ISSN : 0974-2700
Volume 12
Issue 4
October-December 2019

10 YEARS

Journal of Emergencies, Trauma, and Shock

Synergizing Basic Science, Clinical Medicine, & Global Health

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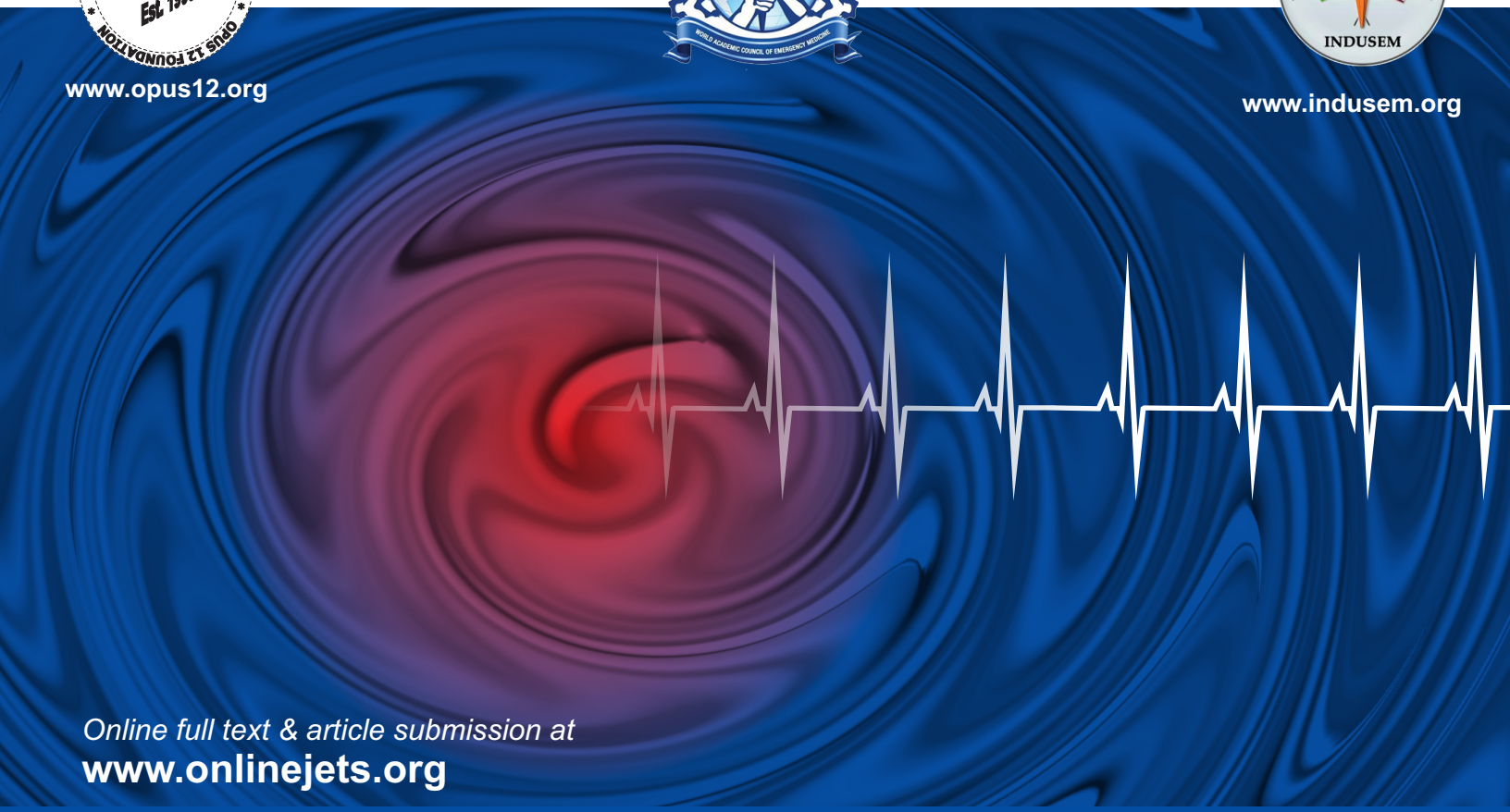

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Position Paper

The 2019 WACEM Expert Document on the Framework for Setting up a Simulation Centre

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Abstract

Almost every institution and academic medical center has its own simulation center today. It seems to have become a prerequisite and is incorporated into the guidelines of setting up new centers as well as in the upgrading and enhancement plans of existing institutions. In considering this, it is critical to consider the needs and demands of the healthcare population and staff the center will be serving. Setting up a simulation center is not an endeavor to be undertaken lightly. It entails a sustainable commitment in terms of political will, professional, educational and financial commitments. On the other hand, setting up a simulation center can be the most worthwhile and rewarding experience if the objectives and goals are met and effective learning occurs. The latter is an important element to be considered in the step toward nurturing an effective healthcare practitioner. In this paper, the principle author, who is the Director of the SingHealth Duke NUS Institute of Medical Simulation (SIMS) in Singapore, shares her views and experience of leading a world-class simulation facility. She has been involved in SIMS from its conception and is a strong advocate of medical education and lifelong learning. At the end of this paper, she shares a Checklist which puts together all the important considerations for anyone or any institution what is looking at setting up a simulation facility, a simulation-based training program, or even upgrading and upscaling their current simulation centre.

