Part V

Program Development in Simulation

Center Development and Practical Considerations

45

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Introduction

Developing a simulation program is not a small task and is not for the faint of heart [1–3]. The thought and precision of the development process will directly impact the opportunities afforded to the learners and stakeholders alike [4]. This chapter will outline a variety of subject areas that should be considered. Not all areas will be applicable to every program. It is recommended that programs that are being developed or those already in operation should create a checklist that deliberately forces consideration of these key areas. The use of project timelines and deliverables will help developing programs remain on task and evaluate their progress. Consider the development of a simulation program as a journey that should leverage best accepted practice in several areas: simulation instruction, facility design, and instructor development, at a minimum. At times, evidence will be scarce, as the industry is still in its infancy, which will necessitate leveraging ideas from other industries that are similar (e.g., aviation). There is no one approach to simulation program development in general. Readers may appreciate that in certain circumstances, similar material is also covered in Chap. 46, "The Business of Simulation"; however, it is impossible to discuss one aspect of development without the other; therefore, this chapter will emphasize center design and planning and when pertinent will include relevant business and financial issues.

Project Management

Developing a simulation program can be a complex task. Depending on the size of the program it may involve one or many people involved in a variety of tasks. The use of project management principles to organize and assess progress is an important consideration. This may involve simple task lists to complex GANTT charts (a GANTT chart is a horizontal bar chart that was developed as a production control tool in 1917 by Henry L. Gantt and is frequently used in project management). Establishing clear lines of communications, team leaders, and deliverables is the cornerstone of successful implementation. Certain tasks will be dependent on the accomplishment of other prior or concurrent tasks, while some will not. For example, a contractor cannot build a facility until he receives construction documents from architects and engineers. Similarly, the purchase of equipment should follow curricular and instructional needs and should not be purchased beforehand.

Definition of a Simulation Center and Business Planning

Definitions

A center can be defined in many ways. It can represent a physical location, a variety of locations, a fiscal entity, or even a virtual concept. The use of the word "center" in itself encourages people to think of a physical location that houses specific activities. For the purpose of this chapter, a center

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A.I. Levine et al. (eds.), *The Comprehensive Textbook of Healthcare Simulation*,
DOI 10.1007/978-1-4614-5993-4_45, © Springer Science+Business Media New York 2013

will signify a simulation program that may represent multiple stakeholders and a variety of locations. The program is larger than any one user group or location. This is an important distinction as it suggests that the "program" is more than a physical plant. Indeed, it embodies the very fabric of the program—all the elements that make it operationally viable. Operations are often misunderstood as relating to technical or administrative elements alone. They in fact represent the sum total of all the elements that make a program or entity function. This includes academic and nonacademic elements.

The Business Plan

A business plan is a written statement of your business (simulation program): what the program wants to achieve and the plan to achieve it. It should outline the structure of your business, the product(s) or service(s), the customer(s), the growth potential, and the financial statements.

In addition to identifying information about the business, the business plan should also inspire the program for future endeavors. It is a blueprint outlining the goals or benchmarks the program wants to achieve with a clear understanding of the methods intend to achieve them. It should not, however, act as a rigid prediction of every future occurrence. Programs cannot predict or control for all future circumstances nor can they anticipate outside circumstances that will have a significant impact on the direction of the program. A good business plan should at least give a clear direction for which to aim. Every business should have a plan whether it is just starting or whether it is expanding. It helps to define strategies, and if properly used, the plan will help involve and motivate key members of the staff.

The business plan can also facilitate success by helping avoid future failure by identifying potential pitfalls along the way. It should outline a realistic set of goals with timelines while being flexible in order to accommodate changes that are likely to occur. By generating a plan with targeted goals, one can monitor the program's progress and get the program back on track fairly quickly if anything goes wrong

Key Components of a Business Plan

Generating a business plan may seem like overkill and unimportant for those with smaller programs, but the underlying principles are critical and will help even the smallest simulation group clearly articulate the plan, starting with a clear identified mission and vision through implementation to mission realization. Many of the sections that follow are often found in a business plan.

Mission Versus Vision

The core of any plan must start with the mission and vision. A simple search on the Internet will show that the two terms are often confused with each other. The mission is often defined as the outward statement of your purpose. It is the statement (brief) that outlines, literally, your "mission." The vision on the other hand reflects how you are going to get there. Disney's vision is "To make people happy." This embodies the notion that to achieve Disney's mission, employees must "make people happy."

In simulation, it is important to clearly identify your mission so that your process and decisions can always tie back to this. Without a mission, a program will run the risk of making programmatic and fiscal decisions that may or may not be the best use of resources (people, time, and money). Even those with a mission must be cautious to avoid what is often called "mission creep" where a program extends beyond its stated mission and begins to involve itself in things that may not be a best use of personnel, time, or fiscal resources. Therefore, mission and vision discipline are critical.

Needs Assessment

A basic premise in any educational activity is that it should be based on a need [5]. When the word need is used, it suggests a problem is present. The need may in fact represent a problem or issue but may also simply reflect the specific "need" of your target stakeholder (e.g., a nursing student has a need for a thorough education in the field of nursing). The need drives the measurable objectives and goals, and the objectives and goals drive the strategy. The strategy in turn drives the equipment, space, time, and personnel needs. Essentially, the needs assessment drives the objectives. At times, the objectives may in fact be driven by a defined assessment. The needs of the program's stakeholders are paramount in determining what services to provide and to what degree. The term stakeholder refers to a heterogeneous group that includes everyone from the executive to the learner. Each stakeholder group must be considered. The services and programs offered must offer "substantive" value to the stakeholder [6]. Needs assessments may be as simple as reviewing curricular needs across specialties and disciplines or can be quite complex, entailing an in depth analysis of internal and external markets to determine met and unmet needs. Needs assessments can be conducted through surveys, in person interviews, SWOT analyses (Strengths, Weaknesses, Opportunities and Threats), and include a review of key data such as scores, outcomes, and risk management information [7].

Ultimately, the current and anticipated needs will drive your program. Failure to consider this basic principle will put even the best intended programs at risk of losing sight of their goals and failing to bring substantive value to stakeholders. While there is no firm rule of how often a formal needs assessment should be done, it is safe to say that a needs assessment is an ongoing process that must be a priority, as a business plan must be continually updated in the form of strategic planning. Strategic planning for organizations normally occur every 3–5 years or more often if the market and environment is unstable and rapidly changing.

Executive Buy-In

"No money…no mission and no mission…no money." This term is often used in business circles and has many meanings but put simply: A program cannot exist without money, and money will not flow to a program without a mission, political legitimacy, or substantive value. Executive buy-in refers to the acceptance and engagement of the executive (decision maker) in a given process. Buy-in can vary in level and may simply reflect support in principle or complete buy-in with financial support tied to key deliverables. Many simulation programs often have simple support with funding coming from soft sources or more limited sources controlled by intermediate level leadership. As programs expand and people change management positions, a program can find itself in jeopardy without substantive buy-in from both proximal and distal executives. The simulation program must be in alignment with executive interests and considerations. This brings into play not only financial issues but political ones as well.

There is no single rule or approach to executive buy-in. Informing and engaging the executive is not always easy. Access to these individuals is often considered the first step. Arguably, the first real step is having a solid understanding of what it is the program seeks to do, why it matters, and what it is that the program needs. All this must be presented in a brief format, as presentations to executives are often limited to 10–15 min. This is not to suggest that a plan should be brief but rather that the presentation (e.g. executive summary) must be brief, succinct, and to the point. It must, however, be backed by additional substantive detail upon request. Executive buy-in and engagement is a key business strategy in many industries. The transformational and cultural changes that simulation offers does require this level of support as simulation in healthcare enters into mass adoption.

Key Program Components

Human Resources

Educator Skillset and Expertise

Simulation in healthcare can be used in a variety of ways: education, assessment, research, and gap and system analysis. The use of simulation for education has become pervasive [8]. The very notion of education in healthcare is undergoing a transformative change. There will be a day when it will no longer be acceptable to simply receive your credential (e.g., MD) as a surrogate of the ability to teach. This standard of "credentialing" is without basis and is rooted in tradition. Educators will be required to understand the fundamentals of educational theory where courses are deliberate (see Chaps. 3 and 43). All courses should arguably be based on properly written learning objectives that meet the needs and skill level of the learner. These objectives must be measurable. With established learning objectives, an appropriate educational strategy is chosen. Finally, the activity and the learner performance are measured using assessment tool(s) that are coupled to the objectives and educational strategy used.

While this may seem outside the scope of this chapter and is actually discussed in great detail in another section of this book (see Chaps. 41, 42, 43, and 44), it underscores the need for properly trained educators as a core part of any program. Whether the program is small or large, the very same principles apply. Simulation is an educational strategy when used for training and assessment. It represents a tool that must be properly leveraged to gain its full potential. While simulation may entertain and has significant face validity, it is far too expensive to be used in a way that does not demonstrate real learner impact and downstream outcomes.

Simulation educators should have a solid education theory foundation and must understand the specifics of simulation as an educational, training, and assessment methodology. The educator needs to appreciate how to leverage the tool they are using. Does this imply that they must actually know how to use the technology? Some would argue that it does, and some would argue that it does not. The answer really resides in the middle and is situational. The need for an educator to understand how to operate the equipment they are leveraging depends on a variety of factors (Table 45.1).

An emerging standard is evolving where simulation educators will have access to a certification process. It remains to be understood the depth and breadth of this process at this time. It is the opinion of the authors that simulation educators should not only understand educational theory but should understand the use of the methodology and the equipment employed. This level of understanding will not only allow educators to choose the best strategy but also to use it to its fullest potential. It also avoids interdependence between skillsets that can become cost prohibitive and sluggish. Certifications may or may not include all three elements.

Educator Development

In the previous section, the need for educators to have a variety of skillsets was presented. A successful program should have an educator development pathway [9]. To move a novice educator to proficiency is not an act of chance but rather should be deliberate and based on sound educational strategies. The use of mastery learning, modeling, apprenticeship,

Table 45.1 Key considerations in equipment use

Simulation methodology used	There are many simulation methods that can be used, each having different operational requirements. A standardized patient versus a mannequin will require a different skillset. The same is true for procedural and task trainers. A simulation method may in fact use a variety of strategies that require the use of technology, actors, and appropriate environmental cues
The size of the program	A program with one person alone (no technical staff) will need to balance what educational strategies it uses and the understanding of how to dynamically utilize the technology (when applicable). Larger programs may leverage technical personnel to set up, run, and maintain the simulation equipment. Does this negate the need of the educator to understand what the equipment can do and how it works? From a purist standpoint, the answer should be no. The educators must be able to direct the technical personnel on how they wish the equipment to be used and how to dynamically adapt to different learning environments and situations. Simulation by definition is not a static activity. While automation of simulation equipment may represent a solution to this issue and is indeed emerging to be more reliable, it is far from perfect. Automation fails to adequately account for the single largest variable in a simulation: the learner. Predicting what a learner will do both temporally and physically is extremely difficult. This is likely true in professions that are not rule driven. Even within professions that are rule driven, as individuals progress along the path from novice to expert, they are much more likely to deviate from rules
How the simulation equipment is used	Simulation methods can be deployed in a variety of ways. The most complex equipment can be used in the most basic way. In the case where a complex mannequin is used to simply represent an inanimate body, the need to understand how it works is of diminished value. It could be argued that the use of such equipment in this way is an inadequate use of resources. Programs that are personnel poor and lack fundamental training are at risk of underutilizing and overbuying their equipment

and other educational techniques can collectively contribute to the overall development of a simulation educator. Like any learner, the simulation educator in training must have a clear understanding of the objectives and standards that they are trying to achieve. The objectives will depend on the type of simulation being used and the learner group that will ultimately be targeted. It is not yet understood whether there is one core skillset that spans all forms of simulation methodologies. This will likely be answered more comprehensively as simulation enters into the mass adoption phase. That notwithstanding, the need to develop simulation educators to a standard that represents current best accepted practice will allow a program to deliver more consistent educational opportunities for its target learners. The quality of a course should vary less when educators have been developed and trained with specific standards in mind. The question remains as to what educator standard should be used? There currently are no globally accepted standards that comprehensively describe a simulation educator. This does not, however, prevent a program from establishing its own standards. As long as the standards are defensible and based on sound principles, then they will likely provide some value if not consistency within the center.

Simulation education is rapidly evolving. Educators should be expected to maintain and update their skills to keep up with technologic and methodological changes and advancements. Programs should not only focus on new instructor development but continued professional development of existing educators. It is important that the simulation project timeline includes instructor development early in the process, as it takes time to develop competency prior to opening the doors of a simulation program.

The use of internal (e.g., educator debriefing) and external (e.g., conferences and trainer courses) development activities will help maintain a high level of quality. This also allows a program to develop a sense of value, purpose, and continual improvement.

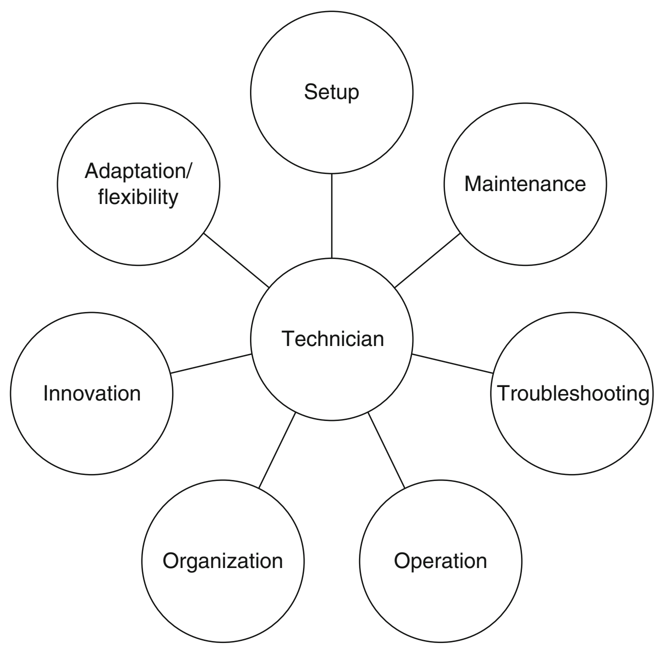

Fig. 45.1 Examples of technician skillset requirements

Technician Development and Skillset

The same principles (standards and development) described for simulation educators apply to simulation technicians as well. The technician must have a core understanding of their role (Fig. 45.1), the equipment they are using, the learner, and the purpose of the activity. In programs where a technician is not a possibility (e.g., due to financial constraints), the educator must assume the technician characteristics.

Table 45.2 Examples of standards across a variety of domains

Equipment	Hardware, software, interface, and documentation	Example: The face of a mannequin will allow for an easy and reliable seal with standard and readily available mask.
Educator	Skills, continuing education, behaviors	Example: An educator will use established basic pedogogical methods.
Technician	Skills, continuing education, behaviors	Example: The technician will operate equipment in a manner consistent with the educational activity and the equipments intent.
Assessment	Methods and development	Example: Assessment are to based on best practice. Assessment elements must be measurable and and perteninet to the area of study.
Train-the-trainer	Content, skills, certification	Example: All courses must cover core established content from referenceable material. Course instructors must carry certification as simulation educators and technicians.

Setup, maintenance, troubleshooting, and innovation are some key skills that are required in a simulation technician. The absence of these skills in a program will increase the likelihood that the program will languish and underutilize available simulation methods. The phenomenon of "mannequins remaining in a box" or "collecting dust" is real and represents a very poor use of limited resources as well as poor planning on the part of a program that did not anticipate their needs for properly trained staff. Like simulation educators, technician standards do not currently exist. Programs should use established business principles to appreciate the balance of skills needed (Fig. 45.1).

Standards

Standards may refer to many things. They may represent standards of conduct, standards of process, or standards of practice. All educational and healthcare institutions are held to certain standards that drive their activities, policies, and procedures. As has been implied in previous sections, simulation is currently standard poor, and there is no one set of accepted universal standards. While many programs have developed their own standards, there has yet to be one dominant standard to emerge. This lack of standards impacts simulation in healthcare (Table 45.2) in both variations in quality and return on investment. When an educator states they "simulate," what does that truly mean? It will become important to understand what underpins that statement to allow all individuals to have the same mental model.

Equipment manufacturers currently follow only basic standards that are not unique to simulation. They, however, do not follow a common set of standards that are more relevant to simulation applications. A good example of this is the variance of how simulated airways are developed and manufactured. The wide diversity in quality and reliability suggests a lack of standards. The application of standards and prerequisites for manufacturers will more closely couple form and function.

