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Educating Healthcare Students: Strategies to Teach Systems Thinking to Prepare New Healthcare Graduates

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ABSTRACT

Background: Educating undergraduate healthcare students is challenging due to the complexity of the healthcare environment today. Healthcare education systems focus mainly on discipline specific thinking using linear frameworks and reductionist approaches. Education of nurses, pharmacists, physicians, social workers, respiratory therapists takes place in a siloed environment with minimal interprofessional interaction. Yet, organizations expect new graduates to have skills and understanding of collaborative care with knowledge of healthcare systems thinking, IPP, TeamSTEPPS®, methods of group dynamics, and a knowledge of Informatics when they enter the workforce.

Purpose: The purpose of this article is to 1) discuss and describe challenges in a high-tech complex healthcare environment that necessitate teaching systems thinking to future healthcare students, and 2) describe the use of interprofessional education (IPE), interprofessional practice (IPP), Team STEPPS®, curricular content, and other teaching methods as strategies for teaching systems thinking.

Conclusion: Systems thinking in healthcare supports a holistic approach to care, inclusive of high-tech in the complex environment. With the rapid changes it is necessary to modify our teaching theories we use to educate new healthcare providers. Educating and practicing the key concepts/principles of IPE, IPP, and TeamSTEPPS®, and group dynamics, along with the important integration of technology, can provide the foundation to develop systems thinking and critical thinking in our complex healthcare environment.

Introduction

Educating our undergraduate healthcare students in systems thinking requires a multifaceted approach for today's complex and rapidly changing healthcare environment. Concepts of learning through systems thinking can help the healthcare professional see more than just themselves in health care. There is opportunity to develop an understanding of how they are a part of the system, how to act more in tune with the larger processes and how to elicit change within the system (Dolansky & Moore, 2013).

Healthcare curricula today do not fully meet the scope of challenges faced upon graduation in all clinical settings. Pelarmo, Gibson, Meiklejohn, Courtney, and Dart (2017) believe our academic training of new graduates needs more focus on systems thinking because we primarily compartmentalize specific competencies, further promoting healthcare education that occurs in academic silos. This reductionist approach to education stipulates a beginning and an end with no interface or impact from multiple system sources when addressing a concept or skill. And yet, we know that the healthcare system is one that works best when there is an interconnectedness of healthcare professionals within that system. The applied process of systems thinking ensures a collaborative effort to work on complex problems both at a sub-component level and the greater whole (Stalter et al., 2017).

When new nursing graduates enter the workforce, healthcare administrators in hospitals and clinical settings have expressed concerns that they are not fully prepared to provide safe, quality, and effective care. In a study conducted by the Nurse Executive Center (Berkow, Virkstis, Stewart, & Conway, 2009) it was noted that nearly 25% of nursing leaders were dissatisfied with new nursing graduate's performance. Some of the lowest ranking scores of dissatisfaction of nurse leaders had to do with handling multiple responsibilities, delegating, and having personal initiative. Spector and Echternacht (2010) add that difficulties persist with the readiness of new graduates in the work place. The authors noted that in a survey to healthcare employers, it was found that new nursing grads were not prepared to deliver safe

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effective care. This could be extrapolated to suggest the lack of critical thinking, a necessary attribute of systems thinking, interfered with recognizing the scope of interactions or interconnectedness. Cappelletti, Engel, and Prentice (2014) recognizes that clinical decisions are dependent on the healthcare setting in which they occur and that good clinical judgement by the nurse depends on recognizing the situation with a total picture, or in a contextual frame. One of the suggestions to enhance this contextual critical thinking was to move toward connecting academic settings to interface more with clinical settings to enhance the education of students in critical areas necessary upon hire.

Rapidly changing technology and complexities in meeting today's healthcare needs is at the forefront of healthcare delivery. Risling (2017) describes the environment of 2025 expecting it to be very different than it is today. It will require adapting and providing training to meet the changing environment. Healthcare students need to know about new technologies they will be using to engage and provide patient centered care within the interprofessional team. Of greater importance Sherman (2012) brings full circle how employers are looking for new nurses, as future leaders, to understand and engage in systems thinking; the ability to see interactive influences. By so doing, nurses will recognize patterns and the relationships; with the lens of the high-tech environment and team makeup necessary to provide quality care.

