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Basing a Nonclinician’s Career upon Simulation: The Personal Experience of a Physicist

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5.1 From Nonclinician to Clinical Simulation Professional

In today’s society, workers are very mobile and do not stay in the same company or even in the same field during their entire professional career. This is not only true for the general unskilled or unqualified workforce but also applies more frequently to trained graduates and highly skilled and specialized professionals. Nowadays, an employer sees a degree more as a learning passport than as a field-specific qualification. It is clearly expected that employers will look for specific attributes in prospective candidates, but it also appears that they believe in the transferability of skills of their new recruits. A qualification is seen as someone’s ability to learn about a subject, hence it is expected that with the right attributes or aptitude and motivation, one can also acquire the relevant knowledge and skills required to adapt effectively to a different field.

This chapter is about the breed of people who start by selecting a nonclinician path and eventually work in clinical simulation. Their new role requires their grasping a wide range of clinical and educational concepts and skills that should already be second nature to their new colleagues who are trained as an educator, a clinician, or health care professional. There are many different opportunities and responsibilities in the domain of clinical simulation, and nonclinicians could occupy almost any one of them. This ranges from educationalist, communication or team dynamic expert, technician, or technical manager, center coordinator, administrator, to operations manager. The background of potential simulation center employees will be an important asset in their new role as it could give them a different perspective, additional skills, and innovative ideas that complement those of their clinical colleagues.

5.2 Working in a Versatile Environment

Simulation is currently a very exciting field where today’s veritable explosion of global simulation activity has come from decades of isolated pioneering efforts. Some of these simulation explorers started developing and testing methods, and technology eventually succeeded in making commercial training products, along with a generalized teaching approach that could be more widely available and affordable [1]. The triggers for this rapid growth have not only been recent technological developments in terms of personal computer power, but primarily clinical educators believing in the potential of simulation training approaches to help others effectively acquire life-saving skills in a safe and controlled environment.

As the appellation “simulation” indicates, everything can and should not be real to allow control of the scenario (patient and environment). The key is determining how much reality
is needed, and how to produce it. Fortunately, the realism of most clinical items and settings can be very high, given that most are actual clinical equipment and clinical settings. However, quite often, because of the procedures to be carried out and for ethical, consent, and safety reasons, one of the principal simulated components has to be the patient. For scenarios including invasive procedures, part or the entire patient is substituted by a mannequin, and in the latter case, under computer direction. In other words, it is a machine or nonbiological system designed by a team of engineers to reproduce the physical aspects, as well as the pharmacological and biological behaviors of a human being. Although great discoveries have been made in medicine in general, creating a machine that simulates a whole human being is a particularly challenging task that might never be realized. Fortunately, education is characterized by the instructor illuminating a small fraction of all reality as a way to attract the students’ attention toward one or two learning objects to the exclusion of all else. This intentional focus and isolation upon a very small segment of reality is the essential basis for simulation’s success, since all that is needed to be created is that which is illuminated.

We often make the analogy between simulation in the aviation industry and in health care, with the aviation being ahead of health care by decades. Technically, this is not a very fair comparison as the simulated atmosphere (the patient equivalent) is readily available for testing and has no will of its own while the simulated aircraft (the clinical devices and tools equivalent) has well-defined components that do not change at the whim of frequent equipment purchasing decisions. Even if it is very costly, it is evident that building a device that will simulate the functions of an aircraft strictly obeying the laws of physics is less challenging than building a life-like patient. Socially, this gap is an indictment on the insufficient interest in creating data and using evidence to drive both clinical care and clinical education.

Today’s flight simulators can be very realistic. Sitting in the cockpit, one could feel as though you were inside a real airplane as it moves through the air. The technology is now even available to the general public in fun parks as rides which can provoke adrenaline rushes. One key difference between flight and clinical simulation is the perceived return on financial investment. The business linkage between the payers for flight simulation (investment) is very close to the payers for flight (customers). In contrast, the payers for clinical education (investment) are very far from the payers for health care (insurance?) and the payers for the lack of health care (all of us). Thus, the amount of resources expended upon developing and implementing both the technology and the acceptance of flight simulation is orders of magnitude greater than that expended upon clinical simulation.

Even with unlimited finances today, we would not be able to build a patient simulator that really feels and looks like a real patient on which one could connect any type of medical monitoring equipment, provide invasive or noninvasive treatment and expect the entire range of possible human responses. However, such a tour de force is totally unnecessary, since today’s clinical care, to say nothing of clinical education, never sees nor treats the entirety of any one patient. Just as we have very large selection of different types of automobiles and trucks to meet differing needs, we will develop and employ a large selection of different clinical simulation devices, each optimized for particular uses.