This also applies to simulation facility design. A variety of organizations have developed standards to help define specific key elements found in a simulation program. The Society for Simulation in Healthcare, the American Society of Anesthesiologists, and the American College of Surgeons are three examples [10]. These organizations have taken similar approaches to create general guidelines for simulation programs to establish core elements that are believed to be of high value in the success of a simulation program. Cross-referencing the program's development to these standards can be a useful exercise. The reader is referred to Chap. 48 for a detailed discussion of this topic and specific details on the individual accreditation processes.

Policies and Procedures

Whether one works in a hospital, outpatient setting, or school, they bear the responsibility to know and follow policies and procedures (so-called P&Ps). These are the very rules that allow an institution to follow regulatory and ethical requirements. They also serve a different purpose that is vital to any successful business—the ability to streamline processes and decision-making. Policies vary from addressing scheduling to confidentiality. These policies are underpinned by procedures that make them practical and applicable. In a simulation program, policies play an important role. Far too many institutions are late to establish their P&Ps in a formalized fashion. They are often boring to write and are considered by many as something that can be left for another day. If we critically look at the smallest to largest simulation program, we recognize that in fact we are applying policies all the time (whether written or not). Appendix includes a list of sample policy headings that any program should consider. For example, consider the situation where two key stakeholders want to schedule a course utilizing the same room on the same day (Table 45.3). Programs should anticipate such situations and preemptively generate polices that address these potentially difficult conflicts.

The solution to the example in Table 45.3 on the surface may seem intuitive on first read, but ultimately, the conflict will and should be resolved through the use of an established scheduling policy. Depending on what policy exists, group A

Table 45.3 Example of a typical scheduling scenario

	Group A	Group B
Group purpose	Teach about normal cardiovascular physiology as part of the circulation courses	Conduct a high-stakes assessment for an accelerated baccalaureate program
Group description	10 medical students	10 senior nursing students
Date space reservation made	Reserved 1 week before group B	Reserved 1 week after group A
Ownership stake	Same as group B	Same as group A
Date needed	Same as group B	Same as group A

or group B may prevail. If the policy gives preference to high-stakes assessment, then group B would prevail. On the other hand, if the time of reservation were by policy more important, then group A would prevail. It is easy to see how preexisting policy that is documented, available, and transparent to the stakeholders will prevent a simulation program from becoming mired in controversy, distrust, and dissatisfaction. Policies not only allow programs to create procedures for dispute resolution but also allow a program to create checks and balances that allow stakeholders to feel that they are part of a fair and balanced system. It is important to remember that stakeholders include everyone from executives, educators, and learners.

From a practical standpoint, it is often useful to work on P&Ps from a list (such as in Appendix) and recognize that they represent living documents that will change with the needs and nature of a simulation program. They can be written early in a program's history and be changed as the program evolves and matures. The policies need not be so rigid that they appear to restrict rather than promote order and innovation. They should change and be informed by unanticipated situations that improve future functionality.

Policies and procedures often dictate common approaches that are designed to make workflow and quality more reliable. The use of common curriculum development processes, common scenario templates, common databases are a few examples. These processes can help a simulation program create and maintain a system that is consistent and more likely to improve over time. The lack of standardization puts programs at risk and leads to potential ineffective use of time and resources. It is important to note that standardization of approach is not synonymous with squelching of innovation. A health simulation program not only has approaches and processes that invite innovation but also is frequently updated to reflect innovation.

Governance

Governance of a simulation program is perhaps one of the most contentious areas in many programs. Governance not only speaks to the organizational structure of a program but how decisions are made and by whom. Governance structures may be as simple as a faculty reporting to a Dean in a small community college, to a complex structure where multiple people report to a variety of intermediate management levels that eventually all report to an institution's CEO or President. What is interesting is that the person in the highest position on an organizational chart may not ultimately be the person who makes the day-to-day decisions. Moreover, the person who makes day-to-day decisions may be subordinate to the person who makes the larger annual budgetary decisions even if that person has little idea of the center's activities. Figure 45.2 illustrates two different institutional governance structure examples.

If this seems confusing, that is because it often can be. In institutions with complex executive and political relationships, it is important to clarify at each level of governance the relevant roles and responsibilities (Table 45.4). This is often described in bylaws, terms of reference, or policy. Irrespective of the size of a program, the exercise of delineating these issues is worthwhile and can insulate programs from variation and leadership changes.

There are many complex governance variations. At some point, the complexity can render decision-making authority ineffective and vague. This will vary by institution. Governance becomes particularly important when a program spans many disciplines, professions, and even institutions. Service line agreements and clear lines for decision-making are critical for success. The ability of an organization to operate efficiently and effectively is very much tied to its governance structure and governance discipline including respect for lines of communication. Governance structures should be identified early in the process of program development so as not to disrupt the success of a program.

The Physical Plant

The natural assumption is that all simulation programs have some sort of dedicated facility or physical plant. This is true in the absolute sense in that all simulation programs must have some physical plant where their simulation equipment is at a minimum housed. The physical plant may serve this sole purpose or may extend to house personnel or may be used to provide simulation-based services. Programs that are entirely point-of-care oriented may only require storage space, whereas programs that also provide simulation-facility-based simulation services will require considerably more space than the former.

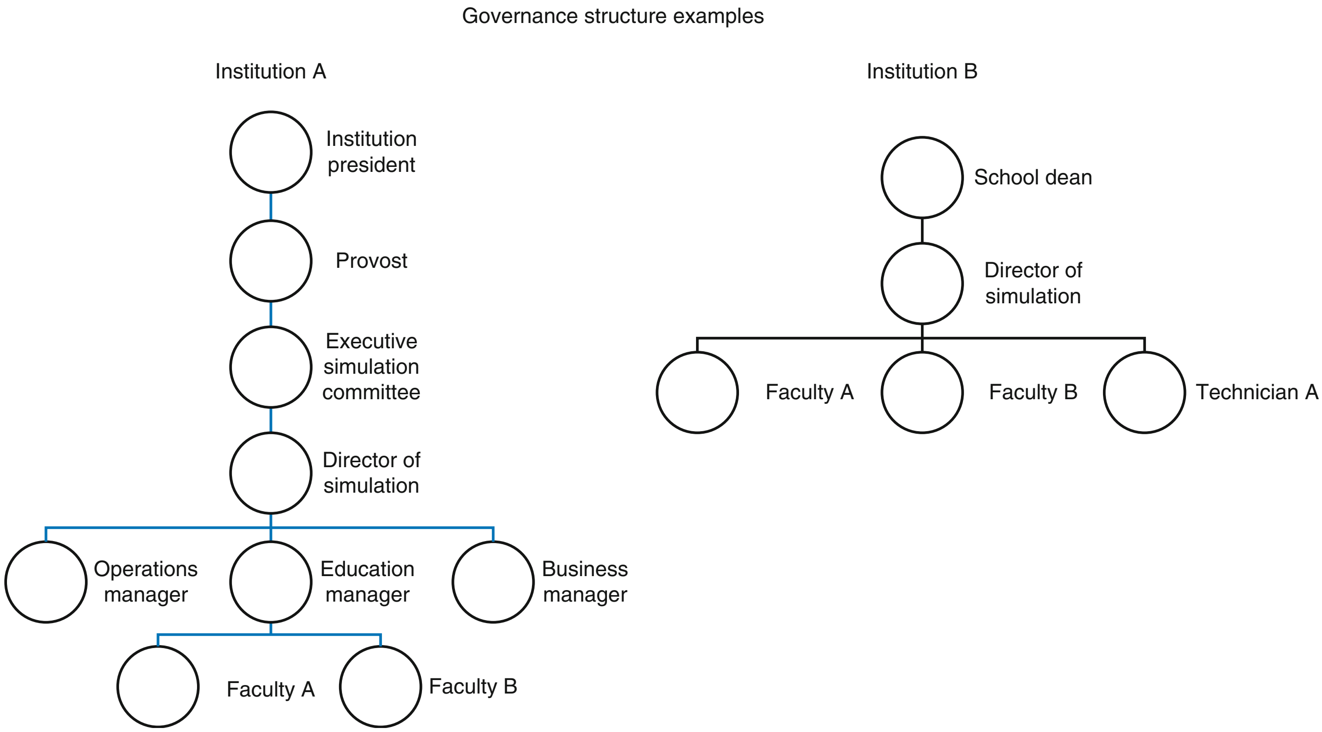

Fig. 45.2 Governance structure examples

Table 45.4 Example organizational scenarios/situations

	Institution A	Institution B
President	Delegates annual fiscal responsibility to provost	Not involved directly
Provost	Responsible for approving annual budget for simulation program	Not applicable
Executive simulation committee	Responsible for advancing an approving all budgetary considerations for presentation and final approval of the provost	Not applicable
School Dean	Involved at the executive simulation committee level or provides a delegate in their role	Responsible for approving annual budget for simulation program
Director of simulation	Responsible for creating, prioritizing, and justifying budgetary line items. Will sit with managers to evaluate overall budgetary needs. Will advance budget to executive simulation committee for approval	Responsible for creating, prioritizing, and justifying budgetary line items. Will advance budget to Dean for approval
Managers	Responsible for organizing budgetary requests and requirements specific to their domain (e.g., education)	Not applicable
Faculty	Will advance requests to managers for inclusion in budget	Will advance requests to Director of simulation for inclusion in budget

These two case examples are extremes of each other and have significant implications. Table 45.5 provides a useful comparison of the two models. Note that these are not the only models, and hybrids of the two exist and will have different considerations.

At the end of the day, the physical plant must meet the needs for storage, support, personnel, and ultimately the actual simulation learning or assessment activity. The construction and design of a dedicated simulation facility is a complex subject, as best practice is still being established. The basic premise that form must follow function, however, remains true, and any facility should be purpose-built. In the case where a dedicated facility is needed, then several space considerations come into play:

- Learning space(s)—classrooms, debrief rooms, simulation theaters, clinic rooms
- Control rooms—for mannequin, hybrid, and standardized patient (SP)-based simulation
- Storage—consumables and hard storage
- Offices—for permanent and temporary personnel
- Kitchen, break rooms, and copy rooms
- Bathrooms
- Utility rooms—gas tanks (“tank farms”), AV/IT server rooms, telephone/conference rooms
- Entry and reception areas

Table 45.5 Implications of the facility model

	Point-of-care only (A)	Point-of-care and facility based (B)
Space—storage	Hospital or off-site	Same as A and in simulation facility
Space—personnel	Will vary, may include dedicated hospital/off-site space or leverage space already allocated to personnel for their other responsibilities in the hospital	Will vary, may include (1) dedicated hospital/off-site space; (2) leverage space already allocated to personnel for their other responsibilities in the hospital; (3) use simulation facility space
Cost—utilities and space	Relative to space used (storage and personnel). Note: if personnel are leveraging space used for other responsibilities, then this cost is often absorbed by someone other than the simulation program	(1) Relative to space used (storage and personnel) in the hospital; (2) utilities related to the simulation facility; Note: if personnel are leveraging space used for other responsibilities, then this cost is often absorbed by someone other than the simulation program
Responsibility for space organization and maintenance	Organization limited to storage and office space used. Point-of-care location, the responsibility of the hospital? Excluding last-minute modifications related to simulation activity. Maintenance of fixed elements usually the full responsibility of the hospital	Same as A and full responsibility to organize and simulation facility. Maintenance of simulation-specific equipment (e.g., fixed audiovisual equipment), the responsibility of the simulation facility
Responsibility for stocking	Simulation supplies the responsibility of the simulation program; supplies relevant to point-of-care, the responsibility of the hospital	Same as A and the simulation program will have full responsibility for the stocking of consumable and nonconsumable supplies
Access	Will vary depending of patient census assuming patient care supersedes training space needs	Same as A and simulation facility access falls entirely under the control of the simulation program

While this list is somewhat general, it does illustrate the many considerations are involved when a simulation program either moves into a space or designs one. The program will either be defined by the space or the program will define the space. The latter is of course preferred but may not be an option for many programs that are given space with little budget and configurability. Even in this circumstance, it is possible for a program to take even the most inflexible space and make it suit its needs with a little innovation and patience.

As discussed in the section on policies and procedures, it is important that any dedicated facility be managed through the use of defendable and representative policies and procedures. Facilities are expensive to build and maintain. Maximizing utilization of any given space while retaining its functionality is an important consideration. When space is underutilized or misused, then programs run the risk of losing the space and/or funding.

Finances (Soft Versus Hard Money and Sustainability)

The subject of finances is complex. At the most basic level, finances can be broken down to capital and operational costs. Capital costs often refer to costs related to brick and mortar and equipment. Operational costs refer to costs related to operating a program on an ongoing basis—personnel, service agreements, utilities, equipment, etc. Good budgeting skills and a solid understanding of basic financial principles will help programs in the short and long term.

As programs become larger, they may need to develop financial pro forma that looks beyond just the next year but extend 3–5 years into the future. Many people have difficulty in developing these as they see them as guesswork. Developing a 3–5-year pro forma relies on making assumptions and applying those assumptions to establish expenses and income. The assumptions themselves should be based on historical and future considerations.

The origin of funds will vary by program. Many simulation programs are initially seeded by “soft” money. This refers to funding that is temporary and self-limited. Examples of this form of funding include grant and philanthropic funds. While this is a useful source for funding both initial startup and ongoing operations, they by their very nature are unreliable and leave a program vulnerable to reduction or even closure should the funding come to an end. The accountability with respect to soft funding is also different and may not be a rigorous as hard funding.

Hard funding refers to funding that comes from the institution as a line item (or several) for the purpose of conduction and delivering simulation services. This funding is generally more predictable and more closely tied to the mission and values of the organization. It is not without its risks as funding may fluctuate related to the overall priorities and condition of the institution. Changes in leadership will also impact this form of funding. The more “entrenched” a simulation program is, the more immune it will be to funding fluctuations or losses. This should not encourage complacence, and a program should always look outward and inward to evaluate its relevance—the unfortunate reality is that simulation often assumes a low priority at many institutions where budgeting is involved. Budgets for hard funding will follow the budgeting cycle of the source institution and will come under the regulations and scrutiny of the same.

Simulation programs are a resource to the institution and stakeholders they serve. They become a cost of business with a return on investment related to their activity. Programs must link their activities to definable outcomes so that they measure the cost of the activity to revenues generated. Recall though that in healthcare, the revenues generated may be in the form of cost saving, cost avoidance, or long-term risk reduction. Much as in the education and insurance world, the impact of an activity may not be realized for years. To take this from the abstract to the concrete: a nursing student who has superior training in part due to simulation will ultimately improve efficiency and effectiveness in the practice environment once they graduate and participate as licensed practitioners. This net gain is realized not only distal to the training intervention but may also be realized by an entirely different organization. The return on investment (ROI) and associated funding is a complex issue and will be driven by many factors and drivers. The more simulation programs make the case in real fiscal terms that simulation has a positive and relevant ROI, then the more likely an institution will be willing to provide hard and ongoing funding.

Utilization and Metrics

As students, learners, or other groups move through a simulation program, it is important to measure both the utilization of a program as well as the outcomes. Both of these concepts are quite complex but should be defined early in a program and revisited frequently. Utilization and outcomes are different and yet related concepts.

Utilization refers to the use of the program. It may reflect the learner hours (learners × hours spent in an activity) or may represent the room use in any given facility (room hours of use per day). There is no set standard currently for which metrics are of most use. The metric of most value will depend on many factors and will vary by institution. It is important to appreciate that if the data is not captured upfront, then the ability to create complete metrics will be difficult in the future. At a minimum, capturing key data points is important (Table 45.6). From these data, complex metrics can be calculated to assess program utilization. Utilization is important to understand as it defines the personnel, equipment, space, and time needs. It is difficult to predict future need as well as current issues without this data. At a most basic level, a program that is entirely facility bound can calculate the maximum number of room hours available in their facility if they know the number of rooms and the work hours.

Measuring outcomes from simulation-based education, training, research, and assessment is more complex. The level of evidence (Table 45.7) [11–13] will vary from the basic self-evaluation of the learner to complex outcomes that relate to the learners' impact on the market in which they practice. That is to say, as a person who has had a simulation-based intervention moves forward, they have an impact on a variety of people and systems. Patient outcome is an example of this as is system efficiency. These are complex issues that are multivariate. Estimating the impact of an intervention that is distal from the outcome must control for variables that are often outside of a simulation program's control. The application of standard healthcare outcome metrics may need to be reassessed to evaluate if measurement methods need to look to other industries on how to best evaluate outcomes. The education industry has developed sophisticated methods that estimate causal effect of interventions [14].