In this light, the purpose of this article is to 1) discuss and describe challenges in a high-tech complex healthcare environment that necessitate teaching systems thinking to future healthcare students, and 2) describe the use of interprofessional education (IPE), interprofessional practice (IPP), Team STEPPS®, curricular content, and other teaching methods as strategies for teaching systems thinking.

Systems thinking

There are many academics that have described, discussed, and applied systems thinking to many fields. Some of the most notable include, Bertanffy, Deming, Senge, Forrester, Richmond and many others. Barry Richmond, coined the phrase ‘systems thinking’ in his field of system dynamics in 1984 (“Systems”, 2014). According to Richmond (as cited in “Systems”, 2014) the definition of systems thinking is “the art and science of making reliable inferences about behavior by developing an increasingly deep understanding of underlying structure” (para. 1). Richmond (1993) recognized that the dynamics of a system are often composed of closed-loop relations, yet few understand the best way to maximize the interconnectedness of these loops within the system. Clark et al. (2017) described system thinking as an “intellectual framework applied across a variety of disciplines to explain, organize, and address the integrated behavior of social, ecological and economic systems” (p. 2). This framework encompasses principles about how each part interacts with other parts of the whole; a system reflecting the ‘real world’; an integration of many chunks or parts of the whole (Clark et al., 2017). Peters (2014) addresses more directly systems thinking in healthcare. He indicates that systems thinking has evolved mainly in the 20th century and can have variations on what it means depending on the discipline. In healthcare, systems thinking is designed to address the many complex problems and how that complexity interconnects. It is our understanding of how things work and as health professionals we interpret interrelationships and interactions within and between the systems we work in (Taghreed, 2014).

Need for systems thinking

Quality and Safety Education for Nurses (QSEN) and American Association of Colleges of Nursing (AACN) guide curricula focusing on several competencies designed to address the complexity of our healthcare delivery system. To fully meet these required competencies Dolansky and Moore (2013) highlight the necessity to develop critical thinking skills by including systems thinking in healthcare education. Recognizing the importance of systems thinking, teaching healthcare students' what systems thinking is, how it works, and why it is important can be just as challenging for faculty as it is for students. One challenge is that healthcare education systems focus mainly on discipline specific thinking using linear frameworks and reductionist approaches with minimal interprofessional interactions. When we have a mental model of a linear framework it is difficult to translate or change to a nonlinear model. Cipriano (2008) suggests systems thinking requires the “use of nonlinear thinking to understand how things work” (para. 6). Richmond (2018) contends the challenge is recognizing that without systems thinking we cannot readily critically think, an important component of nursing education and practice. Richmond asserts that developing systems thinking involves several ‘critical thinking steps’ beginning with dynamic thinking (framing of problems to patterns over time) and ending with scientific thinking. He further describes how these steps can apply to business, educators, and students in developing critical thinking skills and the connectedness to systems. This is supported by Broks (2016) who posits that a 21st century education requires a comprehension of the interconnectedness of parts; “analysis, comparing, and synthesizing as three fundamentals for the operation of systems thinking” (p. 409), and that it is “not enough to just advocate for critical thinking” (p. 408).

In high tech environments and complex healthcare systems, there is an emphasis on learning how to collect data, pull it together, recognize connections, synthesize, and see trends for more in-depth information. This requires complex thinking and to use multiple sources of information to gain new knowledge necessary to make care decisions. Students specifically experience difficulties connecting forces that interact and impact decisions. They often view details as tangible categories, which can be discrete as opposed to interactive. What is desired is a student perspective that goes beyond an event and instead engages the student to develop an understanding of an open system that is complex yet adaptive and constantly changing (Taghreed, 2014).

