in the assessment of performance and could be contacts regarding clinical placements for paramedics for the assessment phase regarding impact of learning strategies on real life performance in the field. • Would welcome the opportunity to partner with you and your members in the development of SLEs.

Any further comments?

	Examples
•	The use of simulated learning and educational advances in this area are and will continue to be an extremely valuable adjunct to paramedic clinical learning.
•	The development of SLEs for this and the other disciplines should recognise the use and development with HWA funding, the full range of SLEs. This means not only the use of role play in full fidelity situations, but part task trainers, e-learning and computer simulation tools (VR/serious games). There is much to be gained by HWA if a coordinated development approach is taken, where developments can be shared amongst the disciplines, making further advances possible and economies of scale realisable.
•	SLEs can be used to supplement student learning outcomes and clinical placements, in addition to reducing the burden on the healthcare system. They provide a safe clinical learning environment whereby students can be taught and assessed on their skills and techniques.
•	The application of IPL within a SLE not only enhances a student's communication skills but has the potential to improve collaboration between health professionals which will ultimately improve patient outcomes.

Chapter Six: Electronic Survey

Participants
In a previous phase of this research (Head of School Survey) Heads of School were requested to provide a nominee for each paramedicine entry to profession/pre-registration program at their University. Follow-up requests were sent to Heads of School that had not provided nominees in the first instance. Emails were sent to the identified nominees (N= 13) and invited to participate in the survey. Nominees that had not completed the survey by the due date received a follow-up email requesting they please complete the survey. As one nominees' program had not commenced (due to start in 2011) they considered it inappropriate to complete a survey at this time, and eleven nominees completed the survey (91% response rate).

Questions
The development of the survey was part of an iterative process that incorporated:

- Feedback received from university Heads of Schools in a separate consultation phase of this project;
- A previously unpublished survey provided by Emeritus Professor Bonnie Driggers from the Oregon Health and Science University (OHSU), U.S.A. and Associate Professor Michael Seropian, President Elect, Society for Simulation in Healthcare and CFO, Oregon Health & Science University. SimHealth Consulting Services LLC, U.S.A.;
- The survey utilised the Council of Ambulance Authorities (CAA) Paramedic Professional Competency Standards. The use of the standards in the survey did not in any way endorse the validity or otherwise of the Standards; and
- It was acknowledged the list of 49 skills utilised in the survey (e.g., access and egress, etc) were not exhaustive. The list was developed from previous HWA qualitative survey data and input from the Steering Group.

The electronic survey questions (see Table 2) included the following modalities:

- General simulation demographics;
  - ➢ Utilisation;
  - ➢ Training of simulation staff;
  - ➢ Evaluation;
- Current Use/Benefits/Challenges;
- Curricula/skills delivery via simulation;
- Enhancing the capacity of clinical placements through simulation; and
- Research.

Table 2 Electronic survey questions

Question Modalities	Questions
General simulation demographics	• Please identify what types of simulation your program has used in the last 12 months • Your school uses simulation (e.g., as "skills-lab" time but not as clinical hours, as additional direct clinical patient care clinical practicum hours) • Do you currently have a dedicated simulation suite? • If you do not currently have a dedicated simulation suite, are you intending to develop one? • In what range of locations do your simulation activities occur?
Utilisation	• Does your program have simulation equipment that is sitting idle or is underutilised?
Training of simulation staff	• The number of individuals/instructors in your school who have been trained to lead/facilitate simulation • The number of individuals in your school with expertise sufficient to train others to lead/facilitate simulation • Do you currently have a professional development (training) program to up-skill instructors/staff that work in your simulation learning environment? • Do you consider there is a need for certification/credentialing, or a required level of training/understanding, to ensure the delivery of simulation and its

	methodologies is not compromised? • What do you consider would be the potential benefits of trainer/staff certification/credentialing?
Evaluation	• How does your school currently evaluate simulation experiences?
Current Use/Benefits/Challenges	• Please check all that apply with respect to how you are currently, or would like to utilise simulation • Please indicate the extent to which you consider the following are benefits to introducing SLEs • Please rate the extent to which you are concerned about the following challenges to the introduction of SLEs
Curricula/skills delivery via simulation	• Of the following Paramedic Professional Competency Standards developed by the Council of Ambulance Authorities, please identify which you are currently delivering via simulated learning environments? • Please identify which of the following Paramedic Professional Competency Standards have the greatest potential to be effectively delivered via SLEs and reach competency standards and/or meet clinical placement objectives? • Please identify which of the following skills that you currently deliver for which the learning outcomes can be met via a simulated learning environment • Of the following skills that you have the potential to deliver (with funding) via simulated learning environments, which do you feel could meet competency standards?
Enhancing the capacity of clinical placements through simulation	• How important is it to your program that you increase the amount of exposure students have to simulated learning environments? • How likely is it that embedding simulation in paramedicine curricula will enhance the capacity of clinical placements? • Compared to other methods to enhance the capacity of clinical placements, how important is the use of simulation? • In considering the potential simulated learning environments have in the training of paramedics, how important is it that simulation is embraced to a greater extent by your program? • How can simulated learning environments be best utilised to increase the capacity of clinical placements?
Research	• In relation to the training of paramedics, are you aware of any national/international research that highlights opportunities for the expanded use of simulated learning environments to achieve the learning outcomes of clinical placements?

Data Analysis

The survey included qualitative and quantitative questions. Responses to the qualitative questions were thematically analysed and included herein. A more detailed explication of the qualitative data analysis process is included in the methodology section (Chapter Two).

The Rating Averages (RA) reported in the body of the report are a means to hierarchically organise the likert scale responses. Rating Averages are the weighted average across all responses to each question. A response of **Strongly Disagree** receives a score of 1, and **Strongly Agree** receives a score of 5. A Rating Average of 4.75 means that this falls to the right of **Agree** and closer to the **Strongly Agree** rating (see below). A rating of 3.25 therefore indicates that the rating average falls to the right of **Unsure**. The greater the rating average, the greater the level of agreement with the given statement or question.

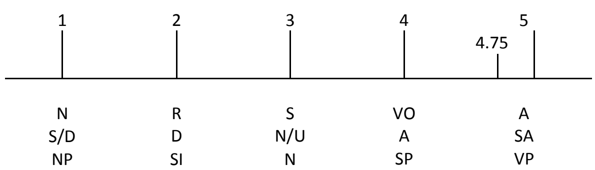

Table 3 Likert scales utilised and their corresponding rating averages

RA=1	RA=2	RA=3	RA=4	RA=5
Never	Rarely	Sometimes	Very Often	Always
Strongly Disagree	Disagree	Neither / Unsure	Agree	Strongly Agree
Not Probable	Somewhat Improbable	Neutral	Somewhat Probable	Very Probable

Electronic Survey Results

Type of entry to profession/pre-registration program identified by respondents:

Table 4 Program identified by survey respondents

Bachelor of Health Sciences Paramedic	2
Bachelor of Paramedic Science	2
BSc (Paramedical Science)	1
Bachelor of Clinical Practice	1
Bachelor of Emergency Health (Paramedic)	1
Graduate Diploma of Paramedicine	1
Bachelor of Paramedic Practice	1
Bachelor of Nursing Bachelor of Paramedicine	1
Bachelor of Health Science and Master of Paramedic Practice	1
Total Programs	N=11

Types of simulation your program has used in the last 12 months (N=11)

Table 5 Range and frequency of simulation utilised

	Never (%)	Rarely (%)	Some-times (%)	Very Often (%)	Always (%)
Peer-to-peer (e.g., role plays) (N=11)	18.2	-	9.1	63.6	9.1
Low technology (e.g., sponges for teaching injection) (N=11)	18.2	-	45.5	27.3	9.1
Screen-based computer simulations (N=11)	36.4	36.4	18.2	9.1	-
Hybrid simulations combining partial/part task trainers with standardised patients (N=11)	27.3	-	36.4	27.3	9.1
Hybrid simulates with high fidelity mannequin and standardised patients (N=11)	27.3	9.1	27.3	27.3	9.1
Low fidelity mannequins (N=11)	18.2	-	9.1	45.5	27.3
Medium fidelity mannequins (N=11)	18.2	9.1	-	45.5	27.3
High fidelity mannequins (N=11)	63.6	-	18.2	18.2	-
Full scale simulation using students as standardised patients (N=11)	18.2	-	54.5	27.3	-
Full scale simulation using community members as standardised patients (N=11)	54.5	36.4	9.1	-	-
Full scale simulation using professional actors as standardised patients (N=11)	72.7	9.1	18.2	-	-
Internet based simulations (N=11)	63.6	18.2	18.2	-	-
Avatars/immersive multi-user virtual environments (N=11)	90.9	9.1	-	-	-
Virtual reality procedural task trainers (N=11)	81.8	18.2	-	-	-
Mobile simulation service (N=11)	90.9	-	9.1	-	-

Although overall the most frequently reported SLEs utilised over the previous 12 month period were low fidelity mannequins (see Figure 2), low and medium fidelity mannequins were both reported to be utilised by 72% of respondents either very often or always (see Table 5). Low technology and peer-to-peer simulations were reported to be utilised 36% and 72% respectively either very often or always.

Students were utilised most often as standardised patients during full-scale simulation (sometimes - 54%, very often - 27%), and professional actors were sometimes (18%) utilised as standardised patients, although 81% reported they never (72%) or rarely (9%) utilised professional actors.

The least frequently utilised modalities were avatars/immersive multi-user virtual environments, mobile simulation and virtual reality.