Table 45.6 Examples of core utilization metrics to capture

Number of unique learners per simulation course
Duration of simulation course
Number of simulation sessions per course
Time (duration) of each simulation session
Number of learners per session
Space used for each session
Equipment used per session
Personnel needed per session

Table 45.7 Levels of evidence

Level	Description
I	Systematic reviews (integrative/meta-analyses/clinical practice guidelines based on systematic reviews)
II	Single experimental study (randomized control trials)
III	Quasi-experimental studies
IV	Nonexperimental studies
V	Care report/program evaluation/narrative literature reviews
VI	Opinions of respected authorities/consensus panels

Mobile Simulation

The issue of mobility is increasingly becoming an issue. Does simulation need to be limited to a fixed facility? As we come to understand the multiple simulation modalities and learner/assessment needs, it is becoming apparent that simulation-based activities can in fact be carried out in a variety of locations including a fixed facility, traditional learning spaces (auditoriums), and actual patient care settings. Each of these locations offers different advantages and issues. To offer simulation-based services in multiple locations requires additional resources (personnel and equipment) and considerations. Ultimately demand, priorities, and resources will determine the availability for such services. Deciding to pursue a mobile program must be deliberate and often can leverage existing resources when demand is low.

Other Considerations: Equipment, Audiovisual, and Security

There are many other issues to consider when developing a simulation program. Some of these considerations are rooted in policy (program or organizational) as well as need. A systematic approach to these issues is helpful. Equipment, audiovisual, and security needs will also be determined by program needs balanced against budgetary considerations.

Equipment is driven by the education strategies used and by the volume of learners. All equipment will have a certain lifespan. The lifespan is determined by the absolute time a product can be expected to remain fully functional using recommended maintenance schedules. The lifespan can also refer to the natural product cycle time in which a product becomes outdated relative to market offerings. A product may not be serviceable after a certain amount of time due to manufacturer discontinuation, for example. Similarly, a product may not be useful as other technologies emerge and render that initial product irrelevant. Relative to other industries, the product life cycle in simulation has been relatively long, which is both good and bad for simulation programs. While it allows products to remain in service over longer period of time, the pace of innovation is slower which hinders progression within the industry as a whole. Equipment considerations can be summarized into four main categories: (1) simulation equipment (e.g., mannequin), (2) medical equipment (e.g., bed or pump), (3) consumables (e.g., syringes or office supplies), and (4) office equipment and furnishings.

The specifics of different AV and information/learning management systems are beyond the scope of this chapter alone. Audiovisual (AV) considerations in a simulation program can be broad and complex. The AV system must ultimately meet the needs of the educational activity and must be in alignment for security and policy requirements. For example, in some cultures, the filming of women is not considered acceptable. So the system must conform to needs as well as policies (internal and external) of a program. The AV system must be used to support operations, learning, and assessment. Educators (operations) and learners will use the AV system differently. Depending on the activity, the operations staff (technicians and faculty) may leverage the system to gather (and manipulate) information as well as deliver deliberate education to the learner (e.g. allowing learners to see specific cameras and views). The learner on the other hand is mainly gathering and integrating information. Lastly, the system should have the ability to archive materials for future review and cataloguing. This archive material may have utility to researchers, faculty, operations, and learners.

AV systems are rapidly moving to digital formats, although analog systems are very reliable and tested. The choice of the system will be determined by a variety of factors including budget, the expanse of the program, goals and objectives for the program, support for the equipment, and program skillset.

Security considerations in a simulation program relate to equipment, personal safety, as well as access to information. A simulation program must consider the level of security it needs. This may be as simple as a locked and keyed door to complex access systems that allow differential access to different levels of personnel and learners. This applies to space as well as information. The loss of mobile equipment can be costly to a program. Similarly, the political and safety considerations related to the theft of medications (whether fake or not) can be substantive and costly. The goals of a security system should be built around: (1) equipment and personnel security and (2) access control to consumables, equipment, and information. For simulation research, these guidelines and details are specifically outlined depending on the institutional research board protocols.

Logistics

Logistics is an important consideration for a successful simulation program. Robust and reliable scheduling, inventory, and maintenance protocols should be developed and put into place as a program evolves. Logistics needs to be based on policy, procedures, and guidelines. This allows for consistency but also inoculates a program from changes in personnel and shifts in funding. Programs that are larger may have the luxury of personnel dedicated to logistic considerations. There are examples where faculty and educators are entirely removed from logistic considerations. That is they arrive to teach and then they leave. While this may be an efficient mode of operation, it does leave a program vulnerable as groups lacked the cross-training to cover for each other especially in times where personnel may not be abundant.

Conclusion

The establishment of a simulation center can be a complex task that requires forethought and ongoing attention. Deliberate action will allow programs to manage what may on the surface seem unmanageable. This chapter has outlined a variety of considerations that will apply depending on circumstance. These elements come from some well establish business models that have been proven to be successful. It is important to consider each element to delineate their importance and priority in the process. Failure to do so can create downstream problems and obstacles. While it is tempting to create a rigid framework, it is important to consider that the structure of the center/program must incorporate flexibility to accommodate for future change and to remain relevant.

Appendix

POLICY & PROCEDURE CATEGORIES/LIST (partial)

General

- Mission statement
- Vision statement
- Values statement

Stakeholder definition

- Who are they (name them)
- Governance
- History of involvement
- Formal agreements
- Decision-making process
- Fiscal/funding sources

Instructors

- Skill categories
- Privileges (do they get to debrief, run sessions, etc...)
- Code of conduct
- Evaluation policy
- Development policy
- Confidentiality
- Travel
- Mentor policy

Personnel

- Operations Manager
- Business manager (if applicable)
- Simulation Technician
- Support staff & contact tree
- Overtime policy
- Scope of work/description for each personnel classification
- Org chart

Scheduling

- Process (intake and confirmation)
- Priority of use
- Facility use (what can or cannot be done in facility)
- Fee schedule if applicable
- Cancellation policy
- Recording of scheduling events (i.e. calendar structure and info)
- Final arbiter of scheduling needs policy

Equipment

- Loan out policy
- Acquisition policy and process – how to request, who makes the decision, etc...
- Maintenance & cleaning (type and frequency)
- Breakage and repair policy (internal and external))
- In-situ versus in-facility use

Supplies

- Acquisition
- Organization
- Inventory
- Budget source
- Usage and re-usage

Miscellaneous Policy - I

- Confidentiality
- Video recording policy
- Video distribution policy
- Video destruction policy

Miscellaneous Policy - II

- Observation of simulation policy for course participants
- Observation policy for non-participants
- Required disclaimers and pre-event statements
- Required event or course acknowledgements
- Simulation facility "Brand" use policy
- Publication policy

Fiscal

- required reporting, (type and frequency) and to who
- Annual budget reporting requirements
- Required fiscal year end documents
- Required documentation
- Purchase and acquisition procedure
- Reimbursement process

Meetings

- Meetings – going to meetings representing the center
- Reimbursement policy
- Covered expenses
- Priority scheduling in case of conflict

Research policy

- IRB policy
- General Guidelines if different from institutions
- Security
- Fiscal impact (overhead, etc.…)

Scenarios

- Template use
- Structure and mandatory minimum components
- Authorship rules
- Storage rules
- When can a scenario be used – policy on validation

Operations Policy

- When scenarios are implemented what is the recommended procedure
- Turn-on process
- Turn-off process
- Security of information (video, scenarios, databases, files)
- Parking

Courses

- List of regular courses
- List of unacceptable courses
- Mandatory elements and documentation for each course
- CME, CE, recertification policy.
- Fee structure

Remediation

- Policy relating to how it must be done
- Documentation
- Policies to reduce liability for the center
- Ethical guidelines

Vendor relations policy

- Beta testing
- Gifts
- Events
- Showcases
- Grants
- Access to facility

Customer Relations Policy

- Dispute resolution process
- Marketing
- Web usage
- Information dissemination
- Official media policy

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Business Planning Considerations for a Healthcare Simulation Center

46

Maria Galati and Robert Williams

…no industry in which human life depends on the skilled performance of responsible operators has waited for unequivocal proof of the benefits of simulation before embracing it. [1]

—*David Gaba, M.D.*

Introduction

Simulation-based training has been used for many years to manage risk and facilitate safety in hazardous professions outside of healthcare, especially in aviation. The use of simulation as a tool in medical education is relatively recent and follows the age-old medical tenet *primum non nocere* ("first, do no harm"). The use of simulation may also follow the more recent emphasis in the business of medicine on improving patient outcomes while reducing healthcare expenses. These demands for value and efficiency in an era of healthcare reform present both new opportunities and new challenges in justifying the investments required for the research and development of simulation to educate healthcare professionals. Although the readers will appreciate that similar material is covered in Chap. 45, for completeness, these chapters are intentionally left intact since it is impossible to discuss one without the other. This chapter will focus on the business and operational considerations in planning a healthcare simulation center and when appropriate will discuss center design concerns as they relate to the business of simulation.

Business Planning

The need to coordinate "vision-driven business planning" was identified as one of eight major themes in an effort to institutionalize and sustain simulation in healthcare by representatives from interested professional and regulatory organizations [2]. Business plans provide an organized construct for the presentation of a project or business, an analysis of the industry and marketplace in which the business will operate, and the strategic, management, and financial goals that are envisioned for the new entity. The depth and scope of a business plan will rest on several factors including the status of the entity as either an independent unit or as a component of an existing business, the scope of the entity's activities, and the type and amount of financial investment required.

In planning a healthcare simulation center, the decision of whether to establish a stand-alone facility or a center within a private or academic medical facility will rest on the mission and goals of the simulation center. The planned scope of simulation activities may include the use of standardized live patients, low-tech models or mannequins, and/or complex task trainers and realistic human patient simulators and may serve single-specialty or multispecialty purposes. The complexity of the simulation services offered will be reflected in the business planning process. Finally, the amount and source of funding required to finance the center will determine the complexity of the financial projections and will guide the planner in selecting the most appropriate metrics to define the investment's projected economic worth.

Three key elements of a business plan that should apply to healthcare simulation centers of all types and complexities are outlined and illustrated below. These include the formulation of (1) a mission statement, (2) an analysis of the market and strategic positions of the business, and (3) a financial overview of the plan. Other elements of a business plan may be included to illustrate and support the business case as is appropriate. A comprehensive listing of the elements of a business plan is shown in Table 46.1.

Mission Statement

Defining the mission and goals of a simulation center is an essential first step in the business planning process. A mission

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A.I. Levine et al. (eds.), *The Comprehensive Textbook of Healthcare Simulation*,
DOI 10.1007/978-1-4614-5993-4_46, © Springer Science+Business Media New York 2013

Table 46.1 Elements of a business plan

I. Executive summary
(a) General description of the business
(b) Business mission and goals
(c) Financial and operational resources
II. Company background and analysis
(a) SWOT: Strengths, Weaknesses, Opportunities, Threats
(b) Service offerings
(c) Technology
(d) Competitive position
III. Industry and market analysis
(a) Scope
(b) Barriers to entry
(c) Demand
(d) Market share
(e) Customers/pricing plan
(f) Marketing and promotional plan
IV. Strategic analysis
(a) Mission and goals
(b) Operating assumptions
(c) Performance metrics
(d) Time frames
V. Operations and management
(a) Table of organization
(b) Key personnel
(c) Policies and procedures
VI. Financial analysis
(a) Financial statements/forecasts
(b) Capital and operating budgets
(c) Supplemental justifications
VII. Conclusion
VIII. Appendices

Sources: Authors' compilation from: Finch [3] and Gerson [4]

statement is an internal document that communicates in a concise and specific way what the business is and what it proposes to do. It is typically constructed by answering a series of questions including:

1. What is the product or purpose of the entity?
2. Who are the entity's customers?
3. What are the entity's quality, human resources, and/or marketing-related goals?

An expanded mission statement may also incorporate goals of the business in a qualitative and/or quantitative manner and may set out timeframes or other specific objectives of the entity.

A mission statement for a healthcare simulation center may also reflect factors including its:

- Profit or nonprofit status or objective
- Scope of simulation services offered
- Range of medical specialties/groups of customers served
- Internal vs. external customer focus
- Educational, research, and/or clinical goals

The box shows an example of a mission statement for a medical school simulation center within an academic medical center.

Example: Medical school-based simulation center mission statement

"The mission of the Center is to provide state-of-the-art, realistic patient simulation to XYZ medical students residents and faculty with the goal of achieving excellence in medical education and assuring the highest standards of ethics, safety, and quality for the care of patients of the XYZ Medical Center."

Market Analysis and Competitive Strategy

A useful framework for analyzing a market and planning a competitive strategy has been described by Porter [5]. He described five forces that drive competition in an industry including the rivalry among existing firms, the bargaining power of both suppliers and buyers, the threat of new entrants, and the threat of substitute products or services.

Barriers to Entry: A Simulation Center in an Academic Medical Center

According to Porter, the threat of new entrants depends, in part, on the industry-specific barriers involving factors such as the economies of scale, capital requirements, product differentiation, switching costs, access to distribution channels, regulatory policy, and other cost advantages unrelated to scale, such as the learning or experience curve. The following is an example of how Porter's framework for competitive analysis may be utilized in planning a simulation center in an academic medical center.

Economies of scale accrue as a reduction in the unit cost of a product or operation as the output in a specific period of time increases. Scale economies accrue to a medical center that locates and organizes its simulation facilities for ease of use across several medical specialties. Capital investment advantages accrue to a medical center that leverages its existing physical plant, audiovisual and teaching lab equipment, and support staff in starting up a simulation center.

A simulation center may diversify its customer base to secure its competitive position. In its start-up period, the center may plan to target the medical students, residents, and faculty of the medical center. Later, this customer base may be expanded to include other community-based or affiliated trainees and faculty, ancillary healthcare personnel, and/or representatives of health-related industries to gain economies of scale.

A simulation center that is the first to enter a geographic market or that is the first to become known for quality services with a particular customer base secures loyalty and learning curve advantages and increases switching costs for customers who may be presented with new service provider options. These advantages may be bolstered by achieving certification and/or endorsement by professional organizations or regulatory bodies (see Chap. 48).

Academic healthcare training programs also control an important "distribution channel" of graduate trainees and alumni customers based on their long-standing relationships and/or reputation for quality education within these professional groups.

Finally, Porter identifies businesses that gain the most significant experience curve cost advantages as those with a high labor content when performing intricate tasks and/or complex assembly. Healthcare simulation centers require a major investment in human resources to design intricate clinical scenarios and execute sophisticated information technology tasks. Academic medical centers have a cadre of medical educators in place who are experienced in didactic and bedside clinical teaching methods that can be leveraged in the simulated education environment. These skills lend experience curve advantages that reduce costs by facilitating design and efficiency. Centers may also produce intellectual property that provides a source of supplemental revenue, reputational benefit, and product differentiation.

Financial Analysis

Financial projection and analysis of the investments required to initiate and maintain a new center are important business plan elements. The financial analysis section of a business plan must conform to the requirements of the business owners and investors. These requirements will vary by type of organization, size of project, availability of investment capital, and type of investor. Conformance to the business plan requirements alone, however, may not determine the success of the business plan. A study of the relation between the form and content of business planning documents and the funding decisions of venture capitalists found only a weak association and suggested that independent sources of information may be involved [6]. Business planners need to design a financial plan and analysis that presents the most robust cost/benefit projections and targets the needs and interests of the decision makers who will determine the fate of the proposal.

Figures of Merit

Capital investments are, by definition, costly and expected to endure over time. They are therefore best evaluated based upon the cash flows that are expected over the life of the project. Business planners must choose the appropriate "figure of merit" (a number that defines a capital investment's projected economic worth) to employ in the financial analysis. Given the long-range nature of capital investments, figures of merit typically incorporate the concept of the time value of money. The net present value (NPV) is one such figure of merit commonly used in business planning. It requires development of a set of assumptions that includes the amount and timing of cash outflows and inflows, and a discount rate, or the rate of return desired/expected on a particular investment.

In the case of a healthcare simulation center, the revenues from conducting training courses, certification programs, competency assessments, and other potential revenue-producing activities would constitute the expected cash inflow. Opportunities to reduce costs should also be counted in the cash flow analysis. Examples include the recapture by the center of continuing medical education fees paid to external providers or indirect savings derived from the avoidance of patient safety lapses and healthcare reimbursement penalties. In some cases, clinicians who participate in simulation-based training may be eligible under risk management incentive programs for reductions in malpractice premiums [7], and these should be included in financial projections, as applicable.

