Hierarchical Healthcare System: Measuring Pre-qualified Student Interprofessional Competency Through High-fidelity Simulations in Higher Education

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Introduction

Interprofessional education (IPE) in healthcare promotes interprofessional competency, which in turn increases team performance and positive patient outcomes. Further research is needed when combining IPE in healthcare with high-fidelity simulations (HFS) (O’Leary, Nash, & Lewis, 2015). Multiple studies have shown positive benefits such as increased teamwork and communication skills through the use of interprofessional learning within the high-fidelity patient simulation setting (Guraya & Barr, 2008; Smithburger, Kane-Gill, Kloet, Lohr, & Seybert, 2013). However, other studies have shown neutral to negative outcomes (Johnson, 2019; Reeves, Pelone, Harrison, Goldman, & Zwarenstein, 2017). Furthermore, IPE has received negative feedback from students in accelerated programs who were exposed to repeated high-fidelity simulations (Kaddoura, Vandyke, Smallwood, & Gonzalez, 2015). Due to divergences in outcomes and the hierarchical structure of healthcare, further research into the use of IPE in healthcare education through the instructional strategy of HFS is needed.

This paper explores the intersection of student interprofessional competency, views on IPE learning, satisfaction with interprofessional interaction, and thoughts about interprofessional collaboration HFSs. The exploration of these topics will include the theoretical underpinnings and their application over time and the relevance they still hold today. Topics will include the healthcare hierarchy, interprofessional teams in healthcare, interprofessional education in healthcare higher education, measuring interprofessional competency, simulation, learning, satisfaction, and collaboration.

Hierarchies of Healthcare

Healthcare of hierarchies are mainly built through licensures, certifications, governing bodies, and legislation to define standards in which a healthcare provider is designated into. Within the clinical setting there are established policies, procedures, and scopes of practice with the purpose of ensuring the best patient outcomes while mitigating legal liabilities (Weller, Boyd, & Cumin, 2014). Despite evidence-based research suggesting alterations are needed to longstanding policies, procedures, and scopes of practice, there remains a rigid system that
providers are classified into; this leads to natural social affects to how healthcare providers are treated by adjacent professions (Shaw, Rees, Anderson, Black, & Monrouxe, 2018).

Research suggest social hierarchies can be viewed as simple to complex creatures, from instinctual animals such as birds (Price & Sloman, 1987) to the reasoning capabilities of primates (Weisfeld & Beresford, 1982). For humans, hierarchies can exist in various forms and arrangements of perceived value. This can include the concept of vertical and horizontal ranks and levels within a group of people or, in the case of this research, can exist within a team of student healthcare providers. During an interprofessional simulation the program of study places the student within the role of their future profession where a hierarchy of orders, decisions, and responses follow.

However, there are complexities to interprofessional clinical simulations that must be first addressed. An example of this are differing points in time of clinical exposure to clinical simulations by healthcare fields such as nursing, medicine, and respiratory therapy. Nursing and respiratory therapy majors are often well adapted to the interactive details of the clinical simulation environment long before medical students are introduced. Another example stems from how these professions are trained. For example, medical students tend to focus on solving a specific medical problem and not the more holistic approach from nursing students (Nyström, Dahlberg, Hult, & Dahlgren, 2016). When put together in a simulated environment, students often learn how differently other professions address patient care. This can lead to role insecurity and produce negative feelings towards IPE. With increased exposure and in-depth understanding of the clinical environment, medical students often grow into their leadership role. This assumed leadership role for medical students makes the simulation more realistic as it will mirror the real-world setting in certain respects. Senior nurses and newly minted medical students approach patient care differently due to differences in training and faculty guidance. IPE provides a mirror to the clinical environments that can help faculty and other educators to incorporate interprofessional competency skills required for high performing healthcare teams (Anderson, Jensen, Lippert, & Ostergaard, 2010; Baker, Day, & Salas, 2006; Leonard, Graham, & Bonacum, 2004).