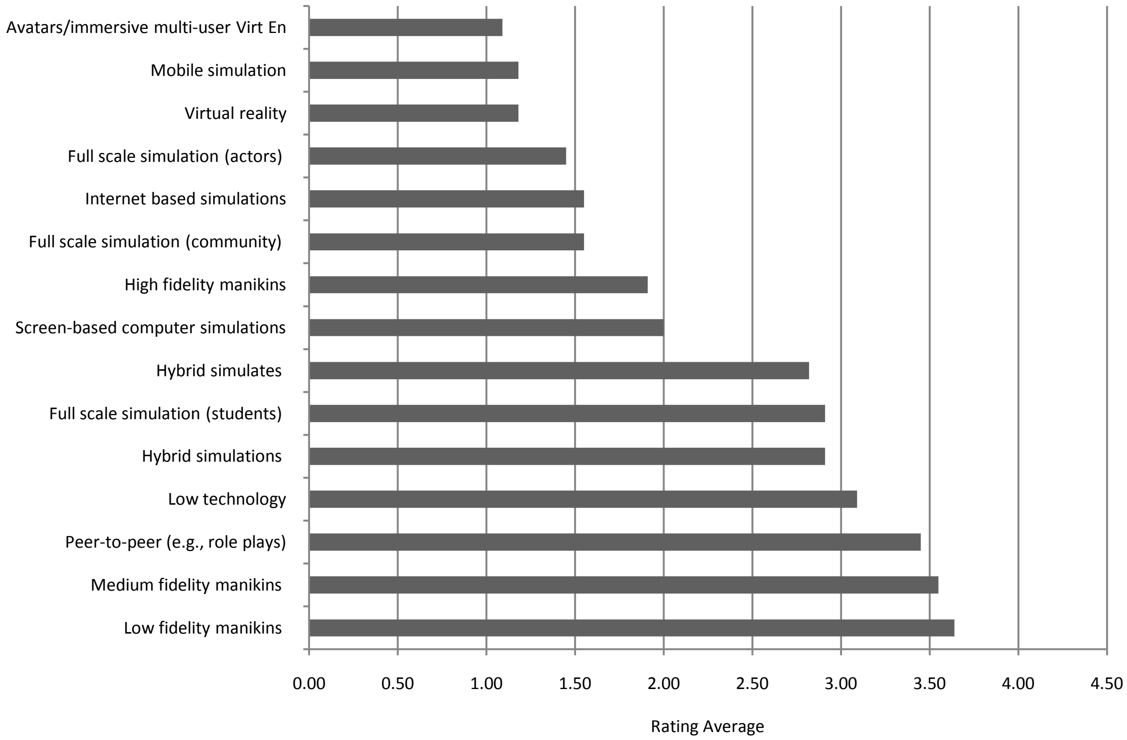

Figure 2 Rating averages indicating type of simulation used over previous 12 months

Your school uses simulation... (N=11)

Table 6 How simulation is utilised

As "skills-lab" time but not as clinical hours	90.9 (%)
As additional direct clinical patient care clinical practicum hours	45.5 (%)
As a substitute for direct clinical patient care clinical practicum hours	9.1 (%)
Don't know	9.1 (%)
Other	-

Ninety percent of respondents stipulated that they use simulation as "skills-lab," and 45% stated SLEs are utilised as additional direct clinical patient care clinical practicum hours (see Table 6). Nine percent stated they utilise simulation as a substitute for direct clinical patient care clinical practicum hours.

Do you currently have a dedicated simulation suite? (N=11)

Table 7 Do you have a simulation suite

Yes	45.5 (%)
No	54.5 (%)
Unsure	-

Forty-five percent of respondents stipulated that they currently have a dedicated simulation suite, and 54% stated that they do not (see Table 7).

If you do not currently have a dedicated simulation suite, are you intending to develop one? (N=6)

Table 8 Intention to develop simulation suite

Yes	66.7 (%)
No	-
Unsure	33.3 (%)

Of the 54% of respondents that stated they do not currently have a simulation suite, 66% percent are intending to develop one, and 33% stated that they are unsure (see Table 8).

In what range of locations do your simulation activities occur? (N=11)

Table 9 Location in which simulation occurs

Traditional learning lab	72.7 (%)
On-site simulation facility	81.8 (%)
Dedicated simulation suite	36.4 (%)
Off-site simulation facility (e.g., outsource to health service)	18.2 (%)
In-situ (e.g. in an actual patient room)	-
Classroom setting	45.5 (%)
Mobile facility	9.1 (%)
Other	18.2 (%)

Eighty-one percent of respondents stipulated that simulation occurs in an on-site simulation facility, and 72% in a traditional learning lab (see Table 9). Thirty-six percent state that simulation occurs in a dedicated simulation suite, and 41% in an off-site simulation facility (e.g., outsource to health service). Two respondents (18%) state that simulation occurred in other settings, through “disaster re-enactments” and through “student participation in Defence Force exercise/simulation activities.” One respondent (9%) stated students utilise a mobile facility.

Does your program have simulation equipment that is sitting idle or is underutilised? (N=11)

Table 10 Underutilisation of equipment

Yes	27.3 (%)
No	72.7 (%)
Unsure	-

Seventy-two percent of respondents identified they do not have equipment that is sitting idle or underutilised. It was stated that to circumvent underutilisation “specialist staff are required to manage simulation activities and clinical education.” A “lack of staff training” was also thought to be problematic.

The number of individuals/instructors in your school who have been trained to lead/facilitate simulation (N=11)

Table 11 Individuals/instructors trained to lead/facilitate simulation

0	-
1 to 5	90.9 (%)
6 to 10	9.1 (%)
Other	-

Ninety percent of respondents identified they have between 1 and 5 individuals/instructors in their school who are trained to lead/facilitate simulation, and one stated they had between 6 and 10.

The number of individuals in your school with expertise sufficient to train others to lead/facilitate simulation (N=11)

Table 12 Individuals with expertise sufficient to train others

0	18.2 (%)
1 to 5	72.7 (%)
6 to 10	9.1 (%)
Other	-

Seventy-two percent of respondents identified they have between 1 and 5 individuals/instructors in their school with expertise sufficient to train others to lead/facilitate simulation, and 18% stated they had no-one. One respondent (9%) identified they had between 6 and 10 individuals.

Do you currently have a professional development (training) program to up-skill instructors/staff that work in your simulation learning environment? (N=11)

Table 13 Professional development (training) program

Yes	-
No	100.0 (%)
Unsure	-

All respondents (100%) state they do not currently have a professional development (training) program to up-skill instructors/staff.

Do you consider there is a need for certification/credentialing, or a required level of training/understanding, to ensure the delivery of simulation and its methodologies are not compromised? (N=11)

Table 14 Need for certification/credentialing

Yes	90.9 (%)
No	-
Unsure	9.1 (%)

Ninety percent of respondents consider there is a need for certification/credentialing or a required level of training/understanding; one respondent (9%) stated they were unsure.

What do you consider would be the potential benefits of trainer/staff certification/credentialing? (N=11)

Table 15 Potential benefits to certification/credentialing

Ensures an understanding of the fundamentals of simulation terminology and concepts	90.9 (%)
Provides an appreciation of simulation organisations and applications in Australia	45.5 (%)
Provide a concrete base for their knowledge and expertise	90.9 (%)
Opportunities for professional development	72.7 (%)
Promotes participation in the simulation community	63.6 (%)
Clear career pathways for those wishing to focus on simulation	45.5 (%)
Provides sustainable workforce which will be required for the continued use of SLP/SLEs	72.7 (%)
Other	18.2 (%)

Although respondents considered there were a number of benefits to trainer/staff certification/credentialing, the primary benefits were that it would ensure an understanding of the fundamentals of simulation terminology and concepts (90%), and that it would provide a concrete base for knowledge and expertise (90%).

It was considered important to ensure “those responsible for the use of simulation be experienced in educational design theory and practice…otherwise it tends to be done poorly.” It was also considered that the certification/accreditation process would also engender “recognition.”

How does your school currently evaluate simulation experiences? (N=11)

Table 16 Simulation evaluation activity

Student satisfaction surveys	72.7 (%)
Faculty satisfaction surveys	9.1 (%)
Patient outcome/error data	36.4 (%)
Student confidence tools	9.1 (%)
Student competence tools	54.5 (%)
Empirically-supported (evidence-based)	27.3 (%)
None	18.2 (%)
Other	-

Schools’ currently evaluate simulation experiences primarily through student satisfaction surveys (72.7%), and student competence tools (54%).

Please indicate the extent to which you consider the following are benefits to introducing SLEs (N=11)

Table 17 Percentages indicating benefits to introducing SLEs

Benefits	Strongly Disagree (%)	Disagree (%)	Neither/ Unsure (%)	Agree (%)	Strongly Agree (%)
Assessment (N=11)	-	-	-	18.2	81.8
Uncommon clinical experiences or events (N=11)	-	-	-	27.3	72.7
Unavailable clinical experiences or events (N=11)	-	-	9.1	18.2	72.7
Otherwise unsafe clinical experiences or adverse events (N=11)	-	-	18.2	18.2	63.6

