Working with Experts from Non-clinical Fields

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Introduction

Healthcare simulation programs work closely with experts from clinical fields to generate scenarios, conduct simulation sessions, and design programs to meet clinical training needs. To maximize the value of simulation, working with experts from other, non-clinical fields is a necessity. As in the case of aviation simulation, healthcare simulation is moving forward beyond providing a level of physical fidelity as task trainers. Simulation is increasingly used in device and facility design, in analysis of system safety in rare events, in identifying training needs, and in facilitating learning of cognitive and team skills and behaviors. As illustrated in the cases below (Examples 28.1, 28.2, and 28.3), experts ranging from game designers to human factors specialists can be productively engaged in simulation. Clinicians can benefit from working with non-clinician experts to understand concepts, methodologies, and theories useful or even vital for simulation to be effective. However, cross-disciplinary collaboration tends to be challenging due to differences in traditions, perspectives, and goals, and it takes time to build common ground. This chapter describes top non-clinical fields that can support simulation programs in innovative uses of simulation for a variety of objectives related to understanding and more effectively enhancing the sociotechnical work of healthcare and with education missions that meet not only clinical needs but enhance the participant's role within the system. We also provide practical suggestions in finding and forming collaborating relationships with experts from non-clinical fields.

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Collaborating Effectively with Experts from Non-clinical Fields

Healthcare simulation continues to advance beyond solely training healthcare providers. Simulation can be used to assess a process, evaluate a medical device, identify latent patient safety issues, perform a failure mode and effects analysis and understand the interaction between information technology and humans. Therefore, in order to maximize the benefit of simulation for healthcare, the expertise of many different disciplines has become necessary. These disciplines may be outside healthcare. The collaboration of clinical experts and experts from non-clinical fields can be somewhat challenging as the groups come from different professional backgrounds, may not speak a common language and have different priorities. Although this partnership can be challenging the outcome of such a team effort has enormous implications for the improvement and advancement of healthcare.

The first step in working with non-clinical experts is to develop the team. There are many models of effective teamwork. According to Mickan & Rodger [1], the six key characteristics of a successful team are a common purpose, measurable goals, an effective team leader, effective communication, rapport and cohesion, and mutual respect. Mutual respect is an important component with diverse teams, it allows for team members to embrace and encourage diversity of thought and opinion. Effort should be given to develop the team, as the upfront work in this process will pay dividends in the end. Once the team is established, the next step should be to develop a Project Charter with the team to define the problem, needs assessment, working objectives, roles and responsibilities, stakeholders, timelines and deliverables. This step will allow the team to be part of the

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process of developing their goals and understanding more fully how their work will contribute to the overall project. Examples 28.1 and 28.2 illustrate the process and approaches in collaborating with experts from non-clinical fields in simulation. Example 28.3 also provides lessons learned in working with non-clinical experts.

Example 28.1 New Space Design

Our hospital system is in the process of constructing a new Women's and Children's building. This building will be state of the art, allowing babies who require intensive care the opportunity to room with their mothers. Both patients will get the appropriate level of care that they require. Since this building and room set up is so new and unique, our simulation center was asked to assist in evaluating the proposed rooms and giving feedback to the Women's and Children's Service Line and the architect regarding the space design.

A number of experts from non-clinical fields assisted us with this project; the architect, a human factors expert and patient/family advisors. The simulation team and the human factors expert co-lead the project. As a first step, we met with all members of the team to determine our goals and objectives as well as the timeline for completion. We were given a preconstruction shell and the architect supplied the preliminary architectural drawings to create the space to scale. Using cardboard boxes, the simulation team built the space creating cabinets and counter tops with accurate dimensions, and adding appropriate equipment, i.e., hospital beds, chairs and monitors (Figs. 28.1 and 28.2). The simulation team and human factors expert then met with the Women's and Children's nurses and physicians to develop patient care scenarios for the session. We developed simulation scenarios to assess process flow during normal work and during emergencies for both the mother and the infant. We wanted to know if the rooms were configured in a way that would allow for simultaneous care for both the mother and the infant. Patient advisors gave feedback regarding how the new parents, grandparents and family would use the space, and feel most comfortable. This project involved many meetings to ensure that everyone was on the same page regarding our goals and objectives; we also discussed how we would observe the simulations. All members of the team, which included simulation experts, a human factors expert, architecture design and construction experts and patient family/advisors debriefed with the obstetrical and neonatal teams after each scenario to understand the clinical team's feedback and priorities for the space.