In healthcare, long-range investment decisions have traditionally been made based on medical or strategic needs with less of an emphasis on economic efficiency [8]. There are several reasons to avoid the exclusive use of traditional figures of merit such as NPV in business planning. These reasons stem from flaws in the methodology that lead to an underestimation of a business plan's benefits and a systematic bias against successful innovation [9]. These flaws include the fact that cash flows of the innovative project are compared against a default scenario in which no investment is made, and the assumption is, therefore, that the company's current success will persist in the absence of the investment.

Real Options Planning

Real options planning is a complementary approach used with traditional figures of merit for the financial analysis of capital investments. It has been described as a technique to "marry the theory of financial options to the foundational ideas in strategy, organizational theory, and complex systems" [10]. The technique shifts the focus of a business from how existing resources can be leveraged for long-term benefit to how an investment in the creation of new capabilities adds value.

Employing a real options approach in a business plan for a healthcare simulation center may involve modeling serial financial investments that will result in a staged implementation of the center. These models would pinpoint opportunities to modify the scale and complexity of the center's activities as the demand for services develops. This facilitates reduction of the initial capital investment, thereby maximizing chances for the success of the proposal when start-up funds are limited.

The real options approach for a simulation center would provide flexibility by accommodating the redirection of the scope, the specialty orientation, and even the location of the project after startup. This may be necessary and beneficial in responding to rapidly changing needs in the financial, educational, regulatory, or political environment in which the center operates.

A center may also incorporate plans to join with interested parties from industry to work in a joint venture arrangement. This arrangement, for example, could provide synergy in a project where a vendor needs a clinical partner to accomplish its product research and development goals and where an academic or clinical practice needs access to the vendor's equipment in order to further its medical education and clinical research goals. In this case, a legal review and documentation of the relationship would be required to avoid any potential conflicts of interest. Typically, a contract between the parties would serve to define the roles and responsibilities of the participants, assure compliance with all applicable laws, and define the ownership of any intellectual property and revenues that may result from the collaboration.

The Role of Philanthropy

Healthcare reform is bringing new uncertainties and new cash flow challenges to medical centers that will need to rely more than ever on their diminishing reserves and the debt markets to fund capital investments. This raises the importance of philanthropy as a supplemental source of funding for capital project needs. However, conditions in the economy can present confounding factors that limit access to capital in the debt markets and, at the same time, may influence donor behavior.

Limitations in the debt market followed the financial crisis of 2008 and nonprofit organizations experienced what may have been the effect of the broader market conditions on healthcare gifting in 2009. According to a report by the Association for Healthcare Philanthropy, gifts to healthcare organizations in 2009 fell 11% to $7.6 billion from $8.6 billion the previous year. At the same time, the return that organizations earned on fund-raising investments fell 9% [11]. This report also noted that in 2009, 8 out of 10 healthcare donors in the United States (US) were individuals with a personal connection to the institution and that 27% of all contributions funded construction and 18% funded investments in equipment.

Business plans for healthcare simulation centers should consider the opportunity and availability of funds from philanthropic sources to defray capital and/or operating costs. Fund-raising activities that provide the most efficient return (based on cost per dollar raised) are those that focus on obtaining major gifts and planned giving rather than on holding special events such as charity balls or benefits [12].

Simulation center activities may be an attractive investment for donors in the current climate of healthcare cost control and with the growing focus on patient safety. High-technology medical training methods present publicity opportunities that can be used to bolster a center's reputation in the community and to attract philanthropy. Business planners should include marketing and development office specialists as early as possible in the planning process to maximize the success of these opportunities.

Supplemental Justifications

The aim of the financial analysis section of a business plan is to show justification for the business's commitment of potentially scarce financial and operational resources to the new investment. In addition to the financial figures of merit chosen, important qualitative benefits of the planned investment may be included to supplement the financial analysis. Items to highlight in the case of healthcare simulation centers include the ethical, educational, and patient safety benefits of medical simulation.

Traditional clinical teaching methods employ live patients in the process of training healthcare professionals and in the general interest of promoting the safety and welfare of all patients. While some clinical experience with real live patients is essential and valuable, these traditional methods are difficult to standardize, inefficient, and create ethical concerns [13].

Centers with a limited patient population may argue for the use of medical simulation to augment live patient teaching methods and to ensure that all trainees receive a comprehensive, standardized, and efficient learning experience that covers the broadest scope of disease states, clinical presentations, and critical events. Simulation-based medical education also gives training programs the flexibility to determine and vary when, how, and for which types of patient interactions it may be appropriate and safe for trainees to participate in live patient care.

Patient safety has been a prominent focus in US healthcare since the release of the 1999 Institute of Medicine (IOM) report that attributed significant rates of mortality and inflation in healthcare and societal costs, measured in the billions of dollars per year, to medical errors [14]. Starting in 2003, regulatory agencies like the Joint Commission instituted programs to set national patient safety goals and governmental and private sector payers followed by linking reimbursement to the adoption and reporting of safety-related measures. The review of healthcare safety and efficiency continues to be an important focus and matter of concern in the US a decade after the IOM report. A 2009 report reviewing healthcare quality among nations found that the United States ranked last of 19 "developed" countries in avoiding preventable deaths [15]. Hospitals and physicians are increasingly incentivized via public reporting requirements and new reimbursement formulas under

Table 46.2 Project management team members and respective roles

Member	Description
Project manager	Responsible for overseeing all aspects of the endeavor. This individual is charged with monitoring its progress, keeping to a timeline, and monitoring expenses. The project manager will interact will all groups and generally keep the project organized
Architect	Provides architectural design expertise and works with the various team members and project groups to realize facility construction based on the scope and vision of the project
Administrator	This team member represents the institution's executive senior leadership and is responsible for assuring that the project satisfies the mission and financial expectations
Simulation expert(s)	May be internal faculty with expertise in simulation or contracted simulation consultants. This individual or group should ensure that the project's design will meet the goals of the simulation center. Experienced simulation instructors will have very valuable input in the design process
Contractor	The contractor should be selected and involved during the design phase of the project and work closely with the architects
Facilities management	Representative of the institution's Facilities Management should be involved to assure the construction meets the institution's standards. They are owner representatives focused on process as it relates to construction and engineering issues such as electrical, plumbing issues, and meeting building codes
IT and AV consultants	May be in-house or contracted. Role is to work with the simulation experts to ensure that defined IT and AV needs are met
Vendor representatives	Representatives from capital equipment vendors for simulation, operating room, and medical equipment should be involved to assure that design and installation requirements are met
Marketing/Development Office representatives	Depending upon the mission and funding plans for the center, representative from Marketing and Development may serve as ad hoc members or consultants to the team

health reform to facilitate compliance with health quality and outcome measures. By 2015, approximately 9% of all Medicare payments to hospitals are expected to be linked to the hospitals' ability to successfully reduce readmissions and hospital-acquired conditions and to publicly report medical errors [16].

Healthcare simulation centers can serve as the nexus for the introduction, practice, and maintenance of patient safety skills that facilitate success for hospitals in both the reimbursement and public reporting arenas. Business planners should consider how simulation training can benefit the organizations facing these challenges and should incorporate projections in the business planning process of the potential benefits of reducing costs and enhancing reimbursements.

Finally, organizations with a teaching mission can differentiate themselves with trainees, patients, prospective donors, and the community at large by highlighting the educational, patient safety, and ethical advantages of simulation-based training as a complement to traditional teaching methods.

Thus far, we have reviewed the considerations in developing a business plan for a healthcare simulation center based on the center's mission, including methods of financial and competitive analysis and other useful factors in justifying the investment. Successful business plans outline a clear mission, propose a strategy for competing in the marketplace, and meet the institutional or company "hurdle rate" for a return on the expected investment. The last step in the planning process is the presentation of the final business plan to key stakeholders and investors.

Estimating Expenses and Moving Beyond the Planning Phase

The remainder of the chapter will focus on elements of the business plan that help planners in outlining the projected expenses of the center and to begin to advance the project toward an implementation phase. Many of these steps are initiated in the course of business planning and can begin once the mission and scope of the center are defined and agreed upon by the stakeholders. Steps for projecting center costs and moving toward implementation include:

1. Selection of the project design and management team
2. Facility design
3. Development of a capital and operating budgets
4. Creation of a timeline and internal controls

Project Management Team

The project design and management team has the responsibility of overseeing the planning and design of the physical space, developing budgets, and monitoring the progress of each stage of the project. The team is typically supervised by the funders of the project. The design/management team should be well balanced and led by a knowledgeable and diligent project manager whose role is to keep the team focused [17]. Table 46.2 lists recommended team members and their respective roles. Collectively, the team will develop an architectural design based on the goals of the project and will select contractors and vendors to execute the plan using available funds. The team will also develop a realistic project timeline to assure that "go live" goals are achieved. Regular meetings to evaluate the project's progress are helpful in managing issues and problems as they arise. All team members should be motivated and possess superior communication skills. The team's ultimate goal is to guide the project from design phase to completion of construction and to ensure that everything is in place for the opening of the simulation center. After the construction phase has been completed, appropriate team members may function on a parallel track to ensure that processes are in place to support the planned curriculum.

Facility Design

The first step in a facility design project is to review the goals of the project and to justify the decision to move forward with a renovation, an expansion, or a commitment to new construction [18]. Goals of the project will dictate the scope of the architectural design. Starting new construction, renovating or expanding an existing educational operation is often subject to the availability of capital funding and the demonstration of financial viability [19]. New facility construction offers the significant advantage of beginning the project with a blank canvas. However, space and cost constraints make it likely that a medical simulation center will be created by renovating of existing space. In other cases, existing education programs will be expanded to include simulation, as it becomes the standard of practice in medical education. In any of these cases, key considerations in facility design include:

1. Fulfillment of the center's mission
2. An inventory of existing services and space/equipment resources
3. The assessment of need or demand for services to be provided
4. Plans for future expansion or increasing capacity

The next step is to review the program's planned or existing curriculum by quantifying the number of participants and programmatic offerings over a defined time period.

Physical space requirements for a simulation center will ideally consist of a suite of rooms including:

1. Simulation lab(s)
2. Control room(s)
3. Standardized patient examination room(s)
4. Conference room or class room
5. Debriefing space
6. Office space

Simulation centers should replicate the actual clinical environment as closely as possible. For example, a center with a surgical emphasis may include a replica of an operating room complete with anesthesia and surgical equipment setups. Depending on the complexity of the simulated environment, the space should be designed with input from physicians familiar with both the clinical environment and with the requirements of simulation education in order to create a realistic presentation. Simulation labs must accommodate hardware and ancillary materials that may include mannequins and patient conveyances, specialty-specific clinical work stations, supply carts, desk and counter space, and storage cabinets.

The number of trainers and trainees who will participate simultaneously in simulation scenarios is a factor in deciding the size and layout of the lab. Other space design considerations include designing the space to meet building, fire, and safety codes as well as structural requirements for the placement of furniture, the installation of medical gas supply systems, and the cabling for information technology (IT) and audiovisual (AV) systems.

Debriefing is an important aspect of simulation-based education and should be considered in facility design. The debriefing space is used as a place for trainers and trainees to review the simulation exercise, to engage in post-scenario discussion, and to reinforce learning objectives. Debriefing rooms should have the necessary AV equipment to view or review recorded simulation activities. Given space constraints, simulation labs or conference rooms may also function as debriefing space. Dedicated office space will be necessary in a stand-alone center. Alternatively, staff may use existing offices for these purposes.

Location of control rooms, size of the conference room, and the audiovisual setup should be based on input from the clinical educators as well as manufacturers' representatives. Simulation systems vendors and capital equipment manufacturers provide important information regarding structural requirements for extensive capital installations such as specialty lighting, ventilation, and medical gas systems. The final facility design should be based on collaboration of all team members, reflecting the needs of the simulation educators and their curriculum, and meet the financial constraints of the project.

The Capital Budget

Administrators or owners may have already determined the amount of funding that is available to be committed to a particular project. Alternatively, the cost of the project may be known and the institution may seek philanthropy or other funding sources to support the expenses. The process for development of the capital budget actually begins during the design phase and may impact or limit aspects of the new facility's design.

The capital budget for any project includes costs for space design, renovation and construction, building materials, and required equipment. Capital equipment is defined as nonexpendable equipment that is used to operate a business or

Table 46.3 Sample operating budget XYZ simulation center Annual operating budget: 20XX

	Quarter				
	1	2	3	4	Annual total
Salary expenses:					
Medical director (0.2 FTE)	$10,000	$10,000	$10,000	$10,000	$ 40,000
Instructor 1 (0.2 FTE)	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 20,000
Instructor 2 (0.2 FTE)	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 20,000
Administrator (0.2 FTE)	$ 6,000	$ 6,000	$ 6,000	$ 6,000	$ 24,000
Fringe benefits (25% salary)	$ 6,500	$ 6,500	$ 6,500	$ 6,500	$ 26,000
Total salary expenses:					$130,000
Non-salary expenses:					
Rent	$10,000	$10,000	$10,000	$10,000	$ 40,000
Utilities	$ 900	$ 900	$ 900	$ 900	3,600
Medical gases	$ 150	$ 150	$ 150	$ 150	$ 600
Preventive maintenance	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 20,000
Repairs	$ 500	$ 500	$ 500	$ 500	$ 2,000
Clinical supplies	$ 150	$ 150	$ 150	$ 150	$ 600
Office supplies	$ 75	$ 75	$ 75	$ 75	$ 300
Total non-salary expenses:					$ 67,100
Total annual expenses:					$197,100

provide a service. Institutions have specific definitions in their policies for capital equipment. For example, any item costing more than $500 and/or with a useful life of more than 3 years may be considered capital. Capital equipment requirements for construction of a medical simulation center will vary with the organization's educational goals. Room furnishings, integrated simulation mannequin systems, anatomical training models, and IT/AV systems are examples of items that will appear in the capital budget. Additional items may include "props" such as medical equipment that would be found in the clinical setting. These may be specific to the course curriculum or targeted professional group. For example, equipment for an emergency medical technician training program will not be appropriate for a surgical residency training program.

The project management team should explore opportunities to seek in-kind support from vendors who may already have a relationship with the organization and may be able to donate capital equipment to the center. Alternatively, centers can consider equipping their simulation centers with capital equipment no longer suited for clinical use but with functionality adequate for simulations.

Most institutions have guidelines and requirements for capital acquisitions that include competitive bidding. Competitive bidding assures that vendors offer optimal pricing for the required capital investments. The project management team will be tasked with putting together a well thought-out and justified capital budget that will assure the best use of the scarce resources required to see the project through to completion.

The Operating Budget

An operating budget for a simulation center is a financial plan for the non-capital expenses of running the center for a specific period of time. It is typically projected on an annual basis and is normally subdivided showing expense projections for shorter monthly or quarterly intervals. These budget intervals provide managers with the ability to anticipate short-term cash flow requirements and to facilitate timely comparisons of actual expenses against the budgeted amounts. A comprehensive operating budget is developed and monitored by the responsible manager and forecasts all expenses for day-to-day operations. These usually include salaries and fringe benefits, fixed costs such as rent and utilities, as well as expenses for supplies, non-capital equipment, and preventive maintenance and repair. Table 46.3 shows a sample operating budget for a for a medical school-based simulation center. It assumes a work effort of 20% from existing employees of the medical school. Salaries are therefore prorated, reflecting the proportional work effort (0.20) of a full-time equivalent (FTE) employee. A stand-alone simulation center may not have the ability to share personnel, in which case the operating budget would reflect the expenses of the specific staffing plan.

Monitoring the Project

The project team is charged with the development of a project timeline. This step is critical to ensuring that the project stays on schedule and meets objectives as set out in the business plan. Many factors will influence the timeline and a careful review of these will enable the project team to create a timeline that is realistic. Key factors include:

- Meeting with stakeholders to develop the architectural plans
- Preparation of construction documents and obtaining permits
- Construction or renovation duration
- Schedule for equipment selection, purchase, installation, and testing

Variables such as lead time for equipment delivery, construction delays, or unplanned findings will complicate the project and affect the timeline. The project management team should meet regularly to review progress and deal with any issues so as to minimize delays. Coordination of equipment delivery and installation schedules to accommodate various phases of the construction process requires finesse and continual reassessment to prevent delays.