Strategies for teaching systems thinking

The challenges faced educating healthcare students leaves little, if any, space to add other components to curricula. Yet, linking systems thinking in development of critical thinking and wisdom will better prepare students for the work environment upon graduation. Ways to facilitate a systems thinking approach in nursing education is through integrating concepts such as TeamSTEPPS®, IPE, and IPP within our current technologically complex healthcare delivery system. With the concerns identified by clinical settings for new graduates many academic settings are working to educate students in such methods as TeamSTEPPS®. It is well documented the significance of outcomes when providers collaborate, communicate, and coordinate as teams. Although the mental and visual model of systems thinking remains somewhat illusive in curricula the principles of both TeamSTEPPS® and IPP have components of systems thinking applied to healthcare organizational systems.

Team STEPPS®

Undergraduate healthcare student's education focuses a great deal on individual knowledge and skills. However, high-tech healthcare environments, with many disciplines that work within it, work as teams. A method that is fundamentally recognized in the clinical setting is TeamSTEPPS®; an approach to collaborative teamwork involving all healthcare disciplines in healthcare settings. The Agency for Healthcare Research and Quality (AHRQ) designed TeamSTEPPS® training curriculum that integrates teamwork principles to improve communication and skills in all areas of the healthcare system (AHRQ, 2017). As an evidence-based program it results in higher quality care by optimizing the use of information and improving information sharing, as well as increasing team awareness. It also is aimed at creating and sustaining a culture of safety. This nonlinear approach educates practitioners in the

clinical setting with specific nomenclature and terminology for teams to engage in a systems approach to delivering care.

For healthcare students to be prepared for the work setting these and other concepts are necessary, along with learning the terminology and nomenclature to communicate with multiple disciplines. In the recent past students in the clinical setting have not been versed in the principles of Team STEPPS®. The clinical settings have communicated requests to teach TeamSTEPPS® to healthcare students while in the academic setting. Answering the call, various approaches have been implemented on the topic of TeamSTEPPS® in classes and clinical settings that focus on professionalism and leadership. This helps to develop teamwork and collaboration necessary to work in interprofessional/interdisciplinary teams, in contrast to undergraduate level education that has focused on details of individual knowledge and individual success and not the success of the team. Therefore, developing students' skills and abilities to work in teams collaboratively in each required course should be the norm. The depth of details can build within group work to engage further questions generating connections leading to systems thinking, necessary for critical thinking to develop.

Interprofessional education and interprofessional practice

Even with evidence that supports IPE and accreditation requirements it is still difficult to infuse IPE concepts throughout entire programs. Few curricula have been revised to comprehensively include IPE in mandatory credit load courses; due to the depth and amount of required content. Approaches to integrate IPE in Universities and schools has included creating IPE departments or centers to promote, engage, and grow the principles of IPE for the healthcare students. Other approaches provide certificates of completion of activities or required activities outside of credits earned within the curricula. An example with earned credit includes required observations in clinic environments together as part of IPP teams during undergraduate course work. The concepts and principles of IPE can mirror those of TeamSTEPPs® enhancing the skills and knowledge to think in a global and systems thinking vantage point; thus, developing more critical thinking abilities (Clark, 2016a) (Appendix A).

To effectively teach IPE it is imperative to bring the students and the respective discipline faculty together (Birk, 2017). This demonstrates the collaborative aspect, placing all participants on a similar contributory level (p. 1). A course created and implemented by Clark, Congdon, MacMillan, Gonzales, and Guerra (2015) consisted of four different academic disciplines and a variety of levels academically. The students were exposed to different scopes of practice and this experience, although challenging for faculty, was a learning experience for all. In this course faculty were present at each class from the respective four disciplines demonstrating collaboration, communication, respect and value of the team.

Barriers exist to IPE education due to its challenges compared to traditional hierarchical development of health care professions. Typically, educational healthcare systems have a leader from a healthcare profession in charge. With this model it can be difficult to view situations and make decisions from a team approach. In developing IPE classes for students, involved and committed faculty in many instances are constrained by factors such as requirements of 'workload' and budgetary limitations. These factors can prevent more than one faculty to be present at the same time during class. Regardless of the barriers and challenges in education, Birk (2017) recognizes IPE in education bringing multiple disciplines of faculty and students together, should be the focus to improve patient centered quality and safe care (p. 1). He suggests increasing the use of technology for web-based conferences, and distance learning; to reach more participants (p. 1).