Reflective practice development (N=11)	-	-	-	27.3	72.7
Increase student confidence (N=11)	-	-	-	18.2	81.8
Provide opportunity for students to reflect on their own performance (N=11)	-	-	-	27.3	72.7
Increased opportunity to evaluate performance in a safe environment prior to placement (N=11)	-	-	-	18.2	81.8
Increase critical thinking (N=11)	-	-	-	36.4	63.6
Improve students' clinical reasoning skills rather than rote learn (N=11)	-	-	-	18.2	81.8
Enhance clinical judgment (N=11)	-	-	-	18.2	81.8
Increase student competence (N=11)	-	-	-	18.2	81.8
Better prepare students for clinical environment (N=11)	-	-	-	18.2	81.8
Ensure fewer clinical errors (N=11)	-	-	-	27.3	72.7
Remediation (N=11)	-	-	27.3	18.2	54.5
Increase student retention (N=11)	-	-	36.4	27.3	36.4
Recruitment of students (N=11)	-	27.3	27.3	18.2	27.3
Increase program capacity (N=11)	9.1	18.2	27.3	-	45.5
Support/anchor the application of theory content (N=11)	-	-	-	36.4	63.6
Address issues raised by our practice partners (practice-education gap) (N=11)	-	-	9.1	45.5	45.5
Ensure graduates are more work-ready (more able to hit the floor running) (N=11)	-	-	-	36.4	63.6
Manage risk (N=11)	-	-	18.2	27.3	54.5
Enhance students understanding of CALD issues/patients (N=11)	-	-	27.3	45.5	27.3
Foster greater levels of interprofessional practice (N=11)	-	-	9.1	27.3	63.6
Managing challenging behaviours (N=11)	-	-	27.3	27.3	45.5
Promote a more ICT competent graduate (N=11)	-	-	45.5	9.1	45.5
Avenue to promote non-technical skills (e.g., problem solving, leadership, teamwork) (N=11)	-	-	-	45.5	54.5
Learn how to build positive workplace cultures (e.g., how to voice concerns, cross-checking, identifying mistakes, and intervening appropriately to avoid adverse events) (N=11)	-	-	9.1	27.3	63.6
Focus on human factors (e.g., skills for communicating, foster ability to provide prompt opinions within their scopes of practice) (N=11)	-	-	-	27.3	72.7
Standardised exp - all students receive similar experience (N=11)	-	-	-	27.3	72.7
Most situations are able to be replicated (N=11)	9.1	-	18.2	27.3	45.5
Sustains student interest (N=11)	-	-	-	45.5	54.5
Integrating prior knowledge/skills in a realistic clinical setting (N=11)	-	-	-	36.4	63.6
Instil appropriate professional attributes (N=11)	-	-	27.3	27.3	45.5
Provide situations that can (almost) replicate the pressures of working in a dynamic workplace (N=11)	-	-	18.2	36.4	45.5
Improve inter-rater reliability in assessment (N=11)	-	-	-	54.5	45.5
Increased simulation will enable more efficient use of clinical placements (N=11)	-	-	18.2	36.4	45.5
Reduce the burden on off-campus clinical settings (N=11)	-	27.3	9.1	36.4	27.3
Opportunities for cross disciplinary work (N=11)	-	9.1	9.1	18.2	63.6
Decrease preceptor burnout (N=11)	9.1	18.2	27.3	9.1	36.4
For students requiring minimal clinical make-up to satisfy registration requirements (N=11)	-	27.3	27.3	18.2	27.3

Table 18 Rating Averages indicating benefits of SLEs hierarchically from greatest to least benefit

	Benefits	R/A		Benefits	R/A
1.	Assessment	4.82	22.	Sustains student interest	4.55
2.	Increase student confidence	4.82	23.	Unsafe clinical experiences or events	4.45
3.	Evaluate in safe environment prior to placement	4.82	24.	Improve inter-rater reliability in assessment	4.45
4.	Improve clinical reasoning rather than rote learn	4.82	25.	Address issues raised by our practice partners	4.36
5.	Enhance clinical judgment	4.82	26.	Manage risk	4.36
6.	Increase student competence	4.82	27.	Opportunities for cross disciplinary work	4.36
7.	Better prepare students for clinical environment	4.82	28.	Remediation	4.27
8.	Uncommon clinical experiences or events	4.73	29.	(Almost) replicates pressures of workplace	4.27
9.	Reflective practice development	4.73	30.	Enable more efficient use of clinical placements	4.27
10.	Opportunity for students to reflect on their perf'	4.73	31.	Managing challenging behaviours	4.18
11.	Ensure fewer clinical errors	4.73	32.	Instil appropriate professional attributes	4.18
12.	Focus on human factors	4.73	33.	Increase student retention	4.00
13.	Standardised experiences	4.73	34.	Enhance understanding of CALD issues	4.00

14.	Unavailable clinical experiences or events	4.64	35.	Promote a more ICT competent graduate	4.00
15.	Increase critical thinking	4.64	36.	Most situations are able to be replicated	4.00
16.	Support/anchor application of theory content	4.64	37.	Reduce the burden on off-campus settings	3.64
17.	Ensure graduates are more work-ready	4.64	38.	Increase program capacity	3.55
18.	Integrating knowledge/skills in realistic setting	4.64	39.	Recruitment of students	3.45
19.	Foster interprofessional practice	4.55	40.	Decrease preceptor burnout	3.45
20.	Avenue to promote non-technical skills	4.55	41.	Students requiring minimal clinical make-up	3.45
21.	Learn how to build positive workplace cultures	4.55			

Table 18 highlights the rating averages for the perceived benefits to introducing SLEs, in order from the greatest to the least beneficial. Although most items were considered to be beneficial, the following five items all received the same rating average and regarded as the greatest benefits to introducing SLEs:

- Assessment;
- Increase student confidence;
- Evaluate in safe environment prior to placement;
- Improve clinical reasoning rather than rote learn;
- Enhance clinical judgment;
- Increase student competence; and
- Better prepare students for clinical environment.

Please rate the extent to which you are concerned about the following challenges to the introduction of SLEs (N=11)

Table 19 Percentages of challenges to the introduction of SLEs

Challenges	Strongly Disagree (%)	Disagree (%)	Neither/ Unsure (%)	Agree (%)	Strongly Agree (%)
Initial set-up costs (N=11)	18.2	-	-	27.3	54.5
Cost – equipment (N=11)	-	18.2	-	45.5	36.4
Cost – human (N=11)	-	27.3	-	45.5	27.3
Ongoing costs running SLE (issues of sustainability) (N=11)	9.1	9.1	-	72.7	9.1
Administrative load required to operate SLE (N=11)	-	27.3	18.2	36.4	18.2
Education/training of staff that work in SLE (N=11)	9.1	27.3	9.1	27.3	27.3
Insufficient number of dedicated technical/support staff (N=11)	-	9.1	-	63.6	27.3
Time management (N=11)	18.2	9.1	9.1	45.5	18.2
Student numbers too large to adequately engage them equally into simulation (N=11)	45.5	-	-	36.4	18.2
Ensuring students have high quality learning experiences through SLE (N=11)	9.1	27.3	-	36.4	27.3
Space requirements (N=11)	27.3	27.3	-	9.1	36.4
Time for developing scenarios (N=11)	9.1	18.2	-	45.5	27.3
Integration into curriculum (N=11)	36.4	36.4	-	27.3	-
Achieving buy-in (shared vision) from teaching team (N=11)	9.1	45.5	9.1	36.4	-
Maintaining staff interest (N=11)	45.5	27.3	-	27.3	-
Running effective debriefings (N=11)	36.4	18.2	-	36.4	9.1
Acceptance by students (N=11)	72.7	18.2	-	9.1	-
Academics concern with their own clinical currency (N=11)	36.4	27.3	18.2	18.2	-
Insufficient numbers of trained staff to run simulation (N=11)	9.1	9.1	18.2	18.2	45.5
Identifying and supporting champions to drive the innovation (N=11)	9.1	36.4	27.3	18.2	9.1
Student dissatisfaction (N=11)	54.5	45.5	-	-	-
Lack of sufficient evidence-base to support it as a reliable/valid approach to develop core competencies (N=11)	36.4	36.4	-	18.2	9.1
Underutilisation of equipment (N=10)	50.0	20.0	-	10.0	20.0
Insufficient level of training/understanding among those that deliver simulation (N=11)	9.1	18.2	-	45.5	27.3
Perception that clinical hours may be reduced as a result of SLEs (N=11)	18.2	27.3	-	18.2	36.4
Simulation will be seen as a substitute for real-life experiences (N=11)	9.1	18.2	-	45.5	27.3
Insufficient database of (rigorous) evidence to prove efficacy of simulation (N=11)	18.2	27.3	18.2	9.1	27.3
Diminished credibility of graduates as ‘work ready’ (N=11)	27.3	27.3	9.1	18.2	18.2

Table 20 Rating Averages indicating challenges of SLEs hierarchically from greatest to least

	Challenge	R/A		Challenge	R/A
1.	Insufficient # of dedicated technical/support staff	4.09	15.	Space requirements	3.00
2.	Initial set-up costs	4.00	16.	Insufficient database of (rigorous) evidence	3.00
3.	Cost - equipment	4.00	17.	Student numbers too large to engage	2.82
4.	Insufficient numbers of trained staff to run simulation	3.82	18.	Identifying and supporting champions	2.82
5.	Cost - human	3.73	19.	Achieving buy-in (shared vision) from teaching team	2.73
6.	Ongoing costs running SLE	3.64	20.	Diminished credibility of graduates as 'work ready'	2.73
7.	Time for developing scenarios	3.64	21.	Running effective debriefings	2.64
8.	Insufficient training/understanding among deliverers	3.64	22.	Underutilisation of equipment	2.30
9.	Seen as a substitute for real-life experiences	3.64	23.	Lack of evidence-base to support it as a reliable/valid approach to develop competencies	2.27
10.	Admin load required to operate SLE	3.45	24.	Integration into curriculum	2.18
11.	Ensuring high quality learning experiences through SLE	3.45	25.	Academics concern with their own clinical currency	2.18
12.	Education/training of staff that work in SLE	3.36	26.	Maintaining staff interest	2.09
13.	Time management	3.36	27.	Acceptance by students	1.45
14.	Clinical hrs may be reduced as a result of SLEs	3.27	28.	Student dissatisfaction	1.45

Respondents identified the following five items (see Table 20) as their greatest challenges to simulated learning environments (in order from the greatest challenge):

- Insufficient number of dedicated technical/support staff;
- Initial set-up costs;
- Cost – equipment;
- Insufficient numbers of trained staff to run simulation; and
- Cost – human.