The project management team should also develop internal controls to periodically monitor the quality of the construction and work with vendors to monitor delays in delivery of supplies and equipment. They must also review expenses and reconcile any variances from the budget. Unplanned additional expenses must be brought to the attention of stakeholders and reincorporated into the planning process. As the facility project nears completion, the project manager and appropriate team members should shift their planning focus to preparation for the day-to-day operations.

Conclusion

This chapter presents the business planning concepts used to identify the operational requirements and justify the investments for the startup and maintenance of a healthcare simulation center. Demand for medical simulation educational programs will expand in response to regulatory, professional, and public interest pressures to optimize safety and efficiency in medical education and healthcare delivery. These basic planning concepts can be used to formulate a successful proposal for the initiation of a simulation-based healthcare education center.

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Securing Funding for Simulation Centers and Research

47

Kanav Kahol

Introduction

While the benefits of simulation in medical education, establishment of best practices, and reduction of medical errors are undoubtedly being recognized, researchers and educators still struggle with establishing a viable business model for simulation centers (see Chaps. 45 and 46) and more importantly for innovations in simulation through research. Simulation centers primarily cater to residents and trainees and hence are part of the medical education division in most healthcare institutions. The misperception that a simulation center must focus only on training could preclude the significant impact simulation can have on patient safety and patient satisfaction.

While researchers have attempted to show the association between simulation-based training and increased patient satisfaction and patient safety, these studies have often lacked the scientific rigor to prove the obvious link [1–9]. This limits the advocacy and funding around the value of simulation in improving patient experience and safety. Within medical education too, simulation is seen as an add-on to traditional training and not as a required component of medical education worth funding. Further, existing centers are seen as a sink for hospital investment given the often sporadic and not fully translational nature of simulation-based education. Another factor that negatively impacts investment in simulation is the lack of affordable simulators. Simulation centers require significant investments in expensive virtual reality simulators as well as mannequins. Even in affluent nations and communities, the cost of simulation is often seen to far exceed the benefits.

This trifecta of (1) a lack of obvious link to patient safety and satisfaction, (2) a lack of complete integration of simulation into medical curricula, and (3) the high costs of simulation-based training together act as a major impediment to use, propagation, and funding of simulation. Given these obstacles, simulation programs struggle to develop sustainable revenue streams, particularly from entities outside their own institutions.

Since most simulation centers cater to their organization's internal educational and training needs, their funding generally comes from providing educational activities for the organization. While a revenue model of this nature is possibly sustainable, it limits the adoption of simulation for the purposes of research and technology development. Hence, there is a need to acquire external funding geared towards simulation research and simulator development. This external funding affords the opportunity to treat simulation as a true scientific enterprise worthy of research and development dollars; this is much needed considering the paucity of well-done scientific studies using simulation. In this chapter we will first outline methods by which a center can overcome the barriers identified and develop a multidimensional program that can seek funding from a variety of sources. We will also explore plausible and sustainable revenue streams for simulation programs with an emphasis on grant acquisition from the private and the public sectors.

Positioning a Center to Secure Funding

Seeking grant monies requires simulation programs to possess or develop certain elements. While the barriers presented above negatively impact fund generation for simulation centers, there are several possible strategies that can provide a systematic method to create a sustainable business model while supporting both research and education. Our simulation program has developed a successful multidimensional strategy towards financial sustainability: (1) integration of required simulation-based training and research into the curricula, (2) the use of simulation for "BEST PRACTICE" identification and training, (3) the use of simulation for

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A.I. Levine et al. (eds.), *The Comprehensive Textbook of Healthcare Simulation*,
DOI 10.1007/978-1-4614-5993-4_47,

national and international concerns, (4) the development of simulation-based research, and (5) the development of affordable simulator technologies. It should be apparent that these dimensions are not mutually exclusive and several can be accomplished using the same methodologies.

Integration of Simulation into Curricula

The first element of financial sustainability involves actively including simulation in required healthcare curricula. This not only maximizes the benefits for students, it also allows for successful demonstration of positive impact and may be responsible for improved resident recruitment [10]. In our institution the surgical curriculum was designed to focus on systems-based practice, a core competency identified by the Accreditation Council for Graduate Medical Education (ACGME) and adopted by the American College of Surgeons (ACS) [11]. The curriculum incorporated three types of mandatory, nonclinical educational activities, including simulation-based training, learning modules that focused on fiscal and operational training, and a research module. The key element in this rotation was to combine a research project with the simulation-based training. This required housestaff to engage in scientific study design, a literature review, and manuscript preparation. This arrangement not only allowed us to teach residents but also allowed us to mentor the residents while exponentially increasing the program's ability to generate research and publications. This strategy is one example of how simulation can be effectively integrated into the curriculum while fostering an environment that generates researchers and simulation-based research. This served to enrich our center's academic productivity and viability, making it a better candidate for funding.

Simulation and Best Practice

The second dimension of addressing the barriers to simulation buy-in focuses on best practices for hospitals. Simulation can prove to be a highly effective aid in experimenting with and deploying best practices. The advantage of focusing on best practices lies in their immediate impact on patient safety and satisfaction. This direct link between quality measures and the training imparted in simulation allows centers to address simulation distrust effectively. Several researchers have alluded to the impact simulation can have on best practices adoption and sustenance. By actively focusing simulation training on best practices, simulation centers can greatly increase the perceivable impact on quality measures. Again, this makes a center more likely to be funded given a track record of successful translation of simulation-based education to better patient outcomes. A key example of best practice was in central venous catheter placement. CVC insertion is a skill wherein simulation has been shown to have a positive impact [12]. CVC insertion skills translate into a measurable impact by hospitals in reduced infection rates and litigations. By direct measurement of the impact of simulation in improving skills, simulation centers can prove their contribution through the CVC best practice training.

Simulation for National and International Concerns

This third element is novel and lies around developing courses that address issues of national and international concern. Such programs may afford center opportunities for funding that were not likely considered during the center's inception. Often, simulation-based training is seen through the pigeonhole of skills training. However, simulation can be effective in large-scale team training and efforts such as disaster management. In the world health arena, simulation can be an effective aid in training healthcare workers. For example, a course that focuses on maternal and child health for healthcare workers would be extremely useful in attracting funding from the World Health Organization, United Nations, and several foundations. Once again, piecemeal work done in this direction has shown how simulation can revolutionize such type of efforts and also establish a revenue stream for simulation centers [13, 14].

Simulation Research

The fourth element towards generating a sustainable revenue stream for simulation programs is more traditional and lies in actively allocating funds for simulation-based research. Research and development should lie at the core of any simulation center's activities. There is no alternative to providing data on the applicability of simulation to improving skills and improving patient safety. In order for simulation as a discipline to stay relevant, research of this sort is necessary. Creating a solid program of research that produces publications is also a must to sustain interest and funding from the parent organization or funding agency. In terms of research, a few things must be emphasized. First, simulation centers should aim to produce multicenter research studies. Multicenter research studies whilst being rare in simulation are indeed very effective in gathering the required number of participants for publication in respected journals. They also lead to formation of consortia which are necessary to secure large-scale grant funding. Secondly, research should include multidisciplinary aspects. Often research in simulation is targeted towards a single specialty. While the benefits of such studies should not be underestimated, there is also major benefit in bringing together multiple disciplines and creating research programs that study teams. This is an effective way of implementing best practices and also maximizing the perceivable impact of simulation.

Simulator Technology Development

The final element in the strategy to address the barriers to simulation funding lies in developing novel and affordable simulation technology. Affordable customized solutions for simulation are necessary to reduce cost and increase applicability of simulation to a larger population. Creating affordable solutions requires interface with engineers and content experts such as nurses and physicians. Unfortunately, there is a built-in disconnect since the engineers are rarely medical experts and vice versa.

In a recently concluded event funded by the National Science Foundation, our group developed a doctoral consortium that brought together engineering students and clinical researchers participating in projects in medical simulation (http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0946781). We compared the publications of engineers pertaining to clinical simulations and the publications of clinicians pertaining to the same topics. We developed word clouds for aggregates of these publications wherein words that are repeated are rendered larger than the words that are less prominent. The word clouds in essence are a representation of concepts associated with clinical simulation, and one can compare the concepts covered by engineers and clinicians. Figures 47.1 and 47.2 show the word charts for clinicians and engineers, respectively.

The word clouds reveal a limited overlap between the concepts important to engineers and clinicians. This lack of common focus and vocabulary translates into limited interaction between the two communities even though a sustained exchange of ideas is necessary for development of effective, affordable solutions. A conclusion of the doctoral consortium was to encourage simulation centers to hire a part or full-time engineer to develop customized solutions. Such strategies are fundable as they generate true next-generation simulators which are both clinically applicable and affordable.

Using of the shelf Nintendo Wii®, our team of engineers and clinicians have developed several different simulators [15, 16]. These have been developed by a team of engineers working closely with clinicians and identifying needs of clinicians and finding technical affordable solutions. These were in some cases funded by grants through National Science Foundation and/or have been licensed for mass consumption by Simulab Corporation.

In conclusion, implementing these five strategies can greatly increase the chances of securing funding and

Fig. 47.1 Word cloud from publications on clinical simulations by engineer

Fig. 47.2 Word cloud from publications by clinicians on clinical simulation

improving current funding situations for existing centers. It leads to an accountable organization in terms of a measurable impact and leads to an organization that commits to a culture of innovation, which is central to the concept of simulation and its uses in the healthcare community.

Innovation Plan for Simulation Centers

To address the needs of a simulation center, it is strongly recommended that simulation programs develop an innovation plan. Innovation plans are based on the five dimensions that address the simulation barriers above. In a simulation center being developed in India, an innovation plan outlined four areas of focus. These four areas were identified by documenting needs of the organization and established multidisciplinary collaborations in that area. We present excerpts from the innovation plan below as an example of how to create such a plan. This innovation plan outlines the overall strategy for one simulation center. It is presented to be used as a template for organizations to plan their innovation strategy towards higher funding levels.

Sample Innovation Plan

There are four focus areas of advanced medical education and learning where technology can play an important role and address gaps in our training capacity.

The *first focus area* lies in delivering *practical training and skills assessment* to the healthcare workforce. Skills such as IV insertion, suturing wounds, central venous catheter placement, cardiac stent placement, endoscopy, advanced cardiac life support, basic life support, blood pressure taking, and ECG monitoring, to name a few, are the basis of modern-day medical practice. Practicing these skills requires significant amount of time and resources. In addition to these technical skills, many skills are actually nontechnical such as team skills that require a healthcare workforce to function efficiently as a team. Traditionally these skills are practiced on patients, which is an extremely unsafe and inefficient method of acquiring such skills. Fortunately technology has been developed that allows for practicing such skills over and over again in a safe environment. Technology also exists for providing skills training on rare skills and rare treatments that enable the healthcare workforce to be prepared for any eventualities including disaster management. There are also provisions in technology for quantitative evaluation of skills that allows for development of benchmarks of examination and allows for competency-based training. This is critical in ensuring high-quality healthcare to the masses. Such technology centered on the core idea of medical simulation has matured rapidly in the past few decades and has been shown to translate to marked significant improvement in clinical skills and quality of care [1, 3, 9, 17–32]. Medical simulation refers to a suite of technologies available for healthcare professionals to practice skills in a variety of disciplines both individually and as a team. It is imperative to develop a coordinated approach to including simulation-based training in the medical education and training infrastructure.

Strategy: We will work with clinicians to identify low-hanging fruit in this area. We will also establish links with local and global engineering institutes to help realize the vision. Funds will be allocated for pilot projects in this domain, and the possible funding agencies will include Science Foundation (equivalent to NSF in USA). Clinicians may help point to direct impact on patient safety based on which institutes of Health (equivalent to NIH in USA) can be applied to. We will work with International Foundations by inviting them to visit the center and present to them skills relevant to their portfolio.

The *second focus area* lies in employing technology for *remote education and monitoring*. A key element of training the healthcare workforce is to contextualize the training to the sociotechnical condition of the environment. Traditionally this has been hard as such efforts require establishment of local infrastructure and local support system which is expensive. With the development of the information communication technology backbone, it is now possible to deliver didactic content and didactic training and examination remotely. The National Knowledge Network (http://www.nkn.in/) is an example of such efforts and displays an important example of leveraging ICT for education. In a similar vein we can deliver medical education and training remotely. There are however two additional opportunities that lie in further strengthening the mission of remote education and monitoring. The first lies in developing remote practice environments like the skills training systems described above so practical skills in addition to didactic material can be taught remotely. This is again possible with the technology of motion tracking, motion-based computing, and virtual reality. The second lies in using technology environments to create a personalized training module that is consistent with system practices of a region and its requirement. This can again be done through personalized content delivery and also by employing mobile units that deliver training through mobile systems.

Strategy: We will work with the telemedicine department to integrate our services with them. The content storage facilities of both the centers can be combined to achieve this goal.

The *third focus area* lies in delivering *best practices design, implementation, and training*. Best practices imbibed through guidelines, procedure checklists, and decision-making algorithms have become the corner stone of the quality drive in medical profession [33]. Training for best practices and implementing and designing best practices are however not trivial. Simple didactic training for best practices is not enough, and there is a need for a safe environment to practice implementation of best practices and adapting best practices to a particular sociotechnical system. There is also a need for a safe environment to design best practices. System-wide best practices and procedures can be designed and tested in a simulation environment, and such efforts have been shown to have a highly positive impact in improving clinical practice that is more significant than simply didactic training [34]. This is a golden opportunity for creating a culture of quality and safety in a system-wide sense.

Strategy: This is a high priority item. We will work with the quality department of our organization to identify metrics. Individual departments will be polled for impending rollout of best practices, and we will identify avenues where simulation can play a role. A joint committee would then be established for pursuing some best practice implementation. Funding can be obtained from Agency for Quality Research (equivalent to AHRQ in the USA). Funding for pilot project would be requested to our organization as it is a multidisciplinary effort.

The *fourth focus area* lies in practical training to ensure *optimal use of equipment and resources* for quality healthcare. An important part of training is to train usage of medical equipment, drug administration protocols, and optimal use of existing resources. Traditional training only serves as orientation training but does not allow for advanced usage. There are many features of equipment such as EKG monitors that are not used efficiently due to lack of training. Simulation environments allow interfacing medical simulators with equipment and provide the capability of designing training scenarios where equipment and resource usage can be taught.

Strategy: We will target equipment manufacturers and sales for this venture. Overall the vision would be to test medical devices in the simulation center. We will identify potential partners and work with them to showcase scenarios where the important points of the device are highlighted in practical use. Pilot funding will be obtained by industry collaboration. We will also keep the legal department in the loop for IP issues and transfer.

In order to develop viable solutions for these four focus areas, we need a comprehensive coordinated strategy to deliver skills education remotely and safely, allowing procedure standardization leading to best practices, objective measurement of skills and proficiency, and training for optimum usage of equipment and resources. With the availability of cheap computing infrastructure, readily available bandwidth, and growth of technologies such as medical simulation, virtual reality, movement analysis, computer graphics, persuasive technology, and mobile computing, it is possible to envision the future of advanced medical education that fully leverages the opportunities presented by these tools. There is a need to focus resources and develop these technologies for medical education and training for all levels of the healthcare workforce from senior physicians to paramedics. Such an effort will both lower the healthcare costs by decreasing medical errors and improving efficiency. We will develop a blueprint for 5 years for innovation.

Funding Sources and Strategies

Having discussed the core elements of a center pursuing funding and ways to prepare for this process, we now move onto a discussion of specific organizations funding simulation. Below we present several funding entities at the local, national, and international levels that have allocated resources towards simulation-based endeavors in the past.

Parent Institution

The core five ideas described above are the basis of securing funding from any source, including your parent institution. The success of the BannerHealth Phoenix (BHP) simulation center, one of the largest in the USA, has been due to tremendous support from the parent organization. This support was ultimately a result of a business plan that was in line with the needs of the organization. At BHP, our group developed an innovative educational program focused on the institution's need for a more efficient onboarding process. *Nurse onboarding* is an expensive process of orientation of new nurses to a new hospital. A plan was developed where simulation, not the traditional senior nurse mentorship model, would be used as the main training for new nurses. In the program, the simulation center proposed a reduction of nurse onboarding time from 4 to 3 weeks. This reduction was based on the assumption that the program would help nurses more efficiently achieve technical and nontechnical skills benchmarks using simulation. The budget proposal also included funding to support research that would investigate the use of simulation to reduce onboarding times while promoting patient safety and satisfaction.

