
Comprehensive Healthcare Simulation

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Comprehensive Healthcare Simulation: Pediatrics

 Springer

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To my wife Estée, thanks for your endless love and support. To my children Everett, Maëlle and Callum, thank you for inspiring me to help build a better and safer future for you and your children.

Vincent J. Grant

To my wife, Natalie, and my two kids, Kaeden and Chloe, for their unwavering support and love.

Adam Cheng

Foreword

The adjective “pediatric” applies to patients ranging from those born at a gestational age of 22–23 weeks with a birth weight of approximately 500 g to young adults aged 21 years standing 2 m in height and weighing more than 100 kg. Addressing many anatomic, physiologic, developmental, and psychological differences in pediatric patients creates tremendous challenges for the healthcare professionals charged with their care, and training those professionals to provide competent, compassionate, and developmentally appropriate care is similarly difficult. These and other challenges serve as a major driving force behind pediatric simulation.

Comprehensive Healthcare Simulation: Pediatrics is written by leaders in the field and encompasses many wide-ranging aspects of pediatric simulation. The first few chapters of the book focus on the importance of scenario design and debriefing as key elements of simulation-based learning methodologies. The significance of covering these core topics early while simulation technologies are discussed later should not be overlooked—indeed, unless one understands how to optimally employ simulation-based methodologies, one cannot make proper use of associated technologies. Issues unique to different pediatric subspecialties are covered in detail, providing helpful hints for the effective use of simulation in these domains. Attention is also paid to important subjects such as simulation instructor development and simulation-based research. Key themes, such as patient safety and human performance, are woven throughout the text.

Driven by the desire to improve the care of children, many of the authors who contributed to this text are also members (in some cases, founding members) of the International Pediatric Simulation Society (IPSS) and/or the International Network for Simulation-based Pediatric Innovation, Research, and Education (INSPIRE). IPSS sponsors the International Pediatric Simulation Symposia and Workshops (IPSSW)—an annual forum for the clinicians, investigators, and educators in the field of pediatric simulation—and hosts monthly webinars and publishes a quarterly newsletter. Through the INSPIRE network, investigators conduct simulation-based research, typically on a multicenter level, to advance the quality of clinical care provided to pediatric patients around the world. Taken in sum, efforts such as this text, IPSS, and INSPIRE are indicative of the passion and dedication that pediatric healthcare professionals bring to this domain.

As you can see from this body of work, the field of pediatric simulation has made tremendous progress in a relatively brief period of time. Yet many challenges remain, and we should not be content with the current state of our knowledge and expertise. Other high-risk industries are well ahead of health care in achieving a level of safety and effectiveness of which we should be envious. On the human side, we need to become more knowledgeable about the many ergonomic/human factors and issues that affect our ability to deliver care. From a technical standpoint, our physical patient simulators require better physiologic models so that their responses to interventions are more realistic. In general, more emphasis needs to be placed upon developing virtual reality-based tools and hybrid devices (physical + virtual components) to allow more flexible learning opportunities that can be tailored to meet the needs of individual healthcare professionals. In addition, the simulation research agenda should be

carefully aligned with the most relevant and important clinical questions to ensure that the research that is funded and conducted actually improves clinical care. While the authors cited in this text may lead some of these initiatives, we all need to collaborate in order to push the field forward.

I look forward to seeing this progress become manifest in the coming years and reading the next edition of this comprehensive, well-organized, and practical text.

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Preface

There has been tremendous growth in the field of pediatric simulation over the last couple of decades. Emerging from small pockets of simulation in neonatal care, emergency medicine, anesthesia, critical care, and transport medicine in various places around the world, pediatric simulation has evolved with the establishment of large hospital- and university-based pediatric simulation programs and the development of national and international pediatric simulation networks. Pediatric simulation programs have also evolved from delivering scenario-based simulations into sophisticated education, patient safety, and research programs, including the development of formal faculty development curricula and pediatric simulation fellowship programs. There are currently more than 125 pediatric simulation programs in over 25 countries around the world. National networks such as the Canadian Pediatric Simulation Network (CPSN) were developed to share experience and resources, promote standardization of curricula on a national scale, and collaborate on pediatric education and research projects [1]. On a global level, the development of the International Pediatric Simulation Society (IPSS) has been a remarkable step forward in consolidating the efforts of simulation educators around the world, including advocacy for regions where resources are limited. IPSS was established to promote and support interprofessional and multidisciplinary education and research for all clinical specialties and professions that care for infants, children, and adolescents. IPSS organizes an annual meeting bringing together leaders in the field of pediatric simulation. 2015 marks the seventh anniversary of the International Pediatric Simulation Symposia and Workshops (IPSSW), a conference that has been marching around the globe in various international venues, providing opportunities to collaborate and cross-fertilize across borders and to promote excellence in simulation education delivery and research [2].