How you are currently, or would like to utilise simulation:

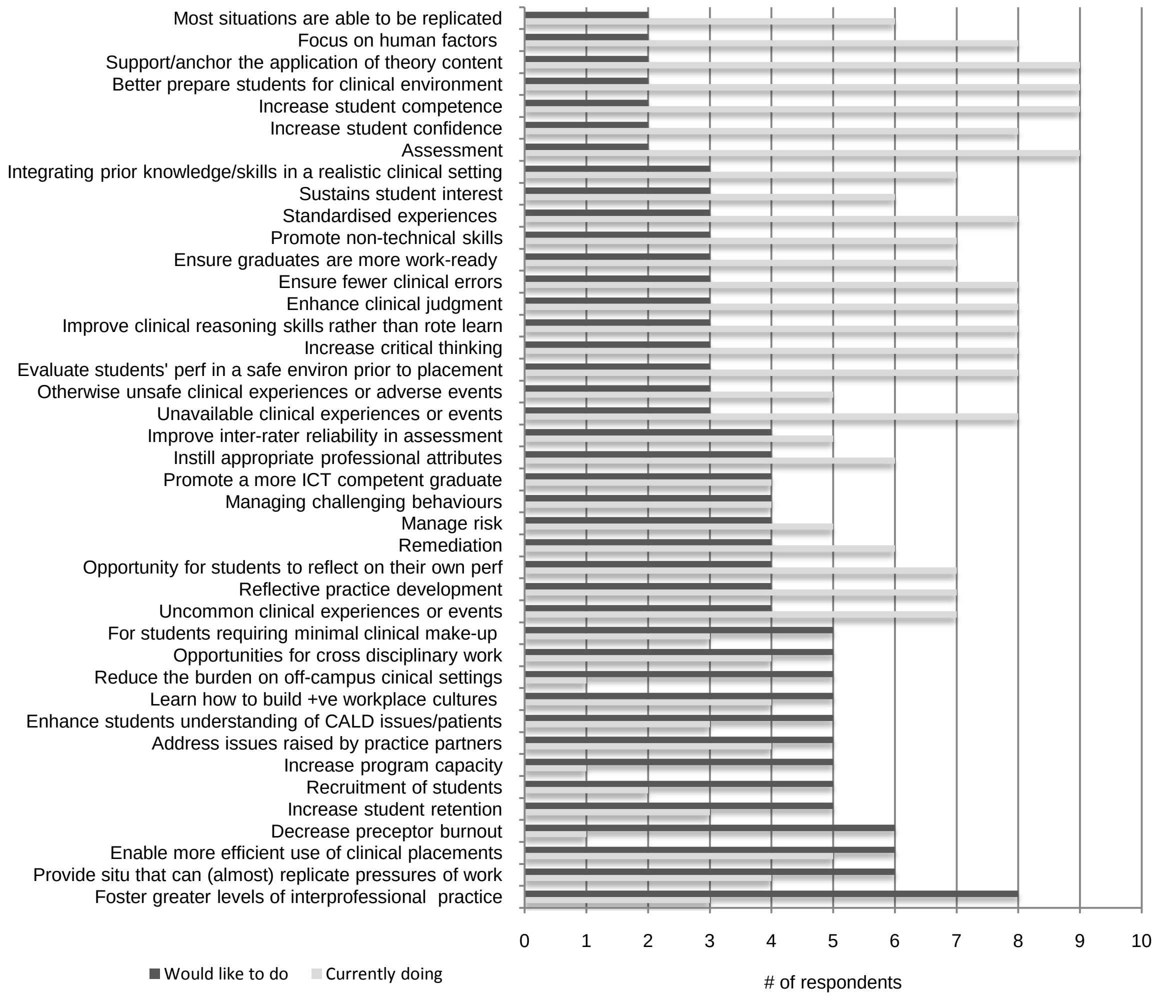

Figure 3 How programs currently, or would like to utilise simulation

Figure 3 identifies the how programs currently, or would like to utilise simulation, highlighting how respondents would like to utilise simulation hierarchically, from least to greatest.

Table 21 Ten primary ways programs currently utilise simulation

	Currently doing	#
1.	Assessment	9
2.	Increase student competence	9
3.	Better prepare students for clinical environment	9
4.	Support/anchor the application of theory content	9
5.	Unavailable clinical experiences or events	8
6.	Evaluate students' perf' in a safe environ prior to placement	8
7.	Increase critical thinking	8
8.	Improve clinical reasoning skills rather than rote learn	8
9.	Enhance clinical judgment	8
10.	Ensure fewer clinical errors	8

The three primary reasons respondents currently utilise simulation is for assessment, to increase the competence of students, and better prepare students' for the clinical environment. How they are currently utilising SLEs differs significantly from how respondents would like to utilise SLEs. The three primary reasons programs would like to utilise simulation are to foster greater levels of interprofessional practice, to provide situations that can (almost) replicate they dynamic pressures of work, and to enable the more efficient use of clinical placements.

Table 22 Ten primary ways programs would like to utilise simulation

	Would like to do	#
1.	Foster greater levels of interprofessional practice	N=8
2.	Provide situ that can (almost) replicate pressures of work	N=6
3.	Enable more efficient use of clinical placements	N=6
4.	Decrease preceptor burnout	N=6
5.	Increase student retention	N=5
6.	Recruitment of students	N=5
7.	Increase program capacity	N=5
8.	Address issues raised by practice partners	N=5
9.	Enhance students understanding of CALD issues/patients	N=5
10.	Learn how to build +ve workplace cultures	N=5

Of the following Paramedic Professional Competency Standards developed by the Council of Ambulance Authorities, please identify which you are currently delivering via simulated learning environments? (N=11)

Table 23 Percentages of currently delivered competency/skill areas

Competency	Never (%)	Rarely (%)	Some-times (%)	Very Often (%)	Always (%)
Operates with appropriate standards of conduct and performance:					
➢ Maintains expected standards of conduct and performance	20.0	-	-	40.0	40.0
Makes informed and reasonable decisions:					
➢ Operates within a framework of making informed, evidence based, reasonable and professional judgments about their practice, with acting in the best interests of their patients as their prime concern	18.2	-	9.1	36.4	36.4
➢ Makes sensible, practical decisions about their practice, taking account of all relevant information and the best interests of the people who use or are affected by the service that is being provided	9.1	-	9.1	45.5	36.4
Demonstrates professional autonomy and accountability:					
➢ Practices within the legal and ethical boundaries of their profession	18.2	18.2	-	27.3	36.4
➢ Exercises a professional duty of care	18.2	9.1	9.1	27.3	36.4
➢ Practices within an approved scope of practice	18.2	-	-	45.5	36.4
➢ Applies effective self-management of workload and resources and is able to practice accordingly within the individual activity	9.1	-	18.2	45.5	27.3
Develops and maintains professional relationships:					
➢ Works, where appropriate, in partnership with other professionals and support staff	9.1	9.1	36.4	18.2	27.3
➢ Demonstrates effective and appropriate skills in communicating	9.1	-	18.2	45.5	27.3

information, advice, instruction and professional opinion to colleagues, service users, their relatives and carers					
➢ Effectively communicates throughout the care of the patient	9.1	-	9.1	54.5	27.3
Demonstrates the knowledge and understanding required for practice as a paramedic:					
➢ Understands the key concepts of the bodies of knowledge which are specifically relevant to Paramedic practice	18.2	-	-	54.5	27.3
Operates within a safe practice environment:					
➢ Acts in accordance with applicable health and safety legislation, and any relevant safety policies and procedures	18.2	-	27.3	27.3	27.3
➢ Develops and maintains personal health and wellbeing strategies	36.4	18.2	9.1	18.2	18.2
➢ Applies infection control procedures which minimise risks to patients and those treating them	9.1	-	-	45.5	45.5
Identifies and assesses health and social care needs in the context of the environment:					
➢ Analyses the situation, gathers appropriate information and selects and uses appropriate assessment techniques	9.1	-	9.1	54.5	27.3
Formulates and delivers clinical practice to meet health and social care needs within the context of the environment:					
➢ Uses clinical reasoning and problem-solving skills to determine clinical judgments and appropriate actions	9.1	-	9.1	45.5	36.4
➢ Draws on appropriate knowledge and skills in order to make professional judgments	9.1	-	9.1	45.5	36.4
➢ Formulates specific and appropriate patient care and treatment actions	9.1	-	9.1	45.5	36.4
➢ Conducts appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely	9.1	-	-	54.5	36.4
➢ Maintains records appropriately	9.1	27.3	27.3	27.3	9.1
➢ Operates effectively within a mobile environment	9.1	36.4	18.2	27.3	9.1
➢ Demonstrates the requisite knowledge and skills to participate in mass casualty or major Incident situations:	9.1	27.3	27.3	27.3	9.1
Critically evaluates the impact of, or response to, the paramedic's actions:					
➢ Monitors and reviews the ongoing effectiveness of their practice and modifies it accordingly	9.1	9.1	-	54.5	27.3
➢ Audits, reflects on and reviews practice	9.1	18.2	18.2	45.5	9.1
➢ Participates in the mentoring, teaching and development of others	27.3	-	36.4	18.2	18.2
➢ Practices within an evidence based framework	18.2	9.1	18.2	27.3	27.3

The hierarchical list of rating averages (see Figure 4) identifies 'Operates within a safe environment: Applies infection control procedures which minimise risks to patients and those treating them' as the most frequently reported competency area to be delivered via SLEs. Table 23 highlights this competency is currently delivered very often (45.5%) or always (45.5%) via SLEs.

The competency 'Operates within a safe environment: Develops and maintains personal health and wellbeing strategies' was the least frequently identified area to be delivered via SLEs. Thirty-six percent of respondents identified they rarely or never deliver the competency via SLEs, and the same percentage (36%) identified they deliver the competency very often or always via SLEs.