The reduction of training time from 4 to 3 weeks not only allowed the hospitals to reduce cost and time of nurse onboarding, but the training provided a solid foundation for new nurses to improve their performance and participate in best practices implementation. This plan was very successful for our group and can serve as a template for other institutions. In this instance, the plan was targeted towards valued needs of the organization. When the organizational leaders perceived a simulation-based program as having value, they were amenable to funding the program. The overall budget for building the simulation center was approximately 12 million dollars and the projected break even was 4 years.

The National Institutes of Health

The National Institutes of Health (NIH) are the foremost research entities in the world that focus on health, with an annual budget approaching 32 billion dollars (www.nih.gov).

Within NIH, there are several institutes that focus on disease and organs like the National Cancer Institute and National Institute of Biomedical Imaging and Bioengineering. Unfortunately, a very small percentage of their funding is currently focused on simulation-driven initiatives. This could be attributed to several factors. A major factor however lies in the barriers presented earlier that prevent a direct link between patient safety and simulation. However, The National Institute of Biomedical Imaging and Bioengineering and the National Institute of General Medical Sciences are two prime organizations that fund simulation centers. Further, simulation centers can also be part of training initiatives and infrastructure projects that the NIH supports. The key again is to prove a measurable impact on patient safety attributable to simulation.

A related institute, the Agency for Healthcare Research and Quality (AHRQ), does have special calls related to simulation (see http://www.ahrq.gov/qual/simulproj11.pdf). Even in these calls, there is a requirement to directly impact and measure patient safety. Hence, the overall scope of any simulation-based research grant proposal should be towards developing protocols that impact patient safety or outcomes in general. The grant should include improvement of safety as a specific aim and highlight processes and methodologies to implement that plan.

The National Science Foundation

The National Science Foundation (NSF) is the premier organization that funds research in basic sciences and computation. Within the NSF, the directorate of Computer and Information Science and Engineering has funded several projects within the realm of medical simulation. Almost all of these projects are multidisciplinary in nature and include engineers and clinicians. A key factor for securing NSF funding lies in making contributions to the science of computation rather than simply creating a working simulator or demonstrating patient-related outcomes. For example, NSF is unlikely to fund a surgical simulator that uses off the shelf algorithms and technologies. On the other hand, NSF is likely to fund a project that involves new technologies and algorithms to make a surgical simulator. In comparison to the NIH, whose main interest lies in improving patient safety, the main interest of NSF lies in improving contributions to science. To seek NSF funding, it is important to work with engineers and develop a common vocabulary. There are several new algorithms being developed in computer science that could be effectively tested in clinical simulation environments. For example the use of Microsoft Kinect's tracking algorithms (www.microsoft.com/xbox) can greatly enhance surgical proficiency detection. Collaborative work with engineers can lead to major funding from NSF, and this is definitely one of the underutilized funding resources for the simulation community.

One area of funding that both NIH and NSF support are the small business grants and technology transfer grants. These grants provide funding that allows small businesses to work with educational and research institutes. These partnerships are very useful for developing novel simulation technologies. These grants in addition to scientific contributions also look at potential commercialization prospects. Successful applications need to demonstrate a clear business plan for simulator development and marketing.

Public Health Departments

Another underutilized stream of funding for simulation centers lies in the public health domain for training and education grants. Public health departments have a variety of training needs which may include disaster management, workshops for public health officials, and law enforcement professional training. Simulation can effectively support these ventures. Thus, it is important for centers interested in funding from these agencies to develop courses around areas of interest for public health officials and reach out to the local departments to understand their needs. Offering courses for emergency medical services (e.g., Advanced Trauma Life Support, Basic Life Support, Advanced Cardiac Life Support, and Pediatric Advanced Life Support) is another excellent and reliable way to generate revenue. The resources needed to conduct these courses are fairly modest, and the ability to conduct them for public health agencies can mean a relatively steady stream of fundable activities.

The Department of Defense

The Department of Defense (DoD) has been a source of major funding for design, development, and evaluation of clinical simulations and simulation technologies. Telemedicine and Advanced Technology Research Center (TATRC) (http://www.tatrc.org/) has been the primary funding body for DoD in clinical simulation. Other bodies include the Office of Naval Research and AirForce Laboratories. TATRC as a funding agency manages earmarked projects for the military in the broad area of telemedicine and simulation and also releases calls for proposals for specific projects of interest to the military. DoD's main aim is to improve healthcare but also to focus on design, development, and evaluation of novel technologies. A key concept in DoD funding lies in Technology Readiness Levels which is a scale to assess the maturity of evolving technologies (i.e., materials, components, devices) prior to incorporating these technologies into a system. It is critical to understand the importance of novel technologies and the applicability of these technologies to the military in order for a successful application for DoD funding.

DoD also releases several calls in which simulations may not have a direct role, but simulation centers can serve as effective testing facilities. For example, the DoD may be interested in experimenting with large datasets for rapid decision making. In these programs, the role of a simulation center as a testing ground can be quite important. Innovative and capable centers can capitalize on the DOD's need for such facilities.

Simulation Companies

Simulation companies often need to collaborate with clinicians in design, development, and evaluation of their products. These could be a suitable revenue source for simulation centers. In addition to product development, several simulation companies offer regular grants for curriculum design and implementation using their products. It is beyond the scope of this chapter to detail each company's program. However, most of these programs are available on company websites.

The key element in establishing a relationship with simulation companies lies in granting them access to clinical and engineering expertise. Clinical and engineering talent can help simulation companies design better products. Supporting this revenue stream naturally requires a base of intellectual property management skills within the simulation center. As simulation centers are designed to be cradles of knowledge generation, it is important for simulation centers to make investments into intellectual property management either as a skill set of directors/manager or as a dedicated human resource for the center.

International Agencies

International foundations like the MacArthur Foundation, Clinton Foundation, Bill and Melinda Gates Foundation, and organizations like United Nations, UNICEF, and The World Health Organization all have major programs that support the use of simulation products and resources. For example, maternal and child health programs supported by the organizations mentioned above are in need of novel technologies and integrated training programs for midwives and other healthcare workers in developing countries. Simulation centers often limit themselves to local contributions, which are important, but should not preclude development of programs that can support international health goals. Developing worldwide partnerships through outreach foundations and organizations is the key to initiating support from these international agencies. International agencies support several nongovernmental organizations which can benefit from courses in skills training (like birthing training, Basic Life Support training). Simulation centers should aggressively pursue these avenues for developing programs that could support patient safety worldwide as a viable and socially worthwhile endeavor.

Conclusions

Funding simulation centers and simulation research requires a dynamic approach that is inherently multidisciplinary in nature. Simulation centers should and must be seen as cradles of innovation. Innovation is necessary in order for centers to develop a sustainable business model. This chapter has provided foundational information on how to structure a simulation center for innovation and funding. While it is up to the reader to develop customized strategies that fulfill his or her center's mission, the elements highlighted in this chapter are universal. No matter what the setting or ultimate goal of the funding may be, cultivating a center's education, research, and development projects will facilitate financial well-being.

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Program and Center Accreditation

48

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Introduction

The use of simulation in healthcare is not new. Rather, if we are to adopt David Gaba's definition of simulation, that is, "…a technique, not a technology, to…evoke or replicate substantial aspects of the real world," then we must acknowledge that simulation-based training has been a part of healthcare education almost since its inception [1]. Over the past two decades, the use of simulation in healthcare education has increased markedly. This is likely the result of multiple factors, including decreased opportunity for real patient encounters, increased availability and accessibility of simulation-based technology, and an increased focus on patient safety and patient-centered healthcare. What has grown from this mix of demand for education, technological advances, and patient safety interests is a strong desire to understand and apply simulation-based training in a rational, evidence-based approach that matches learner needs with available training technology and delivery systems. In other words, there are likely best-practice approaches to simulation-based training.

Healthcare education organizations have begun to examine and, in some cases, implement accreditation processes as facilitators of growth and excellence in simulation-based education. This assumes that the establishment of an accreditation process will lead to more rigorous implementation of best practices. How (and if) this will occur in simulation is somewhat unclear. Certainly, the simple act of establishing credentialing standards and an accreditation process does not inherently ensure quality. Current accreditation and benchmarking programs are extremely diverse in their content, foci, and overall objectives. Additionally, several programs define standards over large programmatic areas, whereas other accreditation efforts focus on smaller areas of content or education delivery. Thus far, the benefits of an accreditation process in simulation have not been clearly demonstrated but have been postulated to include (1) externally referenced evidence of compliance with commonly accepted standards and best practices, (2) increased self-monitoring within accredited organizations, and (3) increased leveraging power for those seeking increased resources to comply with defined accreditation standards [2–4].

In this chapter, we offer some discussion about the benefits to accreditation processes as well as some of the potential ramifications. We discuss in general terms the differences in format of the four primary accreditation/benchmark efforts currently underway: (1) American College of Surgeons (ACS), (2) American Society of Anesthesiologists (ASA), (3) Society for Simulation in Healthcare (SSH), and (4) American College of Obstetricians and Gynecologists (ACOG). We then discuss in more detail each individual effort, process design, and result of efforts to date. While it is likely that other health professional organizations are also exploring an accreditation process for simulation-based efforts, this chapter focuses on these four, as they are

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A.I. Levine et al. (eds.), *The Comprehensive Textbook of Healthcare Simulation*,
DOI 10.1007/978-1-4614-5993-4_48, © Springer Science+Business Media New York 2013

established, ongoing efforts at the time of this writing. By describing the underlying framework and processes involved in each program, we hope to give researchers, educators, and policy makers an understanding of the potential ways in which accreditation efforts can be adopted and assessed. We provide one caveat: the commentary here is based on review of current publicly available material and descriptions. The authors have made every attempt to accurately portray the scope and intent of each program; however, individuals interested in the most accurate and up-to-date information should contact individual accreditation organizations themselves.

Why Accreditation?

In the world of healthcare and healthcare education, providers are acutely aware of the impact of accreditation processes on practice. Curricula are rarely designed without an eye toward how they will be viewed by accrediting bodies such as the Accreditation Council for Graduate Medical Education or Liaison Committee on Medical Education. Hospital policy changes often center on Joint Commission recommendations. In each case, the presumed benefit is adherence to performance standards and external validation of quality. So, the question remains: Is this the place to take simulation?

First, it is important to define who or what would be the beneficiary of a simulation accreditation process. Both the ACS and the SSH state that advancing patient safety is a core objective driving their accreditation process [2, 5]. While this is a noble and important goal of any process, it is likely not the most immediate outcome. The immediate, direct beneficiaries of well-developed accreditation standards—adherence to best practices, adoption of evidence-based approaches, and implementation of solid organizational processes—are most likely the learners.

Beyond this direct effect, simulation program accreditation can positively impact the simulation program itself. Most accreditation processes are not trivial. Obtaining accreditation often requires the commitment of resources from the larger organization (e.g., medical school, hospital) to ensure that the simulation program meets the requirements of the accreditation process. As such, the accreditation process can be used by a simulation program to validate requests for resources such as capital and personnel to support ongoing programming and infrastructure. Simulation programs can also benefit by using accreditation as an external validation of quality. This could potentially translate into an increased client base, improved opportunity for funding, and ability to attract potential collaborators.

With such potential benefits, why not adopt accreditation processes? Well, there are several limitations and assumptions made in the above section. First, we are assuming that without an accreditation process to delineate and reward best practices, such excellence would not be achieved. While this may be true, it is equally possible that an organization would choose to place its energy and resources toward the pursuit of quality programming rather than toward the accreditation application process. Second, the ability of an accreditation process to "validate" quality depends greatly on stakeholder/consumer buy-in. Does the public recognize the need and value in simulation center accreditation? Are there significant numbers of high-quality simulation programs practicing without accreditation? Do funding agencies recognize accreditation as a measure of quality or simply as the ability to pay a fee? These questions illustrate that there is a perceived value metric that is difficult to assess yet directly impacts the level of benefit garnered from accreditation.

We again pose the question "Is accreditation the right thing for simulation-based training in healthcare?" Well, in many ways, this decision has already been made. Two groups (ACS and SSH) offer simulation accreditation programs with a broad institutional focus that encompass all forms of simulation [5–7]. At the time of the writing of this chapter the ACS lists 76 accredited centers, while SSH lists 27 accredited centers. The development and use of metrics to assess benefits to simulation programs, their learners, and, ultimately, patients will be helpful when determining the necessity of accreditation processes.

Overview of Accreditation Program Content and Design

Scope

The scope and breadth of criteria used in determining accreditation varies considerably among accreditation programs. Some (ASA, ACOG) take a specialty-based focus, with concentration on resources and programming dedicated to education in that specialty. Others (ACS, SSH) are broader in scope. Accreditation program scope can have a strong impact on educational institutions in terms of resource allocation, determination of stakeholders, and, potentially, learner access. The scope of an accreditation program is a clear reflection of the program's goals. In the following sections, each accreditation program's scope and overall objectives are reviewed.

Format

As with scope, the format of each accreditation program varies considerably. Currently there are three general approaches to accreditation criteria: (1) a single criteria-based system in which there is one set of criteria for standard accreditation met by all accredited programs [ACOG, ASA], (2) a multilevel system in which accreditation standards are defined at

Table 48.1 Society for Simulation in Healthcare Accreditation Core Standards and Criteria [5]

Standard	Criteria
Mission and governance	1. There exists a clear and publicly stated mission that specifically addresses the intent and functions of the simulation program
Organization and management	1. There is an organizing framework that provides adequate resources to support the mission of the program 2. There is a strategic plan designed to accomplish the mission of the program 3. There are written policies and procedures to assure the program provides high-quality services and meets its obligations and commitments
Facilities, application, and technology	1. There is an appropriate variety and level of technology and applications to support/achieve the activities of the program 2. The environment is conducive to accomplish its mission and activities
Evaluation and improvement	1. The program has a method to evaluate its overall program and services areas, as well as the individual educational, assessment, and/or research activities in a manner that provides feedback for continued improvement
Integrity	1. All activities, communications, and relationships demonstrate a commitment to the highest ethical standards
Expanding the field	1. The program demonstrates commitment to advocate for patients, simulation education, and contributes to the field of simulation.

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two different levels across all content areas [ACS], and (3) a modular system [SSH] in which programs meet a core set of standards then chooses to seek accreditation in one or more content areas, such as assessment, education, and research. Each program's format and criteria (below) are discussed in the following sections.

Criteria and Standards

The four accreditation programs discussed here all have clearly defined benchmarks in four main areas: (1) curriculum, (2) instructor/personnel qualifications, (3) equipment and technology, and (4) organization and supporting infrastructure [8]. However, the level of emphasis given to each area varies by program. This is to be expected, considering widely variable programmatic goals and objectives. The criteria used to evaluate simulation programs and the standards required for attainment of accreditation will likely impact resource allocation more than any other factor of the accreditation process. In Tables 48.1, 48.2, and 48.3, we outline these criteria and discuss them in detail in the sections below.

Simulation Accreditation Programs by Organization

American College of Surgeons

Overview

In 2003, the American College of Surgeons Division of Education first proposed the idea of creating certification standards that were evidence based and focused on active learning techniques. The goal of such an accreditation program was to ensure consistency and rigorous application of education theory and operation to surgical educational programming. The result of these initial efforts has been the creation of a multilevel, comprehensive accreditation process that considers training of multiple types of healthcare learners in multiple types of institutions. This development process is described in the literature and remains a focus of the ACS Division of Education [2, 10]. The ACS Education Institutes' accreditation process was the first and, at the time of this writing, remains the largest effort focused on certifying simulation-based learning centers.

The application process for ACS accreditation requires a written application that is reviewed and, if appropriate, a site visit is conducted. Application costs total $5,250 for Level I ($2,850 for Level II) accreditation plus on-site surveyor costs. Applications are reviewed semiannually. Successful applicants receive accreditation for three years, contingent upon the completion of annual reports. Renewal at the end of three years requires a single surveyor on-site visit and renewal application. As of May 2013, there are 76 ACS Accredited Education Institutes [6].