Keywords: Faculty development, human factors, simulation, simulation curriculum

Introduction

Education in healthcare continues to change and evolve. Some of the challenges today include the increase in the number of healthcare industry students and learners, the lack of sufficient numbers of clinical patients that learners encounter or are exposed to, and the more prominent medicolegal climate as well as the increasing need to reduce the gap between theory and clinical practice. Moreover, the more traditional forms of medical education do not, by today's standards, meet the needs in ensuring a completely safe and efficient training before active engagement with patients [Table 1].

Today, almost every institution and academic medical center (AMC) has their own simulation center. It seems to have become a prerequisite and is incorporated into the guidelines of setting up new centers as well as in the upgrading and enhancement plans of existing institutions. In considering this, it is critical to consider the needs and demands and not jump onto the bandwagon just because others are all having it. Setting up a simulation center is not an endeavor to be undertaken lightly. It entails a sustainable commitment, in terms of willpower, professional commitment as well as from the financial perspectives.

On the other hand, setting up a simulation center can be the most worthwhile and rewarding experience if the objectives and goals are met and effective learning occurs. The latter is an important element to be considered in the step toward nurturing an effective healthcare practitioner.[1-5]

Simulation offers a new spectrum in the paradigm shift in healthcare education today. It involves the use of technology

Access this article online

Quick Response Code:

Website: www.onlinejets.org

DOI: 10.4103/JETS.JETS_102_19

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How to cite this article: Lateef F, Yin S, Suppiah M. The 2019 WACEM expert document on the framework for setting up a simulation centre. J Emerg Trauma Shock 2019;12:232-42.

Received: 05.08.2019. **Accepted:** 28.08.2019. **Published:** 18.11.2019.

and innovation to assist in standardization of training, mastery of learning to cater to the range and spectrum of learners, and also the ability for teachers and mentors to address clinical variations that learners can be exposed to. For those with limited funds and in resource-limited countries, there are various aspects of lower fidelity simulation and innovative ideas to tap on for educational purposes. In fact, one's consideration is to have simulation-based programs rather than a full-fledged simulation center, which may be costly to run and maintain.[6-9] *In situ* simulation also offers an alternative. It is getting more popular today, providing training in the actual clinical environment, such as the resuscitation room, the intensive care unit, the operating theater, or the wards.[7]

Needs Assessment and Strategic Planning

Following the decision to set up a simulation center, the next steps of needs' assessment, focused group brain storming, and strategic planning are critical. It will set the foundation and fundamentals for the center. Strategic planning involves identifying what is currently being done and comparing this to what should be done, bearing in mind the mission, vision, and objectives of the center. It should also set the forward planning milestones, specifically for timelines such as at 1, 3, 5 years, and so on [Figure 1].

Simulation represents a complex sociotechnical process which can be used to mimic, replicate, and reenact real-life scenarios for teaching and practice purposes in healthcare and medicine. In fact, it has been utilized in many other industries much earlier, and thus, they are more organized and established in terms of their development of capacity and capabilities for their purpose and objectives. In fact, simulation creates transformational learning experiences for "learning in context," which is a concept at the forefront of contemporary education reform. In this era where passive learning is being replaced by more active experiential learning, simulation offers a valuable platform.

Table 1: Some of the challenges that simulation-based education can help to address

Simulation-based education can address some of the following challenges:
Reduction in training opportunities
Rapid increase in the number of students and learners to train
Higher awareness of patient safety issues
Regulation and reduction of junior doctors' working hours
The standardization of training requirements and experiences
Greater emphasis on level of competence and certification
Ethical issues which may arise from the use of real patients for skills' acquisition
The need for higher standards of care and performance today
Increase in the medical liability climate
The ability to train and the rate of training individuals, skills, technical performance, interprofessional, and teams
The capability to train and prepare to handle common and rare clinical situations, which can have serious consequences
Others

It is also important to be clear that simulation-based learning and teaching is not here to override every other educational methodologies. It offers a supplement and can be integrated into pedagogies and curriculums, across a variety of disciplines.[1,6,7,10]

Looking at needs' assessment, from the broadest perspective in healthcare, the following are factors to be considered:[10,11]

1. Simulation is but one of the modalities and tools available for education and training, thus it is important to critically review where and how to integrate it into the education methodology and curriculum which is existing. It has to be clear that simulation is not replacing other forms of training. It is utilized as a modality to supplement the existing educational methodologies and to be implemented strategically as deemed useful and relevant. The addition

SingHealth DukeNUS ACADEMIC MEDICAL CENTRE
Institute of Medical Simulation

Vision

The SingHealth Duke-NUS Institute of Medical Simulation (SIMS) aims to be an international leader in the delivery of comprehensive, multi-disciplinary, multi-modality, and interprofessional simulation-based training and research

Mission

1. To develop quality and standards for simulation-based training, with a focus on patient-centered environments
2. To provide a safe environment for trainees to hone their skills, with a view to enhance patient safety and ethical practice
3. To provide the tools to nurture and serve professional learners at all levels effectively
4. To provide support for individuals and teams training from basic to highly complex and specialized areas
5. To innovate and explore new frontiers in simulation-based education and research
6. To form partnerships and collaborations in line with meeting our vision

Core Values

- Strive for Excellence
- Integrity
- Mutual Respect and Teamwork
- Service through Learning to promote a Culture of Safety

For more information, please visit www.singhealthacademy.edu.sg/SIMS.