Curriculum content to promote systems thinking

In the academic settings courses focus on developing connections; building or scaffolding knowledge. An example is course work leading up to learning about co-morbidities and to create the environment of a larger body system where many intersections are seen within a system. However, along the educational scaffold linear thinking is the focus and thus the challenge is switching to non-linear thinking. Interprofessional students' teams have a better opportunity to engage and think non-linearly with different views as to how a system works. An example of merging disciplines early in pre-licensure education would be to require a course for multiple disciplines in professionalism and professions. This platform could begin the process or help to develop systems thinking using IPE as the vehicle. Another important platform in healthcare education is the infusion of informatics with technology in our high-tech healthcare environments. Blending the profession students within an introduction course to healthcare systems and informatics could provide rich discussions and integration of the principles of TeamSTEPPS® and IPE applied to practice and learning to communicate based on the differences in terminology (Appendix A).

Further opportunities exist to develop methods in building systems thinking. Using peer to peer learning with groups of mixed disciplines can help students discover and open the closed loops of their professional identifications and make important linkages in healthcare. Designing more group work throughout courses starting with specific topics to engage, develop and create new questions builds on care delivery knowledge. Groups thinking, and interacting can promote systems thinking and develop critical thinking skills. Collaboration, communication, and valuing each team members discipline establishes and reinforces an overarching system to work effectively and embrace self-motivation to move the team forward. Creating such courses across disciplines as required credit would enhance IPE, respect, exposure and learning about scopes of practice, communication, collaboration and teamwork required upon graduation; thus, more prepared for the challenges when entering the work world. Dolansky and Moore (2013) recommends undergraduate nurses use the clinical environment to broaden the learning focus of 1–2 patients to a focus on sequences of events. We can accomplish this with IPE/IPP and engaging in role modeling teamwork in the clinical arena.

High tech environment

High-tech environment core competencies recommended by the American Nurses Association (ANA) are necessary for successful teams. The ANA Scope and Standards of Informatics (Bickford, 2015) covers much of what the high-tech environment in healthcare systems requires of healthcare providers and what students must be prepared for upon graduation. Some of the standards for informatics include: competence, communication, leadership, more developed collaboration as collaborators, effective and safe use of informatics, and environmental health. In standard four of the ANA Standards of Nursing Informatics Practice information gleaned helps to develop plans for strategies/alternatives to come up with ideas on how to reach expected outcomes. New graduates entering the workforce require competence in this realm to help them understand how technology works within the healthcare system and to learn systems thinking, required for critical thinking. The challenge is how to modify curricula to engage, educate and motivate healthcare students so they are fully prepared for the work environment requires new approaches. New approaches for the 21st century revise methods that we have traditionally used, incorporating a more non-linear skill set for processing and synthesizing information.

Pedagogies in the 21st century in teaching systems thinking

For students and faculty to be effective in their teaching of systems thinking one must look at the methods we use in higher education. As educators we use a variety of teaching styles and methods to engage students. Two main theories that are commonly discussed are 1) Pedagogy, and 2) Andragogy. At times we blend some of the concepts or

principles from both. Pedagogy typically is teaching new information to students that are not necessarily self-directed or motivated, thus, providing more structure. Andragogy is geared more to the adult learner who is more self-motivated, uses past experiences to help learn new concepts, and can apply more of the concepts to solve problems. Many times, they are blended depending on what is needed at the time. Another method incorporated is using reductionism to divide the whole into parts, with the expectation that understanding the details of the parts will lead to new knowledge of how the whole operates and interacts.