Scope

The ACS Program for Accreditation of Education Institutes had several goals that helped define the scope and format of the program [7]. First, an accreditation program would help define a network of simulation centers that would support continuing professional education and resident training, thus promoting patient safety within surgical fields of practice. Second, the accredited centers would support training of medical students, nurses, and other health professionals with the goal of enhancing patient safety through interdisciplinary

Table 48.2 Brief summary of SSH simulation accreditation program characteristics [5]

Simulation areas	Personnel criteria	Curricular requirements	Hardware/infrastructure
Assessment	Instructors and staff are qualified by virtue of education and experience Instructors and staff are routinely evaluated to ensure competence Adequate technical support for data analysis is present Human factors, psychometric, and statistical support available when indicated	Processes are in place to assure that assessment methods and tools are appropriate, reliable, and valid	Facilities and technologies are appropriate for the individuals being assessed and the level of assessment IRB and data security needs are met and documented
Research	Instructors demonstrate a capability to perform research There is a designated director of research with roles delineated in the organizational structure and adequate support time There are instructors with specific research training and internal/external documentation of collaboration	There is evidence of publication and/or presentation of research findings in peer-reviewed forums There is documentation of mentoring simulation researchers	Program has an established record of research The mission statement includes a specific commitment to research Evidence of successful efforts to obtain research support exists Program uses a scholarly approach to training assessment Documentation of IRB adherence and data security protocol
Education	Program oversight is by an expert in simulation education Program facilitates professional development for instructors Instructors engage in certified ongoing training to improve skills Instructors are familiar with capabilities and limitations of simulation modalities	Offers comprehensive simulation-based learning Educational materials are evidence based, reliable, and valid Simulation modalities are appropriate for learning objectives Curriculum design process involves currently understood simulation education theory Program has the ability to offer CME	Educational activities are linked to the strategic plan Records are kept on all instructors and instructor's professional development Feedback incorporated into programming Program continually updates and improves its courses Record keeping supports evaluation, validation, and research of curriculum Records of learner, instructor, and coordinator activities are maintained
Systems integration and patient safety[a]	Simulation personnel are actively involved in performance improvement committees and activities	Process exists to identify and address opportunities for improvement within the organization that utilize principles of process engineering Program activities are influenced by risk management activities of the organization	Systems integration and patient safety activities are linked to the strategic plan Mission statement includes the desire to enhance individual, team, and organizational performance for improved patient outcomes

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[a]Accreditation in systems integration and patient safety requires concomitant accreditation in one or more other areas

Table 48.3 Specialty-sponsored simulation program: a summary of characteristics

Sponsoring organization	Scope and model	Personnel criteria	Learner criteria	Curricular requirements	Hardware/infrastructure
ACS education institutes[a] [6]	Broad[b] Multilevel Level 1[a] Comprehensive Level 2 Basic	Institute director appointed for 3 years at 25% time protected Surgical director is FACS and has 10% time protected Administrator with 50% time for center Coordinator with 50% time	Must include surgeons plus 3 specialties/learner groups, for example: CME GME UME Allied health Nursing Other Must demonstrate the effectiveness of curriculum Must provide evidence of: Long-term follow-up of learners Maintenance of skills Research Interdisciplinary training Curriculum validation	Incorporates procedural and cognitive skills Curriculum development involves: Needs assessment Development of objectives Selection of instructional methods Creation of instructional materials Effective delivery Learner assessment Program assessment Assessment of effectiveness Educational programs are accredited by the LCME, ACGME, ACCME, or equivalent Faculty are appropriately trained	1,200 sq. ft contiguous with face to the public No less than 4,000 sq. ft. additional space for storage, lounge, etc. Can accommodate a minimum of 20 trainees at a time Has teleconferencing available Internet capable Has adequate space for administration Has adequate space for skills trainers Annual budget can support the activities of the institute Provides a mission statement Provides an organizational chart Establishes a steering committee or advisory board
ASA simulation endorsement [9]	Specialty-specific Single level	Must have an established mechanism for instructor training, evaluation, credentialing Program director should hold a doctoral degree and academic appointment at an accredited institution Course director should: Be credentialed as an instructor ASA member Hold appointment in the Department of Anesthesiology	UME, GME (optional)	Quality assurance program must be in place Methodologically sound program for curriculum development and assessment must be evident Sample curriculum and scenario required	Provides a mission statement Organization should maximize the likelihood that course quality will be maintained Document governance and financial model Program leadership and financial stability required Facilities should be sufficient for the coursework offered, including parking, and meals Written policies and procedures should exist Demonstrate necessary educational technology to conduct courses
ACOG simulation consortium	Specialty-specific	Not currently defined	GME Residents in approved OB/GYN programs All residencies can request access to consortium institutes for training of their residents	Simulation-based surgical skills education with patient safety focus Goal of developing a common curricula that can be taught by all Consortium institutions Goal of providing validated simulation-based education	Consortium institutions are defined as state-of-the-art surgical simulation centers States goal of developing standardized teaching methods that can be utilized by all consortium institutions

[a]Criteria listed reflect requirements for obtaining Level 1 (comprehensive) accreditation

[b]Programs with "broad" scopes are defined as those that seek to accredit programs with missions outside of a specific specialty. Those with "specialty-specific" focus are based entirely on performance and resources dedicated to training in one specialty or subspecialty

training. Third, learner assessment would help inform transfer of knowledge and assist with institutional credentialing processes. Finally, such a network of centers could support education-based research and evidence-based curriculum development via collaboration on multicenter studies.

With these goals in mind, the ACS approached its accreditation process with a relatively broad view of simulation training that includes additional guidance on programmatic components specific to surgical training. To ensure a focus on surgical training and expertise, the highest level of ACS accreditation requires that a simulation center appoint a director of surgical simulation at 10% protected time for educational and administrative responsibilities. Additionally, specific requirements for space and administrative staffing are clearly specified (Table 48.3). In setting such standards, the ACS has made an important comment on the need for faculty and resources necessary to build and sustain a successful simulation program. Such requirements have the potential to impact faculty recruitment and simulation center leadership decisions, academic promotions, and overall simulation strategies at institutions seeking accreditation [8].

Format and Criteria

The ACS format defines accreditation requirements at two different levels (Level I and Level II) across all content areas: (1) curricula and learners, (2) instructor/personnel requirements, (3) equipment and technology, and (4) organization and supporting infrastructure [6]. Table 48.3 outlines the criteria for Level 1 accreditation. While the majority of centers seeking accreditation apply for Level 1 accreditation, the presence of multiple levels of standards allows for the recognition of excellence within smaller, more narrowly focused simulation centers.

As stated above, the ACS accreditation program defines standards in four areas similar to criteria used by SSH and ASA. The ACS, more than any other program, specifies infrastructure and equipment requirements including minimum dedicated simulation and office space, teleconferencing capabilities, and availability of support facilities (locker rooms) to enable hands-on training for a minimum of 20 learners. The requirements for curriculum development and assessment are more loosely defined; however, the on-site visit allows surveyors to assess the presence of faculty and programmatic expertise necessary to support the mission of the ACS accreditation process [8].

Society for Simulation in Healthcare

Overview

The Society for Simulation in Healthcare (SSH) is a cross-disciplinary, cross-specialty international organization. As such, SSH currently holds a broad view of simulation and experiential learning utilizing multimodal simulation methodologies for education, assessment, and research. The organization's mission, "to lead in facilitating excellence in interprofessional healthcare education, practice, advocacy, and research through simulation modalities," is one of the primary driving forces behind the creation of the SSH's Council for Accreditation of Healthcare Simulation Programs (herein referred to as the Accreditation Council.) SSH defines a simulation program as one whose mission "is specifically targeted toward improving patient safety and outcomes through assessment, research, advocacy, and education using simulation technologies and methodologies." The goal of the accreditation process is to identify simulation programs that share such a mission as demonstrated through efforts in research, assessment, teaching, and healthcare systems integration.

SSH began its accreditation efforts by first defining standards and criteria for excellence in simulation. This was an iterative process with multiple reviews by appointed committee members as well as the membership at large. Applicants for accreditation submit a written application that is reviewed and followed by a 1-day on-site visit by an accreditation review team. Cost for the application process is $5,780. Successful applicants are granted accreditation for a 5-year period (originally it was for a 3-year period) conditional on the completion of yearly reports. Each yearly report review costs $250. In the first year (2010), seven programs received accreditation in one or more areas. At the time of this writing, there are 27 simulation programs that have been awarded SSH accreditation.

Scope

As a cross-disciplinary organization, SSH has proposed the broadest view of simulation and simulation-based education. Listed requirements for instructors, equipment, and processes are flexibly defined to include the wide variability in simulation programs and centers worldwide. Accreditation is not linked to performance in any one specialty or modality, and involvement of multiple types of learners from different specialties and disciplines is seen as a positive attribute. Standards and formatting (described below) reflect this broad approach and recognize that a "one size fits all" approach to simulation-based education is neither realistic nor optimal. Such a scope is aligned with SSH's objective of facilitating excellence in healthcare simulation across specialties and disciplines, both clinical and nonclinical.

Format

SSH utilizes a modular format within its accreditation process, separating assessment, teaching and education, research, and systems integration and patient safety into separate domains with individual requirements for accreditation. An applicant program must meet requirements for "Core Standards," then may select to apply for accreditation in one or more domain. Only the category of systems integration and patient safety requires concomitant accreditation in another domain (e.g., research).

Criteria

Accreditation criteria are somewhat complex and vary for each program depending upon the accreditation domains sought. All programs must meet a core set of standards regardless of the specific area in which they are applying for accreditation. Described in Table 48.1, these Core Standards are felt to be fundamental operational standards required for a successful program. Infrastructure and operational requirements exist for other accreditation processes. Unlike the explicit requirements in ACS accreditation process, SSH requires accreditation applicants to demonstrate resources, hardware, and infrastructure adequate for their simulation programming. This makes the process somewhat more flexible. However, less explicit requirements can also soften the external mandate for capital items, thus decreasing the leveraging power potentially associated with accreditation standards.

Beyond core requirements, SSH defines standards in four separate domains: (1) assessment, (2) teaching and education, (3) research, and (4) systems integration and patient safety. A program must achieve accreditation in one of the first three areas in order to also be considered for accreditation in the area of systems integration and patient safety. The standards for each domain are listed in Table 48.2. This domain-specific accreditation process is unique to SSH, especially those areas focused on research and system integration. The potential advantage of offering accreditation in specific domains is that smaller, more focused programs can still be recognized for excellent work. It is unclear how such standards and recognition will be adopted and integrated into the simulation culture and, if adopted, how they will influence the field of healthcare simulation.

American Society of Anesthesiologists

Overview

The American Society of Anesthesiologists (ASA) convened the Workgroup on Simulation Education in 2004 with the goal of defining the components of a simulation center essential to supporting high-quality, experiential continuing medical education (CME) [11]. This workgroup transitioned to become the ASA Committee on Simulation Education, which focused on the evaluation and endorsement of simulation programs capable of providing high-quality simulation-based CME programming. In an attempt to maintain a consistent membership over time. The committee transitioned to an editorial board in 2013. By design, such accredited simulation programs would form the ASA Simulation Network whose members would be certified to provide training for the completion of one of the American Board of Anesthesiology's (ABA) Maintenance of Certification in Anesthesiology (MOCA®) Part IV requirements.

The ASA had clear support of the American Board of Anesthesiology prior to establishing the role and scope of accreditation it would offer. This support is critical and has allowed the ASA's accreditation process to clearly highlight an advantage beyond those suggested by other accrediting groups, namely, the ability to provide courses that meets the requirements for MOCA®. Additionally, the ABA helped to defray costs for early accreditation applicants as a way to encourage applications [11]. Applicants must submit a written application along with a simulation-based scenario that would become part of the network's simulation bank if accreditation is awarded [9]. All accredited programs have access to this simulation bank. Application costs are $2,500 with a 3-year reaccreditation cycle and no on-site visit required. ASA requires all applications to be submitted via its online portal (https://simapps.asahq.org/). Currently there are 32 accredited programs nationwide.

Scope and Format

The scope of the ASA accreditation/endorsement program focuses on institutions providing anesthesia-based training and highlights offerings targeting licensed, practicing physicians. In line with its mission, the ASA Simulation Education Network accreditation application focuses heavily on current operations of the simulation program and the ability to facilitate evidence-based ABA MOCA® courses. ASA employs a single criterion accreditation design, with one set of standards defined for core accreditation [9]. Currently there are 2 additional endorsements for MOCA® specialties in pain management and critical care (MOCA® subs).

Criteria

Applicant centers for the ASA Simulation Education Network are required to demonstrate (1) ASA member value; (2) policies and procedures commensurate with high-quality educational offerings; (3) infrastructure that is consistent with the proposed/described services; (4) equipment and space that supports the educational objectives; (5) an evaluation process for the course, the instructors, and the program; (6) policies and procedures to provide ASA members with a confidential and secure environment; and (7) sound education process for course development and education. As suggested above, the requirements in each area are focused directly on what is necessary to support simulation-based MOCA® training courses. Applicants must also submit a detailed simulation-based scenario suitable for an anesthesiology CME course that would become part of a larger simulation case bank. Specific application components are briefly described in Table 48.3.

American Congress of Obstetricians and Gynecologists

Overview and Focus

The ACOG Simulation Consortium holds as its primary mission the development of consistent and substantive simulation-based curricula for graduate medical education and continuing medical education in obstetrics and gynecology. As a specialty-focused body, it shares similarities with the goals and objectives of the ASA Simulation Committee; however, its initial efforts have been targeted toward resident education rather than continuing medical education (ABA).

The consortium first convened in 2009 and consisted of 9 member institutions that were invited to participate by the Vice President of Education for the American College of Obstetricians and Gynecologists, Sterling Williams, MD, MS [12]. These institutions were selected after an in-depth screening process conducted by ACOG to include members who had established educationally sound simulation-based programs and that possessed expertise in using simulation for clinical training, assessment, and educational research. The number of participating institutions increased to 16 in 2010 and to 18 in early 2011, with a minimum of 24 total members planned [13]. Institutions who wish to join the consortium may contact Dr. Williams, who determines the basic qualifications and presents his recommendations to the consortium for approval. Applicants then complete a written application and host an on-site visit by a member of the consortium.

Consortium membership requires two representative delegates from each member institution. A consortium chair and cochair are selected from the representatives and serve a 2-year period. The consortium chair and cochair work in partnership with the ACOG staff and Dr. Williams to organize and lead quarterly meetings for the entire consortium. These meetings include two teleconferences and two in-person meetings at ACOG headquarters. There are currently five primary working committees, each of which is chaired by one or two delegates: obstetrics program, gynecology program, assessment, research, and models/simulators. Subcommittees work on specific needs, such as presenting our work at conferences, meetings, and ACOG publications. Committees and subcommittees work through e-mail and meet through teleconference as needed.

Future Directions

As the consortium has evolved, it became increasingly aware of the need and demand for high-quality and valid simulations for maintenance of certification, licensing and relicensing, and credentialing and re-credentialing of practicing physicians [12]. Active research efforts and simulation validation studies will support more robust simulation-based assessments in the future. However, as with most disciplines, the current data available on obstetric and gynecologic simulation does not satisfy requirements for high-stakes simulation.

Conclusion

The sections above provide a brief overview of current known efforts to further healthcare simulation via accreditation or endorsement programs. Each program is unique and closely linked to the goals and objectives of the parent organization. Clearly, the hope is to advance the science of simulation, whether specialty-specific or as it is broadly applied within healthcare. Development and implementation of measures will be important to study how such accreditation efforts impact simulation centers, healthcare/educational institutions, and the specialty of simulation.

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A Future Vision

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Adam I. Levine, Samuel DeMaria Jr., Andrew D. Schwartz, and Alan J. Sim

Nearly a decade ago many echoed David Gaba's predictions about the future of healthcare simulation: it would either be embraced, embedded, and extensively applied, or it would fail to meet expectations or improve patient outcomes and fall into obscurity.[1] Today it is clear which path simulation has taken (even this textbook is a testament to that), and we ask now, just how far and how widely healthcare simulation will spread and what its real impact will be. As editors, it has become apparent, having read each chapter in this book, that the application of simulation in the healthcare industry is limitless, and therefore, its impact cannot be overstated. With the assistance of many of the authors of this text, we frame this brief chapter as a future vision of simulation, contemplating the extent to which simulation will grow.

Simulation Saves Healthcare

With the next century comes tremendous change in healthcare education and delivery, and the impact of simulation will be widespread, transformative and will ultimately lead to the perseveration of this threatened industry. For this to occur, however, several phenomena will first take place.

Simulation Becomes Ubiquitous in Healthcare Education

Several confluent events occur during the early part of the twenty-first century that lead to an exponential proliferation of simulation-based education throughout healthcare. It is more widely determined and accepted that medical errors, patient harm, and poor patient outcomes can be traced back to inadequacies in healthcare education. Public outcry and outside political and financial forces demand that healthcare education becomes more accountable (much of this has already occurred). This gives rise to a healthcare educational system that is heavily regulated and where performance measures and outcomes are publically reported. Schools with graduates demonstrating persistently substandard performance become vulnerable to scrutiny and risk their accreditation, funding, and research opportunities. Mandated to stem the tide of error and patient harm, a paradigm shift in healthcare education is sought where fundamentals of teamwork, communication, and crisis resource management are introduced very early in practitioners' education.

