SPECIAL COMMUNICATION

Enhancing Simulation Literacy among Healthcare Professionals

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ABSTRACT

The concept of healthcare simulation literacy is yet to be widely discussed in educational conversations within simulation communities of practice. Nevertheless, it is vital to the correct practice of simulation-based education (SBE), the core of which revolves around healthcare simulation literacy, a multifaceted domain encompassing knowledge, skills and competencies required for the effective use of simulation-based methods. This paper begins by providing an overview of the current landscape of healthcare simulation, encompassing a comprehensive definition of this crucial terminology, and describes how we attempt to strengthen simulation literacy among healthcare professionals. The challenges of such an effort are discussed, and future plans proposed.

Keywords: *healthcare simulation literacy, concept, definition, healthcare simulation courses, faculty development program*

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INTRODUCTION

In the last two decades there has been an enormous growth in the global use of clinical simulation (1). This teaching-learning (T-L) methodology is currently one of the major tools used in the training of healthcare professionals. Based on Kolb learning cycles on experiential learning, simulation-based education (SBE) has proven to be an impactful method of T-L in healthcare (2). Clinical simulation is in tune with new paradigms in Education 4.0 (3). In Malaysia, 92.1% of institutions use simulation as a

T-L method (4). Simulation is capable of imparting T-L not only in the cognitive and psychomotor but also the affective domains. Therefore, it is imperative to educate academicians, especially clinician educators, on the essential principles of healthcare simulation.

A recent study showed that 80% of medical educators in major New York universities used simulation in T-L activities but only 5% had received formal simulation training (5). This implies that the majority of healthcare professionals who teach using simulation do so without adequate knowledge regarding the tool that they use. Currently in Malaysia the number of healthcare professionals with qualifications in simulation is very small. Their qualifications vary from international certification to short-term local courses. This demonstrates the huge gap between those who really know healthcare simulation principles and practice, and those who continue to practice SBE without any foundation.

Lacking a comprehensive grasp on healthcare simulation literacy (HSL), educators may encounter difficulties in effectively designing, implementing, and evaluating SBE experiences. More importantly, the absence of skill in conducting a SBE course may result in less-than-ideal educational outcomes, which could undermine the quality of healthcare professionals produced. Undoubtedly this will lead to wastage in terms of time, effort, and cost, due to lack of knowledge in the basic principles of simulation. The call for best standards in simulation-based practice in healthcare was clearly emphasized in the Global Consensus Statement on Simulation-based Practice in Healthcare (6). The aim of this review is to explore the concept of HSL, and how it can be enhanced to empower healthcare educators to deliver T-L effectively through simulation.

Definition of Healthcare Simulation Literacy

Despite our best search efforts, we could not find a definition of HSL anywhere in the peer-reviewed literature, although the term was used in one published conference proceeding document (7). Computer simulationists defined computer simulation literacy as "an individual's ability to (i) understand the results of computer simulations, (ii) evaluate significance and limitations of information generated by computer simulations, and (iii) create useful information with computer simulations through the (a) independent usage and (b) critical examination of such simulations" (8). They further explained that this definition contained three goals (understand, evaluate, create), two activities (using and examination), and one application (simulation).

HSL can be defined as having the understanding, proficiency, and familiarity with healthcare simulation principles of practice, and their application in healthcare simulation. It extends beyond mere technical proficiency in operating simulation equipment. This literacy encompasses knowledge about simulation tools and their application in various medical contexts, interpretation of simulation results, and effective integration of SBE into healthcare practices in enhancing patient care and safety, and professional development.

In practical terms, HSL refers to an individual's knowledge of and ability to correctly apply the best practice of healthcare SBE, starting from analyzing the requirements for SBE, formulation of teaching and learning objectives and outcomes, creating a