A simulation center is a versatile environment in the sense that every aspect of a clinical simulation program is evolving. It needs to follow not only the developments in terms of medical practices across an ever-growing number of disciplines that adopt simulation, but also the development of the simulation technology itself. There is a permanent challenge to stay on top of it all, whether it is the adoption of new resuscitation protocols, hospital policies, new roles of health care practitioners, the release of revolutionary pieces of medical equipment, or even the social and political context. Scenarios and debriefing provided to participants constantly need to be improved just as their clinical competencies need to be improved. Because of recent natural and unnatural catastrophes such as floods, epidemics, and chemical, biological, radioactive, and nuclear terror threats, there has been unprecedented efforts in developing large-scale simulation training programs to review protocols and prepare emergency services and hospitals [2–5]. The consequences after the use of weapons of mass destruction, for example, on our populations would be even more catastrophic if our emergency services have not had the chance to prepare themselves through simulation exercises.

5.3 The Personal Experience of a Physicist Working in a Simulation Center

My interests and technical mindset have encouraged me to study Physics at University, both in France and Great Britain. During and after my Master studies in Applied Physics, I started working for two sister companies primarily specializing in underwater acoustics research and in the design and installation of fish deterrence systems. Although I thoroughly enjoyed the scientific research challenges and the technicality of the work, I felt the need to apply my skills and knowledge in a different area where it could directly benefit people. I did not want to carry on working in isolation or always with the same people (as nice as they are), but instead was in search of doing something where I could more directly see the effect of my efforts and meet more people. In 2000, I decided to look for a position in medical physics, but instead I found myself attracted by a university research job in biomedical engineering and clinical education. It consisted on coordinating projects toward the development of a low-cost interactive patient simulator for the training of preregistration interactive nursing and paramedic
students. This project was funded by the British Heart Foundation, with the goal of creating a low-cost patient simulator with which real medical pieces of monitoring equipment could be used (blood pressure cuffs, ECG monitors, pulse oximeters), which at the time was not available in any low-price commercially available simulator. At first, this seemed an intriguing yet interesting project as I had never heard of patient simulators nor knew anything about the training of health care professionals.

Once engaged to take on this job, for 3 years I strived to come up to speed with the overall concepts and the current developments in the field of health care simulation. Very rapidly, the enthusiasm of the pioneers working in this area fully made sense to me. Learning about the patient simulator developments throughout the world, I realized a fair amount of work had already been carried out and employed in high-fidelity patient simulators. It was often overlapping with projects in which the department in which I was now working was engaged through the work of some of their biomedical engineering students. In parallel, I was made aware of the imminent arrival on the market of the intermediate-fidelity patient simulators with similar features. Not intending to reinvent the wheel, and coincidently with the student recruitment difficulties in biomedical engineering, our project's aims or objectives were significantly reduced. Within a couple of years, the University's biomedical engineering teaching program was stopped, which unfortunately almost put an end to our technical developments in patient simulation.

At the same time, I assumed responsibility for the development of the University of Hertfordshire's Intensive Care and Emergency Simulation Center concentrating primarily on delivering simulation-based training to nursing and paramedical students and evaluating the teaching effectiveness of this approach [6]. The center was initiated and inaugurated by my line managers in 1998, but was not very actively used as a simulation center as no one was in charge of the center on a day-to-day basis. Despite this shift in my focus, I believed that remaining active on the engineering development side of patient simulators was still important for me in order not to lose the skills I had previously acquired through my academic qualification and prior work experience. To that effect, alongside the day job in the Faculty of Health and Human Sciences, I have always tried to pursue my research efforts in technically challenging projects [7] to further enhance current patient simulators. To this end, I supervise the regular visits of physics research students from the French University where I graduated in 1997.

An interesting advantage as a technically minded person is to be able to understand how the patient simulator operates at the overall scale and at the subcomponent scale; that is, from the philosophy inherent to its intended use, to the computer interface to the microswitches and pneumatic valves inside the mannequin. It proves particularly useful to rapidly troubleshoot problems with the patient simulators or pieces of medical equipment and quickly identify solutions. There is also certainly a greater awareness in terms of the technology that can be used to further enhance the simulation center, and make it a better learning environment. This includes, for example, choosing appropriate audio and visual equipment to link the observation room or simply providing advice to colleagues regarding the best tool to use to teach a particular skill, concept, or attitude.

Education or pedagogy is a major aspect of anyone working in the control room or on the simulation platform of a simulation center. Very early on, after starting my research job in simulation, I started studying for a Postgraduate Certificate in Teaching and Learning in Higher Education. It has recently become a compulsory qualification for new UK University lecturers. I felt it could be another very valuable asset to become a faculty in a simulation center. This gave me some underpinning knowledge of the theories of learning, teaching, and assessment that I could relate to in my simulation teaching practice, especially during debriefing, or through the examination sessions organized as part of my research on the effectiveness of simulation training [8]. At the end of my 3-year research contract, I was offered a lectureship to carry on operating the Hertfordshire’s Intensive Care and Emergency Simulation Center as the center coordinator and take on responsibilities for a broader range of activities such as producing short courses and taking on consultancy work. As the only permanent member of staff of the center, I have a very varied role including scheduling, cleaning and maintaining the patient simulators, controlling them during the simulation sessions, and training other faculty how to facilitate simulation sessions. The latter has even been validated by the University’s Postgraduate Medical School as an optional module counting for one-sixth of a Master of Health and Medical Education [9]. This is probably one of the first “simulation faculty training course” attracting academic credits.