The five most frequently competency areas currently delivered via SLEs were:

- Operates within a safe environment: Applies infection control procedures which minimise risks to patients and those treating them;
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Conducts appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely;
- Makes informed and reasonable decisions: Makes sensible, practical decisions about their practice, taking account of all relevant information and the best interests of the people who use or are affected by the service that is being provided;
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Uses clinical reasoning and problem-solving skills to determine clinical judgments and appropriate actions; and
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Draws on appropriate knowledge and skills in order to make professional judgments.

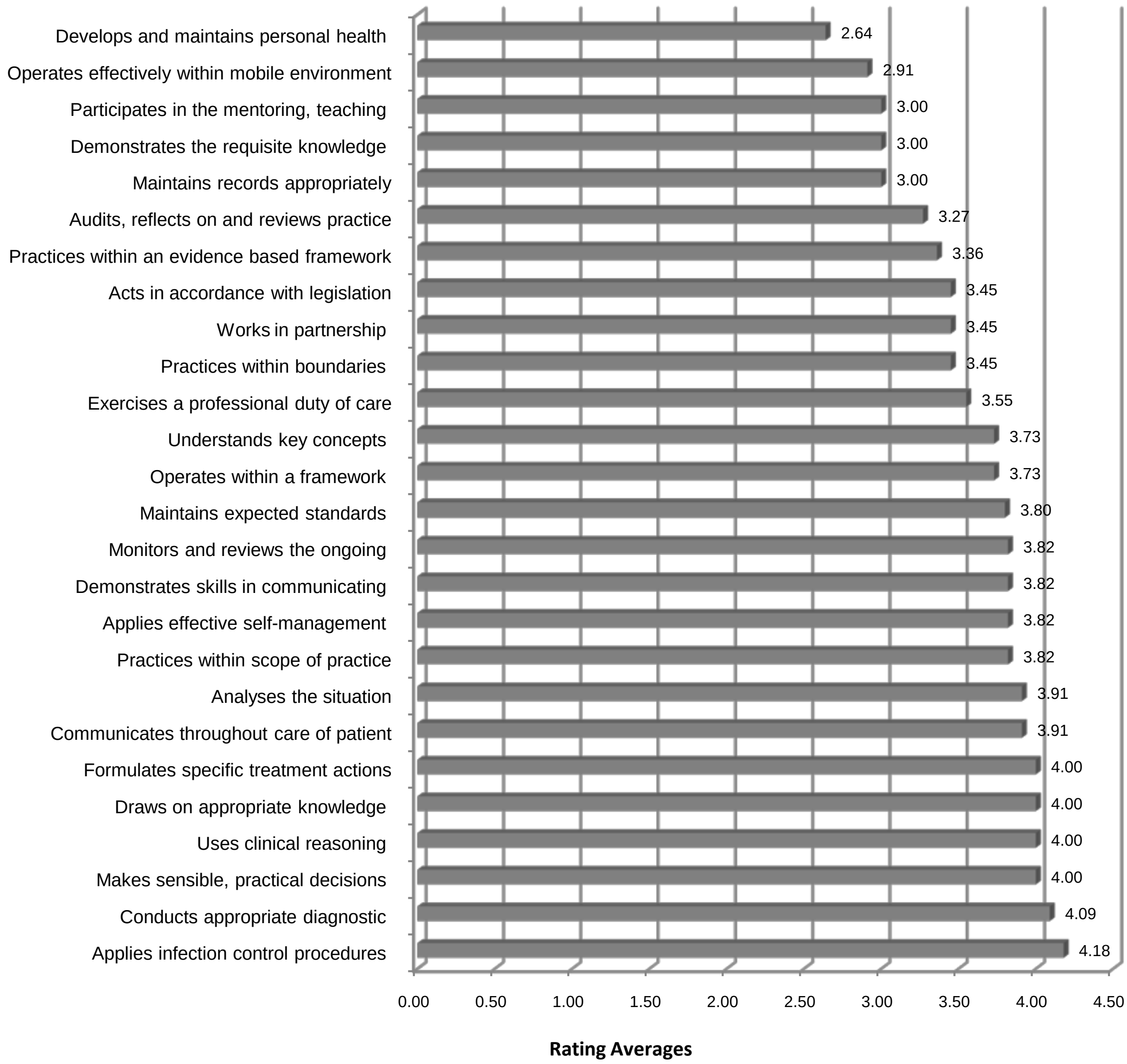

Figure 4 Hierarchical list of rating averages of competencies currently being delivered via SLEs

Please identify which of the following Paramedic Professional Competency Standards have the greatest potential to be effectively delivered via SLEs and reach competency standards and/or meet clinical placement objectives? (N=11)

Table 24 Percentages of greatest potential competency/skill areas

Competency	Very probable (%)	Somewhat probable (%)	Neutral (%)	Somewhat improbable (%)	Not probable (%)
Operates with appropriate standards of conduct and performance:					
➢ Maintains expected standards of conduct and performance (N=10)	54.5	18.2	9.1	9.1	9.1
Makes informed and reasonable decisions:					
➢ Operates within a framework of making informed, evidence based, reasonable and professional judgments about their practice, with acting in the best interests of their patients as their prime concern (N=11)	63.6	27.3	-	-	9.1
➢ Makes sensible, practical decisions about their practice, taking account of all relevant information and the best interests of the people who use or are affected by the service that is being provided (N=11)	54.5	18.2	18.2	-	9.1
Demonstrates professional autonomy and accountability:					
➢ Practices within the legal and ethical boundaries of their profession	45.5	36.4	-	9.1	9.1
➢ Exercises a professional duty of care (N=11)	36.4	36.4	-	9.1	18.2
➢ Practices within an approved scope of practice (N=11)	81.8	-	9.1	-	9.1
➢ Applies effective self-management of workload and resources and is able to practice accordingly within the individual activity (N=11)	45.5	9.1	27.3	9.1	9.1
Develops and maintains professional relationships:					
➢ Works, where appropriate, in partnership with other professionals and support staff (N=11)	54.5	36.4	-	-	9.1
➢ Demonstrates effective and appropriate skills in communicating information, advice, instruction and professional opinion to colleagues, service users, their relatives and carers (N=11)	72.7	18.2	-	-	9.1
➢ Effectively communicates throughout the care of the patient (N=11)	81.8	9.1	-	-	9.1
Demonstrates the knowledge and understanding required for practice as a paramedic:					
➢ Understands the key concepts of the bodies of knowledge which are specifically relevant to Paramedic practice (N=11)	45.5	45.5	-	-	9.1
Operates within a safe practice environment:					
➢ Acts in accordance with applicable health and safety legislation, and any relevant safety policies and procedures (N=11)	54.5	36.4	-	-	9.1
➢ Develops and maintains personal health and wellbeing strategies (N=11)	54.5	18.2	-	9.1	18.2
➢ Applies infection control procedures which minimise risks to patients and those treating them (N=11)	90.9	-	-	-	9.1
Identifies and assesses health and social care needs in the context of the environment:					
➢ Analyses the situation, gathers appropriate information and selects and uses appropriate assessment techniques (N=11)	81.8	9.1	-	-	9.1
Formulates and delivers clinical practice to meet health and social care needs within the context of the environment:					
➢ Uses clinical reasoning and problem-solving skills to determine clinical judgments and appropriate actions (N=11)	72.7	18.2	-	-	9.1
➢ Draws on appropriate knowledge and skills in order to make professional judgments (N=11)	72.7	18.2	-	-	9.1
➢ Formulates specific and appropriate patient care and treatment actions (N=11)	81.8	9.1	-	-	9.1
➢ Conducts appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely (N=11)	90.9	-	-	-	9.1
➢ Maintains records appropriately (N=11)	45.5	18.2	18.2	9.1	9.1
➢ Operates effectively within a mobile environment (N=11)	45.5	18.2	9.1	18.2	9.1
➢ Demonstrates the requisite knowledge and skills to participate in mass casualty or major Incident situations: (N=11)	45.5	27.3	9.1	9.1	9.1
Critically evaluates the impact of, or response to, the paramedic's actions:					
➢ Monitors and reviews the ongoing effectiveness of their practice and modifies it accordingly (N=11)	54.5	36.4	-	-	9.1
➢ Audits, reflects on and reviews practice (N=11)	45.5	27.3	9.1	9.1	9.1
➢ Participates in the mentoring, teaching and development of others	63.6	-	18.2	-	18.2
➢ Practices within an evidence based framework (N=11)	54.5	18.2	18.2	-	9.1

Comparative data indicates that relative to competencies currently being delivered, respondents consider their capacity to deliver all competencies would be increased with SLEs (see Figure 5).

The five competency areas with the greatest potential to be delivered via SLEs and reach competency standards and/or meet clinical placement objectives were:

- Operates within a safe environment: Applies infection control procedures which minimise risks to patients and those treating them (91% very probable);
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Conducts appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely (91% very probable);
- Develops and maintains professional relationships: Effectively communicates throughout the care of the patient (81% very probable, 9% somewhat probable);
- Identifies and assesses health and social care needs in the context of the environment: Analyses the situation, gathers appropriate information and selects and uses appropriate assessment techniques (91% very probable); and
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Formulates specific and appropriate patient care and treatment actions (91% very probable).

The competency area with the least potential was ‘Demonstrates professional autonomy and accountability: Exercises a professional duty of care.’ A total of 27% respondents considered it either not probable or somewhat improbable that this competency could be effectively delivered via SLEs and reach competency standards and/or meet clinical placement objectives.

