

Healthcare Simulation Education

EVIDENCE, THEORY AND PRACTICE



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Evidence, Theory and Practice

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Foreword

The old English proverb ‘You can’t know where you’re going until you know where you’ve been’ rings true with many innovations and developments that have the potential to alter the way we think about how we educate and work. The use of simulation in healthcare education is not a new method, but its adoption and rate of innovation have been rapid in recent years in Australia and worldwide. This has been supported through a range of funding opportunities, training initiatives and, more importantly, through recognition by governments and the World Health Organization of the importance that simulation can have in providing safe and efficient healthcare services. As a simulation community we continue to strive for new ways to incorporate simulation, technology and innovation into our education to improve patient safety and to train clinicians to become acutely aware of the influence of human factors on performance.

Simulation needs to become central to education and improvement processes in an effort to provide a more safety-conscious environment. To assist in this, work is continually being undertaken to make explicit the underpinning theory and application of simulation in the healthcare sector. Researchers, educators and clinicians alike are working together to provide evidence to support current practices in healthcare.

The challenge is to build on the work already undertaken in health and broader disciplines to develop a robust programme of education and research with the central premise of improvement – that is, the safer

delivery of healthcare and higher-quality education and training. This book assists the simulation community in understanding the successes and the complexities of simulation-based education in the context of healthcare.

The range of chapters in this book will help readers gain a systematic understanding of the theory and application of simulation. The book offers a fantastic opportunity to make a clear connection between the underlying rationale for the use of simulation and what it looks like when applied. Although the authors offer chapters on educational theory, the elements of simulation practice and contemporary issues in simulation, they have taken a new and critical approach to these topics. The book goes beyond the healthcare sector to help inform our practices. It also contains examples of innovations from around the world that have emerged from specific challenges that each author has experienced in their simulation practice, providing us all with opportunities to learn.

This text will prove an excellent resource for those at any level of experience. It is a valuable reference that can be revisited to reflect on what is known in order to know how to move forward.

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Debra Nestel, Michelle Kelly, Brian Jolly, Marcus Watson

SECTION I

Introduction

CHAPTER 1

An introduction to healthcare simulation

Debra Nestel & Michelle Kelly

KEY MESSAGES

- Healthcare simulation plays a critical role in patient safety.
- There are benefits of integrating simulation in all phases of education and training of individuals involved in the provision of healthcare.
- Although simulation modalities are diverse, there appear to be commonalities in designing for learning using simulation.
- The focus of this book is on simulation as an educational method.

Overview

This chapter introduces essential concepts for simulation-based education (SBE) in healthcare. The role of patient safety as an endpoint for many healthcare simulation practices is highlighted. The chapter also orientates readers to the book. There are six sections, this chapter being the first, the second on theoretical perspectives and frameworks, the third on contemporary issues, the fourth on elements of simulation practice, the fifth on innovations in simulation and, finally, the sixth, crystal ball gazing 20 years from now. We invite readers to work through the book sequentially. However, it is also designed so that each section and chapter can be reviewed independently.

Introduction

Simulation offers an important route to safer care for patients and needs to be more fully integrated into the health service.
Sir Liam Donaldson (2009)

In 2009, the Chief Medical Officer in the United Kingdom, Sir Liam Donaldson, wrote that *simulation* was one of the top priorities of the health services for the next decade [1]. He emphasized the role of simulation in rehearsal for emergency situations, for the development of teamwork and for learning psychomotor skills in settings and at times that do not place patients at risk. He also questioned the logic of charging clinicians to undertake training to make their practice safer. Although progress has been made in some areas, much remains to be done. In this book we share some of these advances, offer guidance in others and explore new ideas and practices.

Professor David Gaba, a pioneer in healthcare simulation, is widely quoted for the following definition: ‘Simulation is a technique – not a technology – to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner’ [2]. This definition sits well in the educational context for which it was developed. Like Donaldson, Gaba argues for integrated training approaches where ‘clinical personnel, teams, and systems should undergo continual systematic training, rehearsal, performance assessment and refinement in their practice’ [2].