A final report was compiled by the simulation team and human factors expert, based on the outcomes of the simulation sessions. The report detailed the findings as well as suggested changes based on the perspectives of diverse stakeholders. This report was given to the Women and Children's service line as well as the architect and recommendations were incorporated into the design of the new building (Fig. 28.3).

Example 28.2 Equipment Selection

Our institution recently worked collaboratively with multiple non-clinical and clinical experts to determine which new defibrillators to purchase. The team consisted of simulation, clinical engineering, human factors and clinical experts. We met as a team to discuss the project and timeline, and developed a project charter that detailed our goal and objectives. The human factors expert and the simulation team worked together to plan specific tasks for clinical end users, including nurses, and attending and resident physicians, to perform on each device. The clinical end users participated in standardized skills tasks which gave both participants and observers information regarding training needs and device usability. Once the device was selected for purchase, the simulation team developed an educational curriculum based on the observed gaps in clinical end user's knowledge and skill identified during the simulations. Additionally, the simulation team's Advanced Cardiac Life Support (ACLS) coordinator worked with clinical engineering to program the devices. The team members met multiple times throughout the process to ensure a shared mental model, anticipate the needs of the team and discuss the next steps. Throughout this process, the different perspectives of clinical and non-clinical experts allowed us to identify and mitigate potential patient safety issues before the devices were deployed system-wide.

Often non-clinical experts are unfamiliar with clinical care pathways and processes in the healthcare system. They may require orientation to the process and culture before they can fully assist with the project. There are many ways to orient non-clinicians. Table 28.1 gives some examples of opportunities for orientation. The goal of orienting the non-clinician is to allow them to see the current state of patient care processes and to understand the problems or challenges faced by healthcare providers. This orientation process

Example 28.3 Developing a Serious Game

Our project team developed a role-play simulation game for nurses and physicians to gain insight into team communication practices. The team included nurses, physicians, curriculum experts and teamwork experts, and involved game developers from the start. It took nearly a year for the project members to understand each other's field. For example, initially non-game developers did not understand why gaming can be an effective learning strategy, or how many key steps are necessary to develop a game in a virtual environment that a learner can access anywhere at any time. The game developers demonstrated non-healthcare games to educate team members about what is possible. The clinical team members shared key requirements for deploying a game to busy clinicians. The teamwork experts prioritized the most important concepts for learners to master in a 1-hour game. Although the project was a success in deployingSerious game, developing the game in a study, the clinicians on the team were surprised to learn that the game was hardwired into a specific version of a virtual gaming platform. The limitation was obvious to game developers but was not communicated with other team members, who had assumed that that game could be easily updated.

should be tempered by not giving the non-clinical expert too much information and detail, as this may blunt the value of a fresh perspective. Conversely orientation of the clinical experts to the knowledge and skill of the non-clinician is just as important. It allows both groups to understand what each party brings to the table.

Simulation can be a valuable tool to orient non-clinical experts to the processes, settings and challenges in healthcare. A fully immersive simulation can be developed, in order to reveal the problem or process for the non-clinical expert to view. Simulation has the capacity to demonstrate the common interactions between the healthcare environment, providers and patients and their families.

Overview of Non-clinical Fields and Their Value to Simulation

The following section provides an overview of non-clinical fields that may play important roles in healthcare simulation projects. We list places where one may find experts and consultants within health care organizations as well as resources at universities and professional organizations. In addition,

Fig. 28.1 Simulation created to prepare for ChristianaCare's new Women and Children's building. Walls are temporary and cabinets are constructed from cardboard

Fig. 28.2 Finished Labor and Delivery Room after simulation sessions permitted the OB/GYN team, human factors expert and architect to test the space and confirm the optimal design of the room. Work station was lowered and moved at the suggestion of the nurses

universities may offer graduate student projects and undergraduate capstone projects as well as internships that may be useful for collaborative efforts. Please refer to Table 28.2 for a summary of these fields as well as information on finding experts.

Human Factors and Ergonomics

Human factors and ergonomics professionals are trained with knowledge of human abilities and limitations needed to design systems, organizations, tasks, tools, equipment and consumer and professional products for safe, efficient, and comfortable human use [2, 3]. Human factors and ergonomics professionals apply their expertise in understanding complex work systems to improve patient safety and health

Fig. 28.3 Comparison of full-scale simulation (left) with final construction (right) for ChristianaCare's new Women and Children's building

Table 28.1 Orientation to healthcare – specifically the organizational culture and process

Opportunities to orient non-clinicians to healthcare
Grand rounds
Morbidity and mortality conference
Hospital safety meetings
Relevant journal articles
Meetings with care providers/front line staff
Shadowing during clinical care
Webinars
National/state/regional conferences

outcomes. Human factors and ergonomics professionals may specialize in areas of human decision making, expertise development, team performance, performance under stress such as time pressure, vigilance, ergonomics of workplace layout, and human interfaces.