scenario and preparing items needed for the simulation activity, conducting the simulation activity, including pre-brief, facilitation, and debriefing and/or feedback, to evaluation of the effectiveness of the simulation activity. Ismail (9) proposed four phases of SBE, divided into nine components. The components (and phases) are: i) analysis and formation of the learning outcome (Initiation Phase); ii) scenario design, development and preparation (Creation Phase); iii) pre-briefing, simulation activity and debriefing and/or feedback (Execution Phase); and iv) Reflection and Evaluation (Review Phase) (Figure 1). Besides SBE, the individual who is simulation literate should be aware of other uses of healthcare simulation, namely assessment, research, and system integration.
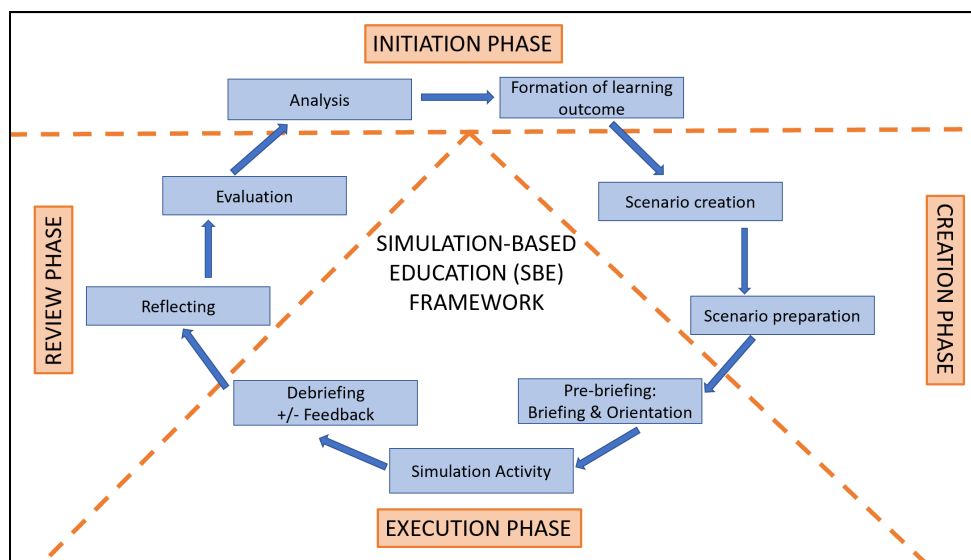

Figure 1: The four phases and nine components of SBE development (9).

Being literate in healthcare simulation includes understanding the language of simulation, the processes, and the tools involved. The individual should be able to match the appropriate technology and modalities with the simulation activity. For example, pairing simulation modalities such as simulated participants (SPs), task trainers, screen/computer-based simulation or virtual reality simulation with purpose of use, such as decision-making, skills training, team training, etc. Scenario creation is a skill that the simulation practitioner should be adept at, knowing how to create realistic scenarios that mimic healthcare situations accurately. A good understanding of medical conditions, procedures, and scenarios is paramount to developing the proficiency to replicate real-world challenges. The ability to operate simulation tools and equipment is also vital, including setting up, operating, and simple troubleshooting.

An individual who is simulation literate should also be able to perform debriefing or deliver effective feedback after or during the simulation activity, which includes discussing what the learners experienced, reflecting on the actions taken, learning

from the experience and how they can improve their future performance. Learner evaluation as well as program assessment capabilities will ensure long term quality improvement, using learning outcomes to identify areas for improvement in patient care, protocols, and individual skills.

Can Healthcare Simulation be Practiced by Chance?

"I use simulation to teach students but I have never been through formal simulation training, hence all I know is that simulation is the imitation of a real life scenario. I am not familiar with any of the principles of simulation but does that matter?" As can be seen from the study by Deepak et al (5), this seems to be the currently prevalent situation among healthcare educators.

The practice of simulation is certainly not by chance. It has its own guidelines and principles that should be followed by all healthcare simulation practitioners. To start with, it has its own code of practice, which was published as the Healthcare Simulation Code of Ethical Practice (10) to safeguard the practice of simulation (Figure 2). To improve communication, the SSH developed a healthcare simulation dictionary (11) that has been translated into various languages including Bahasa Melayu (12). There are even best practice guidelines (Healthcare Guidelines for Simulation Training) that has been produced to guide healthcare simulation practice (13, 14). In fact, over the years, healthcare simulation research and practice have grown tremendously and produced so much evidence (15) (Figure 3) that makes this practice not by chance.

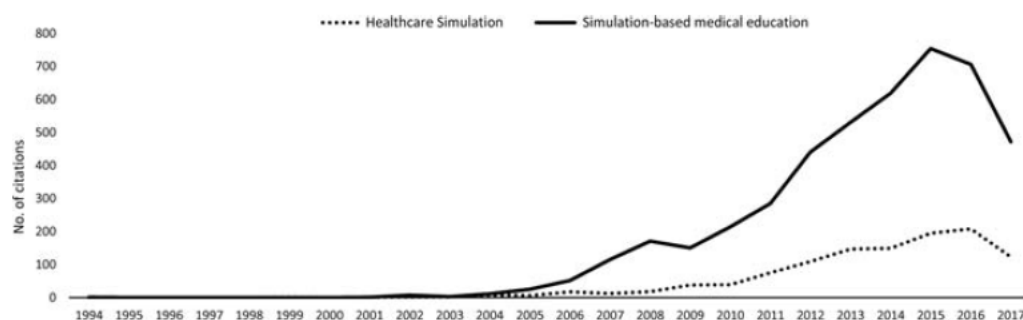**Figure 2:** The SSH Code of Ethics (10).