Figure 1: A sample of the welcome webpage for SingHealth Duke NUS Institute of Medical Simulation, for which the author is the Director

or incorporation must be at points where simulation-based learning can value-add and enhance the process of education and teaching. This can be both in the basic and clinical sciences space, but the integration sequence must make sense to the learner. This would include considerations such as:

- Which residency programs to include
- Which specialties or disciplines are on board
- At which level of training should simulation be incorporated
- At which specific points, and under which topics or themes will simulation be used for training
- How will training be a part of the interprofessional education and interprofessional practice curriculum for the institution?

These details are necessary for forward planning and projection. Reviewing these considerations, one would also notice that this can become a whole of institution approach as a collaborative effort. In this day and age, where healthcare is not a solo endeavor but a team sport, all professional inputs should be heard and taken into perspective.

2. What are your current services, capacity, and capabilities and how much further expansion and development are you providing for? [Table 2] What will be the focus of the training courses? This is also where setting the goals in terms of the cognitive objectives (targeting knowledge), psychomotor objectives (targeting skills and task performance), and affective objectives (targeting attitude/behavior) can be structured and planned.

The following details are important:

- Numbers to be trained (undergraduate, postgraduate, and faculty development)
- Numbers and types of courses to be offered
- Intra- and inter-professional training and courses
- Technical and nontechnical skills' training, weightage, and balance
- Offer of standalone courses or in collaboration with other institutions, national, regional, and perhaps even, international partners.
- One big subset of this is workforce and trainers:
  a. How many trained faculty are required

Table 2: Range of activities in a simulation center

Curriculum development	Development of programs and training across disciplines, for undergraduate, residencies, and faculty development to help in acquisition and maintenance of cognitive knowledge and technical and clinical skills
	Provision of a safe simulated environment for learning
	Training for teams and interprofessional education and interprofessional practice
	Customized programs or workshops for targeted learners, seminars, conferences, etc., These may be *ad hoc* in nature
Educational methodology development	To develop and execute new educational methodologies and techniques to assist learners of all levels. Can work closely with Medical Education Experts
Promotion of patient safety and quality care	Teaching to inculcate clinical reasoning, clinical decision-making, and evaluation techniques
	Enhancement and alignment of patient safety efforts in the clinical setting. The provision of training and inculcation of appropriate learning objectives through simulation education in this area. The simulation center can help promote institution initiatives such as "Target Zero Harm"
"Train the Trainers"	Conduct and support continuous professional development of faculty and trainers
	Proactive in reviewing and bringing in new courses and methodologies to help nurture teachers and trainers
	Have a robust and comprehensive assessment of faculty and trainers mechanism
	Accreditation and recognition of trainers and faculty
Research and collaboration	The simulation center can be the resource for healthcare professionals, educators, and researchers to collaborate on projects and studies which can help uplift teaching and learning (or Pedagogy and Andragogy)
	Assist to build relationships between the various groups of users of simulation-based learning and have an active CoP or even a thought leadership discussion group across disciplines
	Promote collaborative research to help improve healthcare processes, practice, and education
Certification, recertification, remediation	Have a comprehensive system to support continuing professional development
	Maintaining a suitable register or database for certification, recertification and remediation (for routine courses as well as *ad hoc* courses)
Continual development of the simulation environment	Maintain equipment inventory for the center, with the listing of onsite as well as decentralized, *in situ* equipment storage and use
	Have a comprehensive pathway to bring in and evaluate new innovations, technologies, and relevant equipment to help support teaching methodologies and training healthcare professionals of the future
	Be open to new innovations, support development of new products through research and collaboration with other institutions, partners, vendors, and nonmedical partners such as engineering, gaming, and technical professionals
Evaluation and monitoring	Conduct assessment of learning for different courses, different disciplines, and trainees
	Monitor and keep surveillance of the numbers of courses and training on offer and also the numbers of learners. This is to evaluate impact and return of investment for the simulation center. This is necessary to align with the mission and vision of the center
	Have regular satisfaction survey among the users of the center
	Conduct self-assessment for regular instructors and trainers, or faculty

COP: Community of practice

b. How many full-time, part-time, and temporary staff will be needed
c. How many administrative and technical staff are needed
d. Will there be adjunct faculty appointments
e. What will be the reimbursement for the training conducted
f. What will be the ratio of the number of staff from the various specialties and disciplines
g. What will be the optimal class size and ratio of faculty to leaners for the various courses.

Equipment range, choices, and numbers have to be decided. An inventory of the current range of equipment needs to be reviewed, and a new collation of the additional needs to be listed clearly. Even as we know that high fidelity equipment will help provide numerous cues to help with suspension of disbelief in the immersive learning environment, fidelity choice should only be as high as it really needs to be. There are many skills, knowledge, and concepts that can be learnt with lower fidelity equipment and other improvisations.

3. An important consideration at the institution level is whether there is a move toward using simulation-based skills training for certification and accreditation, before allowing residents to perform on real patients. This is something more and more AMCs and institutions are embarking on. If this is a practice, then there may be a need for higher numbers of trainers and training sessions to incorporate training and assessment across the various disciplines.