> *"Team-based training utilizing simulation scenarios will expand to improve communication and teamwork in hospital settings. Medical students and residents will be expected to train with nursing students, physician assistants, pharmacists, and other health professional students. This training should lead to advances in patient safety and improve error recognition."*
>
> —Paul E. Ogden, MD, Courtney West, PhD, Lori Graham, PhD, Curtis Mirkes, DO, Colleen Y. Colbert, PhD

> *"There is no question to me that if we expect individual healthcare providers to work together effectively in interprofessional teams, we need to start training them together at all stages of education, from undergraduate training all the way through to continuing professional development. The last 20–30 years have seen us struggle with how to make this type of interprofessional training work…simulation will be the answer!"*
>
> —Vincent Grant, MD, FRCPC

> *"Simulation will evolve into more centralized centers to co-locate with learners in clinical spaces throughout health centers to allow for more frequent and multi-disciplinary training."*
>
> —James M. Cooke, MD

At the same time, older healthcare educators retire and are replaced with a new generation of innovative faculty. The longstanding barriers and opposition to the use of simulation for healthcare education dissipate as the "old guard" disappears from the workforce. Young educators, who have

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A.I. Levine et al. (eds.), *The Comprehensive Textbook of Healthcare Simulation*,
DOI 10.1007/978-1-4614-5993-4_49, © Springer Science+Business Media New York 2013

experienced firsthand the virtue of simulation-based education, start to enthusiastically and creatively incorporate simulation throughout healthcare curricula in order to meet head-on the societal call for safer healthcare and a better healthcare workforce.

> *"Simulation will be recognized as a new approach to education, rather than a progression of technology."*
> —Mike Smith, MD, F.A.C.E.P.

Simulation becomes entrenched in the educational spectrum including allied health, nursing, dental, and medical arenas. The use of simulation becomes the standard by which healthcare professionals are educated to become master clinicians throughout their careers. The use of simulation is then recognized as critical for the assurance and development of healthcare providers who possess a superior and consistent body of knowledge and skills.

> *"Simulation will become an educational tool that is so ingrained into education that it is simply another tool that all educators use. The role of the dedicated simulation center and simulation "specialists" will wane as simulation becomes ubiquitous."*
> —Paula Craigo, MD and Laurence Torsher, MD

> *"Simulation techniques will spread further into clinical arenas, to allow for more frequent exposure of each learner with lower cost and thereby impact education and culture more broadly."*
> —Sara Goldhaber-Fiebert, MD

> *"In the future, healthcare simulation will be fully integrated into training, both initial and continuing, for all providers across a continuum."*
> —Marjorie Lee White, MD, MPPM, MEd

> *"Patient-dentist communication will become more critical and the virtual worlds will play an important role in training dental health care providers….emphasis on inter professional education will allow more opportunities for the oral health care provider to utilize the human simulator as part of the health care team."*
> —Riki Gottlieb, DMD, FAGD

> *"More medical schools will use virtual patients to improve clinical correlations in the preclinical years. Each student will be assigned a virtual patient or virtual family and will have assignments for care related to the area of study. For instance, during Anatomy, the student may get cases of trauma during musculoskeletal study, or students may be assigned cases directly related to the organ system they are studying. This would require the student to do a full history and physical, order tests, counsel patients, and do follow-up as part of their basic science studies. The virtual patients can be advanced during the clinical years to bring in ethical dilemmas, and other topics that are difficult for competency determination such as communication and systems issues. Virtual "environments," including medical "gaming" scenarios, will also be increasingly used, as they are in military training."*
> —Paul E. Ogden, MD, Courtney West, PhD, Lori Graham, PhD, Curtis Mirkes, DO, Colleen Y. Colbert, PhD

No longer are education and training time-based, but they are transformed to a competency-based model where students, residents, and even faculty attain and achieve milestones associated with the novice, the senior trainee, and the expert levels. Students and trainees are not expected to be taught for a specific number of years before they can graduate, only that their education will last as long as it takes to achieve competence. Simulation assumes its role as the cornerstone of the process of milestone attainment and achievement.

> *"Simulation will be used by medical schools and residencies as part of a "competency-based" promotion system that values standardized demonstration of skills over simply being present in enough rotations to be promoted."*
> —Christopher Strother, MD

> *"The challenge of time and chance is mitigated and learning curves are shifted in such a way that each practitioner and his/her team receive the best, individualized learning experience."*
> —Marjorie Lee White, MD, MPPM, Med

> *"Simulation will be incorporated more fully in the upcoming ACGME residency milestones for multiple medical and surgical specialties"*
> —James M. Cooke, MD

As simulation assumes a prominent role in milestone attainment, healthcare education becomes increasingly dependent on simulation, and the classic clinical apprenticeship model gives way to a simulation-based apprenticeship. The technology becomes so advanced that students, trainees, and practitioners can and must achieve levels of proficiency and attain competence in the simulated environment before actual patient encounters. As healthcare technology expands, practicing healthcare providers are mandated to first receive simulation-based training and assessment, demonstrating expertise before being allowed to apply new therapies or techniques on actual patients.

> *"There will be requirements, a certain number of simulated procedures must be done before being allowed to perform the procedure on real patients, and perhaps a simulation intern year or intern simulation block will be required for new trainees."*
> —Shekhar Menon, MD

> *"Simulation will be used to show procedural competence for hospital accreditation processes, taking precedence over 'procedure logs' "*
> —Christopher Strother, MD

Simulation Becomes Ubiquitous in Healthcare Assessment

During this rapid expansion and application of simulation for education, the entire healthcare educational system becomes more dependent on simulation, and educators and faculty become facile first with formative assessment and then with summative assessment, using simulation. Although checklists are used initially in this process, simulation-based assessment takes on a critical and high-stakes role in assuring student, resident, and practitioner competence throughout their careers, and global ratings become just as widely used and mastered by skilled educators and faculty.

Preadmission screening and the admission process incorporate simulation to identify and detect the most suitable students for the healthcare profession. While in training, simulation-based assessment is used to verify milestone attainment, and once graduated, simulation is a major component of licensure testing. Assessment is also frequent and regular during clinical training and practice. Once overall competence is achieved and confirmed with simulation, residency training is considered complete regardless of the time taken for completion, with certain restrictions placed on minimum and mandatory training intervals. Throughout the practitioners' careers, repetitive testing is made mandatory for Maintenance of Certification (MOC) processes. This complex and structured simulation-based assessment process proves critical to the wellness of the healthcare industry workforce, assuring true MOC.

> *"Surgical boards will require simulation, initially, as a component of the Maintenance of Certification process much like the new American Society of Anesthesiologists MOCA requirements"*
>
> —James M. Cooke, MD

> *"Board exams and MOC will have increased use of simulation in fields such as emergency medicine and intensive care."*
>
> —Christopher Strother, MD

> *"Simulation will become the norm for training and competency testing across medical specialties."*
>
> —Mike Smith, MD, F.A.C.E.P.

> *"Simulation will increasingly be used for national, standardized exams pertaining to clinical skills."*
>
> —Paul E. Ogden, MD, Courtney West, PhD, Lori Graham, PhD, Curtis Mirkes, DO, Colleen Y. Colbert, PhD

> *"There will be a push for safety and competency based training that will force all specialties to move more towards simulation. In some ways, these efforts will be easy in diagnostic radiology where imaging is digital and the images from real patients can be used to simulate the daily practice of radiologists."*
>
> —Alexander Towbin, MD

Simulation-Based Education and Assessment Improves Patient Care

As the integration of simulation becomes complete at the educational and assessment levels, multicenter studies are conducted that definitively demonstrate simulation-based education and assessment improves individual, team, institutional, and global healthcare industry performance. This takes several decades but provides the long-sought "holy grail" of evidence that simulation improves patient care, reduces injury due to medical error, and saves lives. The 2019 Institute of Medicine (IOM) report makes the claim that during the last 30 years, simulation has been transformative and has led to a reduction in medical errors as predicted. The report goes on to say that 60–90% of preventable deaths from medical errors have been averted through simulation-based programs and that the major risks to patients are now systems-based deficiencies. The IOM calls for greater use of simulation for systems processes given its widespread success at the individual and team levels.

> *"Institutions will progressively utilize simulations as internal organizational quality assessment tools (i.e. as a systems and/or process engineering tool)."*
>
> —William F. Dunn, MD

Simulation Leads to a Dramatic Decline in Healthcare Cost

Billions of dollars are saved due to a reduction in medical errors and healthcare-related deaths. Safer healthcare also saves billions of dollars annually in reduced malpractice rates resulting in a reduction in healthcare inflation. Improved healthcare performance causes patient discharge rates to dramatically improve as rebound admission rates drop. Overall, the cost of healthcare per person declines as life expectancy increases and infant mortality decreases. The savings provide a means to deliver healthcare more widely to the country while expanding healthcare research and technology funding. This affirmation regains the public trust in their healthcare provider and the medical industry.

> *"Residencies and fellowships will progressively require simulation training to performance standards facilitating patient safety."*
>
> —William F. Dunn, MD

Technology

In order for simulation to be widespread while also satisfying the new dependence on high-fidelity simulated environments for training and assessment, technologic advancement takes two paths. One is where simulation and simulators become affordable, portable, internet based, and more simplistic to program and operate, paving the way for mass utilization.

> *"Mobile, easy to use, screen-based technology that allows emotionally-charged practice of dynamic case management for various challenges – 'What If' verbal case scenarios will be greatly enhanced with simulated monitors providing realistic vital signs and pulse ox beeping."*
>
> —Sara Goldhaber-Fiebert, MD

"There will be a movement towards use of mobile devices in simulation. A modern smart phone is about as fast as a 5 year old laptop. Smart phones are adequately powered to run complex simulation scenarios."

—Kenneth Gilpin, MD

"Over the coming decade, diagnostic radiology will move out of the era of analog simulators and into the digital era. This move will accelerated by the move from an oral board exam to a computer-based exam. For years, radiology residents have prepared for the oral board exam by interpreting an unknown case shown to them by their attending in an effort to simulate the board experience. When the board exam moves to the computer, residents will employ new strategies to prepare for the exam. The corporate sector is already preparing for this change by placing content online and creating a mechanism for residents to review cases online."

—Alexander Towbin, MD

"Simulation technology will become simpler. The increased sophistication of simulation equipment over the last few years has brought incremental improvements in educational experience but large increases in unreliability, challenges in programing and cost."

—Paula Craigo, MD and Laurence Torsher, MD

The other path will have simulation moving toward the creation of Super Simulators and Super Simulated Virtual Environments (SSVE) used for the mandatory high-stakes assessments that are now part and parcel of healthcare. These sophisticated environments use physical and virtual technologies including robotics, artificial intelligence, holograms, and haptics to create a truly immersive, interactive, and fully autonomous experience. They are entirely manipulatable and can replicate any patient care environment from a single patient room and care suite to an entire hospital, an urban street corner, or even a battlefield. Individual institutions will be able to reproduce their own facility with exacting detail in the SSVE allowing for customized team training, system analysis, and system integration.

"There will be a trend towards virtualisation in simulation. Virtual solutions to engineering problems are cheaper than mechanical solutions (as they have a lower marginal cost). This movement towards virtual simulation may be driven by economic forces rather than best teaching practice per se."

—Kenneth Gilpin, MD

"Virtual environments will allow for just the right mix of fidelity and realism that translates into all patients receiving safe care."

—Marjorie Lee White, MD, MPPM, MEd

These super simulators are recognized as pivotal and critical for the development of fundamental and expert skills of individuals, teams, and institutions. As the dependence on these technologies for training and assessment becomes critical, SSVEs are identified as medical devices, and a governing body like the FDA oversees their fidelity to ensure public safety.

"There will be a validation of physiological models used in simulation. An international simulation organization will form, with input from medical colleges and resuscitation associations, which will aim to explicitly quantify the limitations in simulation models (both software and hardware) compared to real patients. Simulation companies will be obligated to objectively demonstrate the accuracy of their simulators to these organizations."

—Kenneth Gilpin, MD

The initial high cost of such simulation limits its access to centralized centers of excellence. The demand for SSVE training and assessment escalates, resulting in a dramatic reduction of cost due to mass production, and these environments are developed in every major healthcare facility and city as part of a federal initiative.

"Complacency needs to give way to some blue skies dreaming, since today's Model T (technology) simulation needs to move towards the Startrek Holodeck (Danger Room from X-Men) by 2030. This will take broad commitment from clinicians, computer scientists, human factors psychologists, clinical engineers and funding organizations. Real world anatomical scenarios, physiological processes, tissue deformation, fluid dynamics, instrument-tissue interactions; hey…you mean this isn't all real?"

—Derek Gould, FRCR, FRCP

"There will not be a quantum leap in simulator fidelity in the near future. The current limitations on simulator complexity are due to the economic cost of designing and validating complex simulation models (i.e. R&D), rather than the lack of computing power. The tumbling cost of processing power will not come to the rescue of the difficulties facing simulation."

—Kenneth Gilpin, MD

"Federal funding of simulation labs is found to be cost effective and leads to safer medical practice."

—Shekhar Menon, MD

The SSVE is later recognized as ideal for therapeutic and procedural rehearsal. Individual patient physiology and anatomy will be analyzed and downloaded into the environment where physicians and teams can conduct actual procedural rehearsal. Fine motor maneuvers will also be practiced, idealized, and mastered. The perfected moves will be downloaded and captured by intelligent robots, and it is these robots that will carry out the procedure with microsurgical perfection. Patients will now be able to undergo robotically facilitated, minimally invasive, endovascular and open procedures expertly "taught" by the world's top proceduralist without the need to travel long distances.

Taking the lead from psychiatry, the SSVE is used therapeutically for a variety of medical and psychiatric therapeutic interventions. The SSVE is proven to be a potent environment for the treatments of phobias, separation anxiety, post-traumatic stress syndrome. The military use of SSVE for deconditioning proves invaluable, and psychiatric and suicide rates are dramatically reduced for returning servicemen and women. Pediatricians use the SSVE to immerse patients and families into the clinical environment to prepare them for their planned procedures. The access to the environments becomes widespread and patients can "book" their own virtual tours of healthcare facilities or pre-experience their own proposed intervention.

SSVE proves to be invaluable for research and development. Computer-based simulations make dependence on tissue and animal models for experimentation obsolete and provide researchers a rich and reproducible platform to test new therapies. For example, computer-based simulators are used to test tumor responsiveness to chemotherapy. Individual patients with heart disease are benefited, since their own cardiovascular responsiveness to pharmacologic alterations of inotropy (contractility), chronotropy (heart rate), lusitropy (relaxation), and systemic vascular resistance can be tested using these computer-based simulations prior to therapeutic initiation.

By 2100 simulation proves to be indispensible. Training, assessment, and maintenance of competence are dependent on simulation for the individual, team, institution, and industry. No longer limited to healthcare provider training and assessment, therapeutic interventions take a quantum leap forward as simulation is used for treatment and rehearsal. Because of simulation, new and critical therapies, interventions, and pharmaceuticals will be able to be economically developed, tested, perfected, and introduced at accelerated rates affording more and more patients the benefit from remarkable and innovative technologies.

Finding a digital copy of "The Comprehensive Textbook of Healthcare Simulation," healthcare providers of the time will appreciate just how far they have come and contemplate the next extraordinary advances yet to be accomplished.

"A simulation center at every Starbucks!"
—Christopher Gallagher, MD

Back from the Future

Although we hope you enjoyed our (admittedly hyperbolic) journey to the future of simulation, we hope you appreciate that in the past few years, healthcare simulation has made an exponential transformation from a *best secret* to becoming a bona fide *best practice.* Few involved in its past could have imagined the speed, extent, and creative ways in which simulation has been applied in its present future. It's apparent that our only limitations are our imaginations. The future of healthcare simulation is here, bound in the pages of this text. It is our hope that by assembling this prestigious array of experts from around the world, their words and ideas will inspire others to make their own amazing contributions to healthcare simulation.

"The best way to predict the future is to create it."
—Peter Drucker (1909–2005),
Influential writer, consultant,
and social ecologist

Reference and Note About the Quotes

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All quotes were provided via email.