

## Development and Implementation of Pediatric Critical Care Focused Simulation Workshop and Program in India

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### Abstract:

Simulation-based learning has become a part of residency and fellowship training in many training programs in the United States. But, it has not been incorporated into the pediatric critical care medicine training in the developing countries like India. Simulation-based training allows rapid and repetitive learning of skills necessary to provide a high quality and safe care to critically ill children. There is a need to explore simulation as a tool to train pediatric and pediatric critical care medicine practitioners in the developing world. This is particularly pertinent to Indian subcontinent in which pediatric critical care medicine has grown by leaps and bounds over last decade. We hereby present one of the earliest reports of development and implementation of pediatric critical care focused simulation workshop and program in India.

**Key Words:** Simulation, Critical Care, Child, Training, India

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### Introduction:

Simulation training incorporates didactics, case-based learning and hands-on skill training.<sup>1</sup> Simulation based training programs geared towards pediatric critical care medicine have been successfully developed and implemented in western world<sup>2</sup>. But, simulation based training of pediatric healthcare providers is underutilized in developing countries like India. Also, simulation-based, Pediatric Critical Care Medicine (PCCM) courses must focus on basic and advanced PCCM training in keeping with some of the known

challenges of delivery of critical care unique to the developing world. The challenges involved with care of critically ill children in the developing world are limitation of resources, fulminant infections unique to the developing world, transportation of critically ill children to higher level of care and teamwork and communication. We sought to evaluate development and implementation of one of the earliest PCCM focused simulation workshop and program in India. We hereby describe one of the first PCCM simulation workshops which was successful in providing training in basic and advanced PCCM including fulminant infectious cases pertinent to Indian subcontinent.

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### Objectives:

To develop and implement a PCCM focused simulation workshop and program in India.

### Methods:

A group of pediatricians and pediatric intensivists

from different institutions of India collaborated with a simulation expert and pediatric intensivist of USA to develop and implement a PCCM simulation workshop and program in India.

**Need Assessment:** The group first performed an informal need assessment. Since pediatric critical care medicine is often practiced by general pediatricians not formally trained in pediatric critical care medicine, a need assessment was crucial to determine overall structure of the workshop. Also, it was important to assess the needs to characterize the cases, the objectives of the cases, design and on-site resources.

**Planning:** Since one of the major regional suppliers of the simulation equipment was Laerdal Medical India Private Limited, the US-based faculty reached out to them and discussed about the workshop program, their willingness to participate and provide simulation resources (mannequins, simulation technicians and simulation software to run the scenario). The subsequent step was to design the workshop program and prepare the cases with the objectives geared towards the participant needs in keeping with the common critical care scenarios and the key challenges of the practice of critical care medicine in India. While designing the workshop, the organizers discussed about 1) The balance of didactic sessions, hands-on sessions and cases scenarios, 2) The objectives of Pediatric Advanced Life Support (PALS) scenarios, 3) The time allotment for each session, each case and time allotment for debriefing of each case. Since most the participants were anticipated to be PALS trained, the objectives of the PALS scenarios for the workshop were directed towards high-quality CPR, teamwork and communication. During the workshop planning phase, the organizers, faculty and members of Laerdal Medical India Pvt. Ltd. communicated on a frequent basis via email, teleconference and smart phone messenger (WhatsApp Inc, Mountain View, California, USA). The workshop faculty collected the latest guidelines on common critical care scenarios like difficult airway management guidelines, traumatic brain injury guidelines and circulated amongst the participants. The US-based simulation expert provided just-in-time “training of the trainer” course to the workshop faculty with

dry runs of the case scenarios. The team utilized simulation resources and hospital-based resources to run the workshop. The team also designed skill stations for hands-on skill training in PCCM. The team evaluated the workshop and program through a just-in-time debriefing and post-session survey of the workshop participants.

### Results:

The collaboration of pediatricians and pediatric intensivists from different parts of India with simulation expert from USA led to the development and implementation of a successful 2-day simulation-based PCCM workshop. A total of 12 Indian faculties and 1 US faculty participated in the workshop as simulation facilitators. The years of experience of pediatric practice beyond the basic pediatric training among the faculty ranged from 5-20 years. The entire faculty had in-depth knowledge and experience of PCCM and 10 out of 12 Indian faculties had PCCM training at centers of excellence abroad.



**Figure 1.** Faculty, nurses and hospital administrator at the inauguration of PCCM simulation workshop at Fortis Hospital, Mumbai, India. *From left to right (in front)*– Preeti (PICU charge nurse, Fortis Hospital, Mumbai), Vishal Baldua, MD (Pediatric Intensivist, Fortis Hospital, Mumbai), Jesal Sheth, MD (Pediatric Intensivist, Fortis Hospital, Mumbai), Utpal Bhalala, MD, FAAP (Assistant Professor and Simulation Faculty, Johns Hopkins Hospital, Baltimore, Maryland, USA), ArunaBhoy, MD (Director, Fortis Hospital, Mumbai), Praveen Khilnani, MD, FAAP (Chief Pediatric Intensivist, BLK Hospital, Delhi), Mahesh Mohite, MD (Pediatric Intensivist, Sai Children’s Hospital, New Panvel), Chandrabas Deshmukh, MD (Head of Pediatrics, KEM Hospital, Mumbai), Preetha Joshi, MD (Pediatric Intensivist, KDA Hospital, Mumbai); *From left to right (in the back)* – Maninder Dhaliwal, MD (Medanta Hospital, Gurgaon), Sameer Sadawarte, MD (Pediatric Intensivist, Fortis Hospital, Mumbai); *Not in picture* – Rakshay Shetty, MD (Pediatric Intensivist,

Rainbow Children's Hospital, Vijaywada), Swati Garekar, MD (Pediatric Cardiologist, Fortis Hospital, Mumbai), Vinay Joshi, MD (Pediatric Intensivist, KDA Hospital, Mumbai), Rahul Pandit, MD (Senior Intensivist, Fortis Hospital, Mumbai).

