# Clinical Simulation in Medicine

# Clinical Simulation in Medicine

For all Examinations in Cardiology, Critical Care, Anesthesia and Pulmonary Medicine


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## Dedicated to

*My father and family*



**Dr KK Malhotra**
**(4.7.1929–4.1.2011)**

*My father is a never-ending song in my heart—of comfort, happiness and well-being. I may sometimes forget the words but I always remember the tune.*

*My mentor, guide and inspiration in life*
*An extraordinary physician and human being with boundless affection, witty, hardworking and godly qualities who five years after he's gone,*
*still inspires me to read and write. He is my bridge and a good luck charm.*

**—Poonam Malhotra Kapoor**

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# FOREWORD



Medical simulation is a branch of simulation technology related to education and training in medical fields of various industries. It can involve simulated human patients, educational documents with detailed simulated animations, casualty assessment in homeland security and military situations, and emergency response. Its main purpose is to train medical professionals to reduce accidents during surgery, prescription, and general, clinical practice.

This book *Clinical Simulation in Medicine* edited by Dr Poonam Malhotra Kapoor and other stalwarts in academic teaching is a handbook for individuals working in or preparing to work in simulation and for academic and service organizations that are using simulation or are planning to use simulation. It provides the knowledge needed to become a simulation professional and generates information on how to best use that knowledge to effectively use simulation in their organizations for day-to-day procedures. Evidence-based and pragmatic, this book raises awareness of the knowledge and expertise required to utilize simulation strategies.

A true benefit of simulation can be harvested when the simulation models are fully integrated into the routine fabric of health care delivery and academics. Health professionals embarking on a career teaching simulation are embracing a world of innovation in which both teachers and students can develop their healthcare skills more rapidly and promote better patients' outcomes. This is the first practice manual to assist healthcare simulation educators in India and internationally in preparing for certification in this rapidly emerging field.

Healthcare decision makers need reliable tools to support them in decision making for adapting policies to help cutting costs or reducing waiting time, and to provide visualization which allows them to rehearse innovative ideas before they are implemented. The tools should facilitate an evidence-based and informed decision-making environment. Simulation models, especially with transparency into their structure and underlying variables, which can be easily understood and trusted by decision makers, are a helpful tool in decision support, communication and discussion of ideas and policies, and analysis of scenarios.

The book is a guide and reference to the latest technology, operations and opportunities presented by clinical simulation in the field of bronchoscopy and the difficult airway, trauma and basic life support, echocardiography, hemodynamic monitoring and latest trends in monitoring the bleeding surgical patients in point-of-care testing. It shows how to develop and make efficient use of resources, and provides hands-on information to those tasked with setting up and delivering simulation facilities for medical, clinical and related purposes, and the development and delivery of simulation-based education programs.

All in all, the *Clinical Simulation in Medicine* is a very important entry into what I would consider the "examination preparation" category of cardiac critical skills for the fellows and students in the subject. The chapters are well illustrated, and most have an extensive number of topics that they may need to review in greater depth. With expert contributors and sound editing, the book would be a valuable addition to the library of anesthesiologists, surgeons, pulmonologists, pediatric intensivists, and cardiologists interested in a text covering the breadth of topics related to clinical medicine.

"The eyes do not see what the mind does not know" is very true about clinical medicine. As a result, a simple aortic stenosis may be missed. This first-of-its-kind book on the subject of clinical medicine has brought together different contributors from various branches of medicine. There is a great need for a book of this type and the author's present work goes a long way in fulfilling this need.

I wish the contributors, all success in their venture.

**MC Misra**
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# FOREWORD



The book promotes the value of simulation in healthcare and its associated outcomes while clarifying the operational requirements of successful simulations, featuring numerous contributions from international and national experts, consultants and specialists in clinical medicine in simulation.

The use of simulation to gain and maintain skills in healthcare has become critical to the delivery of the curricula in medical schools, nursing schools, residency programs, and hospital-based practice. Specialty boards, such as the American Board of Anesthesiology, now require simulation training as part of the maintenance of certification. This trend is fast catching up in medical simulation.

Medical simulation is a relatively new science that is achieving respectability among healthcare educators worldwide. Simulation and skills centers have become established to integrate simulation into mainstream education in all medical, nursing, and paramedical fields. Borrowing from the experience and methodologies of industries that are using simulation, medical educators are grappling with the problem of rapidly acquiring the skills and techniques required to implement simulation programs into established curricula. This book assists both novice and experienced workers in the field to learn from established practitioners in medical simulation. Simulation has been used to enhance the educational experience in a diverse range of fields; therefore, a wide variety of disciplines are represented.

The book begins with a section on the logistics of establishing a simulation and its role in the medical field and hospitals. Different sections deal with simulation in transthoracic and transesophageal echocardiography, hemodynamic monitoring, ECMO and many of miscellaneous diseases, such as advanced cardiovascular life support (ACLS), basic life support (BLS), and airway management that is required to equip a stand-alone or institution-based center. The features, strengths, and weaknesses of training devices are presented to help the readers find the appropriate simulator to fulfill their training requirements.

The book will continue to vibrate you from the beginning to the end and going through the book is a pleasure. The contributors of the book are unmatched in their pediatric perioperative TEE skills who have excelled in their fields.

I am sure the book will find a permanent place on the desk of all clinicians interested in simulation. I congratulate Dr Poonam Malhotra Kapoor and her team for this wonderful endeavor and wish the book and her great success.

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# PREFACE

Medical textbooks, continuing education programs and reference sources all provide the knowledge base needed for competent medical practice. This book presents the rest of what we need to know to be an outstanding clinician—that is practicing your clinical skills on simulators. *Clinical Simulation in Medicine* goes beyond basic routine teachings. It helps the clinicians improve patients' outcomes with simulation-based learning to enhance practitioners' skills, clinical competence and interdisciplinary collaboration. To advance the field of healthcare simulation, this book provides a platform for every clinician in improving and reforming education amongst the health professionals, in a more robust way!

Today, clinicians, hunting for the answers to questions can find more timely information online and they can find it faster than searching the index and then the numbered pages of a heavy book!! But, how do you practice your clinical skills? The physician participants in this book have discovered better and in some cases, incredibly effective ways to learn the clinical skills over the years by simulating them first, without weakening the conventional system and in most cases, learning and teaching it on the simulators to clear their concepts better! Research studies have proven their success!

The path to mastery and improved performance involves practice and experience. This is true if you are an athlete or a helicopter pilot, but not as a practicing clinician, on a live patient! For education and professional development in the medical field, simulation has provided practice and experiential learning opportunities for years. In my experience of teaching at AIIMS, simulation is the most essential to educate medical professionals.

Any individuals, societies or organizations discussed in this book are mentioned without malice. To the best of my knowledge, this book reports the truth, not with the intent to harm, but to inform to the best of my ability as a scholar who has devoted much time and is passionate about using simulation for academic teaching.

I am grateful to all my section editors, contributors and readers for their constant interest and expert help with this manuscript.

This book collaborates physicians from different fields, first time together with one aim—"Academic teaching and learning different clinical subjects with medical simulation". Most of my thanks go to my teachers, students and family members—my first readers and key critics.

This is lucid text, explained simply by all of us in the words of Einstein, the Great—"If you cannot explain it simply enough, then you do not understand it well enough".

**Poonam Malhotra Kapoor**

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