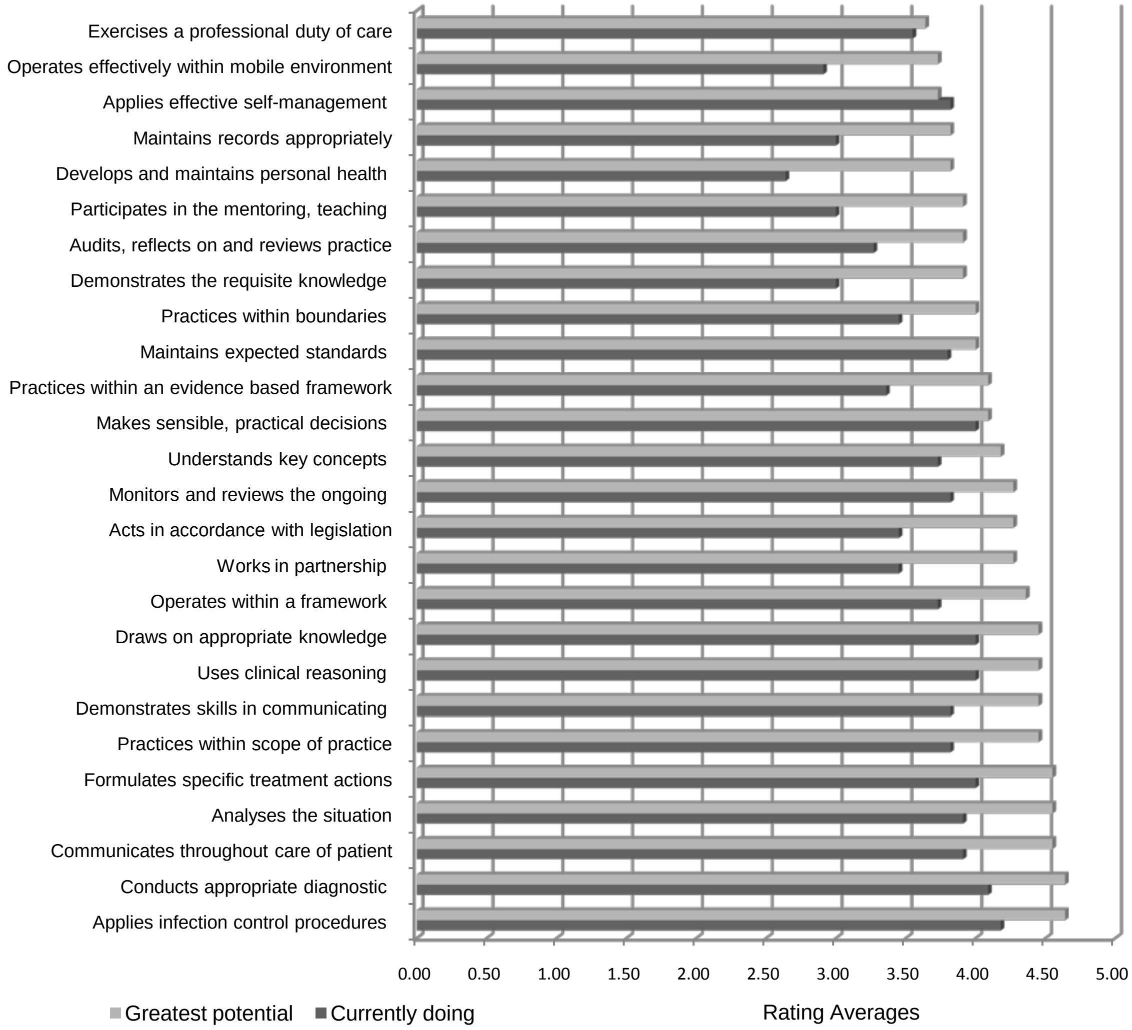

Figure 5 Rating averages of skills areas currently being delivered, and those with the greatest potential to be effectively delivered via SLEs and reach competency standards and/or meet clinical placement objectives

Please identify which of the following skills that you currently deliver for which the learning outcomes can be met via a simulated learning environment (N=11)

Table 25 Skills currently delivered for which the learning outcomes can be met via a SLEs

	Skills delivered	%		Skills delivered	%
1.	Advanced airway management	100.0	26.	Chest decompression	77.8
2.	Basic life support	100.0	27.	Complex patient simulations	77.8
3.	Cardiac arrest management	100.0	28.	Critical care skills	77.8
4.	ECG	100.0	29.	Critical thinking and judgement/clinical decision making	77.8
5.	Hand-over skills	100.0	30.	Emergency childbirth and complications	77.8
6.	Health assessment and physical examination	100.0	31.	Mental health patient management skills	77.8
7.	Inhaled medications/oxygen therapy	100.0	32.	Mobility and patient movement	77.8
8.	Manual handling	100.0	33.	Multidisciplinary/interprofessional simulations	77.8
9.	Medication administration	100.0	34.	Paediatric assessment	77.8
10.	Other assessment tools (e.g., GCS, NVO)	100.0	35.	Professional practice	77.8
11.	Spinal precautions and spinal injury management	100.0	36.	Scene assessment	77.8
12.	Team work	100.0	37.	Time management/prioritisation of care	77.8
13.	Vital signs	100.0	38.	Venipuncture	77.8
14.	Advanced life support	88.9	39.	Leadership skills	66.7

15.	Basic and Advanced Trauma support	88.9	40.	Mental health assessment	66.7
16.	Cardiac/respiratory/chest pain assessment	88.9	41.	Multi-casualty incidents and disaster management	66.7
17.	Communication skills	88.9	42.	Remediation	66.7
18.	IM/SC/IV injections	88.9	43.	Risk assessment/safety (e.g., scene assessment & management)	66.7
19.	Infection control	88.9	44.	Scene Management	66.7
20.	IV therapy	88.9	45.	Surgical and needle cricothyrotomy	66.7
21.	Oral medication preparation and administration	88.9	46.	Access and egress	55.6
22.	Pain assessment (e.g., pain scores)/intervention	88.9	47.	Documentation	55.6
23.	Recognition and management of a deteriorating patient	88.9	48.	Stoma care	55.6
24.	Triage assessment	88.9	49.	Computer scenarios	44.4
25.	Care of a neonate	77.8			

Table 25 indicates that of the 49 skills that are currently being delivered, all respondents consider that the learning outcomes can be met for the following 13 skills, via SLEs:

- Advanced airway management;
- Basic life support;
- Cardiac arrest management;
- ECG;
- Hand-over skills;
- Health assessment and physical examination;
- Inhaled medications/oxygen therapy;
- Manual handling;
- Medication administration;
- Other assessment tools (e.g., GCS, NVO);
- Spinal precautions and spinal injury management;
- Team work; and
- Vital signs.

Of the following skills that you have the potential to deliver (with funding) via simulated learning environments, which do you feel could meet competency standards?

Table 26 Skills that have the potential to be delivered (with funding) via SLEs, which could meet competency standards

Skills	Very probable (%)	Somewhat probable (%)	Neutral (%)	Somewhat improbable (%)	Not probable (%)
Access and egress (N=11)	63.6	27.3	9.1	-	-
Advanced airway management (N=11)	72.7	27.3	-	-	-
Advanced life support (N=10)	80.0	20.0	-	-	-
Basic and Advanced Trauma support (N=10)	80.0	20.0	-	-	-
Basic life support (N=11)	81.8	18.2	-	-	-
Cardiac arrest management (N=11)	81.8	18.2	-	-	-
Cardiac/respiratory/chest pain assessment (N=10)	80.0	20.0	-	-	-
Care of a neonate (N=10)	80.0	10.0	10.0	-	-
Chest decompression (N=10)	70.0	20.0	-	10.0	-
Communication skills (N=11)	63.6	36.4	-	-	-
Complex patient simulations (N=10)	70.0	20.0	-	10.0	-
Computer scenarios (N=10)	60.0	20.0	10.0	10.0	-
Critical care skills (N=10)	70.0	20.0	10.0	-	-
Critical thinking and judgement/clinical decision making (N=10)	80.0	10.0	10.0	-	-
Documentation (N=11)	72.7	18.2	9.1	-	-
ECG (N=11)	81.8	18.2	-	-	-
Emergency childbirth and complications (N=11)	63.6	18.2	18.2	-	-
Hand-over skills (N=11)	81.8	18.2	-	-	-
Health assessment and physical examination (N=11)	72.7	27.3	-	-	-

IM/SC/IV injections (N=11)	81.8	9.1	9.1	-	-
Infection control (N=11)	81.8	18.2	-	-	-
Inhaled medications/oxygen therapy (N=11)	90.9	9.1	-	-	-
IV therapy (N=10)	90.0	10.0	-	-	-
Leadership skills (N=11)	63.6	27.3	-	9.1	-
Manual handling (N=11)	90.9	9.1	-	-	-
Medication administration (N=11)	90.9	9.1	-	-	-
Mental health assessment (N=10)	70.0	20.0	10.0	-	-
Mental health patient management skills (N=10)	70.0	30.0	-	-	-
Mobility and patient movement (N=11)	63.6	27.3	9.1	-	-
Multi-casualty incidents and disaster management (N=11)	54.5	27.3	9.1	9.1	-
Multidisciplinary/interprofessional simulations (N=10)	70.0	10.0	20.0	-	-
Oral medication preparation and administration (N=11)	90.9	9.1	-	-	-
Other assessment tools (e.g., GCS, NVO) (N=11)	81.8	18.2	-	-	-
Paediatric assessment (N=10)	70.0	20.0	10.0	-	-
Pain assessment (e.g., pain scores)/intervention (N=11)	72.7	27.3	-	-	-
Professional practice (N=10)	80.0	10.0	-	-	10.0
Recognition and management of a deteriorating patient (N=10)	80.0	20.0	-	-	-
Remediation (N=10)	70.0	20.0	-	10.0	-
Risk assessment/safety (e.g., scene assessment & management) (N=10)	70.0	10.0	20.0	-	-
Scene assessment (N=10)	70.0	20.0	-	10.0	-
Scene Management (N=10)	80.0	10.0	-	10.0	-
Spinal precautions and spinal injury management (N=11)	90.9	9.1	-	-	-
Stoma care (N=10)	70.0	10.0	10.0	-	10.0
Surgical and needle cricothyrotomy (N=10)	70.0	20.0	-	-	10.0
Team work (N=10)	80.0	10.0	10.0	-	-
Time management/prioritisation of care (N=10)	80.0	10.0	10.0	-	-
Triage assessment (N=10)	60.0	30.0	10.0	-	-
Venipuncture (N=11)	81.8	18.2	-	-	-
Vital signs (N=10)	90.0	10.0	-	-	-