The *science* of pediatric simulation has also grown dramatically in the past decade, as evidenced by both the volume of research being performed and the impact of the outcomes observed [3, 4]. Initial studies that focused primarily on whether learners felt engaged in simulation-based learning and whether it improved their confidence have been replaced by studies looking at short- and long-term clinical and behavioral performance, patient outcomes as well as the objective evaluation of various instructional design features for simulation-based education (SBE). A recent meta-analysis identified 57 studies involving over 3500 learners where SBE was used to teach pediatrics. When studies compared simulation to no intervention, effect sizes were found to be large for the outcomes of knowledge, performance in a simulated setting, behavior with patients, and time to task completion [5]. The authors suggested that future research should include comparative studies that identify optimal instructional methods (i.e., comparing SBE to other methods of education) and include pediatric-specific issues in SBE interventions.

Other areas where novel work is being done include human factors, patient safety, interprofessional education, family and patient teaching, innovative devices, and systems-based interventions [6–19]. Pediatric simulation-based research has also been buoyed by collaboration between pediatric simulation programs [20, 21]. The evolution of the International Network for Simulation-based Pediatric Innovation, Research and Education (INSPIRE) represents a major step forward in the ability to perform adequately powered research to answer many fundamental questions in the delivery and outcomes of SBE (www.inspiresim.com). As of

March 2014, INSPIRE has an active membership of more than 500 simulation educators and researchers spanning 26 countries [22].

The *art* of pediatric simulation has also advanced past the level of turning on a mannequin and running a scenario or having learners practice on a task trainer. Simulation is now being used in novel ways: to teach trainees and professionals how to conduct difficult conversations (e.g., breaking bad news to families, disclosing medical errors, disclosing non-accidental trauma (child abuse), discussions around end-of-life care and organ donation); to educate parents and other caregivers (including school faculty and staff) of patients with known medical needs (e.g., seizure disorder, tracheostomy care, anaphylaxis, among others), potentially also impacting discharge planning and hospital bed utilization; and to facilitate learning and debriefing around hospital-wide systems issues (e.g., patient safety, adequacy of clinical space, adequacy of response teams, building and outfitting of new space, testing of hospital response to large-scale disasters or child abduction/missing patients). You will read about these and many other new uses of simulation in pediatrics in the chapters of this book [23]. It appears that there is no element of health care and delivery that cannot be impacted by the use of simulation, either in training or assessment.

It is this tremendous growth and development that has provided impetus for *Comprehensive Healthcare Simulation: Pediatrics* to be written. As one of the first volumes in the new series, *Comprehensive Healthcare Simulation* (Levine and DeMaria, Series Editors), conceived to complement *The Comprehensive Textbook of Healthcare Simulation* (2013) [24], this book marks the incredible achievements of the international pediatric simulation community in working together collaboratively to remain on the “cutting edge” of simulation-based healthcare training. The authors who have contributed to this textbook are established experts in pediatric simulation, and we are proud to have their collective contribution to this volume. We hope this book will be a valuable resource to all simulation-based educators and researchers, not just for those from pediatric backgrounds. Whether you are setting up a simulation program, recruiting teachers and learners for simulation training, designing scenarios, approaching administration and donors for funding, or trying to understand and measure the impact of your work, we hope this *comprehensive* resource meets all your needs related to simulation. Although some of the content is not specifically “pediatric” in nature, all of the information is applicable to developing, growing, delivering, and measuring safe and effective simulation-based training. Part 1 covers the topics that we perceive as the *fundamentals of simulation for pediatrics*, and includes everything related to developing, organizing, and using simulation for training and assessment. Part 2 covers *simulation modalities, technologies, and environments for pediatrics*, and reviews all of the various types of simulation available to the healthcare educator. Part 3 covers *simulation for professional development in pediatrics* and includes simulation along the healthcare continuum, competency-based education, and inter-professional education. Part 4 is a complete review of simulation as it pertains to the various areas and *subspecialties of pediatrics*, including novel uses of simulation in rural environments, resource-limited settings, and for family-centered care. Part 5 is devoted to *simulation program development in pediatrics*, covering operations, administration, and education and research program development. Part 6 reviews the entire spectrum of *pediatric simulation research*, and Part 7 outlines *the future of pediatric simulation*.

We would like to thank all of the contributors for their dedication and hard work in preparing the high-quality work that forms the content of this textbook. We are honored and privileged to work with you all. We would like to thank everyone in our home simulation program (KidSIM Pediatric Simulation Program at Alberta Children’s Hospital), local hospital and health authority administration (Alberta Children’s Hospital and eSIM Provincial Simulation Programs of Alberta Health Services), and university department (Department of Pediatrics at the Cumming School of Medicine at the University of Calgary) for their ongoing support of all of the academic work that we do. We are privileged to represent such a dedicated group of clinical care providers, educators, researchers, and leaders. Finally, and most importantly, we

would like to thank our families, who sacrifice a great deal so that we can help contribute to the growth and development of pediatric simulation on a global scale. We really believe the collective work of the pediatric simulation community is creating a safer world for our kids to grow up in.

We wish you all good fortune on your journey in simulation. Enjoy the book!

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