Programs of Research in Healthcare Simulation

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Overview

In this chapter, we outline a working definition of what a *program of research* is and describe some of the key components necessary for pursuing a program of research. We next highlight select programs of research within healthcare simulation, highlighting differing ways in which a program of research may arise (e.g., personal or organizational interests, research collaborations) and how programs grow and change as they mature. In keeping with the goals of this text, this chapter is primarily intended for individuals who are newly engaging in or are considering developing a program of research in healthcare simulation.

Practice Points/Highlights

- A program of research can be defined as a purposeful strategy for pursuing a coherent and connected line of inquiry.
- Programs of research can be viewed on a continuum – ranging from those programs just starting out to those that have grown and matured over time.
- The core components of a program of research are a central focus and flexible plan, committed researchers, appropriately selected research methods, and a web of supporting resources, such as space, materials, training opportunities, operational support, funding streams, and partnering groups or organizations.
- Programs of research may be derived through a variety of sources, including personal or institutional interests, accreditation body interests or guidance or research collaborations.

Introduction

Individuals working in healthcare simulation tend to be flexible, innovative, and focused – it is part and parcel of a growing and ever evolving field like simulation – but it may be difficult for them to find time and resources to purposefully pursue a stable research focus amid changing needs and demands. Yet it is precisely a *program of research* that can help build and sustain individuals, programs, and organizations.

In describing programs of research in this chapter, we draw from a rich tradition of varying definitions, from a sustained research enterprise with one or more components [1] to the development of a coherent group of research findings [2] to a series of connected studies that benefit the public welfare [3]. Drawing on these key ideas, we define a program of research as: *a purposeful strategy for pursuing a coherent and connected line of inquiry* [2, 3].

In this chapter, we begin by describing some of the key components necessary for pursuing a program of research. We next highlight select programs of research within healthcare simulation, highlighting differing ways in which a program of research may arise (e.g., personal or organizational interests, research collaboration) and how programs grow and change as they mature.

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Table 3.1 Components of programs of research

Author	Year	Critical components
Sandelowski	1997	Careful researcher *planning*; theoretical *connection* among studies; goals related to broader *social good* [3]
Parse	2009	Discernable *patterns* in a researcher's line of inquiry [2]
Morse	2010	Large-scale programmatic *aim*; *self-contained* but *interconnected* projects [4]
SSHRC	2013	*Resources* (people and funding) to support quality work; *connections* across research communities; positive *impact* on society [1]
Taylor and Gibbs	2015	*Focus* on a real-world topic; formal and informal *support* and *collaboration*; institutional *resources* (e.g., library access, equipment, staff time); research team *training* [5]
Beck	2015	Systematic *planning*; addressing a *knowledge* gap that drives methods choices; *self-contained* studies that *build on* each other [6]

Key Components of Programs of Research

Across this body of literature, programs of research tend to have several core components, as Table 3.1 evidences: (a) a central focus and a flexible plan for pursuing that focus, (b) a team of researchers committed to the focus, (c) research methods for approaching questions related to the focus, and (d) a web of resources that supports the first three components. We touch on each component of the model below.

A central focus and flexible plan. What distinguishes a group of research projects in healthcare simulation from a program of research is a central area of focus. A central focus – on an assessment or treatment goal, on social needs or the social good, on a gap in the literature, on a new or poorly understood phenomenon, or on other real-world problems – is the main driver of a research program. For example, the National State Boards of Nursing program of research seeks to understand the use and role of simulation in pre-licensure nursing education. They first examined how schools of nursing utilized simulation and later considering whether simulation could be used in lieu of clinical time under specific circumstances without having a detrimental impact on board passage rates or readiness for transition to practice [7, 8].

Additionally, the plan for pursuing a focus within a program of research must be flexible. In order to reach program goals, team members must be ready to change plans when (not if!) the situation (e.g., funding, staffing, local program demands) changes. This flexibility is particularly important when pursuing a new area of research (or research on an existing topic in a new context, as is true of much simulation research), where unexpected findings may alter the original plan.

A team of researchers and practitioners committed to the focus. Programs of research are most often carried out by teams of researchers and practitioners. Frequently, these team members may not share the same approaches to research (e.g., quantitative versus qualitative versus mixed methods) and often have different professional training (e.g., clinician, psychologist, psychometrician) but they do have a shared commitment to the focus of the research. Often this allows research program leadership to broaden or strengthen the original team's networks, bringing in specialists with expertise in research methods, clinical practice, or simulation; or connecting with groups in other institutions. A clearly articulated focus for the program helps the team stay true to the larger goals while allowing for innovation and growth.