Most healthcare simulation has patient safety as its ultimate goal. The drivers for SBE are well reported and include the expanding numbers of health professional students and clinicians balanced with constraints on work time. There is a shift to competency-based education and growing evidence supporting SBE as a strategic instructional approach [3, 4]. Healthcare simulation has a long history that includes images, layered transparencies, tactile models and simulated (standardized) patients [5–7]. Developments in computer-driven technologies such as task trainers, mannequin simulators

and virtual environments have increased access to SBE for all health professions. New modalities are developing and blending and refinement of existing ones are occurring. To facilitate SBE, health services and academic institutions around the world have invested in infrastructure in the form of skills labs, simulated clinical settings and mobile training spaces [4]. Faculty development programmes have emerged to support the quality of simulation educational practices [8, 9]. There is a vibrant research community, witnessed by the proliferation of healthcare simulation-oriented scholarly journals and publications.

Since the visions of Donaldson and Gaba, professional and regulatory organizations have begun to accept time spent in SBE as a proxy for some clinical placements [10, 11] and to provide credentialing for simulation-based operative skills [12]. SBE has also emerged as a valuable approach for preparing students across the health disciplines for upcoming clinical placements and for supporting the development of effective interprofessional practice and respectful team-based cultures.

Healthcare simulation also has limitations and information on these is shared across the book. Assumptions are often made about learning in simulation being *safe*. Although it is *patient* safe, it is not necessarily safe for participants. High levels of stress, anxiety, different power relationships and the same sorts of physical risks of working in a clinical setting may all be present during SBE. Clinician safety is essential and in this educational context largely refers to the creation of a *safe learning environment* in which clinicians (and students) can learn and/or improve their practice without psychological and/or physical harm.

Origins of this book

When in the role of Chair of the Australian Society for Simulation in Healthcare (ASSH), one of the editors (DN), in conversation with the Chair Elect (MK), reflected on the extraordinary contribution of the Society's members to the Australian and international healthcare simulation communities, especially offerings showcased annually at the SimHealth conference [13]. Acknowledging this contribution, we proposed a book that would be jointly edited by four consecutive Chairs of the ASSH. This book is the product of that conversation. It is intended to be a valuable resource

for simulation educators, technicians, simulated participants and administrators. However, it is likely to have a wider reach in two directions: to those interested in patient safety, policy and governance of healthcare professionals; and to those interested in educational and training methods.

Editors and authors

The editors all hold academic appointments and work to varying degrees in healthcare simulation education and research. Although many of the authors are very experienced researchers, the common thread is that they all use simulation in their practices. Contributions are truly international, with authors' current workplaces located in Australia, Canada, China, Denmark, Hong Kong, Ireland, Malaysia, New Zealand, Saudi Arabia, Singapore, Switzerland, the United Kingdom and the United States.

Structure of the book

The book is divided into six sections. The first consists of this introduction. The remaining sections *lightly* hold an exciting and thoughtful range of topics. We use the term *lightly* because inevitably there is overlap between sections. For example, Emmerich et al.'s contribution on the ethics of simulation practice (Chapter 16) would sit well within the sections on *contemporary issues* and *elements of simulation practice*, but we have located it in the latter as we envisage it will increasingly become core to any SBE.

Theoretical perspectives in healthcare simulation

The second section addresses *theoretical perspectives in healthcare simulation*. Bearman et al. write: 'Theories can be considered coherent frameworks of ideas, which inform learning and other simulation practices' (Chapter 2). Frameworks or structures help organize, situate and make meaning, so are an obvious way to start a book. We then look to the past to make sense of current healthcare simulation practices. In Chapter 3, Owen is clear that we have not leveraged the learning of pioneers in healthcare simulation. If so, 'we would not have had to reinvent the tools and rediscover the

value of it in education and training'. Centuries-old simulation-based curricula have gone unnoticed. We then shift to a discussion of the contested notion of *realism* in simulation by Nestel et al. (Chapter 4). Synonyms of realism are presented and the concept considered outside of healthcare. The authors then place *realism* against *meaningfulness*, focusing on educational goals rather than aspiring to heightened realism. The section closes with an alternative structure from a social science framework of micro, meso and macro levels, first applied to healthcare simulation by Arora and Sevdalis [14]. This framework shifts the focus of much educational work at the micro level to opportunities at meso and macro levels. In Chapter 5, Watson shares several examples from his practice to illustrate this framework.