Figure 3: An overview of publication trends within Scopus under the search terms "healthcare simulation" and "simulation-based medical education." (14).

ENHANCING HEALTHCARE SIMULATION LITERACY

In Malaysia, the formal introduction of healthcare simulation as an official event began in 2007 with a course conducted by Dr Victoria Brazil (16). In 2008 a Human Patient Simulation Network workshop took place, followed by the ASEAN Simulation User Network in 2012. Since then, simulation courses were conducted sporadically by various organizations. With the establishment of the Malaysian Society for Simulation in Healthcare (MaSSH) in 2016, a series of national and international simulation conferences have been organized.

More recently, as members of MaSSH, we embarked on a campaign to enhance HSL among healthcare professionals in Malaysia. There are five components in our strategy: a) local publication of a book on basic principles of healthcare simulation for the clinical educator (9), b) conducting healthcare simulation courses for i) individuals (Healthcare Simulation Essentials Course), and ii) institutions (Healthcare Simulation Faculty Development Program), c) broadcasting Healthcare Simulation Webinars on a monthly basis covering various healthcare simulation topics that allow educators from anywhere on the globe to participate, d) providing direct consultation to institutions, clinical teams, and individuals regarding healthcare simulation, and e) establishing local trainer certification.

Local Healthcare Simulation Book as Theoretical Framework

The publication of a book on the basic principles of healthcare simulation (9) has been a crucial step in promoting HSL in Malaysia. The book provides a comprehensive guide to simulation, and is easily accessible at an affordable price. Prior to the publication of this book, the only texts available to the local simulation community were journals and books published abroad, which were purchased from foreign agencies at high costs. Moreover, a book written in the local context meets the local needs in relation to diversity, equity, and inclusivity (17) whilst maintaining universally accepted principles and best practices of healthcare simulation. This book forms the theoretical framework for the healthcare simulation courses that we now run.

Healthcare Simulation Courses

Course for individual healthcare professionals: Healthcare Simulation Essentials Course (HSEC)

This is our locally developed one-day course, aimed at creating awareness for individual healthcare simulation training. It covers basic principles of healthcare simulation for beginners, delivered through interactive lectures and discussion. The topics covered include overview of healthcare simulation, simulation modalities and classification, discussing the nine components of SBE, simulation-based assessment, basics of simulation-based research, simulation operations, and systems integration for patient safety. A workbook is also provided for self-evaluation of the participants' understanding of the topics presented. Details of simulation principles such as scenario development and debriefing were deliberately curtailed as the course aimed to provide a moderate overview of simulation to novices in the field. Graduates from this course who wish to further expand their knowledge and skills may choose to

pursue full two-day courses on scenario design or debriefing or a full day simulation-based assessment course at another time.

Since the launch of HSEC in July 2023, almost a year ago, six courses have been run, through which 64 simulation practitioners have been trained, 13 of whom as new HSEC instructors, capable of disseminating HSEC throughout Malaysia and beyond. Participants come from various backgrounds – doctors, nurses, midwives, assistant medical officers, pharmacists, physiotherapists, and even non-healthcare related professionals.

Course for Institutional Faculty: Healthcare Simulation Faculty Development Program (HSFDP)

This is a series of interactions aimed to develop a team of simulation practitioners for any healthcare institution. Realizing the importance of mentorship in training and development of simulation trainers (18), the HSFDP trains a team of 20 potential trainers who are subsequently followed up through intermittent coaching over a period of nine months. It begins with a two-day intensive course that introduces these faculty members to the fundamentals of healthcare simulation, which includes SBE, simulation-based assessment (SBA), simulation-based research (SBR) and clinical simulation system integration (CSSI). Besides the core topics in HSEC, participants are guided through a more detailed scenario design session, covering the four phases and nine components (Figure 2). The reference book for essential reading is the same as for HSEC (9). At the end of the course, participants are required to create their own simulation scenario related to the needs analysis of their workplace, individually or in pairs. Subsequently, these faculty members are coached through their simulation project of scenario design and development, including alpha and beta testing of the simulation scenarios created, in three further sessions over a nine months period (Table 1).