Conflict within Hierarchies of Healthcare

Hierarchies in healthcare exist and so does the natural conflict that exist within these hierarchies that can unfortunately lead to poor patient outcomes. Incivility among healthcare professionals has been linked with a lowered clinical performance, safety risk for patients, and negative patient outcomes (Belyansky, et al., 2011; Katz et al., 2019). Multiple studies show detrimental outcomes to patients when conflict exist within the healthcare team (Gittell, Weinberg, Pfefferle, & Bishop, 2008; Lee & Doran, 2017). Disruptive intraoperative communication and conflict can be detrimental to patient outcomes (Belyansky, et al. 2011). It is this conflict within the hierarchies of healthcare that provides another key reason for research in this area. IPE HFSs attempt to mirror the environments these healthcare students will be entering into and allows students to develop and practice interprofessional competency and collaboration (Josi, Bianchi, & Brandt, 2020). It can be reasonably stated that IPE during pre-qualifying education could decrease future workplace conflicts created by miscommunication and general mistrust between the professions. If the healthcare team is not producing beneficial patient outcomes, then there is a dissonance with its very existence. To bring harmony to this dissonance it is crucial that early and continued opportunities are provided to healthcare students that adjust them to interactions with the multitude of healthcare workers in the clinical setting. IPE provides
this opportunity for applied collaborative practice, a type of practice that can produce positive patient outcomes (Kim, Radloff, Stokes, & Lysaght, 2019).

The Need for Interprofessional Healthcare Teams

There is growing need for efficient, effective, and appealing interprofessional healthcare provider team-based models in the United States largely due to an economical supply and demand issue. On multiple levels, there are not enough healthcare professionals to address the current and increasing number of patients. One of the largest predictors of this shift is the aging population which is set to grow to about 69 million people by 2025 (Altman, Butler, & Shern, 2016). Older populations require more care due to natural aging processes, onset of chronic illness, and comorbidities which all demand increased amounts of healthcare expenditure to address in a holistic manner (Altman, Butler, & Shern, 2016). Current providers face additional stress from administrative pressures for positive Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey scores. This survey is provided to Medicaid and Medicare patients post-hospital stay. The federal government uses a Value Based Purchasing (VBP) program based on these scores in order to determine the reimbursement rate coming from the Centers for Medicare and Medicaid Services (CMS). Scores are also used to provide the public with a comparison between healthcare organizations through the Agency for Health Research and Quality (AHRQ). Depending on the scores, hospitals may be reimbursement in full, at a lower rate, or a higher rate (Shulman, Crowe, Hutzler, Karia, & Bosco, 2018). This ties together real or perceived positive patient outcomes with monetary reimbursement.

In order to attempt to meet these pressures and needs there has been a slow restructuring over the decades from (a) a healthcare system model where a physician makes the majority of the decisions one-on-one with the patient to (b) an interprofessional team-based care model where there is a larger team of a lower level providers that are managed by physicians. These mid- to lower-level providers can include nurse practitioners (NPs), Physician Assistants (PAs), Occupational Therapist (OTs), Physical Therapist (PTs), Speech Pathologist, Respiratory Therapist (RTs), Registered Nurses (RNs), Dieticians, and Community Paramedics who often have an increasing scope of practice and autonomy (Corso, Dorrance, & LaRochelle, 2018; Flaherty & Bartels, 2019). On a clinical level, allowing RNs and RTs practice to the top of their scope of practice decreases physician burden while allowing them to attend to the needs of higher acuity patients.

Further evidence of the growing need for a more rapid healthcare system change to the more interprofessional team-based model can be seen in the decline of medical school graduates who elect to go into primary care and emergency medicine. There are a multitude of reasons for these medical students to not elect to go into these professions. Of specific note is the increasingly higher student loan debt upon graduation, lower salary, and lower insurance/CMS reimbursement rates compared to other more specialized areas such as anesthesiology, gastroenterology, or orthopedics (Corso, Dorrance, & LaRochelle, 2018). Additionally, and sometimes of equal importance, the ever-increasing number of patient interactions to address, lack of work/life balance, lower patient satisfaction scores, and increased negative patient outcomes due to lack of resources. All of these contribute to physician burnout and lower retention rates (Corso, Dorrance, & LaRochelle, 2018; Flaherty & Bartels, 2019). This effect can be seen in the retirement-replacement ratio where there is currently a downward trend in the number of primary care physicians with around 8,500 retiring and being replaced by only 8,000

Due to lack of primary care physicians, mid- to lower-level providers in this hierarchal system have been trying to fill this gap and seizing this opportunity to increase their scope of practice and gain more autonomy. Reports from organizations like the American Association of Nurse Practitioners (2018) reported in 2017, 87% of NP students were in a primary care program while only 14.5% of newly graduated medical students entered a residency program focused on primary care. This skew towards primary care puts NPs in a position for continued employment growth where they could see more mid- to lower-level acuity patients while still under the direction of a physician or have “full practice authority” as they do in 20 states (Van Fleet & Paradise, 2015). Full practice authority simply means NPs do not have to practice under a physician. It has also been shown that NPs can handle 80 to 90 percent of cases conducted by primary care physicians (Mundinger, 1994). Therefore, in the 30 states where there is some level of physician oversight it is these two professions that must work well together. In all states, the vast majority of physicians and NPs will be working in interprofessional teams. Physicians are dominate in this hierarchy which sometimes cause conflict and lead to poor patient and professional outcomes.