Contemporary issues in healthcare simulation

The third section explores *contemporary issues in healthcare simulation*. Nestel and Kelly describe research agendas and programmes of research in healthcare simulation (Chapter 6). They draw on work from several simulation or discipline-specific communities where agendas provide strategic direction. In Chapter 7, Nestel et al. use the overarching term *simulated participants* to refer to various roles that individuals may be asked to portray in scenarios (e.g. patients, relatives, healthcare professionals etc.). They describe ways in which simulated participants contribute to healthcare simulations and the importance of *caring* for them. From Crea et al. we are given insights into ways in which narrative arts offer insights to the complexity of clinical practice (Chapter 8).

Wei et al. direct attention to the role of haptics in simulation training, and particularly the benefits of visual-haptic systems in training healthcare professionals (Chapter 9). Heinrichs et al. orientate readers to the expanding role of virtual environments and virtual patients (Chapter 10). Jolly offers guidance on issues of consistency in simulation from a measurement perspective (Chapter 11). Watson looks beyond simulation in healthcare to its application in other industries in an effort to inform our practice (Chapter 12). From Andreatta et al. we learn about the critical role of professional communities in developing simulation practices (Chapter 13) and the related topic of faculty development is addressed by Edgar et al. (Chapter 14). The section closes with a chapter from Bajaj et al.

on the role of the simulation centre in programme development and its positioning within the landscape of education and the health service (Chapter 15).

Elements of simulation practice

The fourth section focuses on *elements of simulation practice*. Ethical practices in education are increasingly being made explicit. Such practices deserve particular attention in healthcare simulation, as we have the ability to manipulate elements, which is in stark contrast to teaching and learning opportunities in the clinical practice setting. Ethical issues relate to learners, faculty and simulators too – especially in the form of simulated patients (and as Nestel et al. in Chapter 7 discuss, are relevant to the broader roles of simulated participants). Emmerich et al. apply four principles of bioethics to SBE and extend considerations to include virtue ethics and the role of building character through simulation (Chapter 16). From Weller and Civil we learn how simulation can support the development of effective teamwork (Chapter 17). Nestel and Gough share basic structures for healthcare simulation practice and draw on those used in a national simulation educator programme, NHET-Sim. Phases of simulation include preparing, briefing, simulation activity, debriefing, reflecting and evaluating (Chapter 18). The next two chapters explore in greater detail elements of these phases. Kelly and Guinea focus on the role of facilitation across each simulation phase and also consider the characteristics of facilitators (Chapter 19). Marshall and McIntosh offer guidance on dealing with unexpected events in simulations (Chapter 20). Finally, Cheng et al. review approaches to debriefing – a cornerstone of effective SBE (Chapter 21). Using evidence and theory, they suggest frameworks that provide structure to this important conversation. We are reminded that debriefing approaches are characterized by particular methods of questioning, flow of discussion, overarching goals and contextualizing learning to clinical practice.

Simulation applied to practice

The fifth section contains ten innovations of simulation practices. Each innovation is drawn from challenges that the authors have faced when introducing or trying to sustain healthcare simulation. The micro, meso and macro framework from Chapter 5 has been used to order the case studies. For example, at a micro level, that of individual behaviours and actions, Kumar and Nestel

share experiences of using simulation to enhance safe practices of home birthing in Australia (Chapter 22); Gough describes her experiences of video-reflexivity to amplify learning through simulations (Chapter 23); and Gatward et al. document the outcomes of SBE to augment the national organ and tissue donation requestor training programme (Chapter 24).

At the meso level, from a curriculum perspective, Han writes about his journey in reconfiguring and integrating SBE into a medical degree in China (Chapter 25). Next, Atan et al. provide their collective experience of using simulation to help junior doctors identify critical elements of transporting critically ill patients in Malaysia (Chapter 26). Koh and Dong share their success in creating a programme to extend the role of simulation technicians (Chapter 27). This initiative in Singapore and Malaysia has led to increased job satisfaction and retention and continuity of simulation centre operations.