Methods for data collection and analysis appropriate for the focus. Which data to collect and how to collect and analyze it are all critical research design decisions. Teams often need to incorporate new methods in order to maintain their research focus, perhaps even developing new methodological or simulation tools. The relative novelty and flexibility of the simulation context allows teams to try out a variety of approaches to gathering and analyzing data (e.g., simulator outcome data, video analysis, written or oral assessments), but these choices must be made with the research focus in mind. For instance, if the focus is on improving team leadership skills during resuscitation efforts, an analysis of interactions among participants and clinical team members might be appropriate to determine which leadership skills individuals need to improve; however, future efforts to examine if a newly designed intervention improves those leadership skills may be better measured by using an Objective Structured Clinical Exam (OSCE).

Growing Web of Resources

Developing a program of research is an *emergent* process, meaning that, while research teams do make plans for upcoming studies, these plans change as findings from each successive study are considered and resources shift. Thus, the key components of a program of research are supported by an ever-growing web of resources: training and available time of team members, space and materials, access to technology, funding internal and external to the institution, professional organizations in research and simulation, and community connections. The model in Fig. 3.1 emphasizes the interconnectedness of the focus and plan, team of researchers, and research methods, all supported by a web of resources that help researchers carry out their efforts.

Building the infrastructure of that web is critical to the long-term success of a program of research in simulation. Early on, this may mean a loosely connected group of self-contained projects across different institutions with the same focus. These individual studies will most likely draw mainly

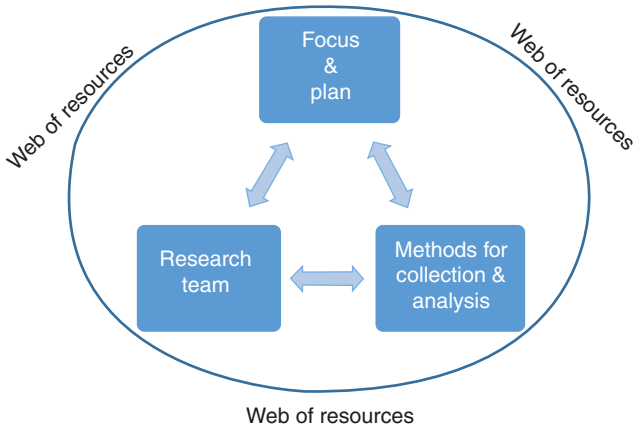

Fig. 3.1 A model for creating programs of research in simulation

on the resources at their local institutions and shared resources in regional and local organizations. As programs grow – and, with effort, time, and luck receiving funding – the infrastructure may formalize or centralize so that study teams are working together in one or two institutions or organizations. At this stage, institutions may become more actively involved, perhaps promoting the focus of the project as one of their core missions. Wherever a program of research stands, team members must consider what level of research (number, size, and type of studies and how interconnected they are) is *sustainable* given the available resources.

In addition to developing a web of resources, programs of research are *reflexive*, meaning they are also responsive to numerous driving forces that further shape future research efforts. These driving forces can range from the long-time research interests of individual investigators to the needs of institutions to the commitments of accreditation bodies. The examples of programs of research in simulation below highlight this range. Simulation researchers like Hunt, Draycott, and Brydges, all of whose research is discussed below, are deeply committed to the work as individuals, but they draw on other sources like accreditation bodies' desire for high-quality and safe educational opportunities, local organizations' needs for improving the quality and safety of patient care, and a growing community of researchers seeking to explore the unique opportunities presented by the simulation context. Recognizing – and drawing from – these driving forces can help simulation researchers formulate and grow a sustainable program of research.

Programs of Research in Healthcare Simulation

Simulation-based research (SBR) offers numerous examples of programs of research with the above components: a focus shared by a diverse team that flexibly draws from a variety of methods and is supported by a web of resources to address real-world clinical issues.

For example, Hunt sought to improve healthcare provider performance and management of pediatric resuscitation events (e.g., cardio-pulmonary, trauma resuscitation) in the clinical setting. To achieve this larger goal, Hunt and her team conducted a series of interconnected studies utilizing simulations to study healthcare professionals' behaviors and actions [9, 10]. As Hunt and colleagues' research program evolved, they also used simulation as an educational strategy to improve resident management of cardiopulmonary arrest [11, 12]. Hunt and colleagues have also employed simulations to develop, test and refine evaluation and assessment tools used for studying resuscitation events based in the clinical setting (Personal Communication with E. Hunt, 2018).