Reductionism

Traditionally much of healthcare education follows a reductionist approach. According to Dictionary.com (Reductionism, 2018) reductionism is "the theory that every complex phenomenon, especially in biology or psychology, can be explained by analyzing the simplest, most basic physical mechanisms that are in operation during the phenomenon. This includes the practice of simplifying a complex idea, issue, condition, or the like; especially to the point of minimizing, obscuring, or distorting it" (para. 1). Another point is 'complexity' which can be understood or interpreted by the simplest minute parts. According to Power (2017), this approach ignores the high level of integration of factors that emerge from complex interactions and "dynamic integrated systems cannot be properly understood and properly treated and cared for in isolation" (p. 721). Educating healthcare students using the reductionist approach is beneficial early on to learn about the component parts and how they relate however, it does not fully prepare them for the complex workplace upon graduation.

Much of medical education over the past two centuries has used a reductionist approach to teaching (Ahn, Tewari, Poon, & Phillips, 2009). However, a systems approach is now advocated. When using a systems approach there is more of a focus and understanding on the dynamic of the whole and not the divided and isolated parts. The dynamics of systems, and applying the knowledge in complex environments upon graduation, recognizes that reductionism alone is insufficient in preparing new graduates. Further, Gehlert, Ressler, and Baylon (2013) expressed concerns that "the complexity of challenges cannot be successfully engaged using linear, reductionist thinking. Today's complex challenges include: globalization, global warming, economic instability, right to life issues, terrorism, scientific/technological breakthroughs, healthcare, converging of religious and political differences, a created polarization in our society" and created gridlock (pp. 79–80). They indicate educators do not successfully integrate systems thinking within coursework/curricula, nor adequately teach systems theory; where every part of the system engages in every other part of that system.

Newer teaching/learning theories in the 21st century approach younger generations emphasizing hi-tech approaches and concepts focusing on the rapidly changing environment and educational expectations. Two such learning theories will be discussed here: Paragogy and Heutagogy.

Paragogy

Paragogy is identified as a 'new culture of learning' (Herlo, 2014) and is defined as the study and practice of peer learning. It began with the digital age, with digital technology and distance learning and focused on discovering how to attain wisdom by using data, information, and knowledge. Thomas and Brown (2011) recognized that we are moving, and in many instances have moved, from our past infrastructure that has been solid and unwavering, to a much more fluid infrastructure. We recognize that these changes engage and are continuously changing surrounding technology creating new realities. Today digital technology has, in some ways, created a digital divide as educators tend to hang on to past principles of solid structures that are likely prescriptive. There are reasons to be prescriptive in our respective disciplines, however, it is necessary to consider flexibility in how we engage, influence, and lead in this changing environment; ultimately changing culture. This new method of learning does not just include traditional classrooms, books, and in direct teaching from educators, it involves much more peer to peer and distance learning. Examples of Paragogy in action include gaming and play. We can see this in how children learn when playing, enhancing their imagination. Gaming is like innovative creations in industry that are used by adults as well as children; which lead to new concepts and ideas. This changes what we know as the culture of learning. However, this idea does not negate the classroom or traditional methodologies, it translates and transfers the engagement to a broader realm, ultimately reaching the younger generations of the 21st century.

Paragogy requires the massive framework of readily accessible information networked and at the fingertips of learners. In addition, having the environmental structure to facilitate building by experimenting with ideas or things within boundaries must be included. In many ways this is integral with systems thinking. With this broad network of what is available, information literacy is a prominent factor. We see this in the concept of information and understanding definitions and methods of ways we require data to become information to gain knowledge (an informatics approach). To do so we must develop skills in collaboration, communication, reasoning, critical thinking, and recognition of the value of others in decision making included in what Tan, Choo, Kang, and Liem (2017) term as 21CC or twenty-first century competencies. These skill sets include flexibility, recognizing there is more to the details at hand, (systems thinking), leadership, positive of self, strong work ethic and even intellectual openness (sharing of innovations). Many challenges exist related to culture, policy, globalization, economies, worldwide volatility and terrorism. Taking into consideration these challenges and the generational differences with rapid changes, this is more reason to modify our approach to how we educate our students.