Registered Nurses (RNs) are the largest licensed health professionals in the lower hierarchical levels addressing the increasing healthcare provider shortage in the U.S. As of 2011, there are around 3.7 million RNs and that number has grown to 3.8 million in 2017 with employment growth projections of 15% from 2016 to 2026 (Institute of Medicine, 2011; Smiley, et al., 2018; Tropey, 2018). RNs practice inside the hospital setting but also outside of it in areas such as home health, ambulatory care, public health, schools, long-term care, skilled nursing facilities, wound care, and hospice. Some have proposed that this group of healthcare professionals, in combination with other professionals, be used responsibly within the creation and establishment of the following: new protocols of practice, complex care management teams, coordination of services between primary and specialty, and a co-visit model with low to medium acuity patients with minor infections and illnesses that do not require a visit to a physician’s office, urgent care, or an emergency room (Flaherty & Bartels, 2019; Institute of Medicine, 2011). This plan allows for physician supplementation need that can conceivably offset the increasing demand for patient care. However, implementation of this plan requires embracing of larger interprofessional teams and a culture of teamwork.

Additionally, there is an established positive correlation among interprofessional healthcare teams to increased job satisfaction, overall performance, and positive patient outcomes (Kash, Cheon, Halzack, & Miller, 2018; Janss, Rispen, Segers, & Jehn, 2012). The effectiveness in positive patient outcomes through interprofessional teamwork is further seen in the inclusion of pharmacist during hospital rounds. Hospital rounds are a dedicated period of time in which a healthcare team address complete care for each patient. It’s been shown that the inclusion of pharmacists can reduce adverse patient drug reactions, resulting in positive patient outcomes (Kucukarslan, Peters, Mlynarek, & Nafziger, 2003).

The question then becomes what goes into the creation of positive healthcare interprofessional team interaction? The recent work of Josi, Bianchi, and Brandt (2020) suggests multiple factors that go into positive healthcare interprofessional team interaction and performance. These factors include conflict management, patient-centered care, communication, and role clarification. However, it is important to emphasize that out of all of the factors listed
above from their study, role clarification was found to be the most important because when a person does not know their role and is placed in a teamwork environment, negative effects on interprofessional team performance has been observed at a significant level. Physicians who lack interprofessional competency may not speak up around nurses with more seniority (Markay, 2006; Sutcliffe, Lewton, & Rosenthal, 2004). Therefore, to create and maintain positive interprofessional interactions and team performance there must be careful consideration and purposeful regard to who is placed on that team. A healthcare team member who does not know enough about their role on the team will consequently be detrimental to that team. The question becomes is the lack of role clarification due to poor team onboarding, incompetence, or performance anxiety? Therefore, there is a need for continued research into interprofessional best-practices and delivery of instruction through HSF environments.

Interprofessional Competency in Healthcare

The section focuses on interprofessional competency and how it intertwines with IPE in the healthcare educational environment to make future effective, efficient, and appealing healthcare teams. High performing teams that improve patient outcomes, produce higher HCAHPS scores, and increase reimbursement rates commonly boost morale of healthcare teams and administration. However, to look at interprofessional competency it is important to step back and first look at interprofessional collaboration.

The need for interprofessional collaboration originates when two or more professions need to interact to achieve a common goal or objective. Most large organizations require multiple professions such as management, human resources, finance, accounting, and logistics working together to meet common goals or objectives. Meeting goals and objectives is important however, it becomes critical in professions that focus on healthcare and interpose immediate decisions that are often lifesaving in nature (Llewellyn & Skevington, 2015).

Interestingly, the origins of the term ‘interprofessional practice’ came from patient-centered healthcare and overtime has been applied in numerous other settings outside of healthcare due to its positive effects in training and performance outcomes (Giess & Serianni, 2018). One of these settings includes higher education. The encouragement of collaboration among students is not a new thing and has been talked about for some time. In regard to higher education, Chickering and Gamson (1987) provide seven principles of good practice in higher education that encourages cooperation between students and mutual respect. Successful cooperation suggests interprofessional competency.