Based on the needs assessment, the organizers were able to design the workshop program, the cases, the objectives of the cases in keeping with the day-to-day critical care scenarios and challenges unique to the practice of critical care medicine in India. The didactics were restricted to 3 lectures - Simulation in healthcare, Cardiac Arrest and quality of CPR and Role of simulation in PCCM. A significant proportion of the workshop time was allotted to the case scenarios, bedside debriefing and hands-on training.



**Figure 2.** Utpal Bhalala, MD, FAAP (USA faculty) going over the hands-on training on the use of glidescope in difficult airway cases.

The first case scenario enacted by the faculty in front of the participants and displayed on the screen through a live video was aimed at highlighting the importance of the teamwork and communication in management of critically ill child. The remaining case scenarios for the participants were spread evenly over 2 days and intermixed with hands-on sessions to avoid monotony. There were 16 case scenarios run over 2 days and they comprised of rapid sequence intubation, difficult airway cases, septic shock, dengue hemorrhagic shock, Dengue with abdominal compartment syndrome, acute meningitis, acute myocarditis, ARDS, status epilepticus, cardiac triage, transport of critically ill child, polytrauma, cardiac tamponade, Pulseless Electrical Activity (PEA), Supraventricular Tachycardia (SVT) and Ventricular Fibrillation (VF).



**Figure 3.** Faculty showing effective bag-mask ventilation during resuscitation case scenario.

There were 4 simulation technicians who followed the instructions for running the case scenarios using structured case files which were prepared, revised and finalized by the faculties before the workshop. For running the cases, the workshop used 1 sim junior, 1 sim man 3G, 1 resuscitation baby with CPR feedback, 1 adult resuscitation simulator with CPR feedback and rhythm generating system; for hands-on training, the workshop used airway trainer, Ultrasound machine and intravenous line tissue blocks. The critical care ultrasound experts first went over the basic knobology. The hands-on training on use of critical care ultrasound for 4-view cardiac echocardiography, evaluation of inferior vena cava, evaluation of vessels for arterial and venous line placement and lung assessment was provided on a volunteer subject. Additional hands-on training on use of critical care ultrasound for peripheral intravenous line placement was provided on IV task trainer.

Of the 34 workshop participants, 11 were pediatric residents/pediatricians, 2 anesthesia trainees, 2 emergency medicine trainees and 19 nurses with interest in PCCM. The workshop cases focused on the learning objectives of teamwork and communication skills. The pediatric advanced life support cases focused on delivering high-quality resuscitation training. The program evaluation and debriefing at the end of the workshop revealed very high participant satisfaction with comments like – “Dedicated and knowledgeable faculty, Case based practical approach, Interactive format, Every Query answered, Excellent quality of the dummies, Hands on experience”.



**Figure 4.** Faculty debriefing about case scenario at the PCCM simulation workshop.

### Discussion:

Simulation-based training is rapidly becoming a standard of medical training in the western part of the globe. In 2011, a survey conducted by American Academy of Medical Colleges (AAMC) reported that all 90 medical schools and 64 teaching hospitals that responded to the survey indicated that they use simulation during medical school<sup>3</sup>. There are well established institutional, regional and national simulation programs and training courses in the US. In the developing world, the simulation in health care is in its developing phase.<sup>4</sup> Over last 5-7 years, a handful of centers have begun simulation-based medical training in India - a few notable names being - TACT (The Academy for Clinical Training), The Apollo Learning and Medical Simulation Center and SRM/STRATUS Centre for Medical Simulation. A group of physicians have been successful in introducing simulation-based training in emergency medicine in India.<sup>5</sup> Also, inception of Pediatric Simulation Society of India (pediSTARS India) has marked the introduction of simulation training in pediatric medicine.

Pediatric critical care training programs in north-east region of the US have successfully established a rigorous, two day, multi-institutional, high-fidelity simulation-based “boot camp” for junior and senior level pediatric intensive care fellows.<sup>6</sup> Unfortunately, the applications of simulation for training focused towards common challenges of management of critically ill children in India are far and few. The high-fidelity mannequins enhance the realism of medical scenarios and promote the concept of “suspension of disbelief.”<sup>7</sup> The concept is to create a learning

mechanism to improve patient care without risk to an actual patient.<sup>8-11</sup> PCCM has grown by leaps and bounds in India over last decade. Many children’s centers of excellence have been established under banners of large tertiary care hospitals or healthcare systems. Also, most of the advanced PCCM centers have started formal PCCM training programs. It is about time for growing awareness of the advanced simulation-based learning technology within PCCM community of India. In a developing country like India, the sheer numbers of patients attending the acute care settings like emergency room and PICU makes the work of PICU physicians extremely stressful. Adequate training of these physicians in such real-life scenarios is important to improve the quality of patient care. In this regard, hi-fidelity simulation technology can become an integral part of PCCM training. The concept of the workshop was not only to give specific training of PCCM scenarios to the physicians, but also to introduce them to the concept of PCCM training through hi-fidelity simulators. Our workshop was one of the earliest PCCM workshops in India which combined the high-fidelity technology to common critical care scenarios and critical care challenges of India.

### Conclusions:

A successful PCCM focused simulation training workshop and program were developed and implemented through collaboration of faculty from different parts of India under guidance of simulation expert from US. Simulation has a huge potential for improving PCCM training in developing countries like India.

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