Table 27 Skills that have the potential to delivered (with funding) via SLEs, which could meet competency standards

	Skills delivered	R/A		Skills delivered	R/A
1.	Inhaled medications/oxygen therapy	4.91	26.	Team work	4.70
2.	Manual handling	4.91	27.	Time management/prioritisation of care	4.70
3.	Medication administration	4.91	28.	Communication skills	4.64
4.	Oral medication preparation and administration	4.91	29.	Documentation	4.64
5.	Spinal precautions and spinal injury management	4.91	30.	Critical care skills	4.60
6.	IV therapy	4.90	31.	Mental health assessment	4.60
7.	Vital signs	4.90	32.	Paediatric assessment	4.60
8.	Basic life support	4.82	33.	Scene Management	4.60
9.	Cardiac arrest management	4.82	34.	Access and egress	4.55
10.	ECG	4.82	35.	Mobility and patient movement	4.55
11.	Hand-over skills	4.82	36.	Chest decompression	4.50
12.	Infection control	4.82	37.	Complex patient simulations	4.50
13.	Other assessment tools (e.g., GCS, NVO)	4.82	38.	Multidisciplinary/interprofessional simulations	4.50
14.	Venipuncture	4.82	39.	Professional practice	4.50
15.	Advanced life support	4.80	40.	Remediation	4.50
16.	Basic and Advanced Trauma support	4.80	41.	Risk assessment/safety (e.g., scene assessment & management)	4.50
17.	Cardiac/respiratory/chest pain assessment	4.80	42.	Scene assessment	4.50
18.	Recognition and management of a deteriorating patient	4.80	43.	Triage assessment	4.50
19.	Advanced airway management	4.73	44.	Emergency childbirth and complications	4.45
20.	Health assessment and physical examination	4.73	45.	Leadership skills	4.45
21.	IM/SC/IV injections	4.73	46.	Surgical and needle cricothyrotomy	4.40
22.	Pain assessment (e.g., pain scores)/intervention	4.73	47.	Computer scenarios	4.30
23.	Care of a neonate	4.70	48.	Stoma care	4.30
24.	Critical thinking and judgement/clinical decision making	4.70	49.	Multi-casualty incidents and disaster management	4.27
25.	Mental health patient management skills	4.70			

Table 26 highlights that between 54% and 90% of respondents consider all of the skills identified have the potential to delivered (with funding) via simulated learning environments, which could also meet competency standards. The 10 most frequently identified skills that have the potential to be delivered (with funding) via simulated learning environments, which could meet competency standards were as follows (see Table 27):

- Inhaled medications/oxygen therapy;
- Manual handling;
- Medication administration;
- Oral medication preparation and administration;
- Spinal precautions and spinal injury management;
- IV therapy;
- Vital signs;
- Basic life support;
- Cardiac arrest management; and
- ECG.

How important is it to your program that you increase the amount of exposure students have to simulated learning environments? (N=11)

Table 28 Importance of increasing student exposure to SLEs

Very important	100.0 (%)
Quite important	-
Fairly important	-
Slightly important	-
Not at all important	-

All respondents (100%) consider it very important to increase the amount of exposure students have to simulated learning environments.

How likely is it that embedding simulation in paramedicine curricula will enhance the capacity of clinical placements? (N=11)

Table 29 Likelihood that embedding SLEs will enhance capacity of placements

Extremely Likely	72.7 (%)
Likely	9.1 (%)
Unsure/neutral	18.2 (%)
Unlikely	-
Extremely unlikely	-

Seventy-two percent of respondents consider it extremely likely that embedding simulation in paramedicine curricula will enhance the capacity of clinical placements, 9% consider it likely, and 18% are unsure.

It was acknowledged SLEs are essential as a means for students to “learn and practice for the clinical setting.” It was considered “students could not possible move into the clinical environment without first having some simulated experience.” It was thought that “once the simulated experience is mastered, it may then be effectively applied in the clinical setting.”

Compared to other methods to enhance the capacity of clinical placements, how important is the use of simulation? (N=11)

Table 30 Importance of SLEs relative to other methods

Very important	90.9 (%)
Quite important	9.1 (%)
Fairly important	-
Slightly important	-
Not at all important	-

Compared to other methods to enhance the capacity of clinical placements, the use of simulation was considered to be very important by 90% of respondents, and quite important by 10% of respondents.

In considering the potential simulated learning environments have in the training of paramedics, how important is it that simulation is embraced to a greater extent by your program? (N=11)

Table 31 Importance of embracing SLEs

Very important	90.9 (%)
Quite important	9.1 (%)
Fairly important	-
Slightly important	-
Not at all important	-

Ninety percent of respondents consider it is very important, and 9% consider it is quite important, that simulation is embraced to a greater extent by their program.

How can simulated learning environments be best utilised to increase the capacity of clinical placements?

Respondents considered embedding SLEs into the curriculum would better prepare students through improving their confidence/competence and skill level. The importance of enrolling placement supervisors was considered an important part of the process. One respondent made the statement, "There is no direct correlation between simulation and clinical education in the workplace."

Themes	Examples
Embed	• Must be embedded into the curriculum and linked with both theory and practice to increase student understanding • Implant SLE into the pedagogy of the curriculum
Prepared	• Better preparation of students • Enhanced preparation for integration of knowledge and skills in the pre-hospital setting • Competencies & confidence in students pre-placement
Increase confidence/competence	• increased confidence, competency development prior to practice in real world
Increase skills	• Initial learning and further practice of clinical skills\ • Acquisition of advanced skills and practices for holistic case management • Performance of advanced patient assessment skills
Increase safety	• Application of knowledge in a safe environment
Enrol clinical supervisors	• Would better prepare the student for clinical placements, provided that placement supervisors are on board and recognise the learning
No correlation	• There is no direct correlation between simulation and clinical education in the workplace

In relation to the training of paramedics, are you aware of any national/international research that highlights opportunities for the expanded use of simulated learning environments to achieve the learning outcomes of clinical placements? (N=11)

Table 32 Awareness of research

Yes	9.1 (%)
No	54.5 (%)
Unsure	36.4 (%)

Only one respondent indicated they were aware of national/international research that highlights opportunities for the expanded use of simulated learning environments to achieve the learning outcomes of clinical placements. Subsequent discussion with the respondent indeed identified cutting edge work in the area of simulation was being conducted, however, investigations indicate no national/international research has been published that highlights opportunities for the expanded use of simulated learning environments to achieve the learning outcomes of clinical placements.

Discussion

Low and medium fidelity mannequins were both reported to be utilised by 72% of respondents either very often or always. Nearly all respondents utilise simulation as “skills-labs” and almost half of the respondents report they currently have a dedicated simulation suite. Over half of those that do not currently have a simulation suite are intending to develop one. Just over three-quarters of respondent’s simulation occurs in an on-site simulation facility and in traditional learning laboratories. Nearly three-quarters of respondents identified they do not have equipment that is sitting idle or underutilised. Nearly all respondents identified they have between one and five individuals/instructors in their school who are trained to lead/facilitate simulation, and nearly three-quarters of respondents identified they have between one and five individuals/instructors in their school with expertise sufficient to train others to lead/facilitate simulation. None of the respondents currently have a professional development (training) program to up-skill instructors/staff and it was considered there is a need for certification/credentialing or a required level of training/understanding to ensure there was an understanding of the fundamentals of simulation terminology and concepts and to ensure there was a concrete base for knowledge and expertise.

Although most items were considered to be beneficial, the following five items all received the same rating average and regarded as the greatest benefits to introducing SLEs:

- Assessment;
- Increase student confidence;
- Evaluate in safe environment prior to placement;
- Improve clinical reasoning rather than rote learn;
- Enhance clinical judgment;
- Increase student competence; and
- Better prepare students for clinical environment.

Respondents identified the following five items as their greatest challenges to simulated learning environments:

- Insufficient number of dedicated technical/support staff;
- Initial set-up costs;
- Cost – equipment;
- Insufficient numbers of trained staff to run simulation; and
- Cost – human.

The three primary reasons respondents currently utilise simulation is for assessment, to increase the competence of students, and to better prepare students' for the clinical environment. How respondents are currently utilising SLEs differs significantly from how respondents would like to utilise SLEs. The three primary reasons programs would like to utilise simulation are to foster greater levels of interprofessional practice, to provide situations that can (almost) replicate they dynamic pressures of work, and to enable the more efficient use of clinical placements.

The five most frequent **competency areas currently delivered via SLEs** were:

- Operates within a safe environment: Applies infection control procedures which minimise risks to patients and those treating them;
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Conducts appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely;
- Makes informed and reasonable decisions: Makes sensible, practical decisions about their practice, taking account of all relevant information and the best interests of the people who use or are affected by the service that is being provided;
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Uses clinical reasoning and problem-solving skills to determine clinical judgments and appropriate actions; and
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Draws on appropriate knowledge and skills in order to make professional judgments.