Table 1 HSFDP Table of Activities.

Event (month)	Activities
Intensive Course (0)	Day 1 – Basics of healthcare simulation, SBE Framework Day 2 – Continue SBE Framework. Debriefing. Alpha testing. Beta testing. Meta-debriefing. Individual project assignment.
First Follow-up (3)	Presentation of project assignment (scenario creation) and alpha testing. Comments from mentors based on checklist. Proceed with corrections, repeat alpha testing, then beta testing before next engagement.
Second Follow-up (6)	Presentation of project assignment from pre-brief to simulation activity, and debrief / feedback. Learners' reflection.
Third Follow-up (9)	Presentation of project results and future plans.

Thus far, two HSFDP sessions have been carried out – one for a local public university and another for a local private university. A full scale HSFDP over a nine-month mentorship period is in progress for a large stakeholder organization in the country.

Healthcare Simulation Webinars

Each webinar is moderated by members of MaSSH, aiming to impart little nuggets of knowledge on simulation principles and practice to the audience. The 90 minutes webinar begins with a talk or forum, and ends with a 30 minutes interactive session. Six webinars have been held so far, with a steadily increasing support in terms of the size of the audience. We aspire to invite a mix of local and international speakers for these webinars.

Healthcare Simulation Consultancy Services

Another aspect in our simulation literacy project is providing direct consultation to any institution, industry, or any interested party about healthcare simulation upon request. Many institutions have shown interest in wanting to know more about simulation, or invest in building their simulation center and/or learn simulation center operations and management. Free consultation is provided to any parties who seek our advice. So far seven local institutions, four universities, two governmental institutions and one non-governmental organization (NGO) have sought and received our consultation.

Trainer Certification

Recognition of a healthcare professional as a certified simulation trainer needs careful systematic consideration with regard to evaluation of the individual trainer. Some organizations adopt the tiered certification approach (19), with reference to a progressive building of skills of increasing complexity at each level. This tiered approach allows for faculty members to develop a personalized plan for development on the basis of structured levels of progression. As faculty members progress in the tiered structure, they gain confidence in their abilities, which benefits both themselves and their learners.

In our approach, we believe in the apprenticeship method of training at this initial stage because we do not have many trainers who are experts in simulation. The steps of our training process begins with identification, training, coaching, and supervision. Initially, we identified candidates who can be trained and certified as trainers. Potential trainers are first identified and trained when they attend the HSEC. Later they are offered to follow subsequent courses where they are given the opportunity to become assistant facilitators. Here, they are coached under the watchful eyes of the lead instructor, followed by individual feedback. Subsequently, the potential trainers are given the chance to become facilitators under supervision before they become full-fledged instructors, at which stage certification is awarded as an HSEC instructor. Potential trainers vary in the length of time taken to become HSEC instructors, in view of their full time career commitments. Their progress was largely opportunistic. Nonetheless, within the past two years, 13 individuals have been certified as HSEC instructors.

Another trainer certification program that is ongoing is the two-year simulation fellowship program. In the pipeline is the Professional Certificate in Healthcare Simulation (ProCHeS). While the fellowship program is restricted to doctors, this six weeks program at the Universiti Kebangsaan Malaysia (UKM) offering four credit units is open to all healthcare professionals.

REFLECTION OF THE PRESENT SITUATION

Realization of the need to advocate healthcare simulation has led us to review simulation literacy among healthcare practitioners and develop programs that run in parallel to fulfil this gaping void. The HSEC focuses on training ad hoc interested individuals, whereas the HSFDP targets institutions. As simulation evolves, new concepts for faculty development has been introduced, such as faculty development for translational simulation (20), with a focus on healthcare quality, safety and systems. Faculty development programs should therefore remain fluid and open to changes from time to time according to new concepts and needs. MaSSH plays the role of a platform from which these programs are executed, thus harnessing multi-institutional human resources to move the agenda forward.

The first challenge was to define HSL. Despite repeated usage, the term remained undefined. Nonetheless the definition is important in order to measure how deep healthcare simulation has penetrated into healthcare professional training and practice. In defining the term, we decided that for someone to be considered healthcare simulation literate, the person should know the basic elements or components of healthcare simulation, its uses, and its principles of practice. Even though simulation can be used for other purposes such as research and system integration, the core usage is educational, hence the fundamental principle falls back on SBE. The core principles of SBE lie in the four phases and nine components of the SBE framework (9). Therefore, a healthcare simulation literate should at least be competent in all nine components of SBE. In addition, they should be aware of the uses of simulation in other areas, such as patient safety.