Peer to peer learning can be discipline specific for students engaging with each other. Some methods already used can be described as tutoring students, students to students, and in groups working together on projects, as ways students can learn from each other. The phrase peer to peer learning is also essentially what we do with IPE. Students learn from and about each other; which creates richer interactions and more real-world expectations.

Lee and Rofe (2016) discuss a research course designed for peer to peer learning using the platform of a massive open online course (MOOC). Creating an environment online has different challenges of time, synchrony, and asynchrony. The peer to peer learning in this course had students, from different disciplines, review each other's work. They employed such activities as open peer assessments along with sequenced activities. This approach was identified as a flipped assessment. A model that they used within this approach was the IR model or intellectual reflection of performance between students, faculty, and the discipline. Rofe (2016; as cited in Lee & Rofe, 2016) explained this model demonstrated that it "places the student at the centre of learning in ensuring enhanced levels of student engagement and, subsequently, achievement. Students learning via the IR Model achieved 5 to 8% better marks than their counterparts on modules taught using traditional pedagogies" (p. 121). Though Lee and Rofe (2016) focus on distance or e-learning employing platforms such as MOOC or Blackboard, what they found with flipping assessments can be replicated as well in brick and mortar environments for healthcare students.

Other examples of using flipped assessment activities for peer to peer approaches can be asking students to reviewing each other's written papers. Other methods to engage students would be working in groups throughout their programs of study in every class; not just for group projects. Students would work together to solve complicated case scenarios using loops for feedback and discussion and use peer to peer

review in simulation activities as well. In using simulation, some activities can be self-determined learning where students have the flexibility in choosing options to scenarios. Simulation helps the students recognize processes and options when dealing with a complex problem that requires many thoughtful considerations for prompt and realistic decision making. As an example, students are given a scenario where there is a Mso4 order for 4 mgs IVP for pain and the student is concerned about respiratory depression. There should be flexibility to consider a lower dose. The problem appears when the scenario has a written order 4 mgs. The thinking here is possibly 1 or 2 mgs could take the reduce the pain and not cause significant respiratory depression. When the scenario checklist considers only the one order for a specific dose there should be the option to call the physician to request alternatives, such as a range for the dosage, and the recognition that the student considered other options. This encourages the student to think about all interactions and options that might be available. More importantly to verbalize it during the simulation. These ways of thinking lead to connections between the concepts of QSEN and TeamSTEPPS®; infusing IPE and IPP in our high-tech environment with a basic understanding of information systems and broad systems thinking (Sherwood & Zomorodi, 2014). Bassendowski (2016) an informatics nurse in Canada, discussed her first exposure to Paragogy. She emphasized (when thinking in terms of using Paragogy) "students need to make these blended and seamless connections and links with each other in order to be successful in their nursing programs" (para. 2).

Heutagogy

According to Blaschke (2012) the principles and the practice of Heutagogy is founded in those of Andragogy. It is self-determined learning or self-motivation to learn (Blaschke, 2012; Herie, 2013). A goal of this approach is that learners are well prepared for the complexities of the workplace. Further, Blaschke (2012) discusses how Heutagogy has been approached as principles for technology and distance education with a learner centered design. One method or design using Heutagogy discussed by Blaschke (2012) is termed learner directed questions. These questions are self-directed and guided by the course topics. Learners can engage with each other beginning with initial questions or topics. When building responses more questions come forward. As the learners in groups address the additional questions the scope of answers develops further questions and broadens the new information leading to increased depth of new knowledge.

Canning and Callan (2010) implemented an approach with students using Heutagogy as a guide. One approach used was reflections. Students were encouraged to reflect to control their own learning as they moved to develop further self -directed learning. "As course leaders we encouraged both students and course team tutors to facilitate a space where reflective thinking, questioning theory, and being critical of practice could take place to explore students' values and attitudes and to develop a process of students engaging with the concept of Heutagogy" (p. 74). Reflective thinking, as a dynamic, is an activity within groups and individuals in distance education. In traditional classroom environments students use this to recognize and build knowledge increasing self-motivation to learn.