The five competency areas with the **greatest potential to be delivered via SLEs** and reach competency standards and/or meet clinical placement objectives were:

- Operates within a safe environment: Applies infection control procedures which minimise risks to patients and those treating them (91% very probable);
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Conducts appropriate diagnostic or monitoring procedures, treatment, therapy or other actions safely (91% very probable);
- Develops and maintains professional relationships: Effectively communicates throughout the care of the patient (81% very probable, 9% somewhat probable);
- Identifies and assesses health and social care needs in the context of the environment: Analyses the situation, gathers appropriate information and selects and uses appropriate assessment techniques (91% very probable); and
- Formulates and delivers clinical practice to meet health and social care needs within the context of the environment: Formulates specific and appropriate patient care and treatment actions (91% very probable).

Of the 49 skills that are **currently being delivered**, all respondents consider that the learning outcomes can be met for the following 13 skills, via SLEs:

- Advanced airway management;
- Basic life support;
- Cardiac arrest management;
- ECG;
- Hand-over skills;
- Health assessment and physical examination;
- Inhaled medications/oxygen therapy;
- Manual handling;
- Medication administration;
- Other assessment tools (e.g., GCS, NVO);
- Spinal precautions and spinal injury management;
- Team work; and
- Vital signs.

The 10 most frequently identified skills that have the **potential to be delivered (with funding) via SLEs**, which could meet competency standards were as follows:

- Inhaled medications/oxygen therapy;
- Manual handling;
- Medication administration;
- Oral medication preparation and administration;
- Spinal precautions and spinal injury management;
- IV therapy;
- Vital signs;
- Basic life support;
- Cardiac arrest management; and
- ECG.

Chapter Seven: Conclusion

There is no doubt as to the importance of SLEs to paramedicine. It is perceived SLEs have the potential to play a vital role in the ongoing development of paramedicine students'.

To ensure health care workers are able to address the increasingly complex environment in which they work, educators are searching for innovative teaching strategies that will optimise clinical learning in an evolving health care delivery system. It is crucial that paramedic educators ensure students' receive appropriate clinical experience. Clinical experience is required so theoretical knowledge is applied in 'real' settings in order that students' become safe, competent practitioners. Many of the issues affecting the quantity and quality of clinical experiences have been highlighted in the report and an increase in the utilisation of SLEs is thought to be an avenue through which students become better prepared to receive the necessary experiences that develop and hone their clinical skills. The three primary reasons programs would like to utilise simulation are to foster greater levels of interprofessional practice, to provide situations that can (almost) replicate the dynamic pressures of work, and to enable the more efficient use of clinical placements.

Simulation activity that occurs in clinical simulation centres provides a recreated clinical environment that is important for student paramedics, yet the environments they create are often very dissimilar to paramedics' usual working environment. While in addition to incidents occurring in extreme situations, much of the care paramedics provide is to patients with medical problems in the setting of their own homes, and a great deal of intervention is provided before the patient is moved to the ambulance where care is *continued* in the ambulance.

A range of responses was received from Heads of School and Nominees, and 64% of Heads of School consider there are some elements of the clinical placement that can be replaced via SLEs. While 36% were disapproving of such a move, the predominant view was that simulation enhances the clinical experience through the almost endless array of preparatory benefits it provides the student. The ability of SLEs to provide a safe environment in which students can practice is unquestionable. Although the benefits were evident there was also a sense that caution is warranted to ensure simulation does not erode the clinical time students have, and that simulation does not erode "real" exposure to the prehospital setting.

While there is paramedic research activity, there is little robust research on the effect of SLEs on learning outcomes. Much of the research that does occur is not specific to prehospital environments and more emphasis is required in paramedic-specific contexts. While acknowledging the evidence supporting the use of simulation to facilitate the transfer of knowledge to performance is in its infancy, findings indicate that simulation is perceived to be a valuable method of learning, which has a positive effect on the clinical effectiveness of students approaching the transition to become paramedics. Although the Paramedic Association of Canada (2001) identifies competencies a practitioner must have demonstrated in a simulated setting, research studies are yet to unequivocally identify opportunities to expand the use of SLPs to achieve learning outcomes of clinical placements.

The primary challenge to implementing SLEs identified in this report is not specific to Australia, and involves human resources. Ironically, cost was regarded as a lesser challenge. The ability to utilise the equipment universities currently have is restrained by a lack of personnel who are sufficiently knowledgeable to ensure simulation is effectively applied as an educational strategy. Future resource allocation must be mindful of this.

There is a significant desire to foster efforts that enhance interprofessional collaboration and to ensure industry is engaged.

Heads of School, stakeholders and nominees that provided input into this report are very excited about the potential SLEs have for the ongoing development of both students' and the profession. The initiative is considered important and one of national significance to paramedic training and has the potential to lead to a greater level of "road–readiness" in paramedic students.
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APPENDIX 1.

Dear Head of School

RE: Use of Simulated Learning Environments in Paramedicine Curricula Project

Following the communiqué you received from Health Workforce Australia dated 13th August 2010 informing you of the above initiative, I am writing to seek your assistance and involvement in this project.

Edith Cowan University (ECU) has formed a project team of Australian and international academics with experience in simulated learning programs to provide the project governance, and the team is seeking to work closely with all Schools involved in teaching paramedicine in Australia and other stakeholders during this process.

The Project Steering Committee is as follows:

- Professor Cobie Rudd, Pro-Vice-Chancellor (Health Advancement), ECU;
- Associate Professor Moira Sim, Coordinator of Postgraduate Medicine and Director of the Systems and Intervention Research Centre for Health at ECU;
- Professor Ian Patrick, National President for the Australian College of Ambulance Professionals;
- Professor Malcolm Woollard, Professor in Pre-hospital and Emergency Care & Director, Pre-hospital, Emergency & Cardiovascular Care Applied Research Group, Coventry University;
- Dr Madeleine O'Donnell, member of the Board of Directors of the National Association of Emergency Medical Services Educators (NAEMSE);
- Professor Judi Walker, Dean, Faculty of Health Science and Conjoint Professor of Rural Health, University of Tasmania;
- Professor Peter O'Meara, Professor of Paramedic Practice and Leadership at Charles Sturt University;
- Professor James Vickers, Head of the School of Medicine at the University of Tasmania;
- Captain Matt O'Shea, Captain in the Royal Australian Army Medical Corp (RAAMC) and the
- Current S2 Doctrine for Special Forces Command;
- Associate Professor Richard Brightwell, Coordinator of Paramedical Science, ECU; and
- Mr Steve Johnston, Senior Lecturer in Paramedical Science, ECU.

The Use of Simulated Learning Environments (SLE) in Paramedicine Curricula Project aims to identify and gain national agreement on which aspects of paramedicine curricula might be able to be effectively delivered via SLEs. The project's final report will focus on opportunities where clinical placement objectives can be met via the use of simulated learning environments and thus opportunities to expand clinical training capacity. The report will draw on national and international research in the area.

For the purpose of this letter, simulation will be described as:

An educational technique in which elements of the real world are appropriately integrated to achieve specific goals related to learning or evaluation. Simulation is an educational strategy, not a technology.
(Adapted from Gaba 2004)

Each School involved in teaching paramedicine across Australia is being invited to participate in and inform this project. The project's findings are intended to inform HWA's infrastructure development and implementation phase for SLEs in paramedicine. It is envisaged that universities and other centres will be able to apply for funding to develop simulated learning environments or to apply to have their facilities upgraded in light of the outcomes of this project.

Initial timelines for the project are as follows:

Information gathering:	4 October - 18 October 2010
Draft findings:	18 October - 29 October 2010
Consultation on findings:	29 October - 12 November 2010
Lodge Report:	22 November 2010

The Steering Committee for this project is keen to tap into your personal views and future gazing, as a Head of School. Hence the first stage of our methodology is a series of high level questions for Heads of Schools, as per Attachment A; there will be a forthcoming electronic survey request that you may wish to delegate to relevant senior staff.

As an initial step, I would be grateful if you could complete Attachment A (questions) and Attachment B which asks for contact details for a lead paramedic academic staff member in paramedical science studies whom we could approach to complete the electronic survey on behalf of your School. If your School offers more than one program leading to entry to professional paramedicine endorsement, could you please forward the contact details of the lead academic/s who coordinate/s each program.

As the project timeline is short I would be grateful for your prompt attention to these requests and ask that both the completed attachments please be returned by Wednesday 13 October to Kirsty Freeman via email ParamedicSLEproject@ecu.edu.au

Thank you for considering this request.

Yours sincerely

Professor Cobie Rudd
Project Lead
for HWA - Use of Simulated Learning Environments in Paramedicine Curricula Project

Enc:
1. Attachment A – questionnaire for Deans/Heads of School to complete
2. Attachment B - nomination of lead academic/s for each paramedical science program for the electronic survey

APPENDIX 2.

List of Key Stakeholders

Army School of Health, Department of Defence.
Australasian College for Emergency Medicine
Australian Capital Territory Department of Health
Australasian College of Ambulance Professionals
Australian Commission on Safety and Quality in Healthcare
CAE Healthcare, a subsidiary of CAE (formerly Canadian Aviation Electronics Ltd)
Clinical Excellence Commission NSW
Consumer Health Forum (CHF)
Council of Ambulance Authorities
Department of Health and Human Services Tasmania
Government of South Australia, Department of Health
Health Quality and Complaints Commission QLD (HQCC)
National Council of Ambulance Unions
Network of Australasian Paramedic Academics
Northern Territory Government, Department of Health and Families
NSW Government, Department of Health
Office of Health Review (OHR) WA
Public Health Association Australia
Queensland Government, Department of Health
State Government of Victoria, Department of Health
State Government of Western Australia, Department of Health
Student Paramedics Australasia
Student Paramedic Australasia
Victorian Quality Council
WA Council for Safety and Quality in Health Care (OSQH)