To measure interprofessional competency it must first be defined, and then appropriate measurement instrument(s) must be found. Defining interprofessional competency can be difficult because the framework of knowledge and skills on display by any one healthcare discipline can be drastically different from one another. A working example of defining competency comes from researchers who studied the Japanese Association of Interprofessional Education (JAIPE) and then developed a framework (Haruta, 2018). This framework consisted of two core domains: “patient-/client-/family-/community centered” and “interprofessional communication” and four peripheral domains: “role contribution”, “facilitation of relationships”, “reflection”, and “understanding of others” (Haruta, 2018). Another example comes from a well-known interprofessional organization, the Interprofessional Education Collaborative (IPEC). IPEC’s Expert Panel (2011) states the following four interprofessional competencies:
“values/ethics for interprofessional practice”, “roles/responsibilities”, interprofessional communication”, and “teams and teamwork”.

Figure 1. Interprofessional Collaboration Competency Domain (adapted from IPEC. (2016), “Core competencies for interprofessional collaborative practice: 2016 update”).

Five years later, IPEC (2016) updated these interprofessional competencies for three reasons: (a) to reaffirm all four competencies, (b) to organize the four competencies under a single domain of “interprofessional collaboration”, and (c) to achieve the Triple Aim of “improve the patient experience of care”, “improve the health of populations”, and “reduce the per capita cost of health care”. Figure 1 from the IPEC (2016) update illustrates this singular domain and how the four competencies are to relate to one another which includes a trajectory for the pre-licensure learner.

All of the competencies mentioned above share very similar wordings and it is through that similarity that a search for an appropriate instrument to measure interprofessional competency was conducted. It was also important to keep in mind that the search for an instrument includes the need for it to be valid, reliable, and appropriate for statistical use and the population size.

Complex Adaptive Systems Theory in Healthcare

The application of a particular pedagogical theory has been an issue when it comes to interprofessional learning. A primary issue is the multitude of learning and performance contexts that needs to be taken into consideration throughout a simulated event. In healthcare environment there is often a level of culture shock and difference from the training environment to the
workplace environment. It is a complex system that has increasingly been viewed through a variety of systems thinking lenses and social networks (Benham-Hutchins & Clancy, 2010; Nugus et al., 2019). Shepard and Burton’s (2019) reviewed and evaluated the need for simulations in healthcare which resulted in the validation of a framework that follows a traditional ADDIE (analyze, design, develop, implement, evaluate) cycle.

There is an established link between a Strategic Operational Research model with a Strategy Development Process model though the use of Complex Adaptative Systems Theory in order to get a more holistic view of that system (Hammer, Edwards, & Tapinos, 2012). It may be possible to use Complex Adaptative Systems Theory to gain a more holistic approach to the development and improvement of interprofessional healthcare simulations HFSs. Below is a figure to be used as a visual guide to explain the application of Complex Adaptive Systems Theory.

![Figure 2](image)

Figure 2. Healthcare organizations: Embedded complex adaptive systems (Benham-Hutchins & Clancy, 2010).

Figure 2 portrays the different parts of a patient hand-off between two units. An example of the above could easily be a shift change or a patient moving from the Intensive Care Unit (ICU) to a Critical Care Unit (CCU). There is a clear complex adaptive system and a patterned output which can be seen by the fundamentals of positive patient outcomes and the multiple interactions between all the facets in the system (Dodder & Dare, 2000). It is because of this that Complex Adaptive Systems Theory can be applied in the process of study and research of healthcare settings. Key characteristics of this theory include a large number of dynamic interaction where elements are constantly affecting each other, non-linear interactions, openness, constant energy, history, and most importantly parts of the system that aren’t aware of each other. This can be summed up in the following properties: emergence, co-evolution,
connectivity, nested systems, simple rules, iteration, sub-optimal, requisite variety, selforganizing, and edge of chaos (The Health Foundation, 2010). It is through the lens of Complex Adaptive Systems Theory that IPE HFSs can capture the highest fidelity and practical utility.

**Interprofessional Healthcare Education**

IPE in healthcare and the research behind it has over the last decade become better defined and validated. The standard accepted definition of IPE in healthcare was set by the World Health Organization (WHO) in 2010. It is as follows, “two or more professions learning about, from and with each other to enable effective collaboration and improve health outcomes.” (World Health Organization, 2010). The primary purpose of IPE in healthcare has been to expose healthcare teams and students to the interprofessional teams they will be working with upon graduation. It is also worth noting the impact well researched and designed training can have in the healthcare setting (Rumball & Tober, 2013).

According to a systematic meta-analysis by Guraya and Barr (2008) IPE in healthcare promotes a positive outlook on other professions. Therefore, there has been a growing popularity to incorporate IPE into the healthcare education curriculum. However, it is important to note that that there are others that state there is no valid evidence to support the claim that IPE increases collaborative performance or improves health outcomes of patients (Reeves et al., 2017). This includes not creating a positive professional identity in the student before the introduction of IPE education can be detrimental and cause negative attitudes towards their own profession and others (Johnson, 2019; Stull & Blue, 2016). The manifestation of the lack of professional identity is seen in the interprofessional environment in which these students will enter upon graduation through the lack of role clarification which becomes detrimental (Joshi et al., 2020).