Beyond training, simulation laboratories can also be a place for usability testing and workflow design. With more agencies in many countries requiring usability evaluation of medical devices, simulation laboratories can support the important function of formative and summative evaluations. Healthcare institutions can utilize simulations and simulation laboratories to test and evaluate devices and processes in a safe setting. Such a service further adds to the logistical requirements such as video and audio recordings, adequate room for all participants and observers, electrical outlets, and possibly even internet connection

4. The location and facilities to be offered at the center must be decided on early, as there may be special requirements. Will the center be a standalone building or incorporated into an existing AMC. Proximity to such a facility has value, especially in the provision of training of clinical staff and residents. The design has to be flexible enough to meet the current demand and have the capabilities for future expansion and accommodate the constantly evolving technology needs within a reasonable and attainable budget.

As the environment will be an immersive one, it should be as realistic and user-centric to promote active learning. It should also create a culture of safety and orderliness. For example, is the simulation center going to offer Bio-Skills Lab (animal and cadaveric training), how many simulation rooms with one way mirrors are to be provided, how and where will the central control room be positioned. Lecture rooms, breakout rooms for discussion, debrief rooms with video playback, audio–visual capabilities are also up for consideration and planning. There is also a need to know the range and types of courses to be offered, which will have to be correlated with the premises requirements. The balance between clinical and nonclinical simulation training must be established. The types of room setup such as resuscitation rooms, operating theatres, debriefing rooms, intensive care units, and ward setup must be planned early.

In fact, the infrastructure and setup of the center must be decided, down to the details. Some of the considerations, which are often overlooked in the initial stages, include the following, pertaining to the physical and technical infrastructure:

- What height the ceiling should be placed at for the best lighting effect, audio–visual and IT requirements, placement of the cameras in the laboratories, and the need for extra servers and the need to place them in secured areas
- Provision of gas supplies and pipes for the provision of anesthetic gases. Generally, compressed air and gasses (CO_2 and O_2) are also required to simulate pulse, chest rise as well as run anesthetic machines adequately in the simulation facilities
- Electrical voltage, load, and power to charge manikins and equipment must be considered beyond the general electrical usage
- Size of each room, thickness of the walls, foldable partitions, noise proofing, and one-way mirrors are also to be decided in the early phases
- Often overlooked are the communication infrastructure: call bell system, telephone lines, speakers, microphones, and web-based services. Most centers today have wireless services available throughout the premises as well.

In planning, it is also prudent to make allowances for future uses and expansion. This is because some centers may start off on a smaller scale and may plan their expansion and provision of full services in phases. Making this option available for future use is important. Thus, some choose to utilize the use of flexible and more mobile proposals.

Some smaller institutions offer simulation training in partnership with other centers. They may have considered the cost of building and running a center versus utilizing services and training offered at a neighboring center. For smaller institutions, coming together in a collaborative and partnership model to offer this is feasible and may be more cost-effective. A review of the choices and options of training and courses can be conducted to fill any gaps. Staff from these centers that are collaborating can plan a common basic/generic simulation

curriculum, with some degree of customization available as they deem needed.

5. One element often overlooked is the provision for storage areas. Simulation equipment and manikins are large and will need proper storage and maintenance. There are also numerous consumables and manikin tissues which the SIM center has to keep stock. Space provision for this must be incorporated into the early planning stages. It must be easily assessable and must be near the simulation areas. Other considerations will include shared storage space on campus or decentralized storage in the different departments. The latter is used especially if *in situ* simulation is conducted in that department. The more IT-driven programs of VR, AR, and gaming may require less of physical storage space, but more of cyberspace and cloud storage
6. Support services and staffing are also important. Simulation is technology driven and depending also on what the simulation center is offering in terms of the spectrum of training (e.g. virtual reality, standardized patients [SPs] and their training, technical, and audio–visual support, video and camera services, e-learning team with appropriate software), relevant services must be available whether directly on site or through outsourced capabilities and partners. Simulation technicians, clerical and administrative staff, managers and other staffing will vary from center to center
7. Funding: The sources of funding, philanthropic donations, sponsorships, and others must be clearly projected at least for the first few years. Some of these can come from local government or parent institution funding and subsidies. Some manufacturer and distributor support is also feasible, but the agreement and terms must be clearly defined. Potential income that will be generated through courses and training, organization of events and conferences too can be projected. This is to ensure sustainability of the center financially. Running an up-to-date, state of the art, modern simulation center is a costly endeavor. The business continuity plans must be clearly defined and planned as well. If the center is part of a large academic medical institution, policies for funding must be aligned with the parent institution as well, with the submission and request for a suitable and reasonable budget. Other costs such as the startup cost and the operational and maintenance costs must also be calculated and planned for.

One time cost investments include the cost for building the premises, purchasing basic, fundamental equipment, appropriate furniture and infrastructure, video and audio systems installation, and software acquisition among other things.

Recurrent cost would include expenses such as salaries of regular staff, purchase of consumables, printing, travel cost, expenses for running training/courses, rental and utility costs and replacement of equipment and repairs and maintenance.

8. Allowance for future developments, expansion, and sustainability. In planning, it is also prudent to make allowances for future uses and expansion. This is because some centers may start off on a smaller scale and may plan their expansion and provision of full services in phases. Making this option available for future use is important. Thus, often the use of flexible and more mobile proposals are utilized. Settingup the simulation center should not be a short-term and short-sighted goal. Program of the future, strategic 1, 3, 5-year and beyond plans and projection must be borne in mind from the earliest stages. Even if the center may not utilize and open all facilities at one go, potential expansion plans should be incorporated into the initial masterplan.