Over time, as Hunt and colleagues' research program matured, their efforts played a contributing role in the formation of the International Network for Simulation-based Pediatric Innovation, Research and Education (INSPIRE) research program, discussed later in this chapter. According to Cheng and colleagues, by forming the INSPIRE collaborative, the research team was enhanced by researchers across diverse fields, such as human factors engineering [13]. Additionally, by forming INSPIRE, their web of resources was enhanced, including "building capacity for the acquisition of grant funding and maintenance of multiple ongoing projects" [13].

In another example, Draycott's program of research seeks to improve multidisciplinary teams' care for mothers and newborns – a real world problem! Towards this focus, Draycott's efforts include a series of studies that build on each other, including those that describe the development and implementation of simulation-based learning activities, improvements in simulator design and the development of a dashboard used to track the impact of training on patient care. For example, in the late 1990s Draycott noted that there were few training programs that could easily accommodate multiprofessional teams learning about responding to obstetric emergency situations (e.g., midwives, doctors, ancillary staff) [14]. Given this, Draycott and colleagues developed and implemented courses that included 'fire drills' to improve response to preeclampsia [14]. They further realized and developed a simulator that could support the training needs of multidisciplinary teams that could also provide force feedback measures, such as delivery force [15]. Subsequently, Draycott and colleagues also sought to measure and evaluate the impact of their training programs on the outcomes of mothers and infants in the clinical setting [16].

Another program of research highlighting a discernable pattern of research efforts is Brydges' program of research focusing on exploring how the healthcare professional's behaviors are influenced by training activities. To achieve

this goal, Brydges and colleagues conduct studies that examine how individuals manage and direct their learning and strategies for optimizing the simulation-based practice environment. Brydges and colleagues' studies are methodologically diverse and include systematic reviews examining the efficacy of simulation-based instructional design [17] and qualitative, quantitative and mixed-methods studies. Furthermore, many of these studies are theoretically connected, often drawing from the social cognitive theory of self-regulated learning theory [18] to examine effective ways to structure clinical skills practice [19, 20].

Although these examples represent selected programs of research in healthcare simulation, they exemplify many of the key characteristics outlined earlier in this chapter, including a focus on real-world problems, being goal oriented rather than methodologically focused, representing diverse research teams, and drawing in networks of resources to continue and expand the work. Additionally, although these examples demonstrate mature programs of research they also highlight how an individual's own research interests can evolve and grow over time.

Contributions of research programs and priorities guided by accrediting agencies. In addition to local and historical factors, accrediting agencies and bodies also direct and influence programs of research. For example, The National Council of State Boards of Nursing (NCSBN) conducted a series of studies aimed at developing guidelines and policy for the use of simulation in nursing education in the United States. The first phase of this program of research initially examined how nursing schools were using simulation through a survey completed by 1060 pre-licensure nursing programs in the United States [7]. The findings from this survey led to a second phase which included a longitudinal randomized controlled trial to determine if simulations and simulation-based learning (SBL) could replace 25–50% of clinical rotations, while not having a detrimental effect on commonly used outcome measures (e.g., knowledge assessments, clinical competency ratings, board pass rates) [8]. The third phase followed student participants as they transitioned to the workplace to determine the longer-term impact of substituting simulations for clinical time. This effort resulted in regulatory recommendations for the use of simulation in lieu of clinical rotations and guidelines for developing, implementing and supporting high-quality simulation for nursing education [21].

Contributions of research programs and priorities set by research consortiums and collaboratives. Programs of research have also been constructed through the formation of research consortia and collaboratives. For example, the International Network for Simulation-based Pediatric Innovation, Research and Education (INSPIRE) was formed in 2011 to facilitate multicenter, collaborative simulation-based research with the aim of developing a community of practice for simulation researchers; as of 2017 it has 268-member organizations and 688 multidisciplinary individual members worldwide [13]. In addition to supporting and providing guidance for research priorities, the group also provides support for members through meetings, conferences and mentoring to name a few.

Conclusions

In this chapter we have described several key components of programs of research (i.e., planning around a central focus, a committed team, flexible and emergent methods, and a web of resources) and provided examples of programs of research within the field of healthcare simulation, including some that are coordinated through collaboratives or professional organizations. We have also discussed how these select programs of research have evolved and matured over time, highlighting how programs of research can be viewed on a continuum from their early stages to maturity. In the chapters that follow, this text will help you take the next steps in developing your own program of research (see, for example, Chap. 4, Choosing your Research Topic), help you explore diverse research methods (i.e., qualitative, quantitative, mixed-methods) that can help you achieve your research goals, and offer strategies for conducting multi-site studies (Chap. 39).

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