The other challenge that we face is the lack of awareness of the need for such simulation instructor training among our healthcare professionals, i.e. a lack of awareness of the importance of HSL. There are many simulation enthusiasts who utilize simulation to train healthcare learners, but most do not seem to see the need to undergo any formal simulation training. They would usually just use the simulator without creating any proper training module, and conduct training 'on-the-fly'. The problem with using simulation without a proper teaching module is that the simulator is treated no differently than a toy. As with any toy, once you got bored with it, the toy will be abandoned. It is not easy to convince these simulation practitioners of the need to learn the fundamental principles of the tool that they use for T-L activities. In depth interviews of such healthcare professionals can perhaps assist in a root cause analysis of the situation. Quite possibly there is a general ignorance of the presence of a systematic methodology underlying SBE, as it has not been very long ago that simulation pioneers researching best practice for simulation started offering courses on how to teach using simulation. The formation of professional societies that provide members a platform to discuss best use of simulation and educator development also happened within the past decade.

With regard to curriculum formation, there are a number of publications looking into teaching fundamental principles of healthcare simulation, or faculty development, which all translate into promoting HSL (5, 7, 21, 22). There are similarities between some of the courses offered by these authors and ours, for example in being "interprofessional" (7) or "multidisciplinary" (5). Both were also in "experiential" or "immersive" workshop format respectively. Deepak et al (5) had a name for their workshop – Fundamentals of Simulation Education (FUSE) – which is very similar to the name of our workshop, i.e. Healthcare Simulation Essentials Course, both of which were comprehensively designed. The lack of such curricula locally was the reason why we developed our own, with a reference book and framework, in our strategy to disseminate HSL. The presence of the locally written book on healthcare simulation was a key factor facilitating this HSL project.

LOOKING INTO THE FUTURE

The question of whether certification as SBE practitioners should be made mandatory before any healthcare professional is allowed to apply this tool in their T-L activities (23) cannot be raised yet as there are still many unresolved issues. To begin with, formal simulation training courses are still developing. These courses are not widely available yet to cope with the existing high number of untrained simulation practitioners. Our fellowship program and the coming professional certificate, ProCHeS, aspire to increase the manpower needed to train simulation practitioners but recruitment has not been easy. Training of potential instructors is labor intensive as it occurs through apprenticeship.

The most appropriate first step towards rectifying the current situation is surveying the current situation objectively, evaluating the actual prevalence of healthcare simulation illiteracy and its determinants. This task was undertaken prior to embarking on the HSL campaign (24). In-depth focus group discussions were conducted to determine the underlying problems. These data served as a valuable tool to illuminate the way forward as to how best to overcome the hurdle of educating healthcare professionals on SBE. These data serve as the foundation of our HSL project focusing on the institutional leadership while a systematic well-structured training program is undertaken at a nationwide level for all institutions, with the aim of developing and nurturing core groups of simulation literate educators in each institution. A recent study in this region demonstrated the importance of institutional leadership support and expanding simulation communities through institutional core teams (25).

Another aspect in the project that was important in spearheading the literacy program is the healthcare simulation consultancy service. This service attracts many parties and some served as the beginning of a more structured program or course. An interesting model of "healthcare simulation consultancy service" has been raised by Davies et al (26). Whilst this may be an entity embedded within healthcare services organizations rather than academic institutions, it may also exist as an external entity that offers advice to health services organizations that are interested in sustaining a simulation center, with focus on simulation human resource development rather than infrastructure development.

CONCLUSION

HSL can be defined as having the understanding, proficiency, and familiarity with healthcare simulation principles of practice, and their application in healthcare simulation. We proposed this definition for HSL with an educational focus. HSL is still sadly lacking within the simulation community of practice. Formal simulation training courses are certainly very much in need but in short supply and not widely available yet. There is still much to be done in order to assess the situation and raise awareness of the need for formal training and correct application of simulation techniques and methodologies in healthcare education. An advocacy program to get buy-in from the leadership of institutions may help enhance the simulation literacy in many countries. Our HSL campaign is still ongoing in full steam. We hope to produce favourable outcomes from this program in five years' time. Watch this space.

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