As the center will be a medium- to long-term investment, it is also crucial to ensure the programs and training stays relevant, up to date and well integrated into other educational, residency, and IPP (interprofessional practice) curriculum. Thus, it needs to be robust, dynamic, and functional. After the initial few years, some centers may become self-sustaining financially if their business model plan is competitive. Sufficient numbers of instructors, students, clients, and staffing are important. Regular reviews of the courses on offer must also be done. If the spectrum is too broad, it may need to be streamlined; otherwise, an expansion will be required, based on continual needs' surveillance.

Technology adoption is another area that continues to develop. Some centers choose to utilize Low Threshold Applications (LTA) to initially support learning and training. LTAs are teaching and learning applications of information technology (IT) that are readily available, inexpensive to procure, and easy to learn. Simulation technology can always be incorporated in a systematic and orderly way, based on an agreed and planned framework for the center. Furthermore, as the center progresses, in-house research will become more established, and thus, the integration of human performance and simulation-based research is imperative.[12-14]

In view that simulation-based education is an area that is developing very rapidly, it will be an added bonus to remain nimble and be familiar with the emerging trends and state of the art technology. Some examples of these would be the use of virtual reality, augmented reality, serious gaming, hybrid simulation, computerized SPs or avatars, synthetic cadavers versus manikins, etc.

Training and Curriculum Development

In developing the programs and training, it must align with the facilities and infrastructure being built. The use of partnership training with other centers can be considered as a working model.[11,13,15,16] One of the greatest appeal of simulation is its ability to offer a diversity of courses and training, utilizing a

variety of modalities. For a new simulation center, it becomes crucial to define the spectrum and range of training and courses to be offered. It also makes a difference if the center is a full-fledged stand-alone one versus one that integrates with an institution or functions in partnership with another center. For the SingHealth Duke NUS Institute of Medical Simulation (SIMS), which is part of a larger AMC planning is done with Academic Clinical Programmes, residencies and departments to ensure relevance, good fit and matching with clinical training [Figures 1 and 2].

Ongoing professional development education should realign its traditional approach and direct the focus on team-based and interprofessional care and training. The emphasis must be on the ability to identify and respond appropriately, in a timely manner, to emergencies and clinical situations, especially by improving role clarity and team-based dynamics and performance**.** This is one of the main thrusts, and it also helps direct our training programs and curriculum setting[1,3,5] [Tables 2 and 3].

What defines the simulation center is its curricula and not the simulators.[1,8,16] Therefore, it is important to determine which parts of the curriculum or training, simulation-based education will enhance. The core curriculum set must be based on needs, and it is also necessary to ensure proper and efficient utilization of resources. Simulated experiences bridge the gap from the educational to the clinical environment and between theory and practice, through the use of realistic scenarios, equipment, and supplies. Learners can develop their higher order cognition, behavior and technical skills with repeated practice to be able to handle more complex, multidimensional problems.

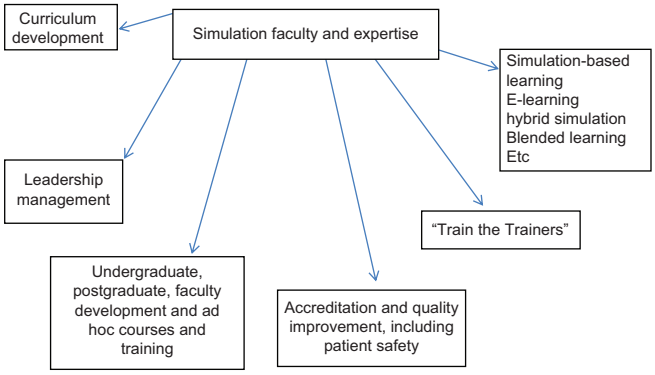

Figure 2: Spectrum of educational activities involving simulation faculty and expertise

Experiential learning will enhance learners' competence and professionalism, bearing in mind as well that there are many different types of learners (e.g. visual, auditory, kinesthetic, or combination type learners). The "hot-seat" experience for learners is an invaluable one, providing proactive immersive training, with the ability for some standardization. Programs should also include interprofessional education and interprofessional collaborative practice training as well as patient safety initiatives. Thus, in setting the learning objectives, it should not be done in isolation. Priorities must include the provision of a safe simulated environment for training and learning, where quality care, patient safety practices, and professionalism are reiterated. Training must be based on evidence-based practices, with clinical reasoning and decision-making opportunities emphasized. The integration of these realistic clinical environment will help ensure a richer learning platform. Issues such as program benchmarks, cost, and workforce efficiency in the execution of the proposed curriculum and timeline for the incorporation of newer courses must be on the agenda. There is also a need to discuss the provision of simulation laboratory-based training versus *in situ* training in the clinical environment. Programs on the menu may be generic in nature or targeted toward specific disciplines or specialties. This is highly relevant when the center is a part of an AMC or larger institution[17-21] [Table 2].

Some other examples of educational drivers to be considered would include:

- Procedural rehearsal and accreditation
- Teams and interprofessional training
- Specialty and high performance teams' training
- Competency-based educational training as well as
- Patient safety and quality assurance initiatives.