**Simulation in Healthcare Education**

Simulation as an instructional strategy has been in use in various forms of practice especially in the medical field for decades (Gaba, 2004; Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005). Simulations today can allow for a variety of situations including medical interventions being brought forth from interprofessional small groups (Bays et al., 2014). Multiple sources of healthcare literature and studies over the years has given the healthcare community a better framework and understanding of which to craft better and higher quality simulations (Jeffries, 2006). The primary purpose of healthcare IPE within simulations has not always been clinical competency but teamwork competency focused. The ability for the team to function took precedence over the quality of the clinical judgement. Over the past two decades there has been a remarkable increase in quality integration in terms of appropriate clinical judgements into the simulations. The definition of teamwork, what it means, and how it is enacted has changed and become a lot more complex through looking at it from a perspective of interprofessionalism (Pollard, Miers, & Gilchrist, 2004; Pollard, Miers, & Gilchrist, 2005).

**High-Fidelity Simulations and the Suspension of Disbelief**

There are some very important questions to ask when it comes to realism so good that a literal suspension of a student’s disbelief occurs. In terms of HFSs, where is the balance to be as real as it can without doing harm to the participants? Suspension of disbelief and fidelity can be a very difficult thing to measure and there are various definitions that encompass a spectrum from
low to high. A variety of sensory measures must be kept in mind and include auditory, visual, tactile, and olfactory (Cook, et al., 2012).

HFSs of patients present the healthcare student with a very realistic simulated environment to apply the knowledge and skill they’ve developed in a safe, no-fault environment. HFSs of patients have long been used by the medical community to help train students before they practice within the clinical setting on live human beings. To be successful in education through simulation there needs to be an understanding of the basics and how the simulation will match the learning and performance context as closely as possible.

The suspension of disbelief can be quite hard for humans when it comes to working on plastic/rubber manikins. It is possible to recreated faces and arms down to details such as pores on the skin, wrinkles, individual hairs, and various skin complexions. However, the cost to do this can be astronomical and increase the fears of cost that already exist when a program invest in HFSs. To overcome this, four themes that healthcare students identified that allowed them to suspend belief and they were: seeing beyond the plastic, knowing what to do, connection and care, and diversity (Power et al., 2016).

There is overwhelming support from students in regard to HFSs. For example, entry-level healthcare students have shown significant increases in skills and knowledge after going through HFSs and applying that practiced knowledge within the clinical setting (Jeffries, 2006). Additionally, there are significant increases in a healthcare students’ self-efficacy and self-confidence in their ability to transfer that skill and knowledge from simulation to a clinical setting (Jeffries, 2005). Jeffries & Rogers (2007) state that fidelity and self-reflection are some of the cornerstones of healthcare simulation. This means there must be enough detail in the fidelity of that simulation that it stimulates the student to put together what they have already learned (Jeffries, 2005; Jeffries 2007). The positive effects of high-fidelity versus low-fidelity or paper/pencil can be seen in research that shows increased student performance and satisfaction with HSFs (Jeffries & Rizzolo, 2006). O’Leary, Nash, & Lewis, (2016) showed increases in student knowledge retention rates and self-efficacy while using HFS versus didactic presentations using PowerPoint.

**Recommendations**

There are drastic changes within the population of the U.S. and a global pandemic of COVID-19. Consequently, changes are being forced on our healthcare system that is causing a complex adaption to a more interprofessional team-based model in order to try to efficiently, effectively, and adequately care for patients. More research needs to look into interprofessional competency, complex adaptive systems theory, learning and performance context, high-fidelity simulations and suspension of disbelief. The following instrument of measure is recommended. The University of the West of England – Interprofessional Questionnaire (UWE-IPQ) (Pollard, Miers, & Gilchrist, 2004; Pollard, Miers, & Gilchrist, 2005) is a validated 35-item questionnaire made up over four scales. It measures communication and teamwork, interprofessional learning, interprofessional interaction, and the interprofessional relationships. The UWE-IPQ was validated and found to have a Cronbach’s alpha in the 2004 study for the first three sub-scales scales of (0.76-0.84). for reliability multiple test were done and reported these three sub-scales at (0.77-0.86) with a p-value of (p < 0.001). The 2005 study included a Cronbach's alpha estimate for the fourth scale, interprofessional relationships at (alpha = 0.71) with a re-test reliability of (alpha = 0.83).
References