When addressing medical education Abraham and Komattil (2017) speak to the need to educate medical professionals using the principles of Heutagogy, developing what they coin as 'capable learners'. They discuss an experience in undergraduate medical education where a foundation is set for the students to design their own projects with the close guidance of a mentor. Although this approach is focused specifically on the medical discipline, it could be designed for interprofessional groups to build working relationships as they address and explore nonlinear relationships. With the complexity of the workplace, educating healthcare professionals engaging the concept of Heutagogy is a prime example of interprofessional educational approaches.

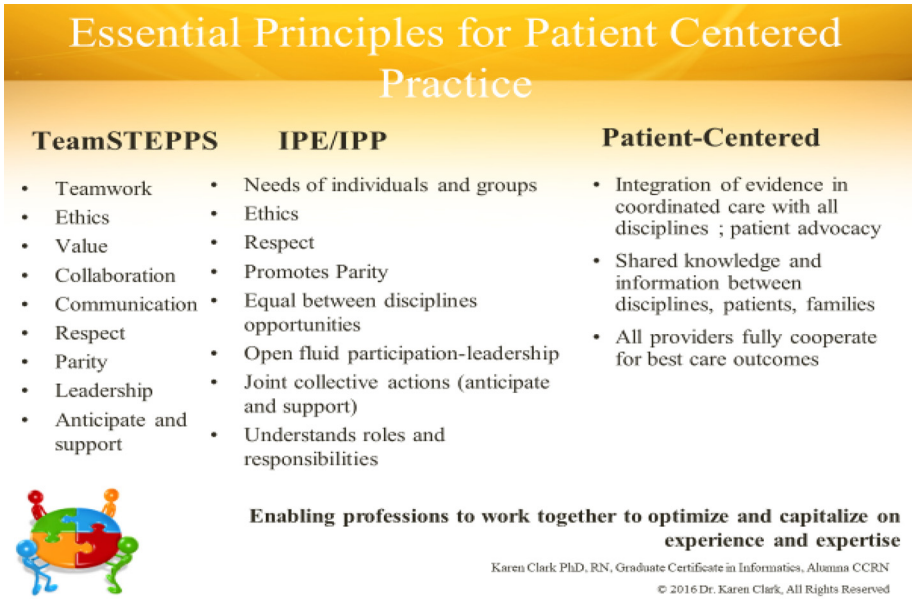
Challenges

Challenges continue to exist within curricula as to how better to design and integrate consistent components in required healthcare courses to develop systems thinking. We see this in pre-licensure and RN to BSN education programs. Phillips and Stalter (2016) focused on identified needs for RN to BSN education incorporating the BSN Essentials and the QSEN competencies to teach critical thinking. RN to BSN practicing RNs have firsthand experience with delivering care, however, have not necessarily developed the knowledge and ability to systems think; necessary for further learning to apply critical thinking; a must for leadership and leadership capabilities. Though Phillips & Statler focus on RN to BSN education much of what is discussed also applies to educating pre-licensure students. In examining the BSN Essential II and the QSEN competencies in the table provided by Phillips and Stalter (2016), team work, collaboration, evidence-based practice, safety (p. 18) and even informatics (p. 20) are clearly identified and integral in delivering quality safe care. This is necessary for success in terms of care coordination, interprofessional teams and communication. Educating with team work and group activities facilitates learning with and from each other and should be part of all required course work.

The nurse of today understands and operates having integrated the QSEN competencies into their own individual care, but not at the level of the system of care (Dolansky & Moore, 2013). Employing new theories and methods can lead to stronger connections between the competences of QSEN, the concepts of TeamSTEPPS®, and the infusion of IPE and IPP in our high-tech environment. This promotes an in-depth understanding of systems and its interdependences, creating more methods to educate systems thinking early on and thus, develop critical thinking skills to be more prepared for the rapidly changing work environment (Sherwood & Zomorodi, 2014).

Appendix A

Essential principles for patient centered practice (Clark, 2016b).



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