There must be competency assessment for all courses and training in the simulation center. This is about having a formal

Table 3: Examples of simulation training modalities

Partial task trainer	Equipment used to train for key elements of a procedure
Procedural simulation	Equipment used to train for a specific procedural skill
Standardized patients	Actors trained to portray patients realistically and consistently in simulation scenarios
Hybrid simulation	Utilization of multiple modality of simulation in a scenario
High fidelity manikin	The most realistic manikin available currently, with the ability to perform near physiological functions and provide voice communications
Voice-assisted manikin	Task training device used to train for a skill, which is able to provide voice feedback
Virtual reality environment	Interactive 3-dimensional environment created with computer technology. It can be delivered through head-mounted displays, for example, oculus rift
Augmented reality environment	Similar to VR except that the synthetic stimuli is superimposed on real-world environments

VR: Virtual reality

Table 4: Checklist for consideration in setting up a simulation centre/simulation-based training

To form a core, interprofessional project team
Needs assessment and management
To brainstorm the mission, vision, strategy
Performing the SWOT analysis
Present to management - Align with institution mission and prepare business case. Show success of other centers as examples
Show interconnection with the greater medical community
Sustainability plan and financial projections
Gathering diversity of inputs and perspectives
Identification of most suitable location for example standalone versus part of AMC
Determining details of the infrastructure, physical setup, layout, infection control guidelines, especially if there is a Bio-skills laboratory
Plan the design the brief
Working with architects, planners, and contractors
Note differences in requirements for a new building and existing premises to be renovated
Decision on the simulation-based educational offerings: courses, types of simulation, mode of delivery of training, etc.
For delivery of training
Simulation activity, eligibility, and participation
Objective/goals
Simulation activity design
Simulation activity content
Educational materials
Simulation activity evaluation/feedback
Decision on equipment, numbers, inventory, storage, fit for purpose, and maintenance in future, etc.
Decision on workforce
Director/codirectors
Administrative staff
Simulation technicians
Faculty: full time, part time, *ad hoc*, others by engagements
Partnerships' decision
Industry partnership and support
Academic partnership
Others
Training the trainers commitment
Finance and budget
Startup cost
Maintenance and replacement cost
Funding for renewal of furniture, minor renovation, and repairs
Donation/sponsorships
Business continuity plans and sustainability, income generating activities, marketing strategies
Reimbursement/payment for trainers and faculty
Accreditation of faculty
Completed faculty development training programme
Participation in simulation educational activities and numbers/interval
Continual professional development monitoring
Accreditation of courses
Faculty in charge/trainers in charge
Course design
Course facilitation/collaboration
Course assessment
Course evaluation
Governance
Equity and participation (accessible to all healthcare providers)
Organization structure, for responsibility and accountability
Ethics and professional standards
Policy and guidelines
Research policy and guidelines
IRB application process and forms/online submission
Grants eligibility and application

SWOT: Strength, weakness, opportunities and threat, AMC: Academic Medical Center, IRB: Institutional Review Board

process to design a formative or summative assessment of the competency in relation to the learning objectives set for each training and course that is conducted.

Quality assurance and improvement must also be in place for the center. This would refer to the whole range of activities and steps involved in quality management and quality control. The framework will encompass all policies, governance, systems, processes, and standards necessary to enhance and upkeep the quality of medical education provided.

The other considerations are understanding and alignment of the definitions to be used, with standardization. Some centers also conduct the certification of their simulation educators. Centers have the option to go for international accreditation such as that offered by Society for Simulation in Healthcare or others. It is important to evaluate the simulation programs and facilitation for their ability to provide support for program outcomes and organization goals that drive continuous quality improvement. The evaluation will help to ensure proper conduct and integration of simulation program into the curriculum. The evaluation of facilitation will help in validating competency of the trainers and faculty. It will also be useful to have a blue print for the simulation teams being trained.

Some simulation centers practice peer-review visitations and feedback sessions. This offers an excellent learning platform, and usually, it is for developmental purposes. It can cover review of operations, governance, and delivery of simulation courses. Sharing of best practices, ideas, and networking is also beneficial. In all areas of training, the learning environment and the element of psychological safety should also be clearly shared.

Faculty Development

This must commence early, at the onset of building the culture of simulation-based education as a paradigm shift in training. In planning faculty development programs, generic as well as specific, niche ones may be required. Building-up capabilities on scenario design, facilitation, and debriefing are core. Faculty development can enrich the center and what it has on offer as well. Faculty development is as important as faculty maintenance. It is an important investment. Qualified faculty is a necessity. Another group of people often overlooked is the

SPs. They can serve as valuable teachers, and in some centers, regular SPs are considered faculty of the center.

To be running all the courses and training, faculty and trainers are an important part of the equation. Some are permanent, while others are part-time or *ad hoc* faculty. They may be clinical specialists in a variety of disciplines and thus have a rich background of clinical experiences. Many centers would offer faculty development courses, to ensure alignment in teaching. For newer technology and training modalities adoption, there will be a need to create awareness, enhance familiarity, and provide training sessions. Faculty buy-in is an important area of focus which is often overlooked.

Faculty represents the center's ambassadors in ensuring a safe and nurturing learning environment. They are competent in their relevant areas of clinical practice and education and can help ensure best practice applications. They will help to ensure psychological safety is applied and reinforced, across all forms of training and teaching.

