
Comprehensive Healthcare Simulation

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Comprehensive Healthcare Simulation: Neurosurgery

 Springer

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*“To my wife Mirna, and my daughters Leen and Nour, with love
and thanks for your unwavering support and encouragement.
You are my inspiration and guiding light”*

Preface

The art of science of neurosurgery has been taught through past and recent history from one generation to another. The past history has relied on some forms of *simulation* to train the upcoming physicians. Initially that includes simulation of surgical procedures mostly on cadavers. Recently, with new technological advances, there has been an expansion of the simulation tools that are available for us for training. Different medical and surgical specialties have developed different modules for the training; the implementation of such training modules varies from one medical/surgical specialty to others. Within the medical specialties, the simulation modules focus more on physical examinations and analysis of emergent scenarios, while the surgical specialties had to come up with different ways to teach surgical skills. That created a huge obstacle to have simulation modules that can realistically mimic the human anatomy, its hemodynamics, and hemostasis as well as the physical properties of the human organs. Neurosurgery field like other surgical specialties have its own unique challenges. Neurosurgical trainees face great challenges in learning to plan and perform increasingly complex procedures in which there is little room for error. The brain is anatomically the most challenging organ in the body. Any surgical training module has to take into consideration the relationship of the skin, bone, brain tissue, and the ventricular system, thus expanding the complexity of any simulation module. The neurosurgical community has embarked on a very complex challenge of creating alternative surgical skill tools that would introduce the technical skills to the new residents, without putting patients at an increased risk.

In this textbook *Comprehensive Healthcare Simulation: Neurosurgery*, we tried to shed the light on the previous, current, and possible futuristic simulation methods that would enhance our ability to train future neurosurgeons. The textbook divides training tools into *physical*, *biological*, and *virtual reality* models. In each chapter, the corresponding authors go into details describing the nature of these models, their current application, and the current evidence of their value in the training. The choice of these models should take into consideration validity, cost-effectiveness, and ease of access.

Modes of simulation include detailed descriptions of cadaveric simulation, lifelike cadaveric simulation, fidelity manikin simulation, and microsurgical skills training in animal models and present on various currently available computer-based augmented reality simulators. The use of physical simulators has a promising role because of its low cost. The advantage of segmented reality simulation includes training on task-specific simulators,

including simple ventriculostomy procedures, expanding into spinal instrumentation, and ultimately including the most complex aneurysm clipping procedures. The textbook also presents the role and future of 3D printing and 3D visualization of medical imaging. This field is only expected to expand which will revolutionize how we interpret medical imaging, how we would teach basic anatomy to medical students, and how to have a rehearsal of surgical anatomy and approaches prior to the surgical procedure using patient-specific data.

The role of such simulation modalities has been very essential in focused level-specific courses; this has been embraced in neurosurgical societies in the United States and internationally. These courses will prove to be helpful as they bring simulation material and faculty in one form. This textbook's aim is to provide a platform where residents in training, practicing neurosurgeons, and organized neurosurgery can go to review the best evidence for the role of simulation in neurosurgical training. I hope that the readers will find the material in this textbook helpful and useful in this rapidly changing field. I would certainly love to get feedback that can be used to enhance the second edition of this textbook.

Chicago, IL, USA

Ali Alaraj

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