Training as a physicist, I had never thought I could ever be involved in teaching or in facilitating learning with such diverse groups of health care trainees and professionals, but simulation opened up these opportunities to me. Hence, I strongly believe that there is a place in simulation centers for physicists who want a career change. I find working in the simulation center very fulfilling and I would not discourage anyone with a nonclinical background trying their chance in health care simulation.

5.4 Advice to Engineers and Scientists Aspiring to Work in Health Care Simulation

Engineers and scientists have rarely been renowned for their outstanding communication skills, and I believe that it is an aspect of extreme importance in the field of health care
simulation education. It is very relevant and applicable to different aspects of a job in a simulation center, whether it involves interaction with participants, colleagues, and especially the media. Whether you are a faculty or a technical manager, communication should always work both ways. If you are a faculty, you need to work closely with other faculty and actors to make the scenarios work and execute smoothly. Good communication skills will help you in this teamwork activity. Another important part of any simulation is the actual debriefing where, after having listened to the participants discussing their experience, you need to be able to appropriately de brief them. Good communication skills will be an asset to clearly and effectively transmit your teaching points and tips. Similarly, if you intend to become a technician or technical manager, you might have to brief fellow educators about particular features of your simulation room, the audio/visual system, or the patient simulator, and similarly, you will continuously take in their suggestions and requests to improve aspects of the environment or the simulator itself to further their teaching objectives.

I believe that poor communication skills could hinder your career progression in this field. Although one might think that if you have a technical role, you are not very exposed to coming into contact with participants because you can hide in the control room most of the time; accepting this limited role will doom you into never ever extending beyond being a technician. In reality, even if you only have to deal with small numbers of participants at a time, you will certainly be involved in their briefing about the simulation environment, the patient simulator, and maybe the debriefing of scenarios. Your interaction with participants can significantly contribute to the learning success of the simulation session. Alongside your colleagues, you need to be able to make participants feel at ease in this unfamiliar environment to them, and not being a good communicator will not help you or them in this aspect. Similarly, you can greatly contribute to the success of your center’s simulation programs by effectively communicating with other educators to refine scenarios provided to your participants, develop the simulation environment and new props.

As an engineer or scientist working in a simulated health care environment places, you are in an ideal position to think “outside the box” and make new ones. It might help you seeing things from a different angle in comparison to your clinical colleagues. This is particularly true and useful when it comes to building simulation props and tricks. Not possessing the physiological knowledge might be an advantage and help you being more innovative and creative. At times, for the development of a simulation component, it is useful to only understand what someone is expecting to see from the outside rather than the full underlying physiological principles. During scenarios, you might have new ideas for future developments that will enhance the simulation experience of the participants. Hence, at any time, it is always useful to take notes before you forget.

Integration of new capabilities required for one new scenario often opens up opportunities for the creation of others. Eventually, exposure to a broader range of scenarios can be very enriching for participants, and helps prevent fatigue and boredom in the educators. Similarly, working collaboratively with clinical colleagues will be something to explore. You might be able to use your skills and technical knowledge to further develop their ideas and improve aspects of the simulation training experience of participants.

The reality of a nonclinician working in a simulation is that you have all chances to become an overall expert of simulation-based training as you will be involved in all aspects of operation of your center. Many people with an engineering background are currently employed by hospitals or universities as “simulation center coordinators” or even “simulation center managers.” Taking on educational training might even enable you to become a member of the Faculty team. The more you want to participate in clinical education, the more you will be able to do so through simulation, but only to the extent that you are willing to learn how to be useful.

5.5 Conclusion

As we have seen through this chapter, the simulation arena is a versatile environment that offers interesting opportunities to nonclinicians. The brief overview of a physicist’s journey in a University simulation center provides a concrete example. The advice provided to engineers and scientists is probably also valid to other professionals wishing to work in the field of health care simulation.

5.6 Favorite Problem Solvers

The Society in Europe for Simulation Applied to Medicine, SESAM
http://www.sesam.ws

Meeting other people in the field was an eye opener. Because it is Europe-based, there are many participants from the UK with the same problems and in the same situation (institutional/economical/social climate).

The International Meeting on Simulation in Healthcare, IMSH
http://ssih.org/

Much broader in terms of audience and experiences, larger-scale centers, but also valuable things to learn from.

A Simulation User Website with a lot of useful information: http://www.patientsimulation.co.uk

An open forum of simulation users. Pages with tips and tricks to simply modify simulators, share scenarios. Thank you Neal for your great work at maintaining the pages up-to-date!
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