Another group of staff, besides the faculty, who also play an important role in the center would be the simulation technicians. They are involved in scenario planning and execution and contribute toward the psychological safety component of simulation-based training. Across the globe, the role of the simulation technicians remains relatively loose, flexible and is still being debated. As this is relatively not fixed and undefined, it is a role that is still growing and evolving. Across centers, some of the roles and responsibilities of simulation technicians include the following:

- Audio–visuals management
- IT
- Operations, repairs, and maintenance of equipment
- Moulage
- Bio-Skills Laboratory management
- Administrative duties
- Conducting the inventory, ordering, and purchasing of equipment and
- Some aspects of teaching.

Other new evolving roles also cover:

- Acting skills, participating as SPs
- Developing new courses
- E-learning
- Debriefing and even
- Marketing simulation-based courses and education
- Evaluation
- Research
- Design and creation of innovation solutions to meet faculty needs.

Centers should explore programs for their professional registration and accreditation as well as their continuing education and development. A career pathway for them would be optimal to have.

The leadership and director of the center is also responsible for setting the pedagogical model of their simulation-based learning and training. Our planning at SIMS typically utilizes the following framework:[22-27]

Introduction and briefing

This is where the objectives of the course or training are shared, and the important concepts are shared with participants. In certain courses, consent is sought if videorecording is being used. These are usually for learning purposes, and each video will be deleted at the end of the course and will not be reproduced.

Simulator and simulation-specific briefing

This is the hands-on orientation and familiarization to the simulator, manikins, room layout, and other equipment being utilized for the specific training. Here is also where our instructors and faculty share on active participation to maximize learning, the concept of active participation, "suspending disbelief" and deliberate practice in simulation-based learning.

Introducing the learning scenario

The scenario is shared, whether in whole or in small doses, at the appropriate timing to make it as realistic as possible for the learners. The scenario must be tailored to fit each group of learners. (There are also courses to teach systematic scenario writing.)

Debriefing

This is where facilitators lead the groups to reflect, review, and analyze their scenario management and performance. The learning goals are also revisited.

Having a framework provides a guide for facilitators and course setters and allows for meaningful conceptualization on their part. It is useful for all faculty to be familiar with and be trained in the debriefing process, as it represents one of the fundamentals of simulation-based training and education.

For simulation centers to remain relevant and useful, there must be the ability to grab the appropriate opportunities and understand the desired outcomes. The clinical training should also be coupled with simulation-based research as this will in turn help direct safety, systems and processes improvement, when translated to the actual clinical practice environment. In all, the goal must be to provide the best training and educational experience for learners, at all levels.

At the end of the day, it is about fostering an environment that rewards educational efforts and help advance a diversity of learners, faculty, staff, etc.[28,29] At some point in time, the center will need to review the need for expansion to reach out to a greater diversity of learners and have a greater repertoire of competencies, to have more impact. Overall, with the competitive academic and clinical environment, it is also necessary to ensure retention of talent among faculty and staff. Centers must have a strategy to do this.

Human Factors in Simulation

Consideration should be given to the incorporation of human factors in simulation-based education program. This is so as to develop better healthcare practitioners with an improved understanding of the resilience in individual practice, enhanced team performance, and systems' improvement. The science of human factors looks at physical and mental demands of individuals and teams and analyzes how task performance, team dynamics, and work environments can interact safely and optimally. The practice of using simulation to hone nontechnical skills and resolve human factors issues has come a long way. Beyond individual skill acquisition, simulations have proven to be effective at exploring and enhancing team-based and interprofessional performance.[30,31]

Today's simulation programs must actively incorporate human factors into their curriculum. Participants should be introduced to mainstream human factors concepts such as situation awareness, effective communication, cognitive workload, recognition of near errors, and even systemic contributions to effective as well as poor performance. Trainers and facilitators have begun building in team-based problems and scenarios which challenge communication techniques, focusing more on resolving people and system issues rather than just clinical competency. Simulation emphasizes systems thinking by exploring the impact of varying interaction between people, devices, and culture. With medical errors stemming more from human factors than medical incompetency, simulation has become a vital technique for improving patient safety and care delivery.

Partnerships and Stakeholders

Networking and communications are important in any project. There is a need to engage all levels of personnel and stakeholders and understand their needs and views. This is crucial to get buy-in and support for the simulation center and courses. Partnerships with other centers, institutions, schools, the community, vendors, suppliers, and distributors can be a win-win one, when planned appropriately. There must be policies and procedures in place to define and manage the relationship between the center and commercial healthcare industry partners. This will require the management of conflicts of interest that may arise. The Director and leadership of the simulation center will have to network extensively, not only locally, but at times, regionally and globally as well. Linking with other simulation centers, sharing best practices, networking among the staff and faculty as well as sharing of resources can value-add to the performance of the center. Considering partnerships with other centers that complement your own center's focus and services offered can also be an advantage. Such centers can draw upon each other's strengths and expertise. The parties to engage include clinical teachers and faculty, leadership of the institution, administrators, technical services staff, the medical schools from which students will be sent for training, quality assurance, and finance staff. Even talking to the Institutional Review Board (IRB) staff of your parent institution may be important as at times, they may not be familiar with educational and simulation-based research methodologies. Building this relationship and partnership is important as all research proposals, like in any other institutions, will need to get clearance from the IRB committee.