Health and Safety Professionals

Health and safety professionals develop procedures and design systems to protect people from illness and injury as well as property from damage. They often combine knowledge of engineering and health and safety to ensure that items, materials, and tasks in the work environment will not cause harm to people or damage to property as well as identifying what works well within an organization [4].

Quality Improvement

Quality improvement professionals use data and feedback to track and evaluate performance and to inform changes in processes to improve performance and outcomes [5]. Quality improvement specialists strive to create a high-value health care system and can provide expertise on using quality improvement methods and tools to improve patient, clinician and organizational outcomes in complex health care systems.

Health Informatics Specialists

Health informatics specialists have expertise in the design, implementation, application and use of IT-based innovations in healthcare services delivery, management and planning. This multidisciplinary approach includes experts from social science, computer science, information science and cognitive science and strives to optimize the acquisition, management, storage, retrieval, and use of voluminous amounts of health care data to improve health outcomes [6].

Game Developers

Game developers often have training and experience in art and animation as well as programming. They can create gaming technology that motivates and engages the end user

Table 28.2 Example of sources of expertise potentially found in hospital and university departments as well as professional organizations

Specialty	Hospital departments	University departments	Professional organizations
Human Factors, Ergonomics	Quality Improvement Patient Safety Risk Management Biomedical Engineering Occupational Health & Safety	Industrial Engineering Psychology Education	Human Factors and Ergonomics International Ergonomics Association
Health & Safety	Quality Improvement Facilities Risk Management Safety	Occupational Health and Safety Industrial/Occupational Hygiene Safety Management	American Society of Safety Engineers
Quality Improvement	Quality Improvement Facilities Safety	Business Quality Management Engineering Statistics	American Society for Quality National Association for Healthcare Quality
Health Informatics	Health or clinical informatics/technology Administration Quality Improvement	Computer Sciences Engineering Bioinformatics Statistics	American Medical Informatics Organization HealthCare Information and Management Systems Society
Game Developers	Health or Clinical Informatics/Technology Innovation	Computer Sciences Human-Computer interaction Media/Art Studies	International Game Developers Association Special Interest Group on Computer-Human Interaction
Sensor technology, automated video/image analysis	Biomedical Engineering Medical Education Video Production	Computer Science Engineering Human-Computer Interaction Kinesiology	Association for Computing Machinery
Biostatistics, Psychometrics	Health or Clinical Informatics Biostatistics or Bioinformatics Quality Improvement	Statistics Public or Population Health Epidemiology Bioinformatics	American College of Epidemiology American Statistical Association, Section on Statistics in Epidemiology

[7]. Examples of use of this technology in healthcare include clinician training and development of health-related apps that support behavior modification (e.g. exercise, meditation).

Experts in Sensor Technology, Automated Video/Image Analysis

The technology fields of sensors and automated video analysis are defined by their capabilities to capture and process data often needed in clinical simulations. Posture trackers, for example, can be used to quantify the impact of workplace and instrument design in reducing skeleto-muscular strains. Physiological sensors may be used to measure workload and stress. With the increasing power of video processing algorithms and ever more ways to capture video materials, metrics can be derived from video sources in clinical simulation aided by automated tools. For example, computer algorithms may support automated time-motion studies or identification of key video clips for manual analysis or archiving.

Biostatisticians, Psychometricians

Biostatisticians collect, analyze and develop statistical conclusions based on data. They can use these methods for the design of research studies, data collection and analysis as well as to identify factors for risk stratification, diagnostic accuracy of tests and measures and effectiveness of medical interventions [8].

Summary: Multi-disciplinary Collaboration in Clinical Simulation Programs

Clinical simulation programs vary widely, often with core missions related to education. Collaboration with experts from non-clinical fields will allow expansion of such programs into research about simulation and research using simulation, as well as simulation to accomplish process improvement. We provide a broad overview of several fields of non-clinical sciences and some examples of how they can contribute to innovative uses of clinical simulation. Experts in many non-clinical fields have knowledge and skills that

can serve as important resources and add value to simulation programs. We have provided a broad perspective of different scientific fields and how they may enrich simulation programs, as well as a structure for addressing requirements for successful collaboration.

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