Finally, we feature four macro-level initiatives that focus on the organizational or systems level of healthcare practice and delivery. Labibidi offers insights into the challenges of planning simulation for a unique healthcare facility in Saudi Arabia – the King Fahad Medical City – comprising four hospitals, four specialized medical centres and a Faculty of Medicine (Chapter 28). An integrated approach to simulation was adopted through central governance and funding, which still allows a level of independence in educational content and delivery in separate facilities. So and Ng write about the importance and benefits of establishing partnerships early in the process of developing a new simulation centre (Chapter 29). The example, from Hong Kong, highlights a tripartite relationship with leaders from the simulation centre, the hospital and the broader health authority. The impact of simulation on groups and their interactions is illustrated by Eddie et al., who report on the benefits of testing workflow and patient care processes in a new paediatric emergency department (Chapter 30). And finally, from Macleod and Moody comes a case study from simulation modelling showing how the configuration of space design features can be manipulated to maximize work efficiencies and patient flow (Chapter 31). In summary, these innovations illustrate the diversity of the application of simulation in healthcare contexts.

In the final section we look to the future of healthcare simulation. Crystal ball gazing, we consider directions for practice drawing on the contents of this book and

our own experiences. We are enormously grateful to our colleagues for sharing their expertise in healthcare simulation to advance our practices.

References

- 1 Donaldson, L. (2009) *150 years of the Chief Medical Officer's Annual Report 2008*, Department of Health, London.
- 2 Gaba, D. (2007) The future vision of simulation in healthcare. *Simul Healthc.*, **2**, 126–35.
- 3 Bearman, M., Nestel, D. and Andreatta, P. (2013) Simulation-based medical education, in *The Oxford book of medical education* (ed. K. Walsh), Oxford University Press, Oxford, pp. 186–97.
- 4 Nestel, D., Watson, M., Bearman, M. et al. (2013) Strategic approaches to simulation-based education: a case study from Australia. *J Health Spec*, **1** (1), 4–12.
- 5 Owen, H. (2012) Early use of simulation in medical education. *Simul Healthc*, **7** (2), 102–16.
- 6 Bradley, P. (2006) The history of simulation in medical education and possible future directions. *Med Educ*, **40** (3), 254–62. doi: 10.1111/j.1365-2929.2006.02394.x
- 7 Howley L, Gliva-McConvey G, Thornton J. Standardized patient practices: initial report on the survey of US and Canadian medical schools. *Med Educ Online*. 2009;**14**(7), 127. doi: 10.3885/meo.2009.F0000208
- 8 Nestel, D., Bearman, M., Brooks, P. et al. (2016) A national training program for simulation educators and technicians: evaluation strategy and outcomes. *BMC Med Educ.*, **16**, 25. doi: 10.1186/s12909-016-0548-x
- 9 Navedo, D. and Simon, R. (2013) Specialized courses in simulation, in *The comprehensive textbook of healthcare simulation* (eds A. Levine, S. DeMaria, A. Schwartz and A. Sim), Springer, New York, pp. 593–7.
- 10 Watson, K., Wright, A., Morris, N. et al. (2012) Can simulation replace part of clinical time? Two parallel randomised controlled trials. *Med Educ*, **46** (7), 657–67. doi: 10.1111/j.1365-2923.2012.04295.x
- 11 Hayden, J., Smily, R., Alexander, M. et al. (2014) The NCSBN National Simulation Study: a longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *J Nurs Regul*, **5** (2 Supplement), S1–S64.
- 12 Rosenthal, M., Ritter, E., Goova, M. et al. (2010) Proficiency-based fundamentals of laparoscopic surgery skills training results in durable performance improvement and a uniform certification pass rate. *Surg Endosc.*, **10**, 2453–7. doi: 10.1007/s00464-010-0985-2
- 13 Simulation Australasia. SimHealth conference [cited 2 February 2016]. Available from: <http://www.simulationaustralasia.com/events/simhealth>
- 14 Arora S, Sevdalis N. HOSPEX and concepts of simulation. *J R Army Med Corps*. 2008;**154**(3):202–5. PubMed PMID: 19202831.

SECTION II

Theoretical perspectives and frameworks for healthcare simulation