Research Strategy

The research objective for the center must be set early and be clear to all parties involved. Setting the strategy should be with the broader context of healthcare research of the AMC or institution in mind. This way, there can be more efficient sharing of research expertise and resources. The IRB or Ethics Committee of the institution can also assist with the simulation-based research applications and approvals. However, if there are no or inadequate numbers of persons with experience in medical education and simulation-related research on the IRB, it would be useful to recruit one. It is beneficial to have someone who is familiar with research methodologies which are applicable to simulation-based research, which needs to be evidence based and outcomes driven as well.[9,10,12,13,32]

Developing and growing existing research faculty as well as recruiting new ones will help strengthen the research culture of the center. Besides internal research, collaboration with industry partners and clinical enterprises will open up new research opportunities. These may follow with grants and other new funding resources. As in other areas of research, it is important to develop research resources and infrastructure that can support trials and studies. It is also important to grow the simulation based and educational research strategically, thus the importance of a clear vision and planned approach to partnerships and collaboration. The center director and board members can also play an active role to help secure philanthropic support and other sources of external funding by creating links, signing memorandum of understanding with other centers and institutions. The director may also have to negotiate for the faculty to have protected research time for those with full time establishment with the center. Offering of research mentoring opportunities is also another platform that can be explored. Other spinoffs that can be generated include developing intellectual property for new innovations at your center. For the more business minded, looking into potential startups, with the ability to monetize some of the offerings can be considered, but this must align with the institution or center's guidelines.

Simulation offers a valuable tool to evaluate of people, devices, and systems. Even as more studies published are pertaining to the use of simulation in education and teaching, the immersive environment provided by simulation can be very useful in planning and executing research in certain areas. It can be used to study various aspects of clinical practice that may not be readily or easily measurable, unless in a

controlled setting, offered by simulation.[12,13] This can help reduce harm to patients and even assess performance such as technical skills, nontechnical skills, and human factors affecting performance. Simulation also offers a good training platform to teach interprofessional practice values and skills. There has been much clinical training conducted in this area, but it is important not to lose sight that this is a fertile area for research as well. A word of caution in the planning would be that simulation-based research must reflect, as close as possible, what actually happens in the real clinical setting in order to be meaningful.[28,29] the clinical performance.

In a simulated environment, validity in research is achieved by making sure the scenarios reflect the real-world setting. The higher degree of fidelity may be able to help learners put themselves or imagine they are in the real clinical setting. Simulation experts and faculty must work closely with clinicians for their inputs for the best possible outcomes and experience. Better still, in some centers, the simulation faculty are themselves practitioners and clinicians and this certainly value-add to the work they do; maintaining consistency and accuracy as much as possible. Consistency allows for the scenarios to be replicated with some degree of standardization so that all participants are given close to the same experience. In SIMS, we utilize a harmonized scenario template to promote consistency. Furthermore, after a scenario is developed, we encourage a trial run with our simulation technicians.[22,26,32] Following this, refinements and modifications can be made accordingly. We also ask our learners to rate the level of realism, after every course, as relevant.

Simulation as a research tool can be linked to other patient safety research methods. This can help enhance its utilization as well as understanding. Simulation can be used to recreate events that are difficult to observe due to its rarity or complexity. When the environment is controlled, cases for teaching can be standardized and thus be more reproducible and outcomes can be measured using validated tools. Hypotheses related to patient safety can also be tested while reducing confounding factors. This can certainly be part of the bigger conceptual safety framework.

Conclusion

What is the real value of simulation-based education in healthcare? What will be the weightage of its qualitative as well as quantitative benefits? The quantitative benefits would include time savings, error reduction, decreased patient safety lapses, and enhanced competency. Qualitative benefits, on the other hand, may be more challenging to measure, and these factors may include increased morale and motivation of staff, satisfaction levels, and reputation of the institution, with the better performance of the healthcare staff. From the business perspective, it may be about how to monetize the real value of simulation-based education in healthcare.

As it is, simulation can be expensive to develop and also maintain. Its teaching methodology is also labor intensive, with a very small ratio of learners to educators/facilitators. Centers must therefore be cognizant of this and be aware of the return of investment, which is a complex formulation taking into account multiple factors. The life cycle of the simulators and equipment should be placed in context with the educational programs conducted and their impact [Table 4].

Simulation-based learning offers an important solution for providing clinical personnel the opportunity to learn, practice, and maintain their abilities without stress or risks to real patients' lives. The value of this can be seen from different perspectives. The direct value would be to the users of the simulation-based training. Its social value would be the benefit this offers to society, by having well-trained and competent healthcare personnel. The operational value can be considered from the results of clinical practice, for example, reduced length of stay and complications.

The institution may also be looking at other strategic value such as certification of competence, safety culture, and "target zero harm." Financial value of a structured and organized simulation-based training would hopefully reduce healthcare cost and increase revenue, in the medium to longer term. Cost investment can be significantly high, especially in the starting-up development and early phases. Some examples would be the cost of development, cost of day–to-day operations, cost of maintenance, and even cost to teach. However, in the end, simulation-based education and training offers a platform for healthcare staff to master what they do for patients and society.[33]

Beyond all these considerations, simulation-based education can be viewed as a change in the value that comes with ensuring that current educational approaches and training benefit our patients. The traditional gold standard that clinical skills can only be taught or learnt in the clinical setting with live patients is being challenged. We are now ensuring that our patients are the beneficiaries of our training, planning, facilitating, and pursuing simulation-based education. Therein lies the real value of simulation, I feel, and this may also be the real return of investment we are all looking for.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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